



PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS BIOLÓGICAS

**DESCRIÇÃO E TAXONOMIA DE UM AETOSSAURO JUVENIL DA
FORMAÇÃO SANTA MARIA (TRIASSICO, CARNIANO DA BACIA DO
PARANÁ)**

DISSERTAÇÃO DE MESTRADO

LÚCIO ROBERTO DA SILVA

SÃO GABRIEL, RS, BRASIL

2013

**DESCRIÇÃO E TAXONOMIA DE UM AETOSSAURO JUVENIL DA
FORMAÇÃO SANTA MARIA (TRIÁSSICO, CARNIANO DA BACIA DO
PARANÁ)**

Dissertação parcial apresentada ao Curso de Mestrado Programa de Pós-Graduação em Ciências Biológicas, Área de Concentração em Ecologia e Sistemática da Universidade Federal do Pampa (UNIPAMPA – *Campus* São Gabriel), como requisito parcial para obtenção de Grau de

Mestre em Ciências Biológicas.

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RESUMO

Os aetossauros (Archosauria: Pseudosuchia) são tetrápodes encouraçados de ocorrência praticamente cosmopolita e restrita ao Triássico Superior. Seus fósseis são encontrados em quase todo o planeta (excetuando Antártida e Austrália). No Brasil, o registro fóssil referente a Aetosauria é proveniente da Formação Santa Maria (Bacia do Paraná), unidade geológica de idade Triássica que aflora no Estado do Rio Grande do Sul. Até o presente momento, duas espécies foram descritas no Estado (Cenozona de *Hyperdapedon*), são elas, *Aetosauroides scagliai* e a recentemente descrita *Aetobarbakinoides brasiliensis*. O objetivo desse estudo é descrever a anatomia de novos materiais pertencentes a um provável juvenil de uma nova espécie. Esse estudo realizou ainda, uma análise filogenética para determinação do posicionamento do novo espécime no clado Aetosauria. O novo material é constituído pelos seguintes elementos basioccipital, parietal, coracóides, escápulas, ulna, ílio, fêmures, astrágalo, calcâneos, vértebras constituintes das séries cervical, dorsal e caudal, metatarsos, falanges. Dez osteodermas provenientes do escudo dorsal, ventral e apendicular também estão presentes. Através da descrição anatômica e pela única combinação de caracteres, foi observado que o material fóssil pertence a uma nova espécie, *Polesinesuchus aurelioi*. A análise filogenética mostrou que *Polesinesuchus* é táxon irmão de *Aetobarbakinoides* e ambos formam um clado que é grupo irmão de um grande clado monofilético constituído por as subfamílias Desmotosuchinae e Typothoracisinae. Devido a pouca representatividade dos registros anteriores, os resultados do presente estudo contribuem de forma significativa para o melhor conhecimento do táxon e sua representatividade no Triássico Brasileiro.

Palavras chave: Archosauria, Aetosauria, Formação Santa Maria, Triássico

ABSTRACT

Aetosaurs (Archosauria: Pseudosuchia) are armored tetrapods virtually cosmopolitan and restricted to the Upper Triassic. Their fossils are found in all continents, excepting Antarctica and Australia). In Brazil, their fossil record come from the Santa Maria Formation (Middle/Upper Triassic of Paraná Basin) which outcrops in the state of Rio Grande do Sul. To the present, two species are described in this unit (*Hyperdapedon* acme zone), *Aetosauroides scagliai* and recently described *Aetobarbakinoides brasiliensis*. The aim of this study is the description of the new material, which belongs to a new genus of a probable juvenile individual. The new material consists of a partial parietal and a well preserved basioccipital and disarticulated postcranial elements: partial axial skeleton (cervical, dorsal, sacral and caudal elements); an incomplete shoulder girdle (partial scapulas, coracoids and interclavicle); two partial forelimbs (a single incomplete humerus and both ulnae); a right pelvic girdle (ilium, ischium and pubis); parts of both hindlimbs, comprising femora, tibiae and fibulae, tarsal elements (both astragalus and left calcaneum), and pes (metatarsal III, Pedal phalanx V, unidentifiable phalanges and a two claws), and ten dorsal and ventral appendicular osteoderms. . The presence of an unique combination of characters allowed the recognition of a new species named *Polesinesuchus aurelio*. The filogenetic analysis shows that *Polesinesuchus* is the sister taxon of *Aetobarbakinoides* and both form a clade that is the sister-group of a large monophyletic clade that comprises the subfamilies Desmatosuchinae and Typothoracisinae. Due to the low representativeness of the previous aetosaurid record in Brazil, the results of this study contribute to a better understanding of the Aetosauria.

Key words: Archosauria, Aetosauria, Santa Maria Formation, Triassic

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Nota: As referências da dissertação são as mesmas do artigo, portanto são repetidas no final do texto.

1. INTRODUÇÃO

Os aetossauros são répteis arcosauros pseudosuquios (Família Stagonolepidae) encouraçados e praticamente cosmopolitas durante o Período Triássico (SULEJ, 2009). Surgiram durante o Carniano e tornaram-se extintos no final do Período Triássico (Rético) (HECKERT & LUCAS, 2000; MARTZ, 2002). Variavam significativamente em dimensões corporais, medindo desde menos de um metro até mais de cinco metros de comprimento (MARTZ, 2002). A couraça dos aetossauros é a característica mais marcante do grupo, sendo constituída por escudos que se estendem desde a região posterior do crânio até a ponta da cauda (HECKERT & LUCAS, 2000). De acordo com Cerda e Desojo (2011), o escudo dorsal apresenta quatro colunas de osteodermas, duas de osteodermas paramedianas e duas de osteodermas laterais, respectivamente. Em alguns táxons um escudo ventral e outro apendicular, também estão presentes (DESOJO & EZCURRA, 2011). Esses elementos variam em forma e tamanho, conforme a região do escudo. Além disso, apresentam a face dorsal ornamentada (PARKER, 2007). Devido ao fato de espécimes completos e articulados no registro fóssil serem raros, os osteodermas foram usados tentativamente para designar até mesmo gêneros e espécies (MARTZ & SMALL, 2006). Entretanto, muitas diferenças observadas na ornamentação e consideradas caracteres distintivos são na verdade variações que ocorrem em um mesmo indivíduo, conforme a região do escudo de onde provém, o que é impossível de se constatar em osteodermas isolados (DESOJO & EZCURRA, 2011). Em relação à sua dieta, a maioria dos autores atribui aos aetossauros hábito herbívoro ou onívoro (MARTZ, 2002; PARKER, 2007; HECKERT *et al.* 2010). Quando onívoros, sua dieta poderia ser bastante generalista dentre as diferentes espécies, supondo-se inclusive que os aetossauros procurassem comida de origem animal de espécies que poderiam ser facilmente predadas, assim como fazem os tatus modernos (Dasypodidae), (DESOJO & VISCAINO, 2007). Bonaparte (1997) afirma ainda que os aetossauros pudessem eventualmente ser até mesmo necrófagos. O registro fóssil do grupo é proveniente da América do Norte, Europa, Norte da África, Índia, Groelândia, Madagascar e América do Sul (não são encontrados apenas na Antártida e Austrália) (HECKERT & LUCAS, 1999; SULEJ, 2009; DESOJO & EZCURRA, 2011). Seu registro fóssil é relativamente abundante no hemisfério norte, tanto em número de táxons como de exemplares, como é o caso do Triássico dos Estados Unidos da América. Em contraste, o registro proveniente da Formação Santa Maria é escasso, (até o presente momento constituído por cinco materiais descritos na literatura (DESOJO & EZCURRA, 2011; DESOJO *et al.* 2012). Adicionalmente, os espécimes até então descritos

são representados por poucos elementos ósseos. Por essa razão, a descoberta e a descrição de novos materiais é de suma importância para a melhoria do conhecimento acerca desses interessantes arcossauros. Tendo em vista esse objetivo, a presente dissertação contribui com a descrição e estudos taxonômicos de um novo espécime juvenil de um aetossauro encontrado no sítio Buriol, em São João do Polêsine- RS. O material foi encontrado em junho de 2005 pela equipe de Paleontologia da Universidade Luterana do Brasil-ULBRA e refere-se ao exemplar de aetossauro de menor tamanho já encontrado na América do Sul. Está tombado na coleção paleontológica da mesma instituição sob o número e sigla ULBRAPVT003.

2. SOBRE A DISSERTAÇÃO

A presente dissertação foi realizada na forma de artigo visando à publicação dos seus resultados em um periódico científico. Dessa forma, ela contém a seguinte organização:

- a) Uma breve introdução acerca das principais características dos aetossauros e o seu registro no Triássico brasileiro e os objetivos e as justificativas da execução do trabalho de pesquisa.
- b) O artigo propriamente dito.
- c) Anexos, apresentando as tabelas com mensuração das estruturas descritas, mapas e as imagens do material fóssil.

3. OBJETIVOS

Gerais:

- Realizar a descrição osteológica de um novo fóssil e sua identificação taxonômica no menor nível inclusivo possível.

Específicos:

- Contribuir para a discussão acerca da validade das demais espécies de Aetosauria já descritas na literatura.
- Verificar o posicionamento filogenético do novo espécime.

4. JUSTIFICATIVAS

Devido ao fato, do registro pertencente à Aetosauria na Formação Santa Maria ser escasso e muito fragmentário, torna-se importante o conhecimento das novas informações que aparecem recuperadas no novo material. Além disso, através da descrição anatômica, obter novos dados para a filogenia de Aetosauria.

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6. ARTIGO: A NEW AETOSAUR FROM THE UPPER TRIASSIC OF THE SANTA MARIA FORMATION, SOUTHERN BRAZIL

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Abstract Aetosaurs are armored pseudosuchian archosaurs widespread in Upper Triassic Units. In the last years, their diversity significantly increased in South America, where four species are known: *Aetosauroides scagliai*, *Neoaetosauroides engaeus*, *Aetobarbakinoides brasiliensis* and the *Chilenosuchus forttae*. This contribution presents and describes a new Late Triassic juvenile aetosaur from the Santa Maria Formation of southern Brazil, *Polesinesuchus aurelioi* gen. et sp. nov. Its juvenile ontogenetic stage is suggested by its small size and neurocentral suture opened in all vertebrae. However, future paleohistological investigation is necessary to fully corroborate this assumption. This new taxon is distinguished from all other aetosaurs by the presence of a unique combination of character states (not controlled by ontogeny) such as: cervical vertebrae with prezigapophyses widely extending laterally through most of the anterior edge of the diapophysis; absence of hyposphene articulation in both cervical and mid-dorsal vertebrae; presence of ventral keel in cervical vertebrae; anterior and mid-dorsal vertebrae without a lateral fossa in their centrum;

proximal end of scapula expanded; medial portion of scapular blade anteroposteriorly expanded; a short humerus with a robust shaft; and the iliac blade dorsoventrally very low with a long anterior process slightly exceeding the pubic peduncle. Regarding its phylogenetic relationships, the present analysis placed *Polesinesuchus* as the sister taxon of *Aetobarbakinoides* and both as sister taxa of the monophyletic clade composed of *Desmatosuchinae* and *Typothoracisinae*. However, the data-matrix used in this study lacks information about appendicular skeleton. So, the results should be considered with caution. Therefore, this analysis had pointed out the necessity of a phylogenetic reassessment of Aetosauria with the inclusion of as many postcranial characters as possible. As *Polesinesuchus aurelioi* is (when compared to other aetosaurs) quite complete regarding its postcranial anatomy, it adds significant anatomical information regarding this interesting group of pseudosuchians.

Keywords: Western Gondwana, Carnian, Archosauria, Pseudosuchia, Aetosauria, stagonolepididae

Introduction

Aetosaurs are a group of heavily armored quadrupedal archosaurs from the Late Triassic. They are encountered in several continental deposits from South and North Americas, Greenland, Europe, Morocco, and India (Desojo & Ezcurra, 2011) (Fig.1). They are included in the less inclusive clade Pseudosuchia which comprises archosaurs close related to crocodylians, but the relations with other suchians are still matter of debate (Desojo *et al.* 2012). To the present, four species of aetosaurs are described in South America, proceeding from Argentina, Brazil, and Chile (Desojo & Ezcurra, 2011). The Argentinean record comprises *Aetosauroides scagliai* Casamiquela, 1960 from Ischigualasto-Villa Unión Basin

(Carnian to Norian, Ischigualasto Formation) and *Neoaetosauroides engaeus* Bonaparte, 1971 (Norian-Rhaetian, Los Colorados Formation), (Desojo *et al.* 2012). The Chilean record comprises *Chilenosuchus forttae* Casamiquela, 1980 (Estratos El Bordo), (Desojo, 2003). In Brazil also occurs *Aetosauroides scagliai*. The Brazilian record is restricted to the red beds of the Santa Maria Formation, which crops out in the central region of Rio Grande do Sul State (Langer *et al.* 2007). The first Brazilian remains ascribed to aetosaurs come from the vicinities of the municipality of São Pedro do Sul, at the locality of Inhamandá. Zacarias (1982) described this fossil in her unpublished master degree dissertation, baptizing the specimen “*Aetosauroides subsulcatus*”. This specimen was never formally described (Lucas & Heckert, 2001; Desojo & Ezcurra, 2011). Actually, the taxonomic history of this material is divided into several “chapters”. Heckert (2000) and Lucas and Heckert (2001) stated that all aetosaurs from Brazil are junior synonyms of *Stagonolepis robertsoni*. In a recent reappraisal of the taxonomic status of *Aetosauroides scagliai*, Desojo and Ezcurra (2011) concluded that these materials present the same apomorphies observable in the Argentinean *A. scagliai*. Later on, Desojo *et al.* (2012), based upon new postcranial material also proceeding from Inhamandá locality, erected the new Brazilian genus *Aetobarbakinooides brasiliensis* (specimen under collection number CPE2 168). This material also had been regarded as junior synonym of *Stagonolepis robertsoni* by Heckert and Lucas (2001). In this contribution we present the new aetosaur *Polesinesuchus aurelioi* gen. et sp. nov..

INSERT FIGURE 1 ABOUT HERE

Institutional abbreviations

ULBRA PVT, Universidade Luterana do Brasil, Coleção de Paleovertebrados

CPE 2, Coleção municipal, São Pedro do Sul, RS. Brazil.

MCP, Museu de Ciências e Tecnologia, Porto Alegre, RS. Brazil.

NHMUK, The Natural History Museum, London, United Kingdom.

PVL, Paleontologia de Vertebrados, Instituto “Miguel Lillo”, São Miguel de Tucumán, Argentina. PVSJ, División de Paleontología de Vertebrados Del Museo de Ciencias Naturales y Universidad Nacional de San Juan, Argentina.

SMNS, Staatliches Museum für Naturkunde, Stuttgart.

TTUP, Texas Tech University Museum of Paleontology, Berkeley, California, USA

INSERT FIGURE 2 ABOUT HERE

Systematic Palaeontology

Archosauria Cope, 1869 *sensu* Gauthier & Padian (1985)

Pseudosuchia Zittel, 1887-1890 *sensu* Gauthier & Padian (1985)

Aetosauria Marsh, 1884 *sensu* Parker (2007)

Stagonolepididae Lydekker, 1887 *sensu* Heckert & Lucas (2000)

***Polesinesuchus aurelioi* gen. et sp. nov.**

Etymology. The generic name is derived from the name of the municipality from where the specimen was recovered (São João do Polêsine, Rio Grande do Sul State). The specific name is in honor of the physician Pedro Lucas Porcela Aurélio, an enthusiast of paleontology of the Rio Grande do Sul State and a personal friend.

Holotype. ULBRAPVT003, comprising cranial and postcranial elements: a partial parietal and a well preserved basioccipital; a partial axial skeleton (cervical, dorsal, sacral and caudal vertebrae); an incomplete shoulder girdle (partial scapulae, coracoids, and interclavicle); two partial humeri and both ulnae); a right pelvic girdle (ilium, ischium, and pubis); parts of both hind limbs (femora, tibiae and fibulae, both astragali and left calcaneum), and pes (metatarsal III, pedal phalanx V, unidentifiable phalanges, and a two ungueal phalanges). Ten isolated osteoderms from dorsal, ventral, and appendicular region of the armor.

Diagnosis. *Polesinesuchus* is distinguished from all other aetosaurs by the following unique combination of characters: cervical vertebrae with prezigapophyses widely extending laterally through most of the anterior edge of the diapophysis; absence of hyosphene articulation in both cervical and mid-dorsal vertebrae; anterior articular facet width of cervical vertebrae measure less than 1.2 times of the posterior one; presence of a ventral keel in cervical vertebrae; anterior and mid-dorsal vertebrae without a lateral fossa in their centrum; proximal end of scapula expanded; medial portion of scapular blade anteroposteriorly expanded; a short humerus with a robust shaft; and the iliac blade dorsoventrally very low with a long anterior process slightly exceeding the pubic peduncle. *Polesinesuchus* differs from *Aetosauroides scagliai* by the presence of an anteroposterior projection of the scapular shaft, absence of a lateral fossa in the presacral vertebrae, tip of the anterior process of the ilium longer and very pointed in comparison, the acetabulum is laterally projected, distal ends of the femora slightly twisted along the axial length. It differs from *Aetobarbakinoides* by the presence of ventral keel in cervical vertebrae, absence of circular pit in the neural spine and absence of hyosphene articulation in dorsal vertebrae, the humeral shaft is very robust in comparison, the larger tuberosity of the humerus is poorly defined in comparison and the tibial shaft is very robust in comparison.

Polesinesuchus aurelioi sp. nov.

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Locality and horizon. Buriol outcrop, municipality of São João do Polêsine (coordinates 29°39'34.2"S; 53°25'47.4"W) in the central region of the state of Rio Grande do Sul, Southern Brazil. This locality is included in the Sequence 2 of the Santa Maria Supersequence (Fig.3), *Hyperodapedon* Acme Zone, (Langer *et al.* 2007; Soares *et al.* 2011).

INSERT FIGURE 3 ABOUT HERE

Geological and biostratigraphical settings

The material comes from an outcrop located 6 km southeast of the Municipality of São João do Polêsine, central region of the Rio Grande do Sul State (Fig.2). This outcrop is included at the Santa Maria 2 Sequence (Zerfass, 2003; Langer *et al.* 2007; Dias da Silva *et al.* 2011, 2012) , which is constituted mainly of mudstones and high concentration of early diagenetic carbonate which is interpreted as deposited under a dry climate (Zerfass *et al.* 2003; Langer, *et al.* 2007; Dias da Silva *et al.* 2011). These sedimentary rocks were deposited in a system of shallow lakes and floodplains of anastomosed ephemeral rivers (Langer *et al.* 2007; Dias da Silva *et al.* 2011, 2012). The occurrence of the rynchosaur *Hyperodapedon* justifies the inclusion of the Buriol outcrop in the *Hyperodapedon* Acme Zone, which is dated as Carnian (see Zerfass *et al.* 2003; Soares *et al.*, 2011).

Ontogenetic stage. The recognition of ontogenetic stages in aetosaurs is problematic, due the lack of knowledge about juvenile individuals (Parker, 2008). The usual practice regarding this issue is the observation of neurocentral sutures of vertebrae in archosaurs (Brochu, 1996). The small size of an individual cannot be to safe information to establish its juvenile ontogenetic stage (Parker, 2008). In the last years paleohistological analyses of growth marks in osteoderms arose as a solution for the understanding of ontogeny in the Aetosauria (Cerdeira & Desojo, 2010). However, the ontogenetic stage of *Polesinesuchus* was tentatively proposed based solely in the observation of vertebral neural sutures. All vertebrae of this specimen show neural opened sutures. So, here we tentatively propose that *Polesinesuchus* is a juvenile specimen. Future paleohistological studies are needed to obtain a more accurate idea of the ontogenetic stage of *Polesinesuchus*.

