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THE TAXONOMIC STATUS OF *STAHLECKERIA IMPOTENS* (THERAPSIDA, DICYNODONTIA): REDESCRIPTION AND DISCUSSION OF ITS PHYLOGENETIC POSITION

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ABSTRACT – The cranial and postcranial materials of the holotype and paratype of the recently described *Stahleckeria impotens* Lucas from the Middle Triassic of Brazil is redescribed. These specimens are compared to juveniles and adults of *S. potens* Huene. The available data indicate that the materials of *S. impotens* represent merely juvenile or immature specimens of *S. potens*. *Stahleckeria impotens* is thus considered a junior subjective synonym of *S. potens*. The materials share important characteristics with other derived tuskless kannemeyeriiforms, such as *Angonisaurus*, *Ischigualastia* and *Jachaleria*. A lectotype is designated for *S. potens*.

Key words: Therapsida, Dicynodontia, *Stahleckeria*, Middle Triassic, Brazil.

RESUMO – São redescritos materiais cranianos e pós-cranianos do holótipo e parátipo de *Stahleckeria impotens* Lucas, uma espécie de dicinodonte recentemente descrita como um novo representante do Triássico Médio do Brasil. Estes espécimes são comparados com adultos e juvenis de *S. potens* Huene. Os dados observados indicam que os materiais de *S. impotens* representam exemplares juvenis ou imaturos de *S. potens*. *Stahleckeria impotens* é aqui considerada sinônimo subjetivo júnior de *S. potens*. Os materiais compartilham características importantes com outros kannemeyeriiformes derivados e sem presas, como *Angonisaurus*, *Ischigualastia* e *Jachaleria*. É designado um lectótipo para *S. potens*.

Palavras-chave: Therapsida, Dicynodontia, *Stahleckeria*, Triássico Médio, Brasil.

INTRODUCTION

The Middle Triassic tetrapod continental fauna from southern Brazil include a large number of herbivorous taxa, among which there are also several dicynodonts. One of the most conspicuous herbivores of the fauna is *Stahleckeria potens* Huene (1935), a huge dicynodont from the Chiniquá fauna, Santa Maria Formation, Rio Grande do Sul state. The material described by Huene comprises three skulls and numerous postcranial elements of adult specimens, as well as some postcranial bones attributed to a juvenile specimen.

Camp (1956) interpreted the skull of *S. potens* quite differently from Huene's (1935) original account; however, he based his drawings on an incomplete skull with a lot of plaster restoration (designated here as a paralectotype GPIT/RE/8002), which is one of the three skulls described by Huene (1935). Recently, Maisch (2001) presented a new reconstruction of the skull of *S. potens*, which agreed in all major points with the original description of Huene (1935).

A tuskless anomodont collected in an outcrop close to the type locality of *S. potens* was described by Romer & Price (1944). This new species, *Stahleckeria lenzii*, was later redescribed by Cox (1965) as a new genus, *Barysoma*. Lucas (1993) considered *Barysoma lenzii* as a junior synonym of *S. potens*, and suggested that *S. lenzii* and *B. lenzii* would be invalid taxa, making of *Stahleckeria potens* the only valid taxon. Recently, Lucas (2002) described a new species *Stahleckeria impotens*, from the Santa Maria Formation (Ca-

choeira do Sul city, Rio Grande do Sul). The name of the species refers to its small size.

The purpose of this work is to redescribe the materials of *S. impotens*, and to evaluate its validity, demonstrating that some important cranial and postcranial features were either ignored or misinterpreted by Lucas (2002). Furthermore we discuss the impact of the new morphological information resulting from our study on the phylogenetic relationships of *Stahleckeria*.

Abbreviations

Institutional abbreviations. DGM, Museu de Ciências da Terra, DNPM, Rio de Janeiro, Brazil; **GPIT**, Institut für Geologie und Paläontologie of the University of Tübingen, Tübingen, Germany; **MCP**, Museu de Ciências e Tecnologia, PUCRS, Porto Alegre, Brazil.

Anatomical abbreviations. a, angular; **ar**, articular; **d**, dentary; **f**, frontal; **ip**, interparietal; **j**, jugal; **l**, lacrimal; **mx**, maxilla; **n**, nasal; **p**, parietal; **pmx**, premaxilla; **por**, postorbital; **prf**, prefrontal; **q**, quadrate; **qj**, quadratojugal; **sa**, surangular; **smx**, septomaxilla; **sq**, squamosal.

EXAMINED MATERIALS

Type-materials. *Stahleckeria impotens*, MCP 272PV, holotype, skull, lower jaw and partial skeleton;
DGM269-R, paratype, skull and lower jaw;
Stahleckeria potens: Lectotype by present designation, GPIT/RE/8000, skull [specimen originally described as skull 1 by Huene (1935)]. Paralectotypes, GPIT/RE/8001, skull [specimen originally described as skull 2 by Huene (1935)] and almost complete mounted skeleton; GPIT/RE/8002, skull [specimen originally described as skull 3 by Huene (1935)].

Non-type material. *Stahleckeria potens*, GPIT/RE/00600/1-9, scapula, precoracoid, coracoid and a humerus attributed to a juvenile individual.

DESCRIPTION

The holotype of *S. impotens* (MCP 272PV) is an almost complete skull, compressed and deformed antero-posteriorly. The right posterior side of the skull, corresponding to right squamosal, is damaged by diagenetic features. The mandible is attached to the skull. The paratype specimen (DGM 269-R) is also almost complete, lacking part of the interorbital bar, the latero-anterior and posterior process of the right squamosal. The skull is compressed laterally, mainly in the temporal region, and most of the sutures are difficult to visualize in this exemplar. The mandible is also attached to the palatal region.

Skull

Dorsal view. The skull length of *S. impotens* (MCP 272PV) is 40 and its width is around 25 (Figure 1), while DGM 269-R has 36,7 in length and width of approximately 26 cm. The total skull length of *S. potens* is around 50 and its width is around 60 cm. So, the skulls of *S. impotens* seem relatively much narrower as compared to *S. potens*.

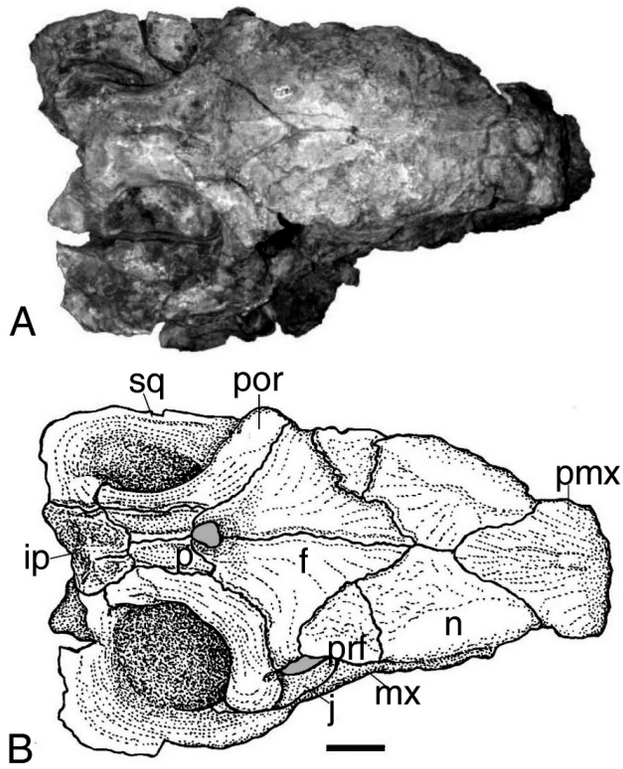

Figure 1. *Stahleckeria impotens*, MCP 272PV, holotype. Photograph (**A**) and drawing (**B**) of the dorsal view of the skull. Scale bar = 5 cm.

The snout of *S. impotens* is long and rectangular. The premaxilla is a huge bone, nearly triangular, with a great participation on the snout. This bone contacts the nasals posteriorly, sending a long lanceolate tip backwards that comes close to the anterior margin of the frontals, as in *S. potens*. Although the dorsal exposure of the maxillae is a diagnostic character of this species (Lucas, 2002), the contact between premaxilla and maxilla is not seen and the maxilla does not appear in dorsal view.

The nasals are large and extend strongly laterally. The sagittal suture of the nasals is small, as they are almost separated by the ascending premaxillary process and the anterior processes of the frontals. In the exemplar MCP 272PV, there is a small crest on the dorsal snout surface which begins in the posterior part of the premaxilla and extends up to the posterior ends of the nasals, but does not reach the frontals. This small crest is not observable in DGM 269-R, neither in premaxilla nor nasals. In *S. potens* the crest is observed, although Maisch (2001) only show the principal crest on the premaxilla, which is more pronounced.

Lucas (2002) noted that the suture between nasals and frontals is not clear, although he presented the supposed suture between these bones (Lucas 2002, fig. 5A). Nevertheless both specimens (MCP 272PV and DGM 269-R) show clearly that the frontals extend far anteriorly penetrating between the nasals, just as in *S. potens*, and seems to be quite close to Lucas interpretation. The frontals of both specimens of *S. impotens* do not present any crest or

depression, and lateral expansions in direction to the orbits are visible.

The prefrontals (not mentioned in Lucas, 2002) are clearly seen in MCP 272PV, and can be delineated between the nasals and frontals (Figure 1B). They have an almost triangular shape, extending more latero-medially than antero-posteriorly, as in *S. potens*. In DGM 269-R, the prefrontals seem to be more rectangular shaped, although sutures are not clear.

In MCP 272PV, the postorbitals are extensive, reaching the squamosals posteriorly, as in *S. potens*. The intertemporal bar is large, and the pineal foramen is largely enclosed by the frontals, with the parietals only forming the posterior border, as in *S. potens*. In DGM 269-R the position of the pineal foramen in relation to the frontals and parietals is not clear.