Description

Parietal. This bone is mostly broken. A single identifiable small ridge separates this element in two parts with distinct angles (Fig.4). Medial to this ridge, it is almost flat, showing a gentle ornamentation constituted for of small and irregular fossae. Laterally, this bone protrudes ventrally and forms the dorsal part of the supratemporal fenestrae. Due to the fragmentary nature of this element, most of its features are not observable.

INSERT FIGURE 4 ABOUT HERE

Braincase. It is represented by a partial but still well-preserved basioccipital, which participates in both condylar neck and occipital condyle (Fig.5). It is dorsally placed regarding the foramen magnum as in *Tecovasuchus chatterjeei*, *Typothorax coccinarum* (TTUP 9214) and *Neoaetosauroides engaeus* (Martz, 2002; Martz & Small, 2006; Desojo & Baéz, 2007). The articular facet of the occipital condyle is slightly projected dorsoventrally. In posterior view, the occipital condyle is semicircular with a shallow notochordal pit in the center of its articular surface. These conditions also occur in *Stagonolepis olenkae* (Sulej, 2009). Two non-contacting facets for articulation with the exoccipitals are present in the dorsolateral surface of the occipital condyle. A pair of rugose ridges (known as basal tubera) are present at the basis of the condilar neck. These tubera function as areas to attach subvertebral muscles (Romer, 1956; Desojo & Baéz, 2007). Despite of the absence of the exoccipitals, the basioccipital presents two channels in dorsal view. The first one forms part to the metotic foramen, which encloses nerves IX, X, XI and jugular vein. Posteriorly, the basioccipital also partially compose the ventral margin of the foramen for the hypoglossal nerve (XII).

INSERT FIGURE 5 ABOUT HERE

Cervical vertebrae. Six cervical elements, including the centrum of the axis. Using the information about the position of their parapophysis and the degree of prominence of their ventral keels, their placement along the axial skeleton were tentatively suggested. The cervical segment is constituted by the axis and probably third, fourth, fifth, seventh, and eighth cervical vertebrae. Thus, three cervical elements are not preserved in the series, as in aetosaurs nine vertebrae are considered for this region (Walker, 1961; Parker, 2008).

Axis. This element is poorly preserved, comprising only the centrum which is mostly constricted along its length. The anterior facet of articulation is comparatively more distinguishable than the posterior one, being “U”-shaped. It is also possible to observe a prominent and dorsally displaced odontoid process (Fig.6). Its posterior facet is circular and concave. In lateral view, the ventral surface of the centrum is shorter than the dorsal one; a small parapophysis, almost ventrally displaced, is also present. In ventral view, it is possible to observe a conspicuous ventral keel, as occurs in *Aetosauroides scagliai* (PVL 2059; MCP13a-b-PV), *Neoaetosauroides engaeus* (PVL 5698), *Stagonolepis robertsoni* and *Typothorax coccinarum* (Long and Murry: 1995 fig 102c; Desojo *et al.* 2012). In contrast, this feature is absent in *Aetobarbakinoides* and *Desmotosuchus* (Parker, 2008; Desojo *et al.* 2012). In lateral view, the axis of *Polesinesuchus* does not present the well-rimmed fossa observable in cervical vertebrae of *A. scagliai* (PVL 2059; MCP13a-b-PV), (Desojo and Ezcurra, 2011). This absence is shared with *Aetobarbakinoides*. Thus, the presence of a ventral keel and the absence of well-rimmed fossa are characters extended to all preserved cervical elements of *Polesinesuchus*.

INSERT FIGURE 6 ABOUT HERE

Third cervical element is almost complete, preserving both neural arch and spines (Fig 7). Two neural pedicles are preserved, both higher than the centrum and laterally projected, a condition shared with *Aetobarbakinoides* (Desojo *et al.* 2012). In lateral and medial views they present a slight concavity. The neural canal presents the same ratio and size of *Aetobarbakinoides* (Its height is round two times lower than the height of the anterior articular surface of the centrum). The transverse process is short, lateroventrally projected, and its

diapophysis is oval-shaped. The infradiapophyseal lamina is absent in cervical elements of the holotype, as in *Neoaetosauroides*. Conversely, in *Aetobarbakinoides* and *Aetosauroides* the infradiapophyseal lamina is present (Desojo *et al.* 2012). In *Polesinesuchus*, the absence of both postzygapophyseal lamina and infradiapophyseal fossa are shared with *Desmotosuchus spurensis* (Parker, 2008; Desojo *et al.* 2012). Only the right prezygapophysis is preserved in the holotype of *Polesinesuchus*. Its articulation facet is dorsally projected and medially restricted, not exceeding the anterior edge of the diapophysis as in *Aetosauroides* (PVL 2059), *Neoaetosauroides* (PVL 5698), *Typothorax* (TTU P-9214), *Desmotosuchus spurensis* (Parker, 2008) and *Stagonolepis robertsoni* (NHMUK 4784). Conversely, *Aetobarbakinoides* presents laterally projected prezigapophyses (Desojo *et al.* 2012). In *Polesinesuchus* a small oval-shaped fossa is visible between the prezigapophysis. This fossa is known as the prespinal fossa, which is not dorsally extended along the neural spine, a condition similar to that found in *Aetobarbakinoides* (Desojo *et al.* 2012). Unfortunately, none of the postzigapophyses are preserved in the cervical vertebrae of the holotype. Its centrum is amphicoelous with a smooth lateromedial constriction. Its length is longer than the height of the anterior facet with a ratio of 1.1. This condition is similar to that encountered in *Aetosauroides* (Desojo *et al.* 2012) (Fig.7). In *Polesinesuchus* the anterior facet of the centrum is wider than the posterior one (1.1 times) but in a comparatively smaller degree with *Aetobarbakinoides* (1.35 times). *Desmotosuchus* and *Typothorax* also present a smaller degree regarding this ratio (Parker, 2008) (Desojo *et al.* 2012). The lateral surface of the cervical centrum is slightly concave and lacks a well-rimmed fossa, differently from *Aetosauroides* (Desojo & Ezcurra, 2011). The absence of a well-rimmed fossa is a condition shared with *Aetobarbakinoides* (Desojo *et al.* 2012). The parapophysis is situated in the ventralmost portion of the anterior margin of the centrum and placed in a low pedicle, a similar condition to that found in *Aetobarbakinoides* (Desojo *et al.* 2012). Additionally, in ventral view, *Polesinesuchus* presents a sharp ventral

keel as in *Aetosauroides* (PVL 2059; MCP 13-a-b-PV), *Stagonolepis robertsoni* (Walker, 1961: fig 7f), *Typothorax* (Long and Murry, 1995: 102c) and *Neoaetosauroides* (PVL 5698), (Desojo *et al.* 2012). Conversely, in *Aetobarbakinoides* and *Desmotosuchus spurensis* the ventral keel is absent (Parker, 2008), (Desojo *et al.* 2012). The fourth cervical element is represented only by a centrum (Fig.8).

INSERT FIGURE 7 ABOUT HERE

INSERT FIGURE 8 ABOUT HERE

Fifth cervical vertebra, the set of features is the same of the third vertebra, including the position of parapophysis. The fifth cervical element comprises the centrum and the left neural pedicle (Fig.9). Only the prezigapophysis is preserved.

INSERT FIGURE 9 ABOUT HERE

Seventh cervical vertebra, preserves the centrum and also the left neural pedicle (Fig.10). It also shows a ventrally projected transverse process that is longer than the transverse process of the third vertebra. Its parapophyses are dorsally displaced and close to the neurocentral suture. The eighth vertebra only preserves the centrum with the same characteristics already mentioned for the previous elements. Additionally, it is possible to observe a diagenetic distortion in the right surface of the centrum, which makes it more swollen than the parapophysis in comparison (Fig.11).

INSERT FIGURE 10 ABOUT HERE

INSERT FIGURE 11 ABOUT HERE

Dorsal vertebrae. The first dorsal vertebra presents the left neural pedicle with its pre and postzigapophyses, transverse process, and centrum (Fig.12). In lateral view, this element is anteroposteriorly shorter than the subsequent (the more medially placed dorsal vertebrae). Its centrum is amphicoelous, laterally compressed, with and spool-shaped as in *Aetosauroides* (Desojo & Ezcurra, 2011). The centrum of *Polesinesuchus* is longer than the height of its anterior articular facet, with a ratio of approximately 1.7, resembling the condition found in both anterior and medial dorsal vertebrae of *Aetosauroides* (1.5 in PVL 2073), anterior dorsal of *Stagonolepis robertsoni* (1.45 in NHMUK R4784; Walker 1961: fig 7i) and also of *Sierritasuchus* (1.46 in Parker *et al.* 2008: fig 2g) (Desojo *et al.* 2012).

INSERT FIGURE 12 ABOUT HERE

The parapophyses are still present. They are dorsally displaced, close to the neural suture. Additionally, a well-rimmed fossa is absent in the lateral surface of the centrum, the same condition of *Aetobarbakinoides* (Desojo *et al.* 2012). In contrast, in *Aetosauroides* this structure is present (Desojo & Ezcurra, 2011). In ventral view, the centrum is devoid of a ventral keel. The infradiapophyseal lamina that occurs in *Aetosauroides*, is absent in the first

dorsal vertebra of *Polesinesuchus* and *Aetobarbakinoides* (Desojo *et al.* 2012). The transverse process is shorter than the middle dorsal ones, but heavier, showing a slightly anterior displacement in relation to the center of the neural arch, a condition shared with *Aetosauroides* (MCP 13a-b-PV), (Desojo & Ezcurra, 2011). In posterior view, the transverse process possesses a sharp postzygapophyseal lamina between the diapophysis and the postzygapophysis. This lamina is also present in dorsal vertebrae of *Aetobarbakinoides* and *Desmotosuchus* (Parker, 2008; Desojo *et al.* 2012). The diapophysis is suboval in shape and its long axis is anteroposteriorly placed. Four disarticulated centra probably proceeding from anterior dorsal series are present. These elements do not present any distinctive difference from each other (Fig.13, 14, 15, 16). They present the same characteristics of the other centra. The middle dorsal series is represented by three elements in which most structures are preserved (probably thirteenth, fourteenth, and fifteenth vertebrae) (Fig. 17, 18, 19). Their position in the dorsal series is tentative, based upon the location of the parapophysis, as in this region of the column it is placed on the transverse process. This feature is reported in all aetosaurs (Parker, 2008).

INSERT FIGURES 13 ABOUT HERE

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INSERT FIGURE 16 ABOUT HERE

The better neural spine belongs to the putative thirteenth vertebra. However, both transverse processes are partially broken (Fig.17). In dorsal view, the transverse process is trapezoidal and laterally projected. In lateral view, it is possible to observe only the parapophysis in both sides. The infradiapophyseal lamina is completely absent in dorsal vertebrae of *Polesinesuchus*. In contrast, these laminae are present in the middle dorsal axial elements of *Aetosauroides* (PVL 2073), *Stagonolepis robertsoni* (NHMUK R4784), *Desmatosuchus spurensis* (Parker, 2008) and *Typothorax coccinarum* (Martz, 2002), (Desojo & Ezcurra, 2011; Desojo *et al.* 2012). This condition of *Polesinesuchus* is shared with *Neoaetosauroides* (PVL 3525) and the Polish *Stagonolepis* (ZPAL AbIII 502/67) (Desojo & Ezcurra, 2011). Furthermore, the infradiapophyseal fossa is absent in dorsal vertebrae of *Polesinesuchus*, as in *Aetosauroides* MCP 13a-bPV), (Desojo & Ezcurra, 2011). The neural spine is wide and posteriorly placed. Unfortunately, the apex of the neural spine is broken and its relationship with the centrum cannot be established.

The prezygapophyses are anteroposteriorly short and dorsally oriented as in *Aetosauroides* (PVL 2073, MCP 13a-b PV), *Stagonolepis robertsoni* (Walker, 1961), and *Typothorax coccinarum* (Martz, 2002; Desojo & Ezcurra, 2011). The longer axis of the prezygapophysis is lateromedial. Only the left postzygapophysis is preserved in the thirteenth vertebra. . The hyosphene is absent in *Polesinesuchus*, the same condition found in *Aetosauroides*. In contrast, this structure is present in *Aetobarbakinoides* and *Desmatosuchus* (Parker, 2008; Desojo *et al.* 2012). The postzygapophyseal lamina is present in the holotype, *Aetobarbakinoides*, and *Aetosauroides* (see Desojo & Ezcurra, 2011; Desojo *et al.* 2012). Additionally, a circular pit (located in both sides of the neural spine and present in

Aetobarbakinoides), is absent in *Polesinesuchus* and *Aetosauroides* (Desojo *et al.* 2012).

Regarding the remaining dorsal vertebrae, the centrum is amphicoelous and anteroposteriorly elongated, longer than the height of the anterior facet, with a ratio of 1.42 (in *Aetosauroides*, 1.5:PVL2073), in the anterior dorsal of *Stagonolepis robertsoni*, 1.45: NHMUK R4784; Walker, 1961, and in *Sierritasuchus*, 1.46:Parker *et al.* 2008: fig.2g) (Desojo *et al.* 2012).

INSERT FIGURE 17 ABOUT HERE

The fourteenth vertebra comprises a centrum and a partial basis of the transverse process (Fig.18). Also, only the left parapophysis and prezigapophyses are preserved. The articular facet of the parapophysis is oval-shaped and placed on the transverse process. The prezigapophysis is similar to that one from the first dorsal vertebra. The centrum is amphicoelous, without a well-rimmed fossa. In dorsal view, the centrum is compressed (spool-shaped) as in *Aetosauroides* (MCP 13a-b PV), (Desojo & Ezcurra, 2011). Its length is comparatively longer than the height of the anterior articular facet (1.33 of ratio).

INSERT FIGURE 18 ABOUT HERE

The fifteenth vertebra comprises a centrum with an open neural suture, basis of the neural spine, a complete left transverse process, the diapophysis, and the parapophysis (Fig.19). The diapophysis is oval-shaped and the parapophysis is anteriorly placed. In dorsal view, the transverse process is trapezoidal with an anteroposteriorly longer proximal end as in

Aetosauroides (PVL 2073; MCP 13a-b PV). The infradiapophyseal lamina is absent and the parapophysis is placed over the transverse process, reaching the half of its length. As in many other centra described above, the centrum is longer than the height of the anterior articular facet with a ratio of the 1.36. This element is amphicoelous and transversely compressed. Laterally, the well-rimmed fossa is absent. In ventral view, the centrum does not present a ventral keel.

INSERT FIGURE 19 ABOUT HERE

Sacral vertebrae. The sacral vertebrae comprise two disarticulated centra, both amphicoelous and considerably more robust than those described for the dorsal series (Fig. 20, 21). Both anterior and posterior sides are wider than tall as observable in sacral centra of *Desmatosuchus supurensis* (Parker, 2008). These vertebrae possess slightly flattened anterior and posterior sides as in *Typothorax coccinarum* (TTUP 9214) and phytosaurs (Martz, 2002). In lateral view, it is possible to observe both areas for articulation of the neural arches almost reaching the midline of the centrum as in *Typothorax* (Martz, 2002). However, in both sacral centra, these structures cover the dorsal half of the length of the centrum. A well-rimmed fossa is absent, as in other vertebrae of *Polesinesuchus*. In ventral view, both sacral centra are devoid of a ventral keel or groove.

INSERT FIGURES 20 ABOUT HERE

INSERT FIGURE 21 ABOUT HERE

Caudal vertebrae. Five disarticulated centra are preserved in the holotype. The first two are amphicoelous and longer than the height of the anterior articular facet (ratio: 1.16) (Fig.22, 23). These elements are quite robust with oval-shaped articular facets. These facets form a thickened rim as in *Desmotosuchus spurensis* (Parker, 2008). In ventral view, it is possible to observe a groove, that is laterally limited by two ridges that end anteriorly in chevron facets as in *Stagonolepis robersoni* (Walker, 1961). In *Polesinesuchus* the ridges and grooves cover only the anterior half of the centrum. In contrast, in the anterior caudal element of *Desmotosuchus spurensis* the ridges extend throughout its entire length (Parker, 2008). Laterally, the two first caudal centra are devoid of a lateral fossa. Two other centra are attributed the middle caudal region. These elements present some degree of distortion and their lateral surfaces are broken (Fig.24, 25). The centra are longer than the anterior ones, with a length comparatively longer than the anterior articular facet (ratio: 1.31). In ventral view, they present ridges with a groove in anterior half of the centrum. As in the other caudal elements, lateral fossae are absent. The distal caudal region is represented by a single centrum (Fig.26). This element is smaller when compared to the other caudal elements, but with the same morphology. It is longer than the anterior articular facet (ratio: 2.33).

INSERT FIGURE 22 ABOUT HERE

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INSERT FIGURE 26 ABOUT HERE

Scapulae. Both scapulae and coracoids of *Polesinesuchus* are preserved. The left elements are more complete than the right ones (Fig.27, 28). Both proximal and distal ends of the left scapula, as well as the scapular blade, are well-preserved. In contrast, the right scapular blade, both proximal ends and anterior margin are broken. The coracoids present comparatively different states of preservation. The right coracoid is broken. The left element is more complete, allowing its observation in detail. As usually, the scapula is a slender element with a slight constriction along its center, and expanded extremities. In lateral view, this bone is wide and slightly convex. Its anterior margin is, in comparison, sharper than the posterior. The posterior margin is thicker than the anterior one. Dorsoventrally, the scapular blade is thin, presenting a large anteroposterior expansion to support the suprascapular cartilage, which possibly becomes ossified in adult individuals (Walker, 1961). The medial portion of the scapular blade is more expanded in comparison with of the condition found in *Aetosauroides* (PVL 2073). The ventral expansion presents a marked acromial process. It is thick and laterally placed as in *Aetosauroides*. In contrast, in *Aetobarbakinoides* (PVL 2073), *Aetosaurus* (SMNS 5770 S-2) and *Neoaetosauroides* (PVL 3525) this structure is less prominent (Desojo *et al.* 2012). According with Romer (1956) the articular process would serve as a point of attachment with the clavicle. Distally, the subacromial tuberosity delimits a shallow anteroposterior groove as in *Aetosauroides*. Conversely, in *Aetobarbakinoides* and *Neoaetosauroides* the subacromial tuberosity delimits a moderately deep subacromial depression (Desojo *et al.* 2012). Distally, the scapula shows an articular facet for accommodation of the coracoids. This articulation is lateromedially expanded towards dorsal. Anteriorly, it is slender as in some basal archosaurs, such as *Prestosuchus chiniquensis* (Huene, 1938) and *Rauisuchus tiradentes* (Lautenschlager, 2008). The glenoid fossa is dorsolaterally projected as in *Aetobarbakinoides* (Desojo *et al.* 2012). Alongside the glenoid

fossa there is a small process for the attachment of the *triceps muscle* as in *Batrachotomus kupferzellensis* (Gower & Schoch, 2009).

Coracoids. These elements are laterally convex, medially concave, and longer than wide as in *Aetosauroides* (PVL 2073), (Casamiquela, 1961). Proximally, they are thick, as they attach to the scapulae to form most of the glenoid, resembling *Aetosauroides* (PVL 2073) (Casamiquela, 1961). Posteriorly, these elements are also thick and rounded and, as usual, below the glenoid there is a neck. Dorsally, a posterior process is present. The coracoid foramen is quite visible in *Polesinesuchus*. This foramen is circular and relatively large. In contrast, *Neoaetosauroides* possesses a small foramen. In *Polesinesuchus* this foramen is situated 7,8mm from the glenoid (Fig.27, 28).