The parietals are rectangular, contacted posteriorly by the interparietals. In MCP 272PV, that are subdivided by a strongly intergrown but decidedly visible sagittal suture. The interparietals intrude deeply on the skull roof, as is clearly visible in dorsal view. In DGM 269-R, the interparietal is a single bone, attached to the skull roof by a prominent anterior pointed expansion. In *S. potens*, the sagittal suture of the interparietals, although presented with broken lines by Maisch (2001), was reanalyzed and is clearly visible in GPIT/RE/8001, in the mounted skeleton, and seems to appear also in GPIT/RE/8000.

The temporal fenestrae in both exemplars of *S. impotens* are antero-posteriorly elongated, which is probably exaggerated by deformation. Originally, however, it was probably wider and thus more similar to *S. potens*.

Lateral view. The left sides of the skulls MCP 272PV and DGM 269-R are better preserved (Figure 2). The skulls are little deformed anteroposteriorly, and this is probably the reason why the premaxilla does show the same ventral projection as in *S. potens*. The premaxilla and maxilla suture appears in the anterior region of the ventral projection of the caniniform process. The external naris is enclosed by the premaxilla, maxilla and nasal.

The maxillae lack tusks. The caniniform processes are short, not pointed and less developed than in most specimens of *S. potens*, but rather similar to those of GPIT/RE/8002 of that species described by Huene (1936) and Camp (1956). These processes show reentrances and rugosities that could have served for a better attachment of the horny beak. This feature is found in both maxillae of *S. impotens* and also occurs in *S. potens* (GPIT/RE/8000).

The septomaxilla is clearly visible in left lateral view of MCP 272PV and DGM 269-R, occupying the same position than in *S. potens*. As the septomaxilla is short and not exposed on the lateral snout surface, but restricted to the circumnarial recess, remaining far separated from the lacrimal, the nasals have an extensive contact with the maxillae laterally.

In MCP 272PV the lacrimal forms the whole anterior border of the orbit, and is limited dorsally by the prefrontal. The prefrontal is large and forms the antero-dorsal border of the orbit in MCP 272PV and DGM 269-R. Also in both specimens, the frontal occupies just the dorso-central portion of the orbital margin, as in *S. potens*, and is followed by the

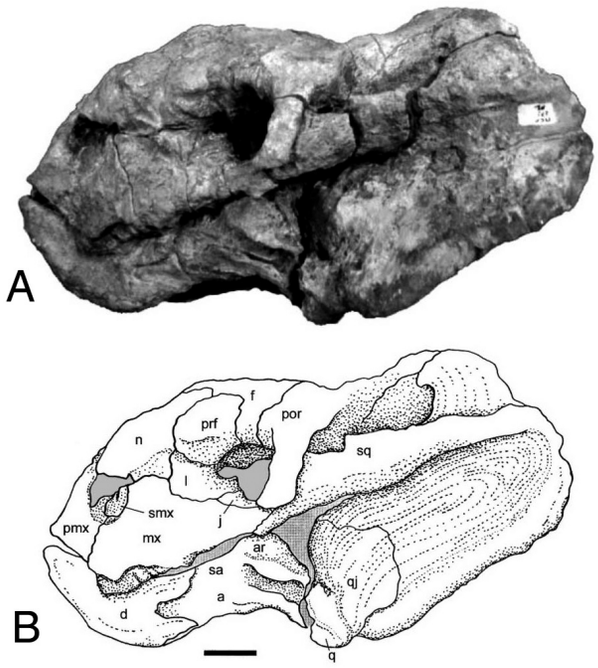

Figure 2. *Stahleckeria impotens*, MCP 272PV, holotype. Photograph (**A**) and drawing (**B**) of the left lateral view of the skull. Scale bar = 5 cm.

postorbital, that forms the whole posterior border of the orbit. As in all kannemeyeriiforms, there is no separate postfrontal.

The suture between lacrimal and jugal is not clear, but most probably the jugal occupies the whole ventral border of the orbit. The jugal also seems to be displaced into the internal part of the orbit. The contact between maxilla and squamosal is clearly V-shaped, with the maxilla intruding deeply into the squamosal, as in *S. potens*. The postero-lateral aspect of the skull is dominated by the squamosal. The suture between squamosal and quadratojugal is clear in MCP 272PV, and seems to be quite comparable to *S. potens*.

Occipital view. In occipital view (Figure 3A), MCP 272PV shows the ventral half of the skull quite compressed laterally. The right side of the skull is very damaged, and it is impossible to see any suture. In DGM 269-R, the compression is very pronounced, and the ventral portion was projected anteriorly.

The dorsal portion of the occiput, that forms the intertemporal crest, is dominated by the interparietals in MCP 272PV. In DGM 269-R, on the contrary, it is observed a single interparietal. Considering the anteroposterior and lateromedial compressions of the skull, the intertemporal crest seems to be similar to *S. potens*, where the crest is low, almost incipient, but relatively wide.