INSERT FIGURE 27 ABOUT HERE

INSERT FIGURE 28 ABOUT HERE

Interclavicle. This blade-like shaped element is disarticulated from the coracoids (Fig.29). Ventrally, it is convex with its anterior end possessing two small articular facets separated by a tall crest as occurs in *Aetosauroides* (PVL 2073) (Casamiquela, 1961). This element is anteroposteriorly expanded. In *Polesinesuchus* its posterior end is partially broken with a total length of 44,5mm in comparison to *Aetosauroides* (PVL 2073 - 64mm) a fully grown individual.

INSERT FIGURE 29 ABOUT HERE

Humerus. A fragmentary right humerus and parts of the left one were recovered for *Polesinesuchus*. The right element presents transversal fractures (close to its distal extremity) across the diaphysis. The left element comprises both proximal and distal epiphyses. Its diaphysis is missing (Fig.30, 31). The right humerus is long and relatively robust, with both proximal and distal ends transversally expanded, and a robust diaphysis. It measures about 1.2 times the length of the ulna (this ratio resembles that of *Aetosaurus ferratus*) (Schoch, 2007). In contrast, in *Aetosauroides* (PVL 2073) and *Aetobarbakinoides* the humeral diaphysis is a lot narrower than the two expanded ends of this bone. The humeral head is prominent and presents a convex articular surface as in *Aetobarbakinoides* (Desojo *et al.* 2012). The larger tuberosity is poorly defined as occurs in *Aetosauroides* (PVL 2052, 2073; PVSJ 326), *Neoaetosauroides* (PVL 3525), *Stagonolepis robertsoni* (Walker, 1961) and *Thyphothorax* (Martz, 2002). This structure is comparatively more conspicuous in posterior view as in *Thyphothorax* and other basal archosaurs (Martz, 2002). A well-prominent large tuberosity is present in *Aetobarbakinoides* and “*Argentinosuchus bonapartei*” (*nomen dubium*, an indeterminate aetosaur according to Desojo & Ezcurra, 2011), (Desojo *et al.* 2012). The later authors described two tuberosities in the humeral head of *Aetobarbakinoides*. The first one situated in the lateroventral corner and the second in the dorsal margin of the humeral head. In *Polesinesuchus* these structures are either poorly developed or absent. The deltopectoral crest is poorly developed ventrally and subtriangular in medial view. This condition is shared with *Batrachotomus* and *Aetosauroides* (Desojo *et al.* 2012). The distal end presents two ventrally placed condyles: laterally the ectepicondyle and medially, the entepicondyle. These two

condyles are rounded and separated by a medial groove. In the dorsal surface of the distal end there is a shallow subtriangular depression as in *Aetobarbakinoides* (Desojo *et al.* 2012). In lateral view, a distal deep groove is also present (ectepicondylar groove: Schoch, 2007). This groove is bounded by a dorsal ridge, similarly to *Aetobarbakinoides* and other aetosaurs, such as *Aetosauroides* (PVL 2073; PVSJ 326), *Neoaetosauroides* (PVL 3525) and *Stagonolepis robertsoni* (Walker, 1961) (Desojo *et al.* 2012). This groove functions as a pathway for the radial nerve and associated vessels (Peyer *et al.* 2008).

INSERT FIGURE 30 ABOUT HERE

INSERT FIGURE 31 ABOUT HERE

Ulnae. Two well-preserved ulnae are present in *Polesinesuchus*, both presenting a slight fracture in their shafts (Fig.32). They are lateromedially compressed with a slightly expanded and anteroposteriorly twisted proximal end, which is wider than the distal one in comparison. The olecranon is poorly-developed. In contrast, this structure is well-developed in *Coahomasuchus* (Heckert & Lucas, 1999). It is probable that *Polesinesuchus*'s olecranon would be filled with cartilage, which is suggested by its poorly observable prominence. Also, it presents a gentle angle contrasting with the L- shaped one observed in *Thyphothorax coccinarum* (Heckert *et al.* 2010). In ventral view the articular surface is oval-shaped as in *Thyphothorax coccinarum* (Heckert *et al.* 2010).

INSERT FIGURE 32 ABOUT HERE

Ilium. Only left ilium is preserved in *Polesinesuchus*. Its iliac blade is long, dorsoventrally short with two processes (one anterior and other posterior). Its outline resembles that of *Desmotosuchus haplocerus* (UMMP 73322), (Long & Murry, 1995), (Fig.33). In lateral view, the blade is proportionally lower than the iliac blade of *Aetosaurus ferratus* (A: S-20), *Typhothorax coccinarum* (UCMP V2816 122683 70/Fa54) and *Stagonolepis robertsoni* (Walker, 1961; Martz, 2002; Schoch, 2007). In *Typhothorax*, the iliac blade is high and shows, in both sides, two transversal buttresses above the acetabulum, a feature that does not occur in the iliac blade of *Polesinesuchus*. The anterior process of the iliac blade is short, slightly exceeding the pubic penduncle, a condition shared with *Neoaetosauroides* (Desojo & Baéz, 2005). The tip of the anterior process is very slender with an oblique anteroventral direction as in *Aetosaurus ferratus* (Schoch, 2007) and longer than in *Aetosauroides* (PVL 2073). Additionally, the tip of the anterior process is also very pointed when compared with the rounded one present in *Aetosauroides* (PVL 2073; PVL 2052). The anterior process of the iliac blade serves as the insertion area of *iliotibialis* and *iliofemorales* muscles, both directly related to the movement of hindlimbs (Desojo & Baéz, 2005). The posterior process is long and massive. In dorsal view, the iliac blade presents a ripple in its distal end. The acetabulum is a non-perforated shallow concavity. The acetabulum almost entirely formed by the ilium and delimited by a supracetabular crest that forms an overhanging ridge to accommodate the head of the femur. Ventrally, the ilium expands and ends in two articular surfaces.

INSERT FIGURE 33 ABOUT HERE

Pubis. Represented by fragments of both pubial elements (Fig.34). The left pubis preserves both proximal and distal ends, so the medial region is missing. The right pubis only preserves

its proximal end. The reconstructed pubis is a short element in which the proximal end is stronger than the distal one in comparison, which presents a massive rugosity. The left proximal end is comparatively better preserved and allows the recognition of some structures, such as: the articular surface for the ilium is almost flat and “U” shaped. Anteroposteriorly, the articular surface is long as occurs in *Neoaetosauroides* and other basal archosaurs (Lecuona & Desojo, 2011). Medially, there is a bony tongue with a groove over its sagittal length. This structure is a thin proximal portion of bone for the obturator foramen, which in *Polesinesuchus* is difficult to observe due to its poor preservation. This structure is reported only for *Postosuchus kirkpatricki* Chatterjee, 1985 (Long & Murry 1995, fig.135) and *Gracilisuchus stipanicorum* Romer, 1972 (Lecuona & Desojo 2011, fig.4). Parts of the proximal end of the pubis are broken and the obturator foramen is not preserved. A part of the distal end of pubis is preserved in the left element. It is constituted of a very thin lamina which becomes thicker distally to form a prominent pubic foot. This feature is usual in aetosaurs, phytosaurs and sphenosuchians (Gower & Schoch, 2009).

INSERT FIGURE 34 ABOUT HERE

Ischium. Only the left ischium is preserved in *Polesinesuchus*, in which most structures are preserved (Fig.34). It is L-shaped with the proximal end wider than the distal one in comparison. The proximal end is also thicker than distal, possessing two articular surfaces: one medial and other lateral. The medial articular surface is almost flat smaller in comparison, and articulates with the posteroventral articular surface of the ilium. The lateral articular surface contributes to the ventral margin of acetabulum. It is larger and almost oval-shaped. The anterior margin of the ischium is very thin and it is partially broken in *Polesinesuchus*. It

forms the puboischiatic plate. Distally, the ischium becomes posteriorly expanded and shows a curvature medial to the symphysis. Apparently, the symphysis is distributed along the length of the ischial shaft as in *Aetosauroides* (Lacuona & Desojo, 2011).

Femur. Both femora are present and well-preserved in the holotype. They are robust, with a typical sigmoid shape as in *Aetosauroides* (PVL 2073) and most archosaurs (Nesbitt, 2011), (Fig.35, 36). However, in the femora of *Polesinesuchus*, the extremities are slightly twisted along the axial length. In contrast, the extremities of *Aetosauroides* (PVL 2073) are strongly twisted. Probably this feature is related to the type of insertion of the femur due the ventral position of the acetabulum (Desojo & Baéz, 2005). The femoral head is medially displaced for connection to the acetabulum. The greater trochanter is slightly developed. Medially and below the greater trochanter there is a strong ridge that ends almost over the fourth trochanter. This ridge is accompanied by a longitudinal concave area that has the same length. In the proximal femoral lateral surface there is another ridge, but low and poorly-developed in comparison. In dorsal view, the proximal end of the femur presents in its articular surface an anteroposterior groove. The fourth trochanter of *Polesinesuchus* is very high and forms a well-prominent crest as reported in *Aetosauroides* and *Stagonolepis welllesi*. In contrast, the fourth trochanter of *Aetosaurus* presents a longitudinal bulge that forms a low platform (Schoch, 2007). These trochanters function as an insertion area for of the *M. caudifemoralis longus* (Lacuona & Desojo, 2011). The distal end of the femur presents two ventral condyles. The medial one is for articulation with the tibia. Laterally, the condyle attaches with the tibia. These condyles are separated by a longitudinal intercondilar groove for attachment of the *M. quadriceps femoralis*.

INSERT FIGURE 35 ABOUT HERE

INSERT FIGURE 36 ABOUT HERE

Tibia. A complete left tibia and a proximal end of the right element are preserved *Polesinesuchus*, both in a good degree of preservation (Fig.37). The tibia is a strong bone with expanded extremities, the proximal wider than the distal one in comparison. The tibia of *Aetobarbakinoides* is gentle in comparison with that of *Polesinesuchus*. The expansion of the proximal end of the tibia in aetosaurs is wider than those in non-aetosaur pseudosuchians (Parrish, 1986; Martz, 2002). However, in *Aetosaurus* both extremities of the tibia present almost the same width, contrasting with those of *Stagonolepis*, *Aetosauroides*, *Neoaetosauroides*, *Thypotorax*, and *Desmotosuchus* (Schoch, 2007). The shaft presents a posteriorly projected curve, as in *Aetobarbakinoides* and *Aetosauroides* (PVL 2073), (Casamiquela, 1961; Desojo *et al.* 2012). Tibia and fibula have almost the same length (1.2 times of the femur). The shaft is lateromedially flattened and presents a slightly bowing towards the fibula. Laterally, the tibial shaft presents a longitudinal edge, as in *Aetobarbakinoides* (Desojo *et al.* 2012). Dorsally, the proximal extremities form two articular surfaces for articulation with the femoral condyles. The distal end has an expanded and slightly elliptic outline which presents two ventral condyles, both forming two divided facets for the astragalus, as occurs in *Typothorax coccinarum* and also in other non-aetosaur pseudosuchians (Martz, 2002).

INSERT FIGURE 37 ABOUT HERE

Fibula. Both elements are preserved in *Polesinesuchus*. They are deformed and damaged in some extent. These elements are gentle, measuring almost the same length of the tibia (Fig.38, 39). Both proximal and distal ends are slightly expanded transversely and connected by a slender shaft. In the anterolateral surface of the shaft there is a prominent crest-like *iliofibularis* trochanter, which is longitudinally longer than in *Aetosauroides* (PVL, 2073). In contrast, in *Aetosaurus* this structure is less pronounced than in all remaining aetosaurs (Schoch, 2007). A huge *iliofibularis* trochanter is described for *Tyothorax coccinarum* (UCMP V2816 34248 70/G6) but in this taxon it is placed almost halfway in the shaft. The distal end of the fibula presents two articular facets, one for the calcaneum, larger than the one for the astragalus, which is very smaller in comparison.

INSERT FIGURE 38 ABOUT HERE

INSERT FIGURE 39 ABOUT HERE

Tarsus and pes. Both proximal tarsals, astragali and the right calcaneum are preserved in *Polesinesuchus*. A few elements from the pes are preserved in the holotype: a complete metatarsal (probably metatarsal III) and fragmentary elements of other metatarsals, phalanges, and a pedal digit V.

Astragalus. It is a massive bone that presents two articular facets (fibial and tibial) in its proximal region (Fig.40, 41). These articulations are separated by a thick crest which forms an acute angle among them. In *Gracilisuchus* these facets are divided by a sharp crest (Lecuona & Desojo, 2011). The tibial facet is subdivided into two facets by a small elevation and larger in comparison, occupying almost entirely the proximal region of the bone. Its anterior articular surface is strongly concave, whereas the posteromedial one is almost flat. These two facets diverge to form the screw-joint articulation for the tibia. Diverging facets are also related in other aetosaurs, such as *Neoaetosauroides* and *Stagonolepis wellsi* (Long and Murry 1995, fig.82; Lecuona & Desojo, 2011). Anteriorly, there is a poorly prominent astragalar hollow, which does not contact the distal hollow. According to Martz (2002), a small foramen located in the hollow is present in *Desmotosuchus* and *Alligator*, but not evident in *Thyothorax*. Also, this foramen is not observable in *Polesinesuchus*. The distal hollow is large and articulates with metatarsals I, II and the third distal tarsal. In lateral view, three articular surfaces for the calcaneum are present, two forming the astragalar peg as in *Gracilisuchus* (Lecuona & Desojo, 2011).

INSERT FIGURE 40 ABOUT HERE

INSERT FIGURE 41 ABOUT HERE

Calcaneum. It is also a robust element with a wide shaft and a slight dorsoventral compression (Fig.42). The calcaneal condyle is very prominent. Dorsally, it presents a concave surface that forms the area that receives the fibula in its lateral half, through a sliding

articulation. The astragalus articulates with the condyle in its medial length as occurs in *Gracilisuchus* (Lecuona & Desojo, 2011). Beneath the calcaneal condyle, there is a compressed tuber which serves for the attachment of the gastronemius muscle (Martz, 2002). Between the calcaneal condyle and the calcaneal tuber, *Polesinesuchus* displays a well-marked notch as occurs in *Aetosauroides* and *Gracilisuchus* (Lecuona & Desojo, 2011). In the posterior surface of the tuber of *Polesinesuchus* there is the so-called shallow medial groove, which holds the tendon of the *M. gastrocnemius externus* reported in *Gracilisuchus* and other aetosaurs. Distally, the surface of the calcaneal condyle is flattened and contacts the fourth distal tarsal. Below this surface, there is a deep fossa in *Polesinesuchus*, as in *Typothorax coccinarum* (Martz, 2002). However, in the former this fossa is “U”-shaped, differently from *Typothorax*. In lateral view, other smaller oval fossa (in comparison with the distal calcaneal fossa) is present. Medially, the condyle of the calcaneum displays a deep socket which is supported dorsally by a protruding lip as in *Typothorax coccinarum* (Martz, 2002). This socket receives the peg of the astragalus, the typical articulation of the crocodile normal type of tarsus.

INSERT FIGURE 42 ABOUT HERE

Metatarsal III. It is a relatively long bone with expanded ends. The proximal end is dorsoventrally compressed and more expanded than the distal one in comparison (Fig.43). Unfortunately, the proximal end shows fractures that difficult the recognition of some structures. Nonetheless, in the proximal end, the degree of expansion is longer than in *Aetobarbakinoides*. According to Desojo *et al.* (2012), in this taxon the degree of expansion of the proximal end is lesser than in *Neoaetosauroides* (PVL 3525), *Aetosaurus* (Schoch,

2007), *Stagonolepis* (Walker, 1961) and *Typhothorax* (Heckert *et al.* 2010). The shaft towards the distal end becomes thinner. Distally, the shaft presents a slight twist, as seen in *Postosuchus alisonae* (UNC 15575) and *Aetobarbakinoides* (Peyer *et al.* 2008; Desojo *et al.* 2012).

INSERT FIGURE 43 ABOUT HERE

Pedal digit V. Medially, the proximal articular surface forms a small condyle, and its proximal end is quite expanded; with the articular surface strongly concave (Fig.44). The proximal articular surface possesses small foramina and ligament attachment marks. The shaft is hook-shaped and becomes tapered towards the distal end, as in *Postosuchus alisonae* and several archosauromorphs (Peyer *et al.* 2008; Desojo *et al.* 2012). Its dorsal surface is slightly convex. The distal end is less expanded than the proximal one.

INSERT FIGURE 44 ABOUT HERE

Phalanges. Two phalanges are present. In both, the proximal and distal ends are wide (Fig.45). The first phalanx (Fig. 45a) is longer in comparison with the second, presenting a dorsoventrally compressed distal end. Laterally, in both sides, there are small pits. The anterior articular surface is trapezoidal and more expanded in comparison. The second element (Fig. 45b) is shorter than the first one and robust. Its distal end is dorsoventrally higher and the pits are larger in comparison. Furthermore, this element shows a developed

ginglymous articulation as in *Aetobarbakonoides* (Desojo *et al.* 2012). According to these features, it is quite possible that this element proceeds from the four digit of the pes (see Desojo *et al.* 2012).

INSERT FIGURE 45 ABOUT HERE

Ungual phalanges. They are quite curved and lateromedially compressed, with strongly sharp tip (Fig.45). In both sides, close to distal end, there are grooves for blood vessels (Martz, 2002). The morphology these elements are very similar to those from other aetosaurs as *Neoaetosauroides*, *Aetobarbakinoides* and *Aetosauroides* (Desojo & Baéz, 2005; Desojo *et al.* 2012).

Dorsal paramedian osteoderms. Three elements are present (Fig 46A, B, and C, respectively). The osteoderm A is subrectangular in dorsal view and wider than long (a ratio of about 2.76 times), (Fig.46). Unfortunately, it is quite damaged. On the external surface, there is an anterior bar with a small elevation devoid of ornamentation. This bar becomes anteroposteriorly longer towards the lateral edge as in *Aetosauroides* (MCP 13-a-b PV), (Desojo & Ezcurra, 2011). The lateral edge is partially broken but permits the observation of an anterolateral projection as occurs in a large specimen of *Aetosaurus ferratus* (SMNS 12670: Schoch, 2007). In *Polesinesuchus* this projection is comparatively lower and its medial edge is not projected. Posteriorly, the paramedian osteoderms of *Polesinesuchus* present a strong ventral flexion as occurs in typhothorascisines and desmatosuchines (Parker, 2007; Desojo *et al.* 2012). The ornamentation consists of irregular circular pits and ridges with a radial pattern projecting from the dorsal eminence as occurs in *Aetosauroides* (PVL 2073; MCP 13-a-b PV), *Aetobarbakinoides* (CPE2 168) *Neoaetosauroides* (Bonaparte 1971),

Aetosaurus (Schoch, 2007), *Lucasuchus* and *Paratypothorax* (Long and Murry, 1995), *Coahomasuchus* (Heckert and Lucas, 1999) *Stagonolepis robertsoni* (NHMUK R4788) and *Stagonolepis wellsi* (Long and Murry, 1995), (Desojo & Ezcurra, 2011; Desojo *et al.* 2012). However, the overall osteodermal ornamentation of *Polesinesuchus* shows poor density. In small specimens of *Aetosauroides* this fact is attributed to a juvenile ontogenetic stage (Desojo & Ezcurra, 2011), probably the same situation of *Polesinesuchus*. The dorsal eminence is posteromedially displaced, incipient, and does not contact the posterior edge, as occurs in *Aetosauroides* (MCP 13-a-b PV), (Desojo & Ezcurra, 2011). An incipient dorsal eminence occurs also in *Aetobarbakinoides*, *Typothorax* and *Redondasuchus* (Long and Ballew 1985; Heckert *et al.*, 1996). Due to these characteristics, the osteoderm A probably belongs to the left posterior cervical or to the anterior dorsal region of the armour. Desojo & Ezcurra (2011) claim that the pitting density in cervical and dorsal osteoderms presents differences according to their position in the armor (e. g. a diminution of density towards the sacral region).