Incomplete squamosals occupy the lateral margins of the skull in MCP 272PV. The suture between quadratojugal and squamosal is visible only on the left side of the skull. The supraoccipital is not clearly seen in occipital view, since this region is much compressed. In DGM 269-R, the left side of the skull is complete but poorly preserved. In this specimen, it is possible to visualize the contact between quadrate and quadratojugal.

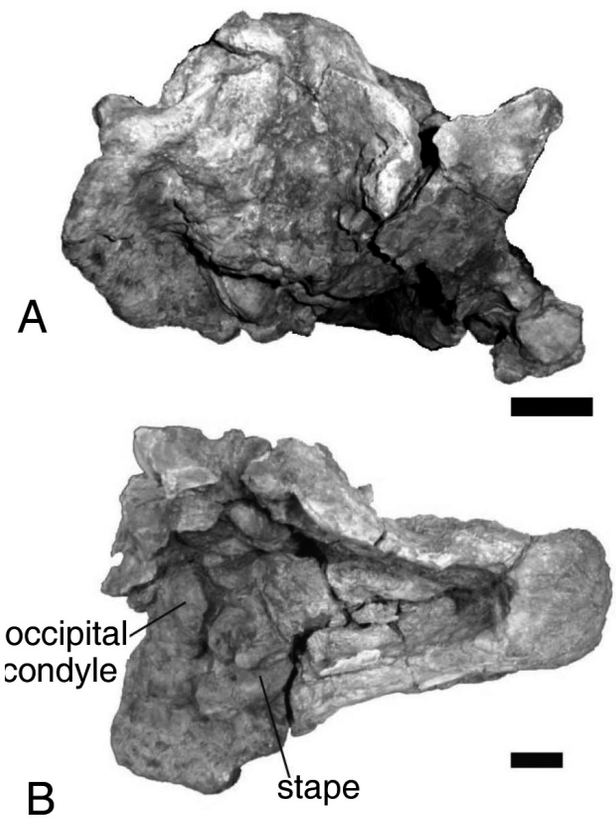

Figure 3. *Stahleckeria impotens*, MCP 272PV, holotype. Occipital (**A**) and ventral (**B**) views of the skull. Scale bars = 5 cm.

Although Lucas (2002) presumed about the absence of the tabular, this region is so poorly preserved that it is not possible to distinguish any other bones beyond squamosals, interparietals and quadratojugals.

Ventral view. The lower jaw is preserved in situ and articulated to the skull in MCP 272PV and DGM 269-R. Removal of the lower jaw by preparation seems impractical at the moment, because there is high risk to damage the specimen. Therefore, most of the features of the ventral surface of the skull (Figure 3B) are inaccessible for study.

The right side of the skull MCP 272PV is badly preserved. All the bones are distorted and crushed. Since the skull is compressed antero-posteriorly, parts of occipital bones are observable in ventral view, as described below.

The occipital condyle measures around 3 cm, and is formed by the basioccipital and exoccipitals. The semilunate exoccipitals are indistinguishably fused to the periotics. Anterior to the occipital condyle, the tubera basioccipitalia measuring around 3 cm are clearly exposed. The tubera contact the stapes laterally. The stapes is very huge, with its extremities larger than the shaft of the bone and contacting the quadratojugal laterally.

The squamosals dominate the lateral sides of the skull. The contact between squamosal and quadratojugal is clear and similar to *S. potens*.

Lower jaw. The left sides of the mandibles (Figure 2) are better preserved, although in DGM 269-R it is not possible to identify any sutures. The dentary of MCP 272PV is anteriorly robust and shows strong rugosities on its lateral and ventral surfaces, which mark the attachment of the horny beak in life. The dentary contacts the angular and surangular posteriorly. The angular has a well developed reflected lamina and it is not possible to observe suture between this bone and surangular in any exemplars. In the posterodorsal region of the lower jaw is observed the lateral condyle of articular (contrary to Lucas 2002, fig. 5D). This condyle is separated from the reflected lamina of the angular by a small and deep recessus angularis.

Vertebrae and ribs. There is a sequence of articulated cervical and anterior dorsal vertebrae with the left scapula and some ribs attached. The portion of the vertebral column is broken and separated into two portions, which complement each other (Figure 4). The vertebral column continues with another sequence formed by four articulated dorsal vertebrae and an articulated rib. The centra of all vertebrae are slightly amphicoelous, as in all Triassic forms.

The first vertebral sequence is poorly preserved. The vertebrae are covered by the left scapula, and present such dorsal contortion as expected due to cadaveric rigidity. The anterior half presents the whole cervical series, including the atlas, and attached dichocephalous ribs. The posterior portion, after the scapula, displays some clear dorsal vertebrae. This sequence is complemented by the second portion of the vertebral column, showing short and robust neural spines. On the lateral surfaces of the vertebrae, there are only synapophyses for the attachment of the holocephalous ribs. There is a distinctly holocephalous rib attached to the fifth dorsal vertebra, where it is slightly displaced dorsally and located besides the neural spine. All the characters of the neural spines and rib articulation demonstrate that this second portion belongs to the posterior part of the dorsal vertebral column (Cox, 1965; Vega-Dias & Schultz, 2004), and not to the neck, as envisaged by Lucas (2002, fig. 3A).

The vertebrae of Triassic dicynodonts are not diagnostic on the familiar or generic levels. According to Lucas (2002), the vertebral elements do not differ, except in size, from those of *S. potens*, a view with which we agree.

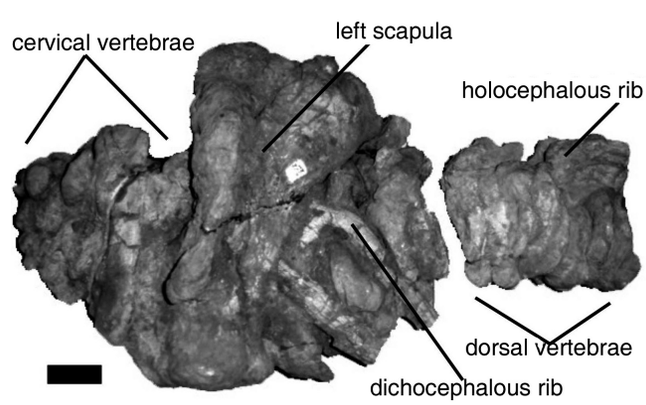

Figure 4. *Stahleckeria impotens*, MCP 272PV, holotype. Cervical and dorsal vertebrae. Scale bar = 5 cm.

Pectoral girdle. Only part of the right scapula and the complete left scapula of the type of *S. impotens* are preserved. Preservation of the right scapula is poor, and only part of the scapular blade and the distal extremity are present. Nevertheless, it is possible to see a continuous crest extending along the lateral surface of the scapular blade and into the acromion process.

The left scapula is complete (Figure 5A). The total length of the bone is around 34 cm. In lateral view, the scapular blade measures almost 20 in length, and there is a constriction that measures 10 in width near the acromion. The region for the articulation of the precoracoid and glenoid area measures 10 each, as observed by Lucas (2002).

There are similarities in sizes between this scapula and the right juvenile scapula of *S. potens* (GPIT/RE/00600/1-9) described by Huene (1935) (Figure 5B). The total length of the bone is around 35 in Huene's specimen, the scapular blade measures 17 and the constriction near the acromion has a width of 8cm. The contact area for the precoracoid measures around 10 and the glenoid area has a length of 8,5cm.

The coracoid foramen of *S. impotens* was not observed in the scapula, so it must be inside the precoracoid. All of these features (a lateral scapular spine that runs towards the acromion process, a constriction near the acromion and the position of the coracoid foramen) are also observed in *S. potens*, but with larger dimensions. The scapula of *S. potens* measures almost 59 in length, the scapular blade is around 32 long and the scapula is about 12 in width near the acromion process. The articulation area for the precoracoid is 15, and the glenoid area 14 in length.

Humerus. Both humeri of *S. impotens* are preserved, but just the right is complete.

The left humerus can only be observed in anterior view, since it is still attached to other elements of the skeleton. This bone has just the proximal portion preserved, which is of almost semi-circular shape (Figure 6A). The proximal condyle measures around 10, and the deltopectoral crest around 15cm.

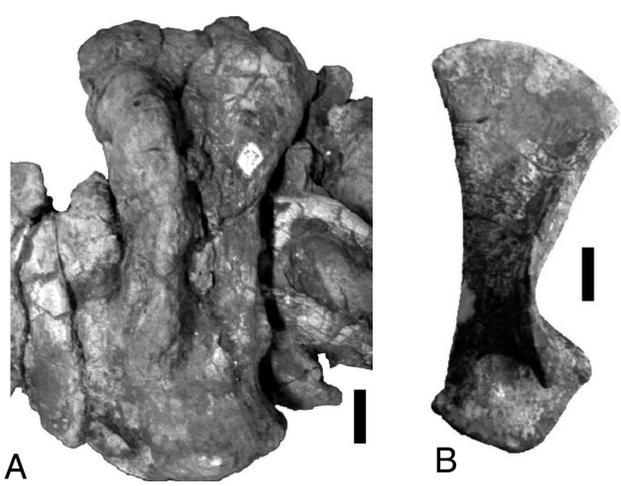

Figure 5. *Stahleckeria impotens*, MCP 272PV, holotype (**A**) and *S. potens*, GPIT/RE/00600/1-9 (**B**). **A**, left scapula in lateral view; **B,** right scapula of juvenile in lateral view. Scale bars = 5 cm.

The right humerus (Figure 6B) was erroneously interpreted by Lucas (2002) as being the left. This bone is complete, but much swollen during diagenesis. The proximal and distal portions have the same length, with a constriction at midlength of the bone, where the deltopectoral crest ends. The humerus is very robust with a length of around 30cm. In dorsal view, the proximal condyle is pronounced, with the caput humeri well defined, measuring around 17cm. The deltopectoral crest has a length of almost 20 and occupies more than half the total length of the bone, which is different from *S. potens*. The width of the distal portion is around 29 cm. The ectepicondyle is more robust than the entepicondyle, but this feature could be due to diagenisis, since the distal portion is very swollen. The torsion of the bone (around 40^0 - 45^0) may also be attributed to the preservation of the material, showing little differences in relation to *S. potens*. In ventral view, the distal extremity shows a well developed trochlea, that can be divided in two portions: the bigger one representing the radial condyle, that occupies almost half of the distal end of the bone, and the smaller one corresponding to the ulnar condyle.