INSERT FIGURE 46 ABOUT HERE

The osteoderm B comes from the right transverse segment and presents almost the same characteristics of the osteoderm A but, differently, its ratio is 2.15 (Fig.47). Its lateral ridge shows a rounded distal half, and the ornamentation is more conspicuous and the dorsal eminence forms an anteroposteriorly displaced ridge. Due to the density of the ornamentation in osteoderm B, this element is probably more anteriorly placed than A.

INSERT FIGURE 47 ABOUT HERE

The ornamentation of osteoderm C is distinct. In dorsal view, the ridges and pits are deeper in comparison with osteoderm A and B. In the medial region, the small pits merge, increasing their size and being surrounded by anastomosed ridges (Fig.48). In posterior view, the osteoderm C is not flexed. According to this pattern, this element was probably placed close to sacral region. (TABORDA, personal communication, 2012).

INSERT FIGURE 48 ABOUT HERE

Ventral osteoderms. Seven elements are present in *Polesinesuchus* (Fig.49). They are subrectangular and slightly wider than long as occurs in *Aetosauroides* (MCP 13a-b PV), (Desojo & Ezcurra, 2011). The anterior bar is well-developed, without ornamentation. The pattern of the ornamentation consists of pits and grooves in a radial pattern, starting from the center of the osteoderm, as in *Aetosauroides* (Desojo & Ezcurra, 2011). Among the preserved elements, four are still enclosed in the matrix, imbricated to each other, which shows their original disposition in the ventral armor. They are slightly flexed in posterior view.

INSERT FIGURE 49 ABOUT HERE

Phylogenetic position of *Polesinesuchus aurelioi* and discussion. In order to verify the likely position of *Polesinesuchus* within Aetosauria, we used the data-matrix by Desojo *et al.* (2012) which is constituted of 37 characters and 20 ingroup taxa plus the rauisuchian *Postosuchus kirkpatricki* and *Revueltosaurus callenderi* as outgroups. Desojo *et al.* (2012) modified the data-matrix from Parker (2007) and Parker *et al.* (2008). The phylogenetic analysis was performed using the software TNT (Goloboff *et al.* 2003, 2008). The analysis was executed using Traditional Search. Two most parsimonious trees (MPTs) of 67 steps each and consistency index of 0,686 were recovered in the analysis (Fig. 50, 51). The strict consensus tree is also depicted in fig 52. See appendix I for character coding of *Polesinesuchus aurelioi*:

As stated in the diagnosis, the new genus is based upon an unique combination of characters. Some of them are shared with *Aetosauroides*, whereas some others with *Aetobarbakinoides*. For instance, in *Polesinesuchus* the cervical centra present a very marked ventral keel as occurs in *Aetosauroides*. In contrast, in *Aetobarbakinoides* this structure is absent. Additionally, the dorsal vertebrae of *Polesinesuchus* do not present both infradiapophyseal laminae and the well-rimmed fossa laterally placed in the centra as is seen in *Aetosauroides*. The absence of these structures are shared with *Aetobarbakinoides*. Furthermore, the morphology of the appendicular skeleton is quite similar to that of *Aetosauroides*, as both present robust limbs. Conversely, *Aetobarbakinoides* had gracile limbs. In addition, some derived features were recognized in the pelvic girdle of the new taxon, which were not coded in the updated data-matrix by Desojo *et al.* (2012), which is mostly based upon the morphology of the osteoderms. The ilium of *Polesinesuchus* is very similar to that found in the genus *Desmotosuchus*.

The phylogenetic analysis shows that *Polesinesuchus* is the sister taxon of *Aetobarbakinoides* and both form a clade that is a sister group of the large monophyletic clade

composed of the subfamilies *Desmotosuchinae* and *Typothoracisinae*. However, this result must be taken with caution, as the holotype of *Aetobarbakinoides* is quite incomplete with several missing entries in the data-matrix, so the sister-group relationship between it and *Polesinesuchus* might be an artifact caused by the incompleteness of the former one and considered provisional. Besides, several postcranial characters present in are not preserved in the holotype of *Aetobarbakinoides*, such as the pelvic girdle, femora, fibulae, skull elements, tarsus.

An interesting result worth to point out is that the addition of *Polesinesuchus* in the data-matrix by Desojo et al (2012) produced just slight changes in the topology found by these authors (only in the basis of the Aetosauria). The first MPT (Fig.50) shows *Aetosauroides* as the most basal aetosaur as seen in Desojo *et al* (2012), but not placed between *Calyptosuchus* and *Stagonolepis*. The second MPT (Fig. 51) also presents *Aetosauroides* as basal taxon and the sister taxon of *Coahomasuchus*. *Neoaetosauroides* occurs as the sister taxon of *Calyptosuchus* and *Stagonolepis*. The strict consensus tree of the present analysis (Fig. 52) resembles the first topology of the Desojo *et al.* (2012).

INSERT FIGURE 50 ABOUT HERE

INSERT FIGURE 51 ABOUT HERE

INSERT FIGURE 52 ABOUT HERE

In the work by Desojo et al. (2012, Fig. 19), the first tree shows the presence of genus *Coahomasuchus* within a polytomy among *Neoaetosauroides*, *Coahomasuchus Aetosaurus*, and a derived group (also polytomic) comprising *Stagonolepis*, *Calyptosuchus* and more derived forms (Typothoracisinae plus Desmatosuchinae). After a posteriory pruning of *Coahomasuchus* from the analysis the authors obtained a more resolved result, where only the tricotomy among *Calyptosuchus*, *Stagonolepis* and Typothoracisinae plus Desmatosuchinae remained. As stated above, in spite of the well resolved placement of *Polesinesuchus* as a sister taxon of *Aetobarbakinoides*, this result should be seen with caution, as we need to consider the small representativeness of postcranial characters in this phylogenetic analysis. Previous phylogenies of Aetosauria (e. g. Parker, 2007, 2008, Desojo et al. 2012, among others) are mainly based upon cranial and osteodermal characters, as most members of this group lack information regarding postcranial skeletons. The generalized use of osteoderms in such analyses, could be distorting the “real” phylogenetic relationships of Aetosauria. In fact, the validity of the use of osteoderms and their pattern of ornamentation has been discussed in several contributions (Martz & Small, 2006; Parker 2007, 2008; Cerda & Desojo, 2010). Therefore, as long as postcranial data are not available for many aetosaurs we should be aware that cranial/osteoderm based phylogenies might embrace a great deal of biases due their homoplastic nature (Parker, 2008). Moreover, some characters used, at present moment, can be individual variations due to ontogenetic development and anatomical position from where the osteoderm comes in the body (Harris *et al.* 2003; Martz & Small, 2006). At this point, this kind of problems cannot be avoided due to the lack of postcranial information in many aetosaurs.

Conclusion. Recent studies have pointed out the importance of American aetosaurs and their role in the origins, distribution and diversity of this group, especially in Upper Triassic deposits from the Santa Maria Formation. The description of *Polesinesuchus* significantly increases the availability of data regarding South American aetosaurs (particularly concerning postcranial data). This new species is based upon a unique combination of characters, many of them shared with other two genera from the Santa Maria Formation, *Aetosauroides* and *Aetobarbakinoides*. Despite the unequivocal position of *Polesinesuchus* in the topology generated here, some problems arose during this study. Among them, the small representativeness of postcranial elements in phylogenetic studies of Aetosauria. As *Polesinesuchus* adds a great amount of postcranial features regarding this group, a new evaluation of postcranial characters of aetosaurs housed in different collections around the world, as well as the inclusion of as many of them as possible in future phylogenetic studies is necessary in order to improve anatomical, phylogenetic, and palaeobiogeographic knowledge of the Aetosauria.

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7. CONCLUSÃO

Estudos recentes tem mostrado a importancia dos aetosauros Americanos para o conhecimento da origem e diversidade do grupo, especialmente na Formação Santa Maria, Triássico Superior do Sul do Brasil. A descrição da nova espécie *Nanoaetosauroides aurelioi* apresentada aqui, aumenta o conhecimento a cerca desse interessante grupo de arcossauros, (principalmente de informações do pós-crânio).

Esta nova espécie é baseada em uma combinação única de caracteres, muitos deles compartilhados com outros dois gêneros *Aetosauroides* e *Aetobarbakinoides*. Apesar de não haver dúvidas na posição de *Nanoaetosauroides* nas topologias geradas neste estudo, alguns problemas foram observados durante o desenvolvimento da análise filogenética. Dentre eles, a pequena representatividade de elementos pós-cranianos na atual matriz de Aetosauria. Devido ao fato, de *Nanoaetosauroides* ter acrescentado uma grande quantidade de caracteres pós-cranianos, uma nova avaliação dos materiais referentes ao pós-crânio tombadas em diferentes instituições ao redor do mundo torna-se necessária. Por consequência, existe a necessidade de inclusão de muitos desses novos caracteres em futuros estudos filogenéticos, visando melhorar o conhecimento anatômico e paleobiogeográfico de Aetosauria.

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APPENDIX I. Characters scores for *Polesinesuchus* nov. gen. et nov. sp

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APPENDIX II

List of character-states preserved in *Polesinesuchus* and coded in the datamatrix published by Desojo *et al.* 2012 and modified of Parker, 2008.

Character 10. *Transverse processes of dorsal vertebrae short, less than twice as wide as the centrum*(0) *or elongate, buttressed ventrally* (1).

Character 12. *Cervical centra keeled ventrally* (0) *or unkeeled* (1).

Character 13. *Anterior bars on dorsal and lateral plates: absent* (0), *weakly raised bar* (1), *strongly raised bar* (2).

Character 14. *Width to length ratio of widest dorsal paramedian plates: maximum of less than 3.5/1* (0), *3.5/1 or more* (1).

Character 16. *Patterning of paramedian plates: radiate* (0) *or random* (1).

Character 17. *Ornamentation of paramedian plates consists of mixture of pits, elongate pits, grooves and ridges* (0) *or small subcircular pits only* (1).

Character 18. *Dorsal eminence contacts posterior margin of the paramedian plates majority of the time* (0) *or almost never* (1).

Character 19. *Raised dorsal eminence on cervical and anteriormost paramedian plates: absent* (0), *present* (1).

Character 20. *Ventral keel or strut never present* (0) *or present* (1) *on some or all paramedian plates.*

Character 23. *Flexure of paramedian plates: none or minimal* (0), *strongly flexed ventrally* (1).

Character 27. *Fusion of last presacral vertebra into sacrum does not occur* (0) *or occurs* (1).

Character 29. *Dorsal eminence on paramedian plates: centralized* (0), *moderately offset medially* (1) *or strongly offset medially* (2).

Character 30. *Lateral spikes in anterior and mid-dorsal regions: not present* (0), *form a dorsoventrally flattened 'horn'* (1) *or form a conical spine* (2).

Character 32. *Dorsal eminences on posterior paramedian plates are in the form of a low pyramid or knob* (0) *or an elongate spine* (1).

Character 33. *Cervical vertebrae extremely shortened anteroposteriorly: no* (0) *or yes* (1).

8. ANEXOS

TABLE 1. Measurements in millimetres of the available elements of the axial skeleton of *Nanoaetosauroides*. Abbreviations:AFH, anterior articular facet height; AFW, anterior articular facet width; CL, centrum length; MH, maximum preserved height;PFH, posterior articular facet height; PFW, posterior articular facet width. * incomplete; () distorted, and ca. for estimated measurements.

	CL	AFH	AFW	PFH	PFW	MH
Cervical 2	0.9	0.85	0.8	0.85	0.82	1.2*
Cervical 3	0.9	0.9	0.88	0.8	0.8	24.3
Cervical 4	0.93	0.9	0.92	0.85	0.88	0.85*
Cervical 5	10	0.92	0.9	0.85	0.88	19.5*
Cervical 7	10.5	0.9	10	0.9	0.88	20*
Cervical 8/9	10	0.92	11	0.85	0.88	10*

TABLE 2. Measurements in millimetres of the available elements of the axial skeleton of *Nanoaetosauroides*. Abbreviations:AFH, anterior articular facet height; AFW, anterior articular facet width; CL, centrum length; MH, maximum preserved height;PFH, posterior articular facet height; PFW, posterior articular facet width. * incomplete; () distorted, and ca. for estimated measurements

	CL	AFH	AFW	PFH	PFW	MH
--	----	-----	-----	-----	-----	----

Ant Dorsal 1	10.5	0.88	10.2	0.8	0.85	20*
Ant Dorsal 2	10.8	0.76	0.8	0.8	0.9	0.7*
Ant Dorsal 3	11.2	0.81	0.83	0.7	0.78	0.8*
Ant Dorsal 4	12	0.9	0.85	0.75	0.7	0.9*
Ant Dorsal 5	12.2	0.9	0.85	0.75	0.71	0.9*
Mid Dorsal 13	12.8	0.93	0.88	0.88	0.9	23*
Mid Dorsal 14	13.3	0.95	0.98	0.98	10.3	20.2*
Mid Dorsal 15	13.8	0.95	0.98	0.98	10	16*
Sacral 1	14	11.2	13.1	10	13	12.2*
Sacral 2	14.2	10.8	12.5	10	12.1	10.5*
Caudal 1	13	11.2	10.8	12	11.5	12*
Caudal 2	12.5	11.5	11.8	11.5	12	11.5*
Caudal 3	14.2	(10.8)	(0.92)	(10)	(0.91)	12.3*
Caudal 4	15	0.91	0.88	0.9	0.88	0.95*
Caudal 5	14	0.62	0.58	0.6	0.56	0.9

TABLE 3. Measurements in millimetres (mm) of poscranial elements of *Nanoaetosauroides* (all the measurements are the maximum preserved). *, incomplete; (), approximate.

Scapula

Length	49.5
Proximal transverse width	24*
Proximal anteroposterior depth	3.5

Distal transverse width	23
Distal anteroposterior depth	7.5
Coracoid	
Length	(28)
Proximal transverse width	15.5*
Distal transverse width	16
Interclavicle	
Length	45*
Proximal transverse width	9.8
Distal transverse width	6.5
Humerus	
Length	(60)
Proximal transverse width	19
Proximal anteroposterior depth	5
Mid-shaft width (mediolateral)	0.75
Mid-shaft thickness (anteroposterior)	0.6
Distal transverse width	16.5
Distal anteroposterior depth	5.2
Ulna	
Length	4.5
Proximal transverse width	11
Proximal anteroposterior depth	7
Mid-shaft width (mediolateral)	6
Mid-shaft thickness (anteroposterior)	3
Distal transverse width	8.5
Distal anteroposterior depth	4
Ilium	
Length of the iliac blade	50.5
Height of iliac blade above to acetabular crest	10.4

Transverse width of acetabulum 23.5

Height of acetabulum 19.5

Ischium

Length 37

Proximal transverse width 22*

Distal transverse width 7

Pubis

Length (50)

Proximal transverse width (20.5)

Distal transverse width 15*

Femur

Length 90

Distance from head to fourth trochanter 35

Head width 10

Head length 22

Thickness across fourth trochanter 12

Mid shaft length 12

Mid shaft width 9

Intercondylar thickness 7.5

Distal transverse width 24

Tibia

Length 70

Proximal width (mediolateral) 13

Proximal thickness (anteroposterior) 18.5

Mid-shaft width (mediolateral) 7

Mid-shaft thickness (anteroposterior) 8.3

Distal transverse width 10

Distal thickness 13.5

Fibula

Length 72

Proximal width 6.8

Distance proximal end to trochanter 19.3

Thickness at trochanter 6

Distal width 8

Distal thickness 12

Metatarsals III

Length 32

Proximal width 3.8

Distal width 5.5

Distal thickness 5.9

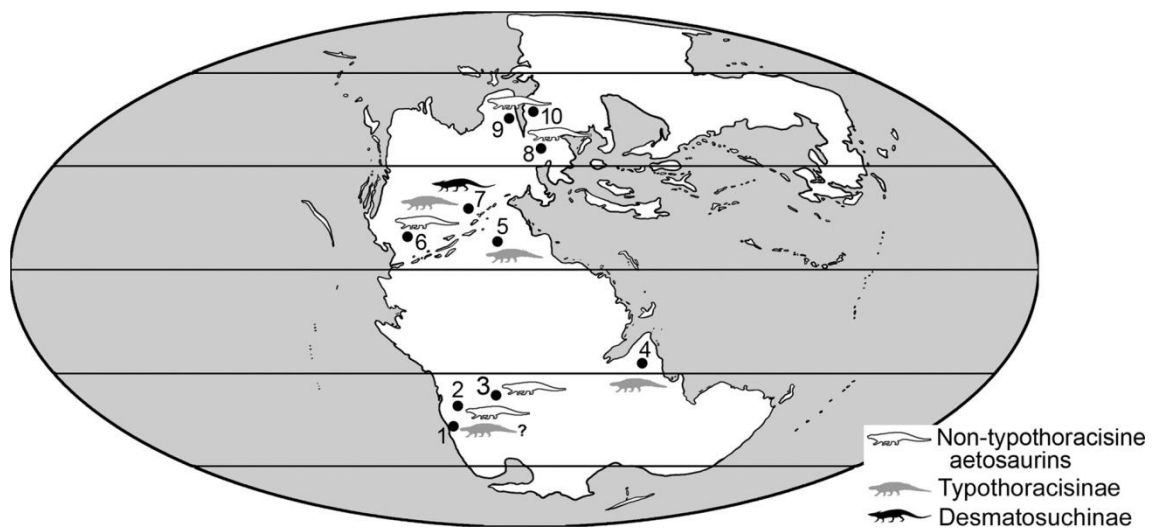


FIGURE 1. Late Triassic paleogeographic map indicating the worldwide occurrences of aetosaur specimens (map redrawn from Blakey, 2006). 1, Stratos El Bordo (Chile); 2, Ischigualasto-Villa Unión Basin (Argentina); 3, Paraná Basin (Brazil); 4, Pranhita-Godavari Basin (India); 5, Timesgadiouine Formation (Morocco); 6, Chinle Group (U.S.A.); 7, Newark Supergroup (U.S.A.); 8, Keuper Group (Germany) and Alpine marine Triassic beds (Italy); 9, Fleming Fjord Formation (Greenland); 10, Lossiemouth Sandstone (Scotland). Modified of Desojo and Ezcurra, (2011).