The juvenile left humerus of *S. potens* (Figure 6C) described by Huene (1935) is not complete, as part of the diaphysis is lacking. Nevertheless, it is possible to observe many similarities between this specimen and the humerus of *S. impotens*. In dorsal view, the proximal condyle measures 12,5, and the deltopectoral crest extends for 15cm. On the dorsal surface, behind the proximal condyle, there is a pronounced projection of the bone, that could be for muscle attachment. There is a crest that runs through the bone, corresponding to a concavity in ventral view. In the distal portion, the size and shape of the ectepicondyle and entepicondyle are the same observed in *S. impotens*. In ventral view, the distal articular trochlea of the humerus is also divided in a big part – the radial condyle – and a smallest one – the ulnar condyle – as in *S. impotens*.

The large humerus of the adult specimens of *S. potens* shows similar features. The length of bone is almost 45, the proximal condyle measures 24, the deltopectoral crest has also a length of 24 and the width of the distal portion is around 31cm.

Ulna, radius and manus. The left ulna (Figure 7A) is well preserved, but swollen due to diagenetic processes. Its total length is about 27cm, with the proximal portion more expanded than the distal one. The sigmoid notch for the articulation of the radius is not pronounced. The portion of the ulna distal to the sigmoid notch is clearly longer than the proximal portion, as the olecranon process is not well preserved. Lucas (2002) mentioned that the ulna of MCP 272PV lacks a fused olecranon. In fact, it seems that just part of the olecranon is preserved in anterior view, and the rest of this process was probably cartilaginous, a condition that we interpret as related with the juvenile age of the specimen. Comparisons with the olecranon process of the large *S. potens*, which is very huge and is fused to the ulna, indicates that the olecranon was cartilaginous in the juveniles, and ossified late in ontogeny during the life of the animal.

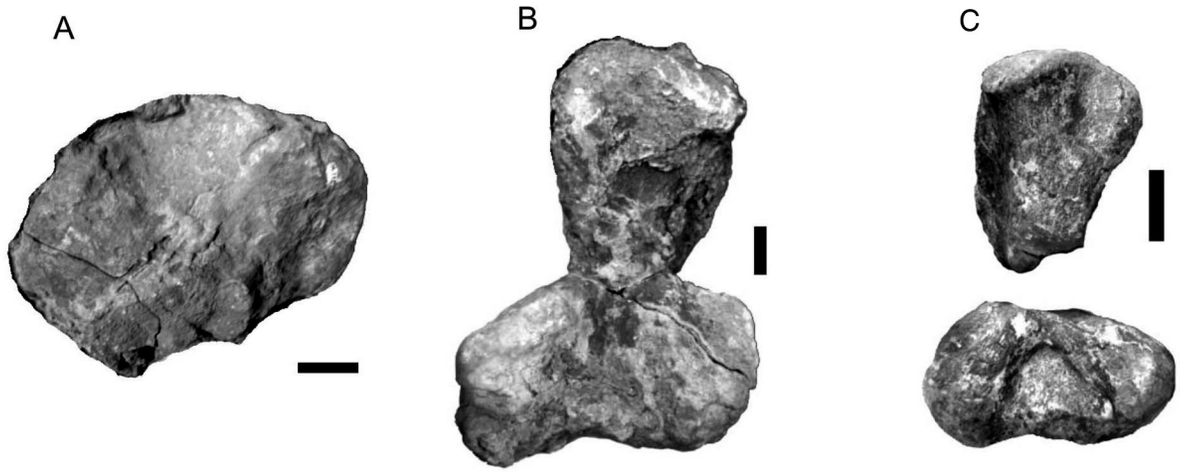

Figure 6. *Stahleckeria impotens*, MCP 272PV, holotype (**A-B**) and *S. potens*, GPIT/RE/00600/1-9 (**C**). **A**, proximal portion of the left humerus in anterodorsal view; **B,** right humerus in dorsal view; **C**, left humerus of a juvenile in dorsal view. Scale bars = 5 cm.

The left radius (Figure 7A) is attached to the ulna. It is as robust as in all kannemeyeriiforms. Lucas (2002) mentioned a very weak biceps tubercle, but in our opinion the scar of the bicepis radialis is not clearly observable, because of the poor preservation of the material. However, there is a clear muscle scar on the medial-distal portion, which was also observed in a similar position in *Jachaleria candelariensis* (Vega-Dias & Schultz, 2004, fig. 17). The distal portion of the radius is more swollen than the proximal portion.

The manus (Figure 7B) is well preserved, with all articulated bones. It has pointed ungual phalanges, as indicated by Lucas (2002).