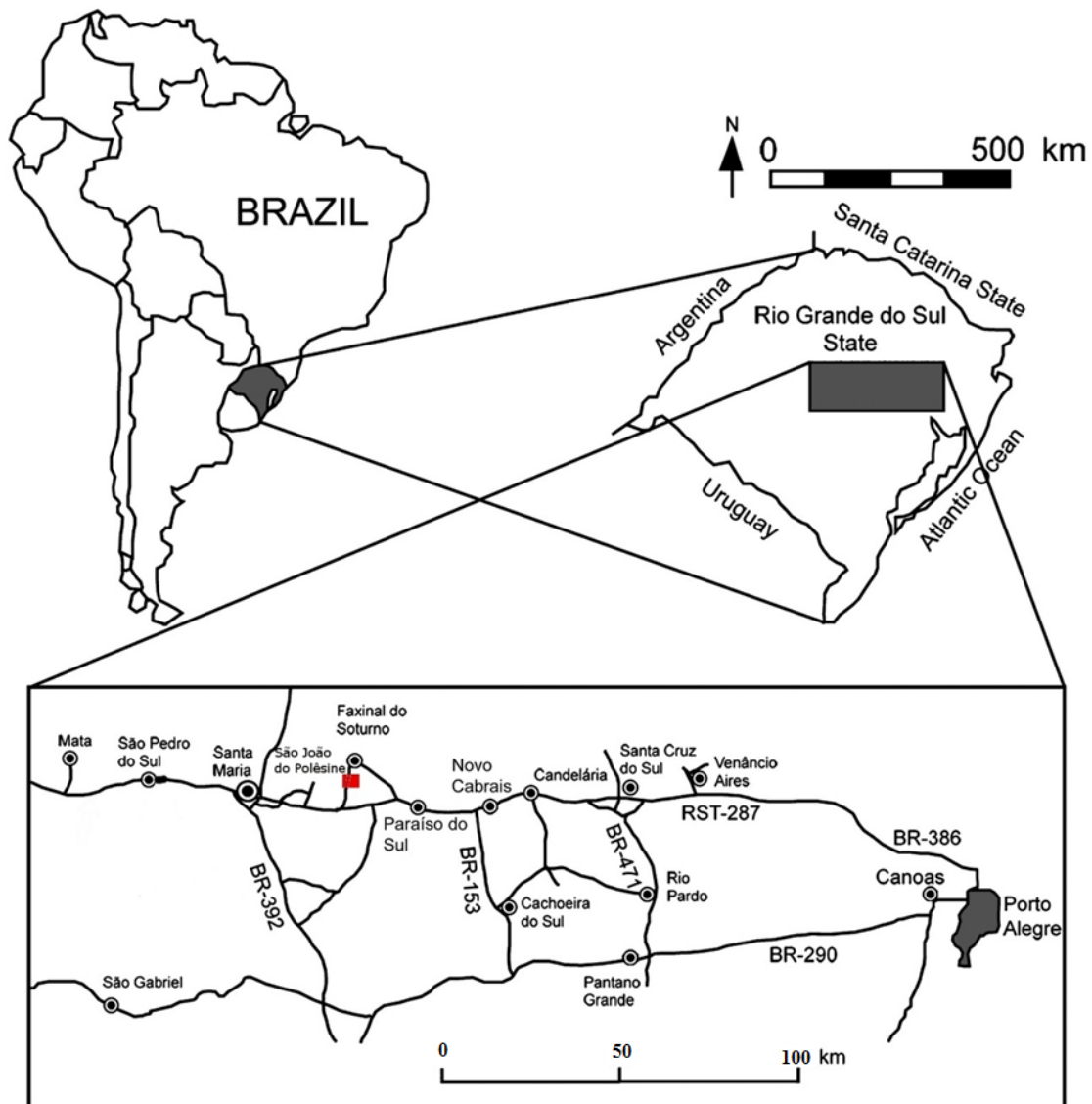


FIGURE 2. Map showing the municipality of São João do Polêsine (in red) localization of Buriol outcrop where was found the holotype of *Polesinesuchus aurelioi* (Modified of Reichel *et al.* 2009).

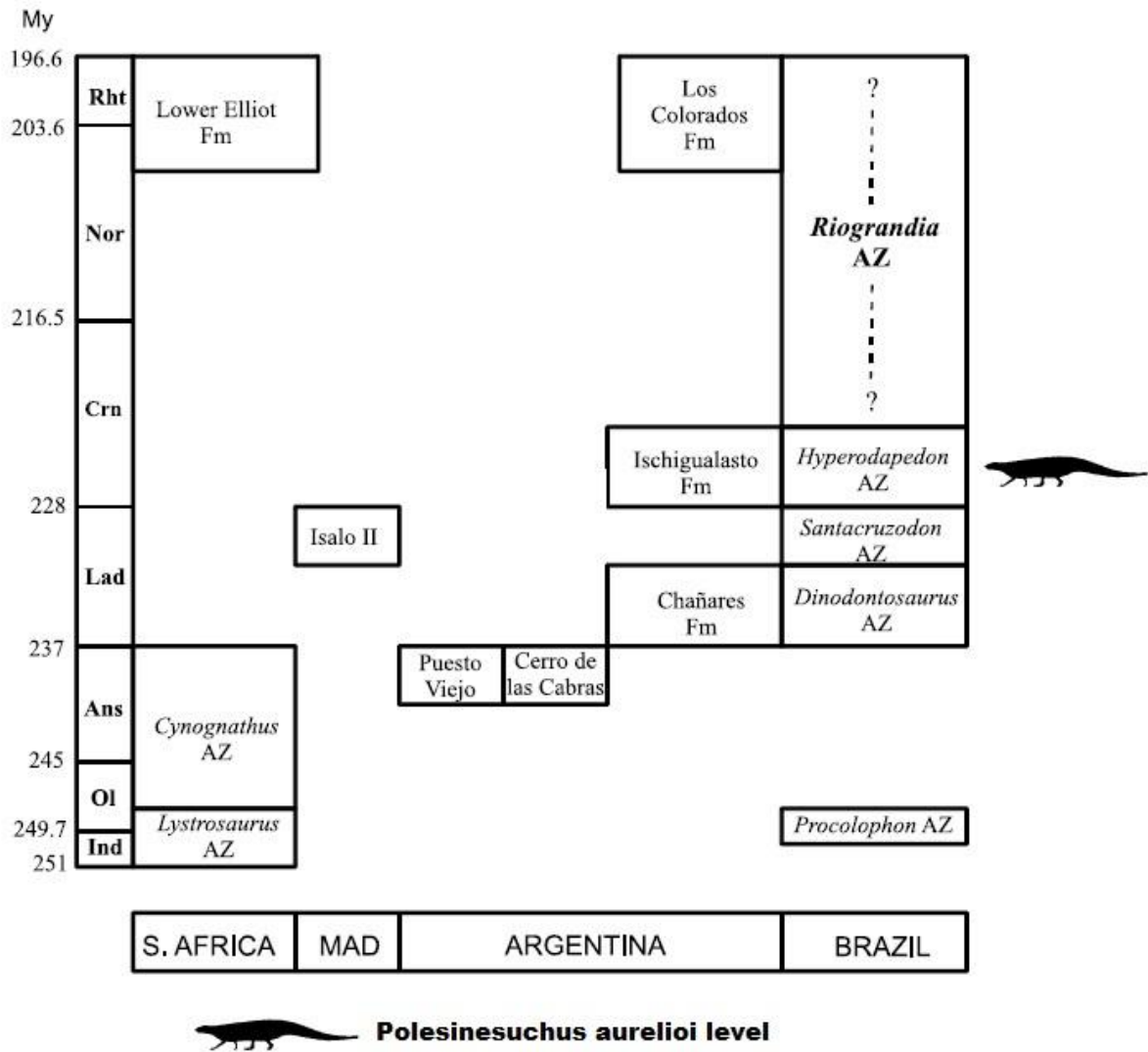


FIGURE 3. Biostratigraphic chart of terrestrial Triassic faunas from Gondwana showing the *Riograndia* AZ. *Dinodontosaurus* AZ (*sensu* Barberena et al. 1985), *Santacruzodon* AZ (*sensu* Abdala & Ribeiro 2010); *Hyperodapedon* AZ (*sensu* Abdala et al. 2001). Ans, Anisian; AZ, Assemblage Zone; Crn, Carnian; Ind, Induan; Lad, Ladinian; Mad, Madagascar; Nor, Norian; Ol, Olenekian; Rht, Rhaetic; S. Africa, South Africa and the position of *Polesinesuchus* level. Modified from Abdala and Ribeiro (2010). Geological Time Scale based on Gradstein and Ogg (2004). Modified from Soares *et al.* (2011).



FIGURE 4. Dorsal view of a fragmentary parietal preserved in *Polesinesuchus* holotype (ULBRAPVT003). Scale bar equals 10 mm.

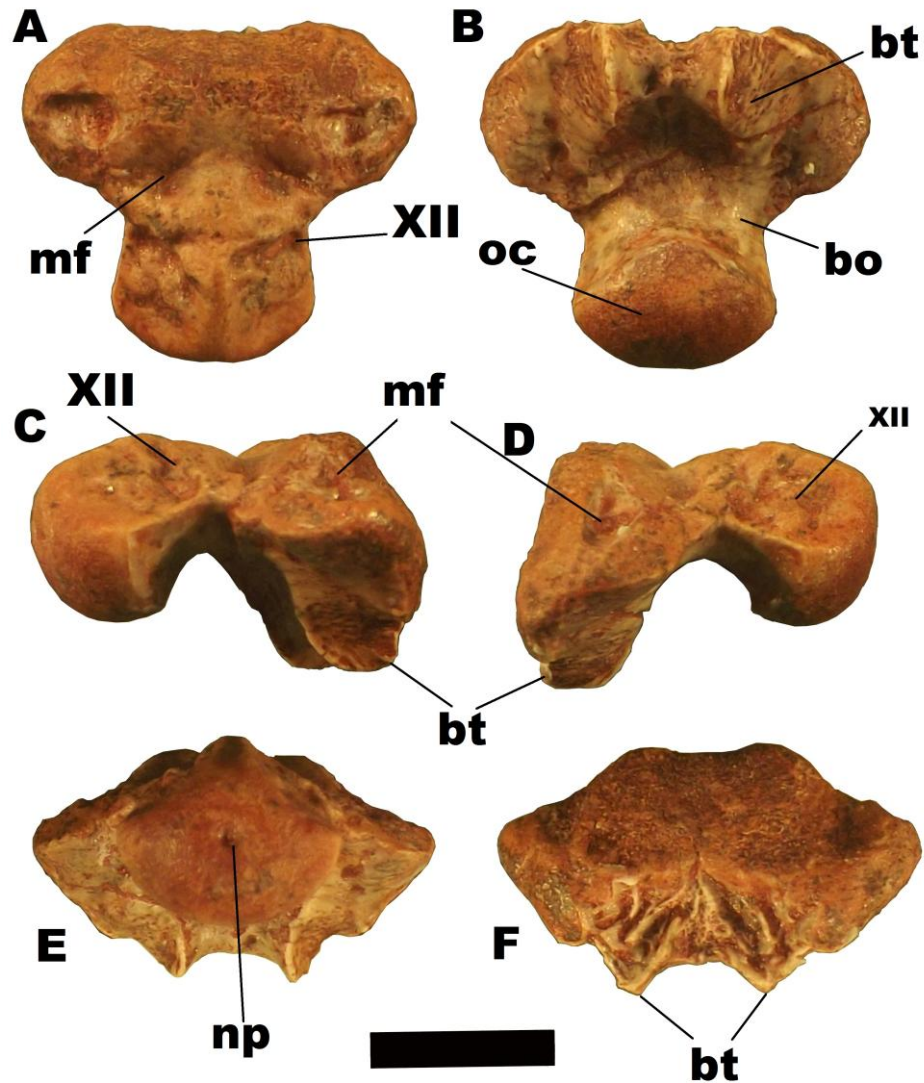


FIGURE 5. Partial braincase of *Polesinesuchus aurelioi* holotype (ULBRAPVT003). **A** dorsal view; **B**, ventral view; **C**, right lateral view; **D**, left lateral view; **E** posterior view and **F**, anterior view. Abbreviations: **bo**, basioccipital **bt**, basal tuber (a) of the basioccipital; **mf**, metotic foramen; **np**, notochordal pit; **oc**, occipital condyle; **XII**, foramen for hypoglossal nerve. Scale bar equals 10mm.

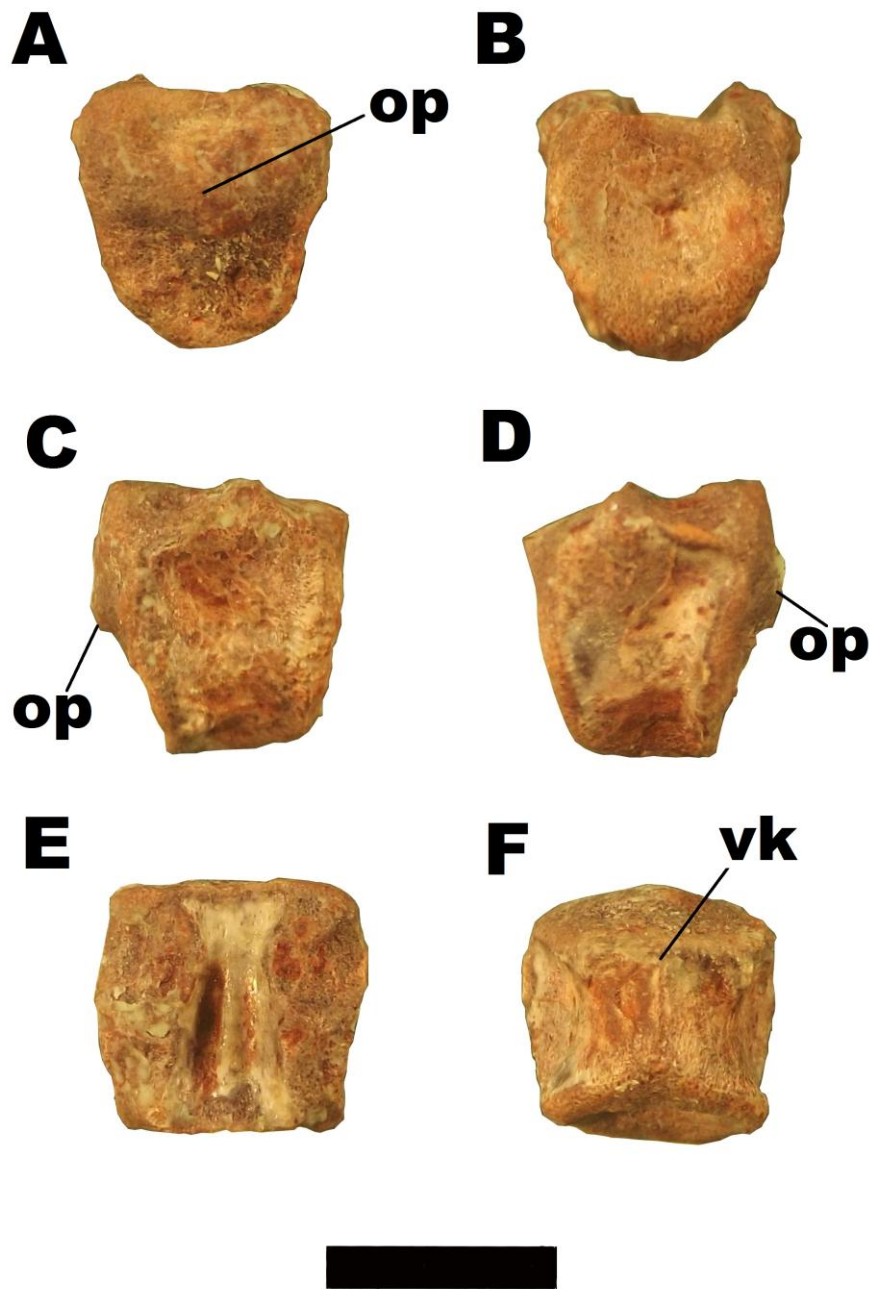


FIGURE 6. Axis of the *Polesinesuhcus aurelioi* holotype (ULBRAPVT003). **A**, anterior view; **B**, posterior view; **C**, left lateral view; **D** right lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **op**, odontoid process; **vk**, ventral keel. Scale bar equals 10mm.

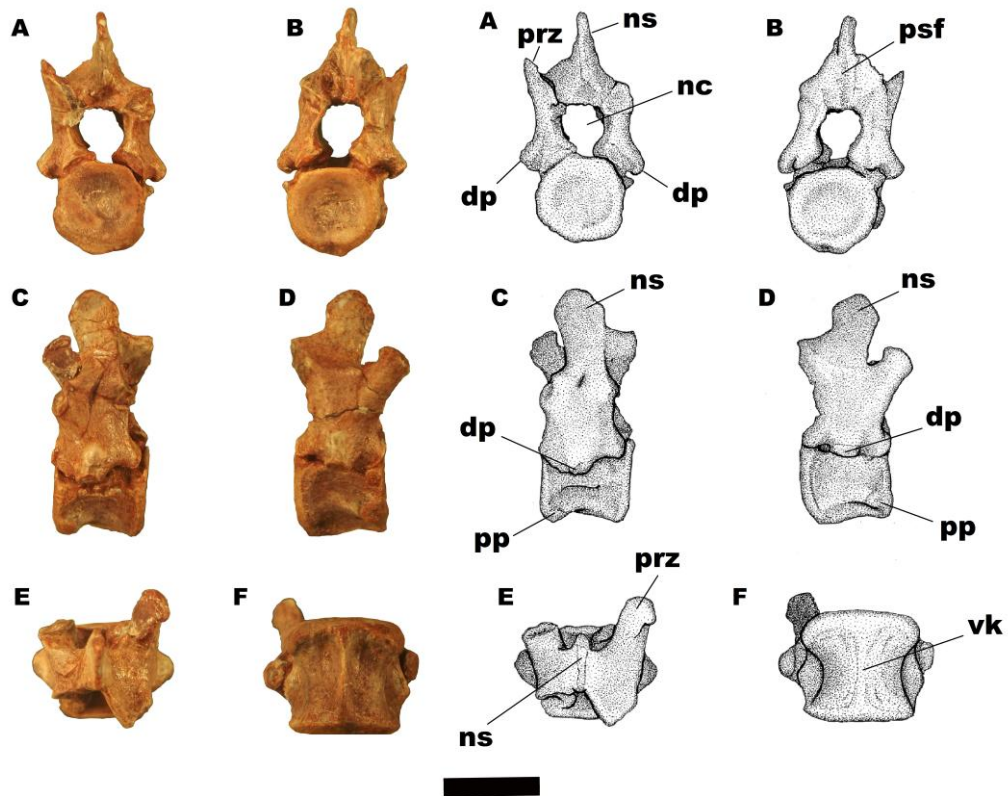


FIGURE 7. Cervical vertebra (C3?) of the *Polesinesuchus aurelioi* (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, left lateral view; **D** right lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **dp**; diapophysis; **nc**, neural canal; **ns**, neural spine; **pp**, parapophysis; **prz**, prezigapophysis; **psf**, post spinal fossa; **vk**, ventral keel. Scale bar equals 10mm

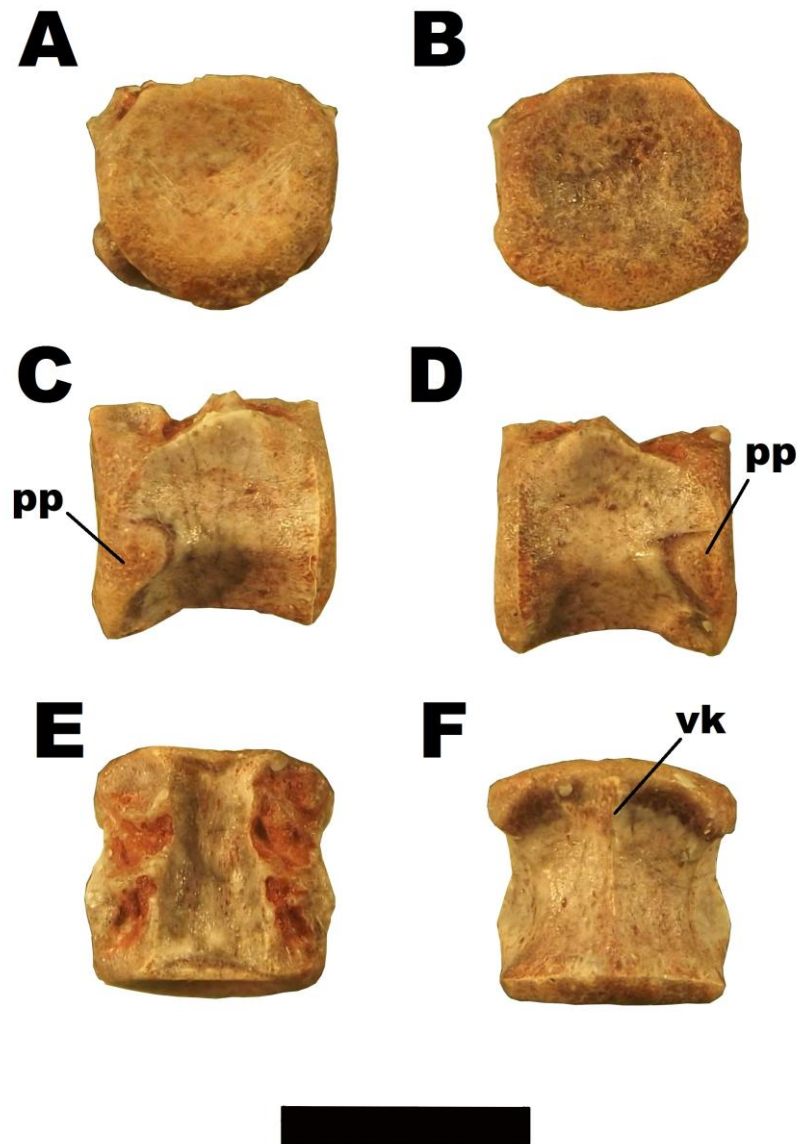


FIGURE 8. Cervical vertebra (C4?) of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **pp**, parapophysis; **vk**, ventral keel. Scale bar equals 10mm.