DISCUSSION

The diagnosis presented by Lucas (2002) for *S. impotens* rests on its dolichocephalic skull, the dorsal exposure of the maxillae on the skull roof, the lack of septomaxillae and the unfused olecranon process on the ulna.

Concerning the shape of the skull, it is necessary to mention that the type and paratype specimens underwent considerable lateral compression and the margins of the occipital wing of the right squamosal are incomplete (Figure 1) which accounts to a large degree for the supposedly narrower skull. Taking slight ontogenetic changes of proportion into account to accord for the remaining slight dissimilarity, there seems to be no reason to separate two species based on skull proportions at the moment. As noted in the decription above, the maxillae of the type and paratype specimens do not show a marked dorsal exposure, and septomaxillae of the same size and morphology as in *S. potens* are observed on the left sides of both skulls.

We observe however that the specimens attributed to *S. impotens* also present some notable differences in relation to *S. potens* in the ventral projection of premaxilla and the development of the caniniform processes. The small projection of the premaxilla could be attributed to the anteroposterior deformation of the skull, and probably originally the shape of the snout was very similar to *S. potens*. The size of the caniniform processes could be an ontogenetic feature: in juvenile exemplars of *Dinodontosaurus*, a tusked dicynodont from the Middle Triassic of Brazil, the caniniform processes are big, but less developed than in adult. In addition, as indicated in the description, there is variation in the size and shape of these processes among adult specimens of *Stahleckeria potens* (Huene, 1936; Camp, 1956).

The interparietal as a double bone is observed in one specimen of *S. potens*, but is not clear in other exemplars neither in *S. impotens*, as discussed above. This, as well as other features like the size of the caniniform processes and a number of other characters, already listed by Huene (1935), such as the shape of the anterior wing of the ilium or the position of the postzygapophyses on the vertebrae, demonstrate that a high degree of individual variation has to be expected in *S. potens*.

Comparing the materials of *S. impotens* with juveniles attributed to *S. potens* by Huene (1935), show that the differences envisaged by Lucas (2002) are not reliable. All the small specimens of *Stahleckeria* appear to have a markedly similar morphology and there seems to be no reason to refer it to two different species. In addition, the paratype of *S. impotens* MCT 269-R has a small size in relation to the type material MCP 272PV, but both specimens present the same characteristics as *S. potens*. Taking into account these arguments, we interpret the two specimens included by Lucas (2002) in *S. impotens* as subadults of *S. potens*.

The olecranon process of the ulna is a variable feature in Triassic dicynodonts. *Kannemeyeria* (Pearson, 1924) and adult *Stahleckeria* (Huene, 1935) have a fused olecranon, while *Placerias* (Camp & Welles, 1956), *Ischigualastia* and *Dinodontosaurus* (Cox, 1965) have an ossified olecranon, which remains unfused to the ulna. In *Rhinodicynodon*, Surkov (1998) mentioned that the olecranon process was probably cartilaginous and the same may hold true for other shansiodontids as well.

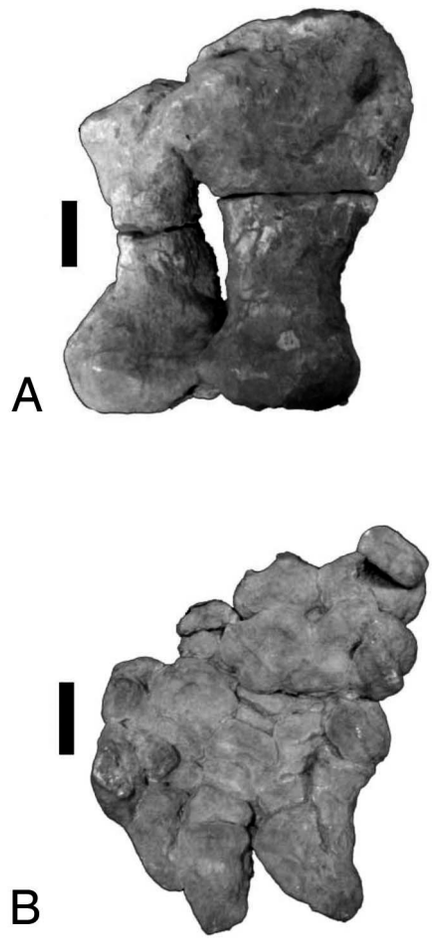

Figure 7. *Stahleckeria impotens*, MCP 272PV, holotype. Left ulna and radius (**A**) in anterior view; and manus (**B**). Scale bars = 5 cm.

The left ulna used in the mounted skeleton of *S. potens* has a fused olecranon, and a small right ulna attributed to a juvenile specimen also has the olecranon epiphysis, but the olecranon is clearly absent in a juvenile left ulna of *S. potens* (Huene, 1935). This last specimen was referred to *S. impotens* by Lucas (2002). This feature seems to be quite variable though in known *Stahleckeria* specimens and could rather indicate individual, particularly ontogenetic, variation, but does not seem useful at present to distinguish between different species.