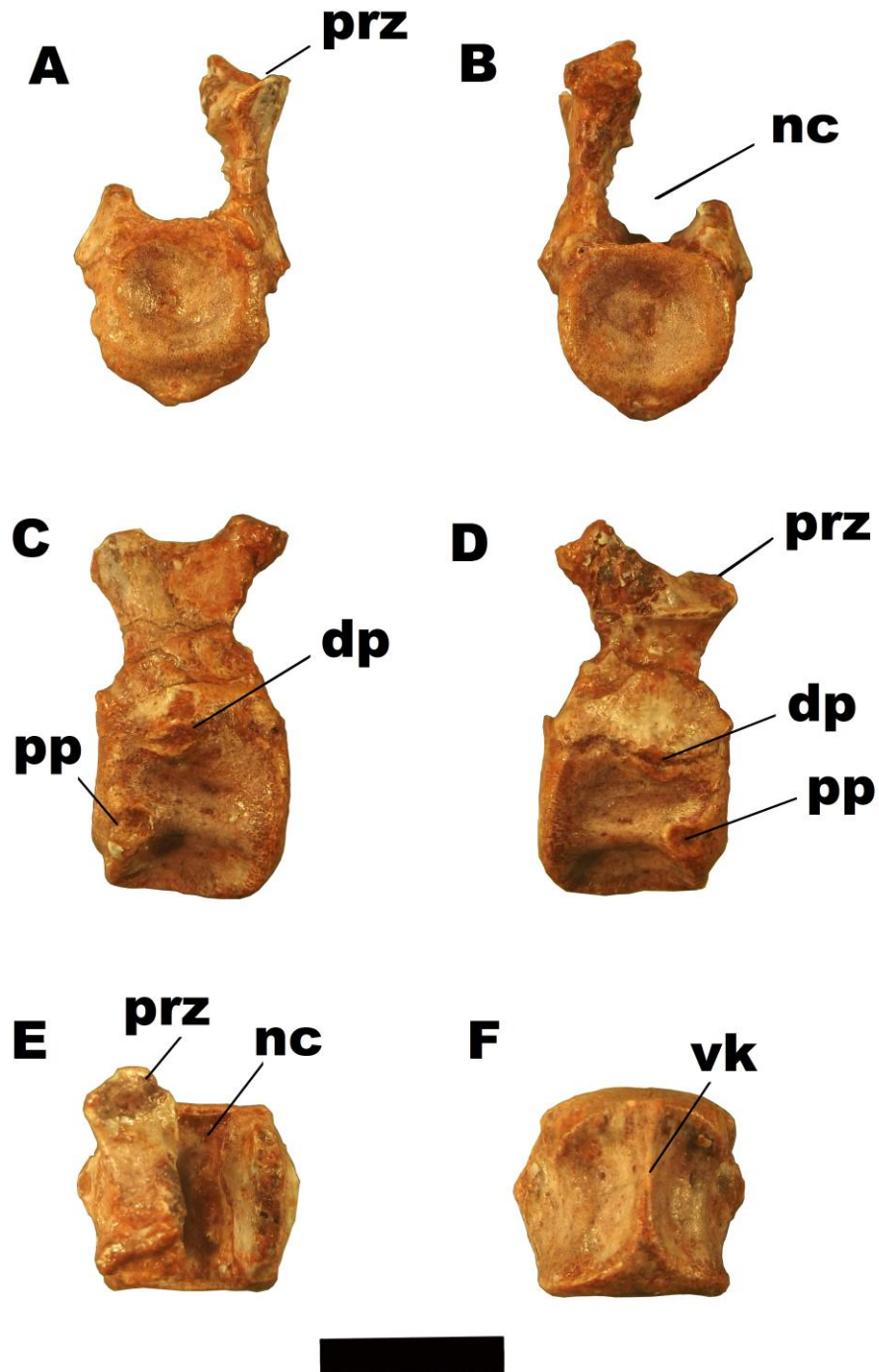


FIGURE 9. Cervical vertebra (C5?) the *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, left lateral view; **D** right lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **dp**; diapophysis; **nc**, neural canal; **pp**, parapophysis; **prz**, prezygapophysis; **vk**, ventral keel. Scale bar equals 10mm.

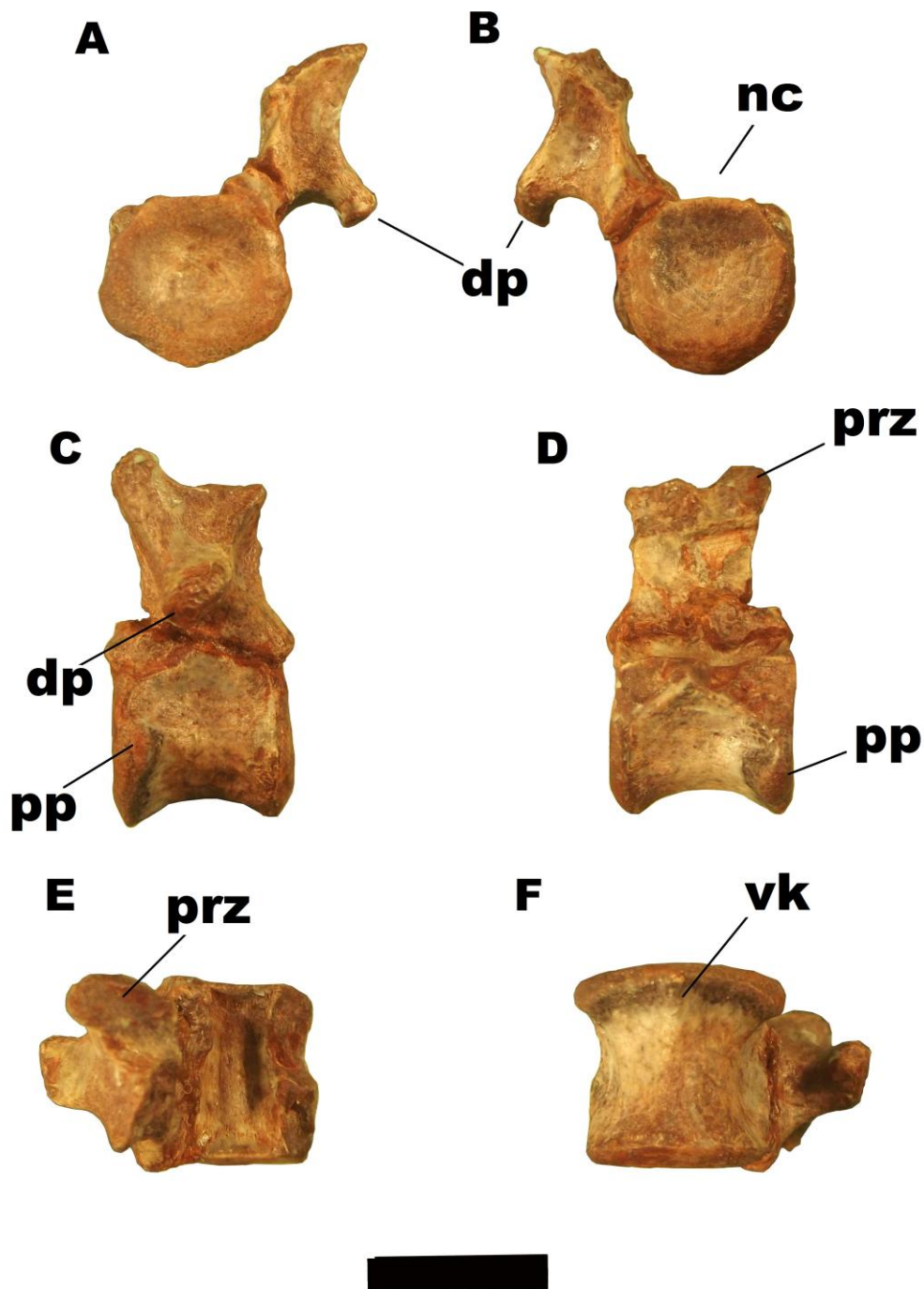


FIGURE 10. Cervical vertebra (C7?) the *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, left lateral view; **D** right lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **dp**; diapophysis; **nc**, neural canal; **pp**, parapophysis; **prz**, prezigapophysis; **vk**, ventral keel. Scale bar equals 10mm.

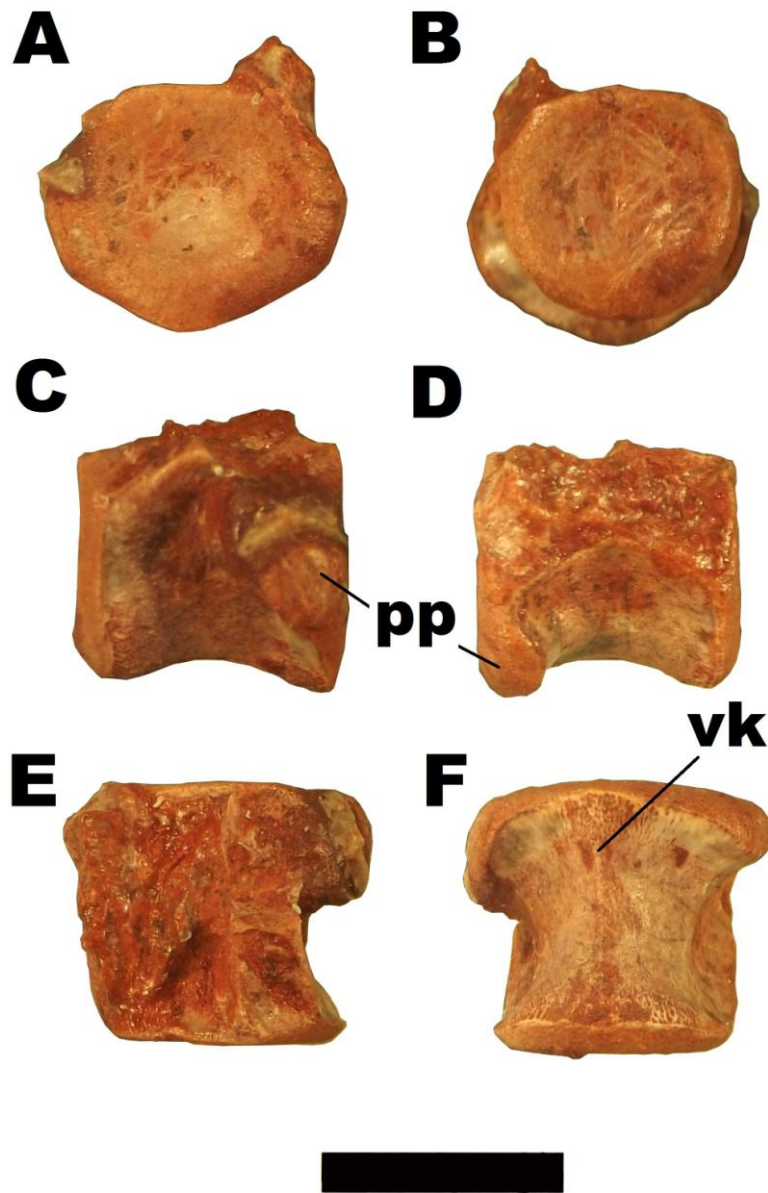


FIGURE 11. Cervical vertebra (C8?) the *Polesinesuchus aurelio* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **pp**, parapophysis; **vk**, ventral keel. Scale bar equals 10mm.

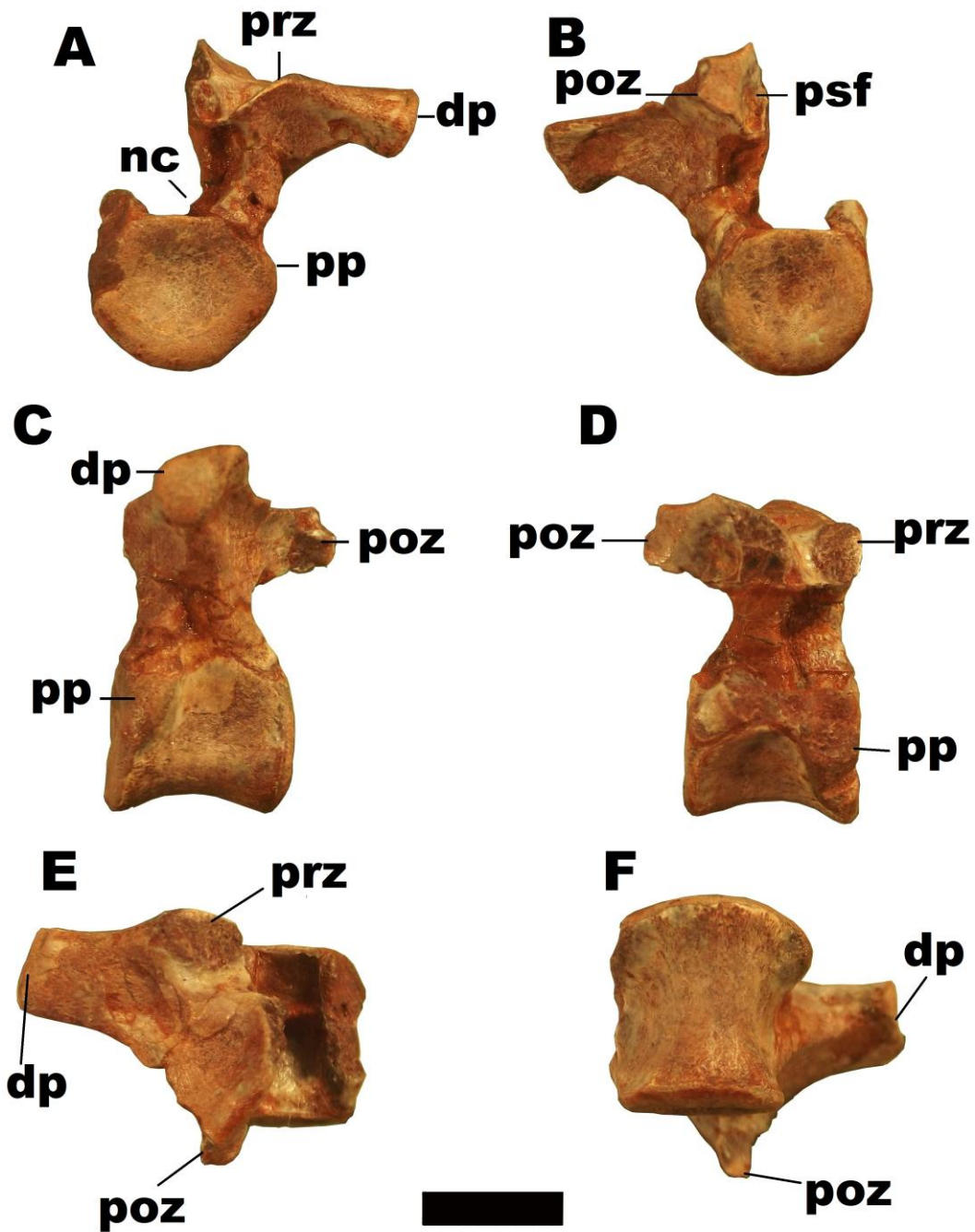


FIGURE 12. The first dorsal vertebra of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **dp**; diapophysis; **nc**, neural canal; **pp**, parapophysis; **prz**, prezigapophysis; **poz**, postzygapophysis; **pp**, prezigapophysis. Scale bar equals 10mm.