Another difference that we observe between *S. impotens* and *S. potens* concerns the size of the deltopectoral crest of humerus. The deltopectoral crest is notable longer in *S. impotens*, but the material is scanty to evaluate the significance of this character as diagnostic for the species. For the time being, we prefer to consider it as an ontogenetic or individual variation.

Vega-Dias *et al.* (2004) provided an analysis of the phylogenetic interrelationships of the kannemeyeriiform dicynodonts. In *S. impotens*, the characters 5 (relation between pre-maxilla/maxilla and premaxilla/nasal sutures), 12 (projection of the squamosal), 16 (measure of the sagittal crest from the dorsal margin of the orbit), 18 (squamosal width), 21 (occipital width), 23 (height of suspensorium) are different in relation to *S. potens*. However, all of these differences could be attributed to diagenetic compression and deformation of the skulls of *S. impotens*. The character 34 refers to the size of the deltopectoral crest, and seems to be the only that could represent a major difference in relation to *S. potens*. The character 36 refers to the size of the ulna with the olecranon process, which seems to be variable in *Stahleckeria potens*. The character should probably be scored after the condition of adult specimens.

Concerning phylogenetic position, *Stahleckeria* is one of the most derived dicynodonts. The analysis of Vega-Dias *et al.* (2004) showed that *Stahleckeria* is included in a group formed by other tuskless dicynodonts, such as *Angonisaurus*, *Ischigualastia* and *Jachaleria*. *Stahleckeria* shared many features with *Angonisaurus*, while *Ischigualastia* and *Jachaleria* form their sister- group.

In summary, there is no convincing diagnostic features that justify the recognition of *S. impotens* as a valid species. Although the length of the deltopectoral crest in the humerus (character not considered in the diagnosis by Lucas) and, maybe, the lack of an ossified olecranon process of the ulna are noteworthy, these features may also be interpreted as individual and/or ontogenetic variations. Since its original description, *Stahleckeria potens* is known to be a quite variable species (Huene, 1935), and remains for the time being the only tuskless dicynodont species registered in the Middle Triassic of Brazil.

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REFERENCES

Camp, C.L. 1956. Triassic dicynodont reptiles. Part II. Triassic dicynodonts compared. *Memoirs of the University of California*, **13**(4):305-348.

Camp, C.L. & Welles, S.P. 1956. Triassic dicynodont reptiles. Part I. The North American genus *Placerias*. *Memoirs of the University of California*, **13**(4):255-304.

Cox, C.B. 1965. New Triassic dicynodonts from South America, their origins and relationships. *Philosophical Transactions of the Royal Society of London, B*, **248**(753):457-516.

Huene, F.von. 1935. *Die fossilen reptilien des südamerikanischen Gondwanalandes an der Zeitenwende. Ergebnisse der Sauriergrabungen in Südbrasilien 1928/29. Lieferung 1: Anomodontia*, Munich, C. H. Beck'sche Verlagsbuchhanlung, 92 p.

Huene, F. von 1936. Ein *Stahleckeria*-Schädel. *Zentralblatt für Mineralogie, Geologie und Paläontologie, (B)*, **11**:507-509.

Lucas, S.G. 1993. *Barysoma lenzii* (Synapsida: Dicynodontia) from the Middle Triassic of Brazil, a synonym of *Stahleckeria potens*. *Journal of Paleontology*, **67**(2):318-321.

Lucas, S.G. 2002. A new dicynodont from the Triassic of Brazil and the tetrapod biochronology of the Brazilian Triassic. *New Mexico Museum of Natural History and Science Bulletin*, **21**:131-141.

Maisch, M.W. 2001. Observations on Karoo and Gondwana vertebrates. Part 2: a new skull-reconstruction of *Stahleckeria potens* von Huene, 1935 (Dicynodontia, Middle Triassic) and a reconsideration of kannemeyeriiform phylogeny. *Neues Jahrbuch für Geologie und Paläontologie Abhandlungen*, **220**(1):127-152.

Pearson, H.S. 1924. A dicynodont reptile reconstructed. *Proceedings of the Zoological Society*, **52**:827-855.

Romer, A.S. & Price, L.I. 1944. *Stahleckeria lenzii*, a giant Triassic Brazilian dicynodont. *Bulletin of the Museum of Comparative Zoölogy*, **93**(4):465-491.

Surkov, M.V. 1998. The post-cranial skeleton of *Rhinodicynodon gracile* Kalandadze, 1970 (Dicynodontia). *Paleontological Journal*, **32**(4):402-409.

Vega-Dias, C.; Maisch, M.W. & Schultz, C.L. 2004. A new phylogenetic analysis of Triassic dicynodonts (Therapsida) and the systematic position of *Jachaleria candelariensis* from the Upper Triassic of Brazil. *Neues Jahrbuch für Geologie und Palaeontologie Abhandlungen*, **231**(2):145-166.

Vega-Dias, C. & Schultz, C.L. 2004. Postcranial material of *Jachaleria candelariensis* Araújo and Gonzaga 1980 (Therapsida, Dicynodontia), Upper Triassic of Rio Grande do Sul, Brazil. *Paleobios*, **24**(1):7-31.

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