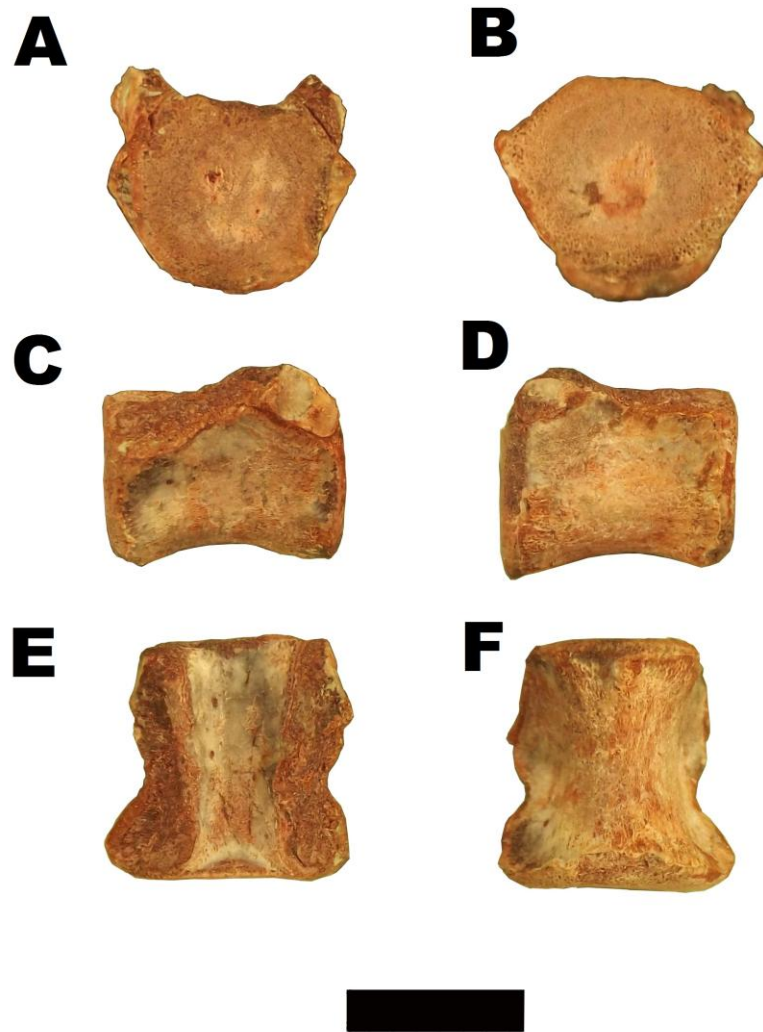


FIGURE 13. Dorsal centrum of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003), (probably between the first and thirteenth dorsal vertebrae) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

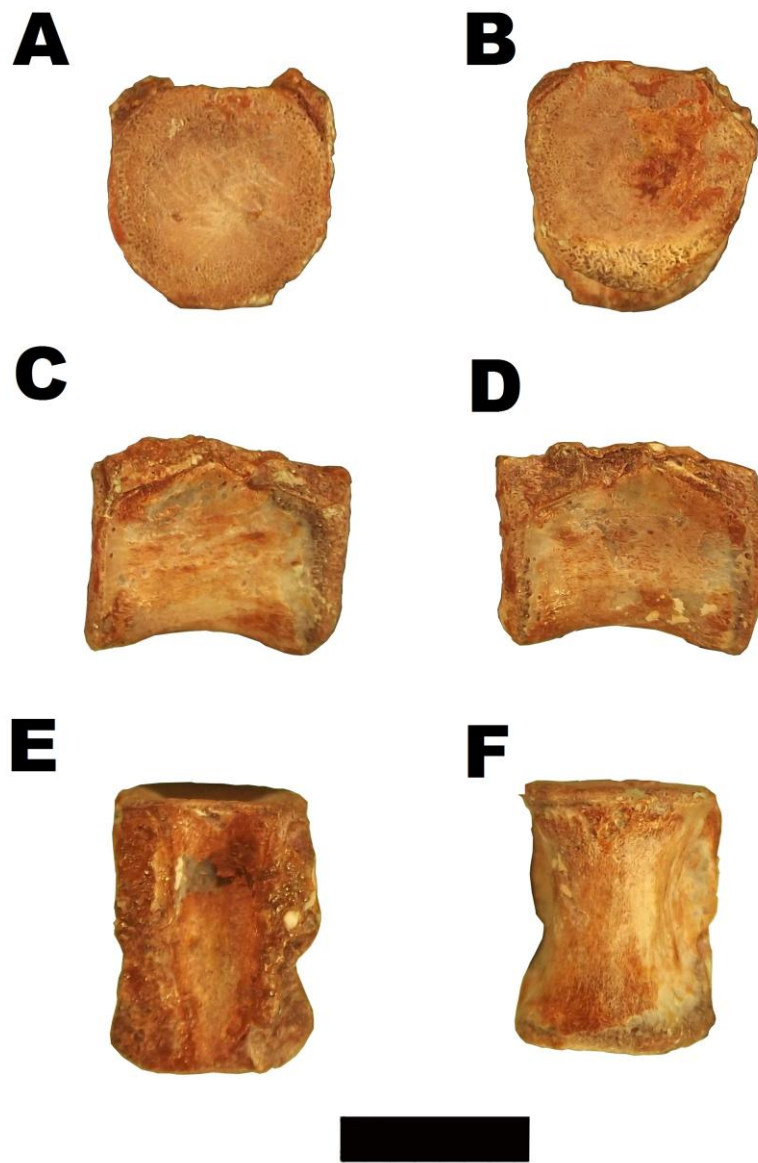


FIGURE 14. Dorsal centrum of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003), (probably mid dorsal vertebrae) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

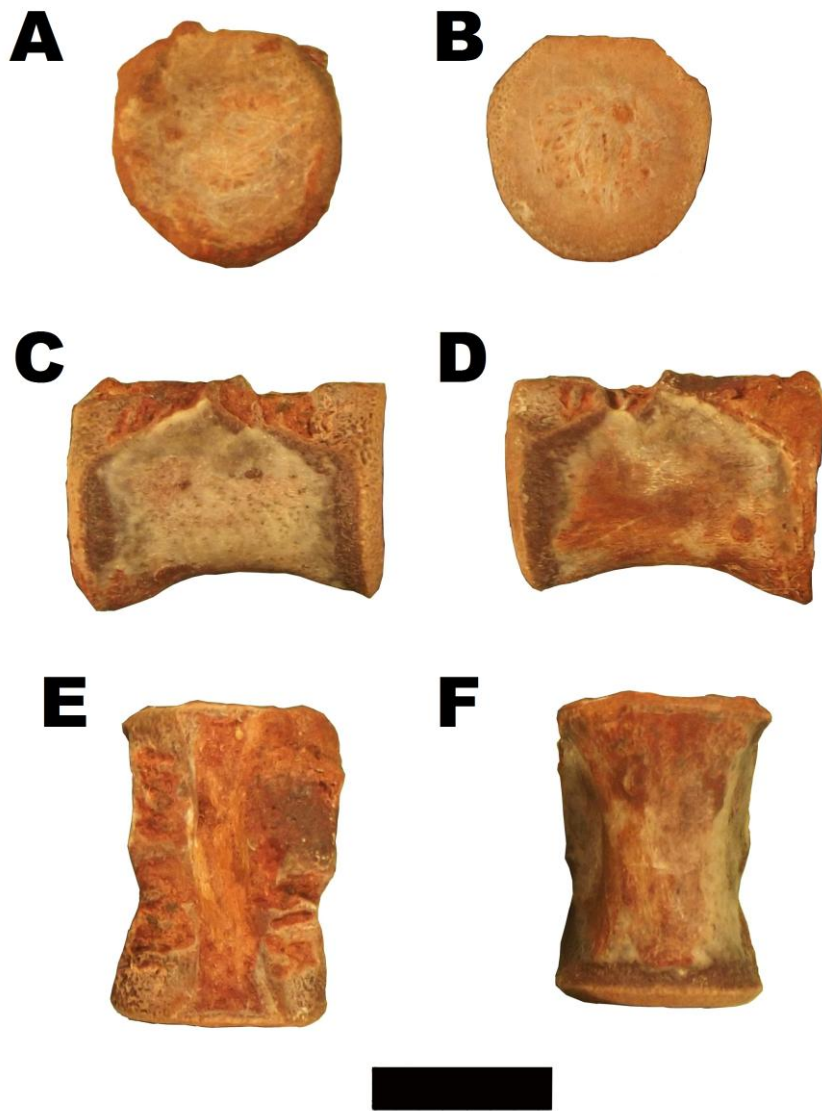


FIGURE 15. Dorsal centrum of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003), (probably mid dorsal vertebrae) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

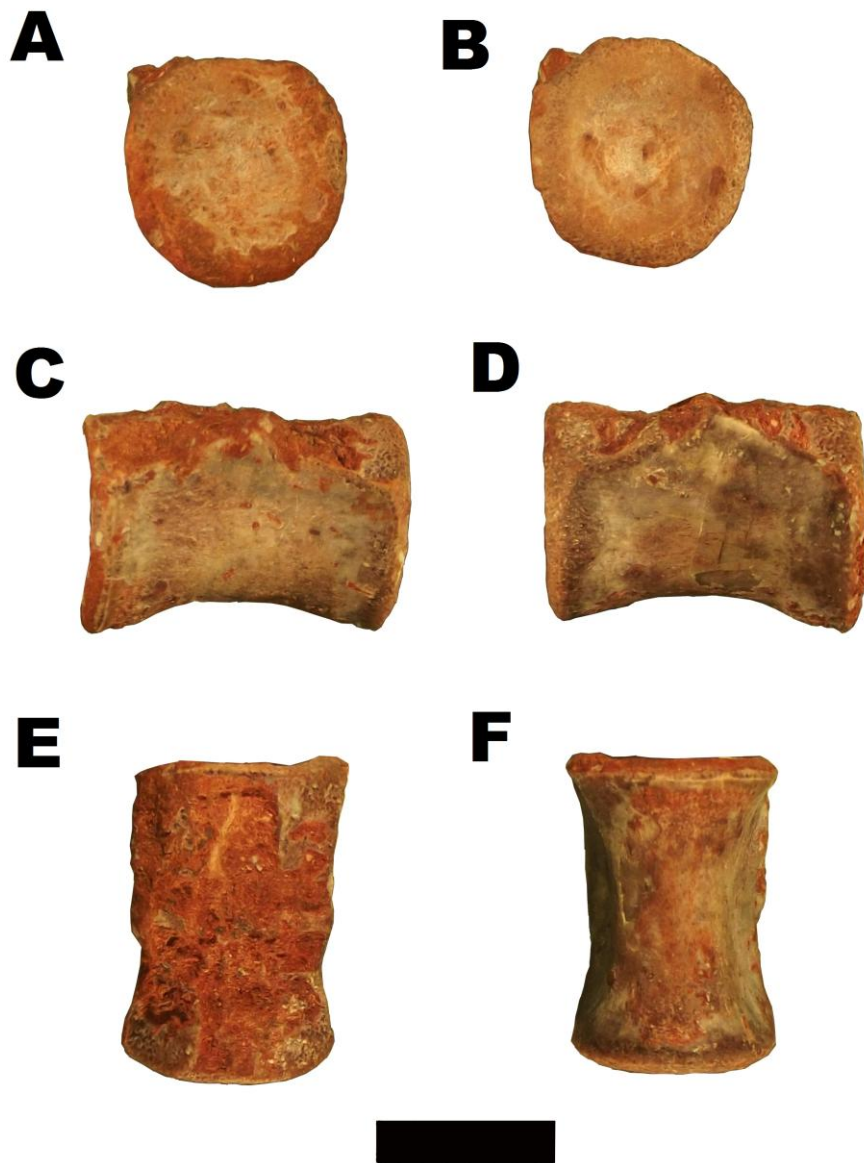


FIGURE 16. Dorsal centrum of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003), (probably mid dorsal vertebrae) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

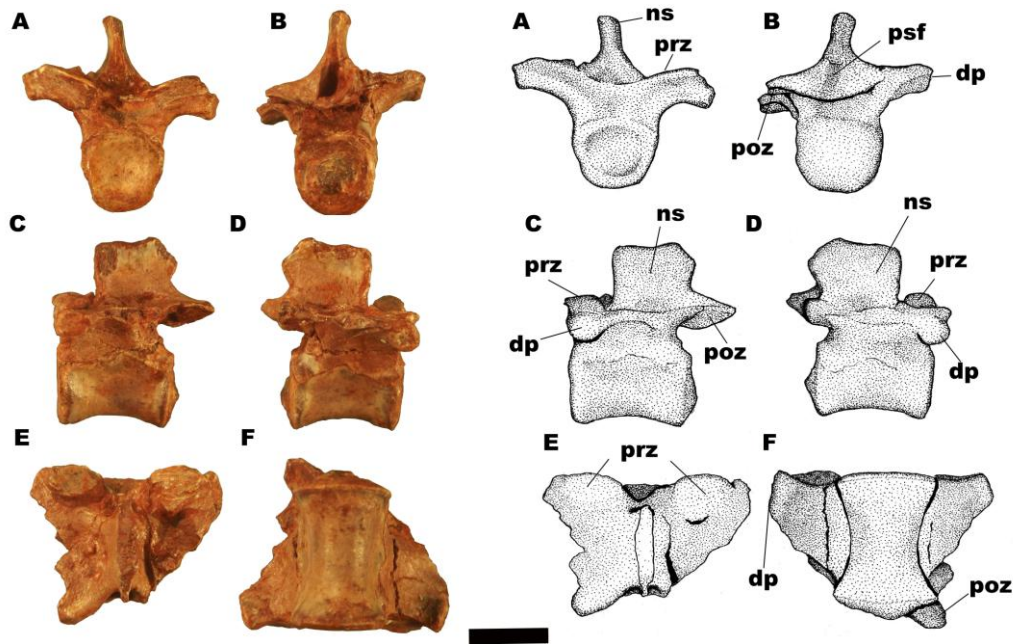


FIGURE 17. The thirteenth (?) dorsal vertebra of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **dp**; diapophysis; **nc**, neural canal; **ns**, neural spine; **pp**, parapophysis; **poz**, postzigapophysis; **prz**, prezigapophysis; **psf**, post spinal fossa. Scale bar equals 10mm.

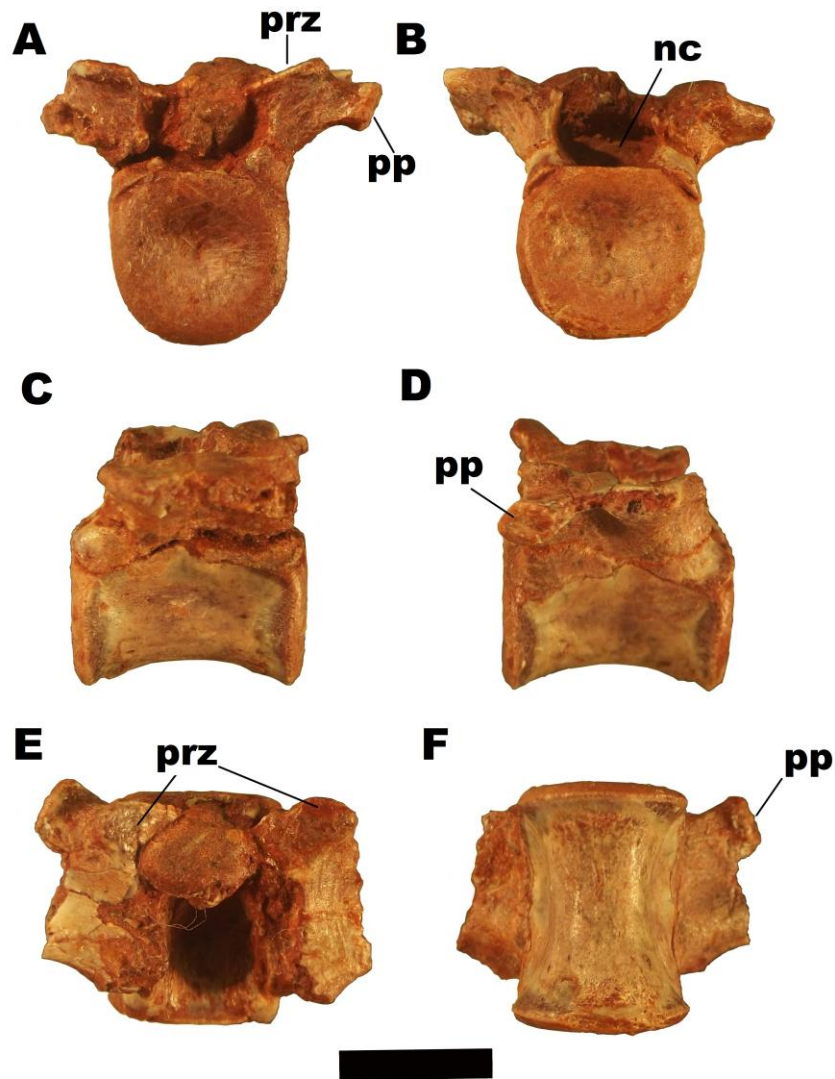


FIGURE 18. The fourteenth (?) dorsal vertebrae of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **nc**, neural canal; **prz**, prezigapophysis; **pp**, parapophysis. Scale bar equals 10mm.

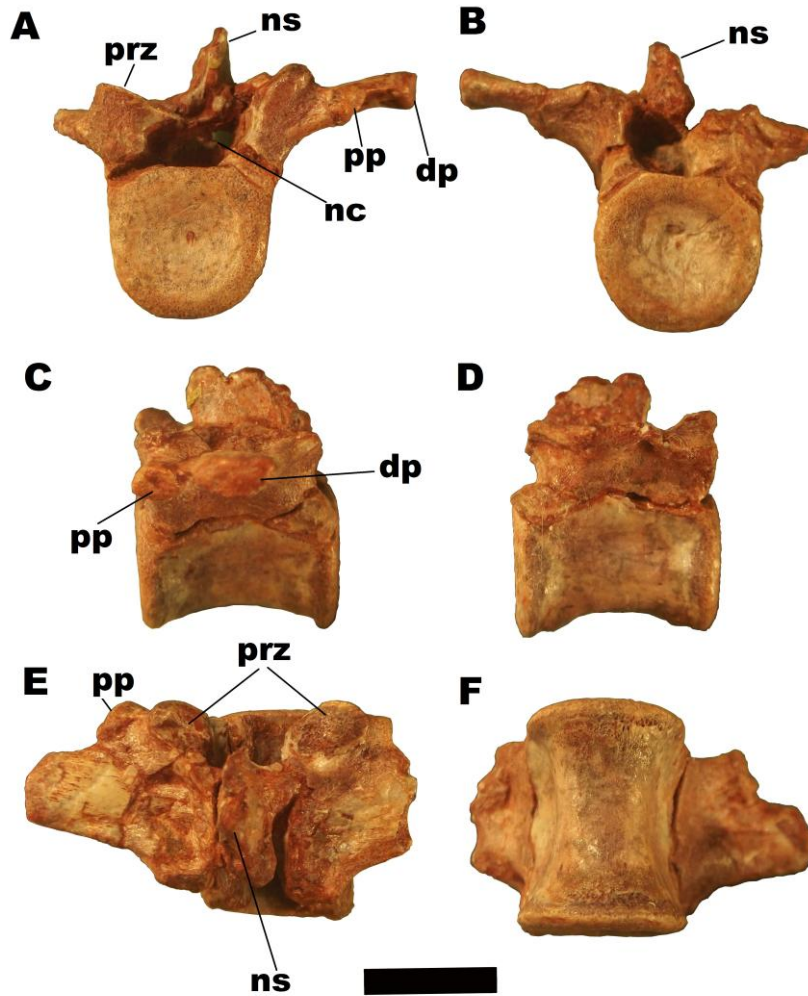


FIGURE 19. The fifteenth (?) vertebra of the *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Abbreviations: **nc**, neural canal; **ns**, neural spine; **dp**, diapophysis; **pp**, parapophysis; **prz**, prezigapophysis. Scale bar equals 10mm.

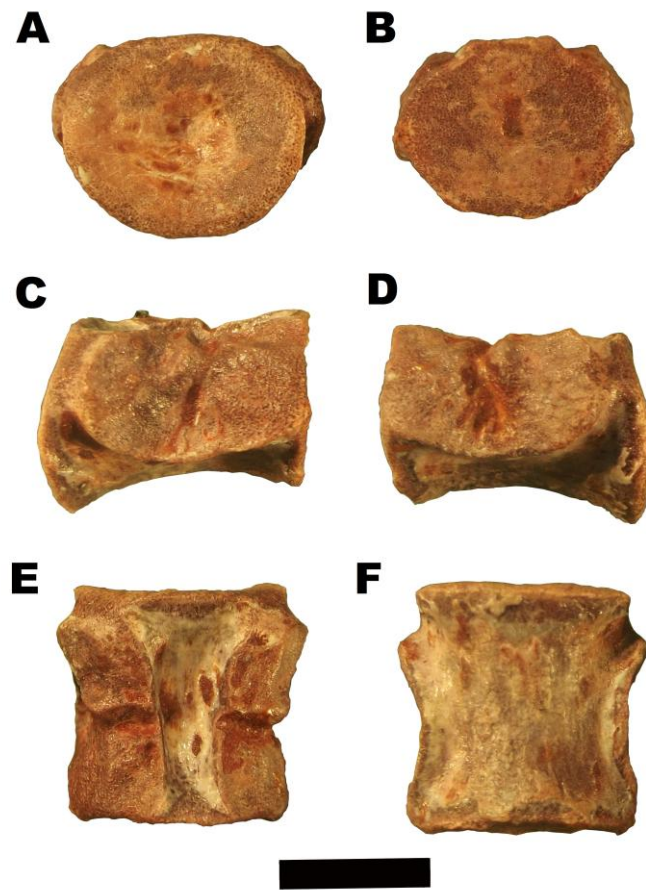


FIGURE 20. The first sacral vertebra of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

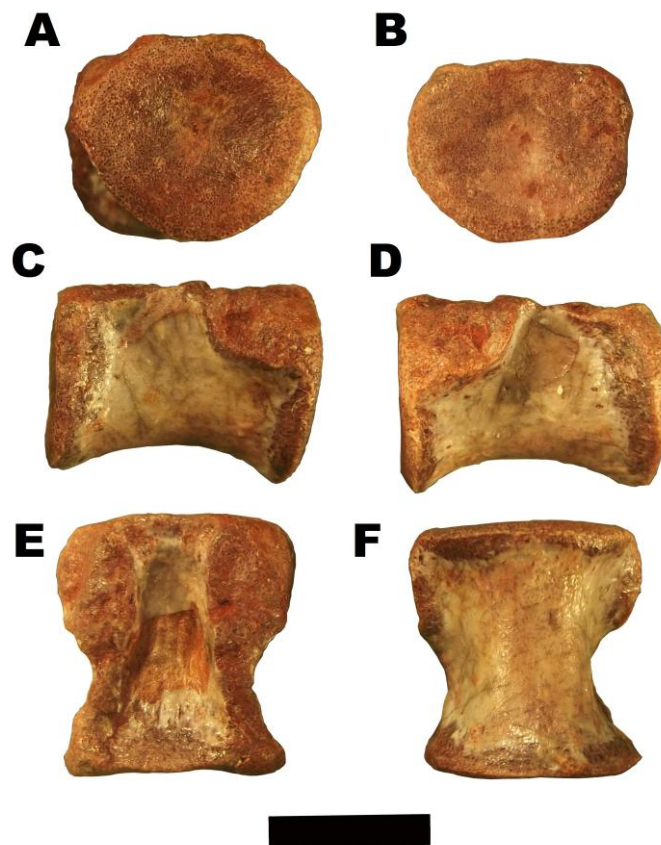


FIGURE 21. The second sacral vertebra of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

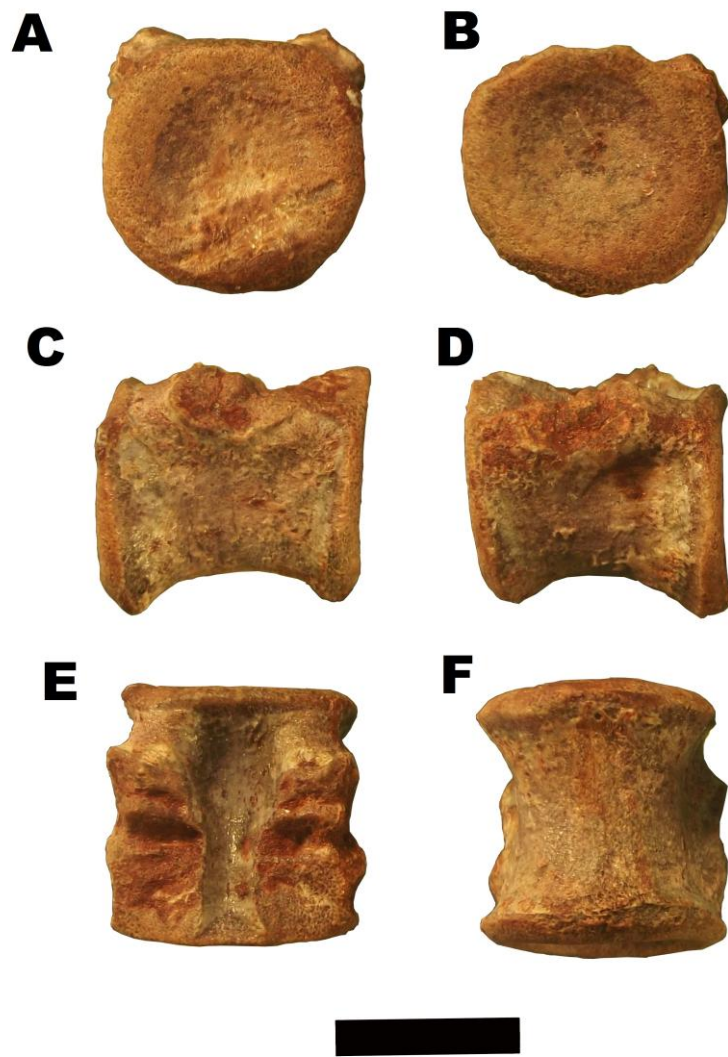


FIGURE 22. Caudal vertebra of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

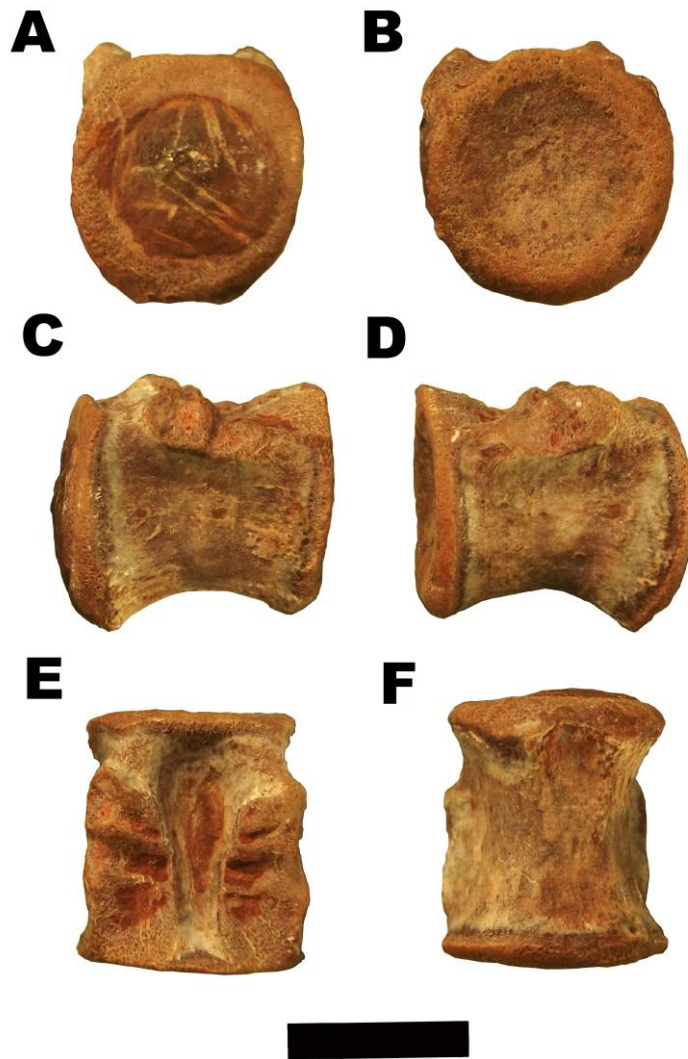


FIGURE 23. Caudal vertebra of *Polesinesuchus aurelioi* in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

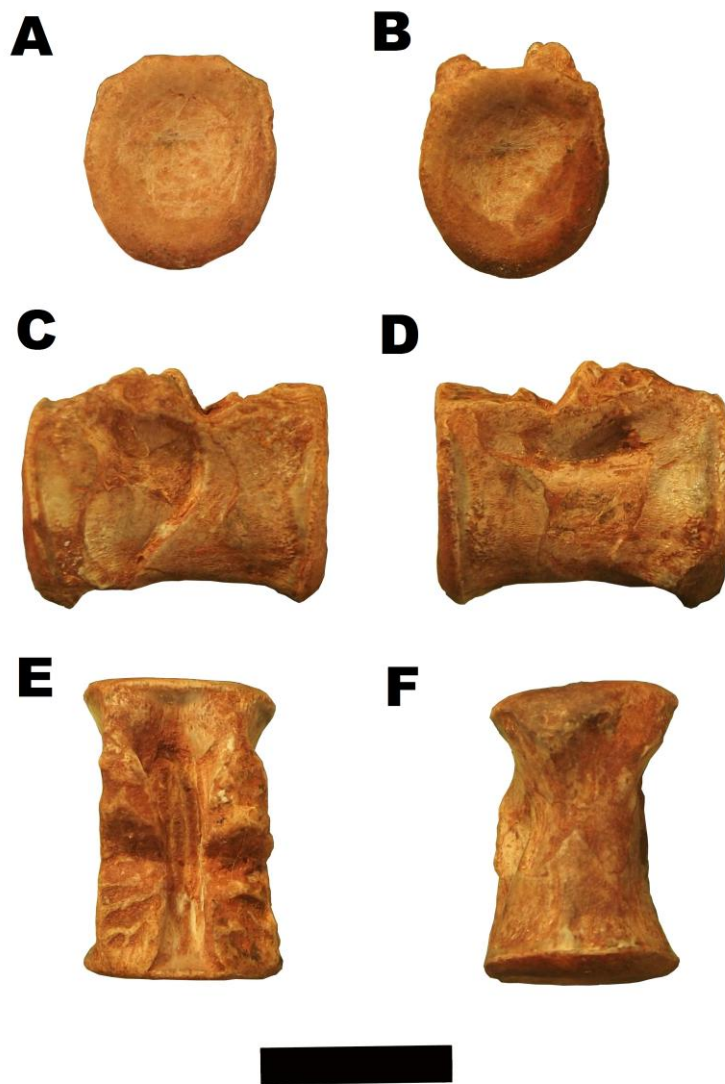


FIGURE 24. Caudal vertebra of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

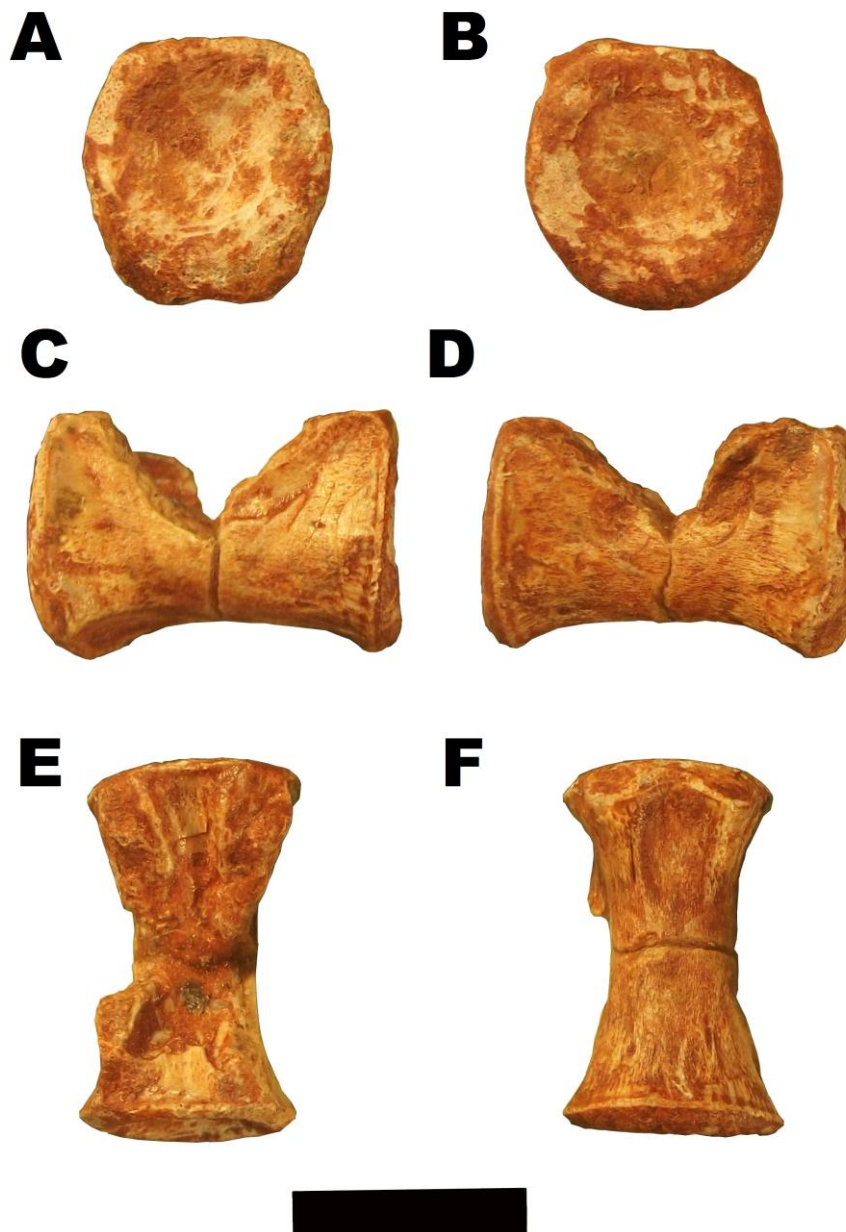


FIGURE 25 Caudal vertebra of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

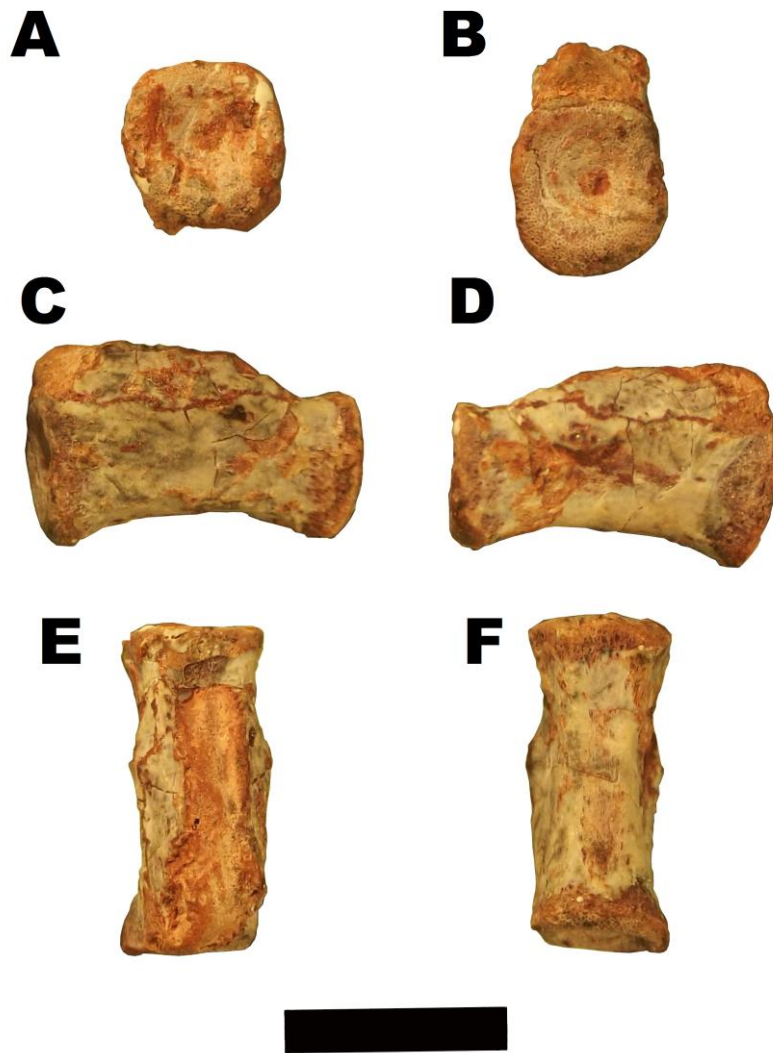


FIGURE 26. Caudal vertebra of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, anterior view; **B**, posterior view; **C**, right lateral view; **D** left lateral view; **E**, dorsal view and **F**, ventral view. Scale bar equals 10mm.

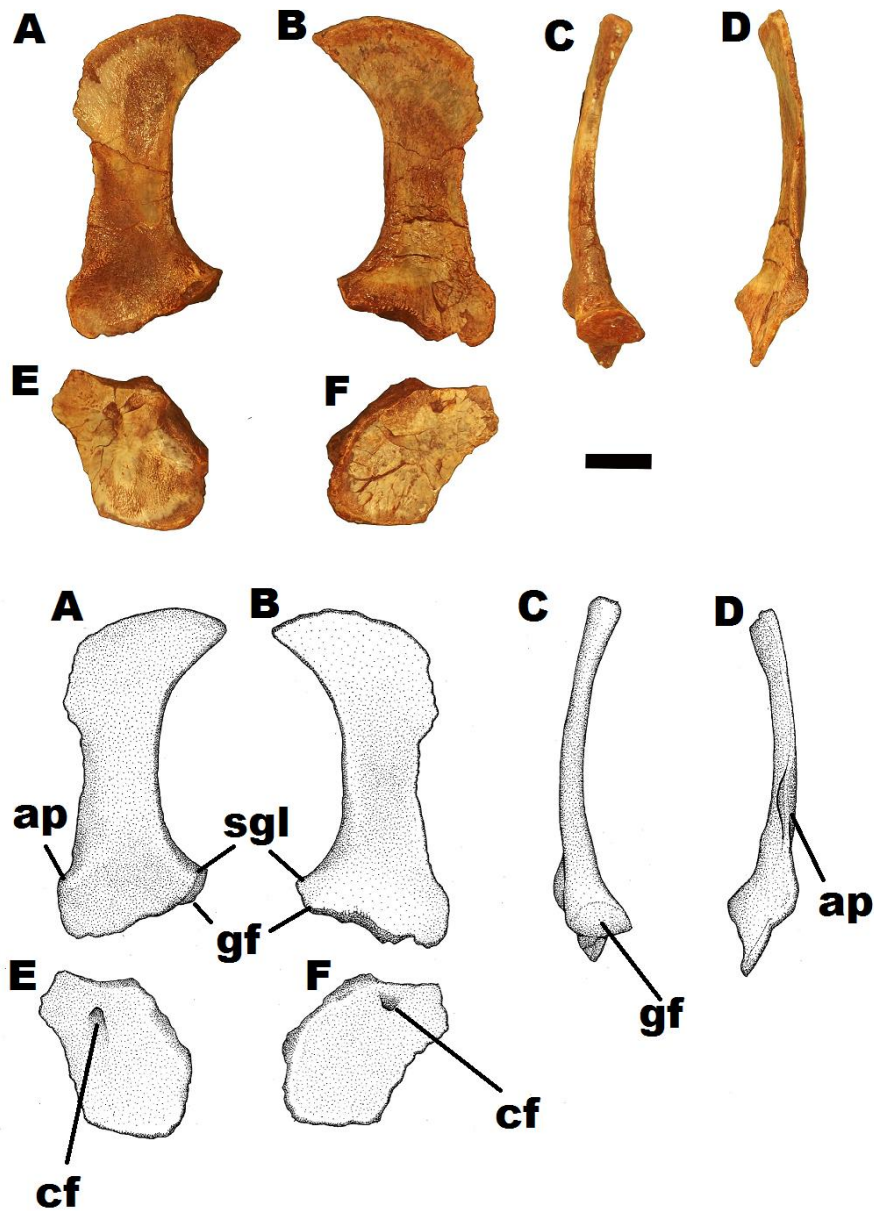


FIGURE 27. Left scapula and coracoid of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, lateral view; **B**, medial view; **C**, posterior view and **D**, anterior view; **E**, left coracoid in lateral view and **F**, left coracoids in medial view. Abbreviations: **ap**, acromial process; **cf**, coracoid foramen; **gf**, glenoid fossa; **sgl**; supra glenoid lip. Scale bar equals 10mm.

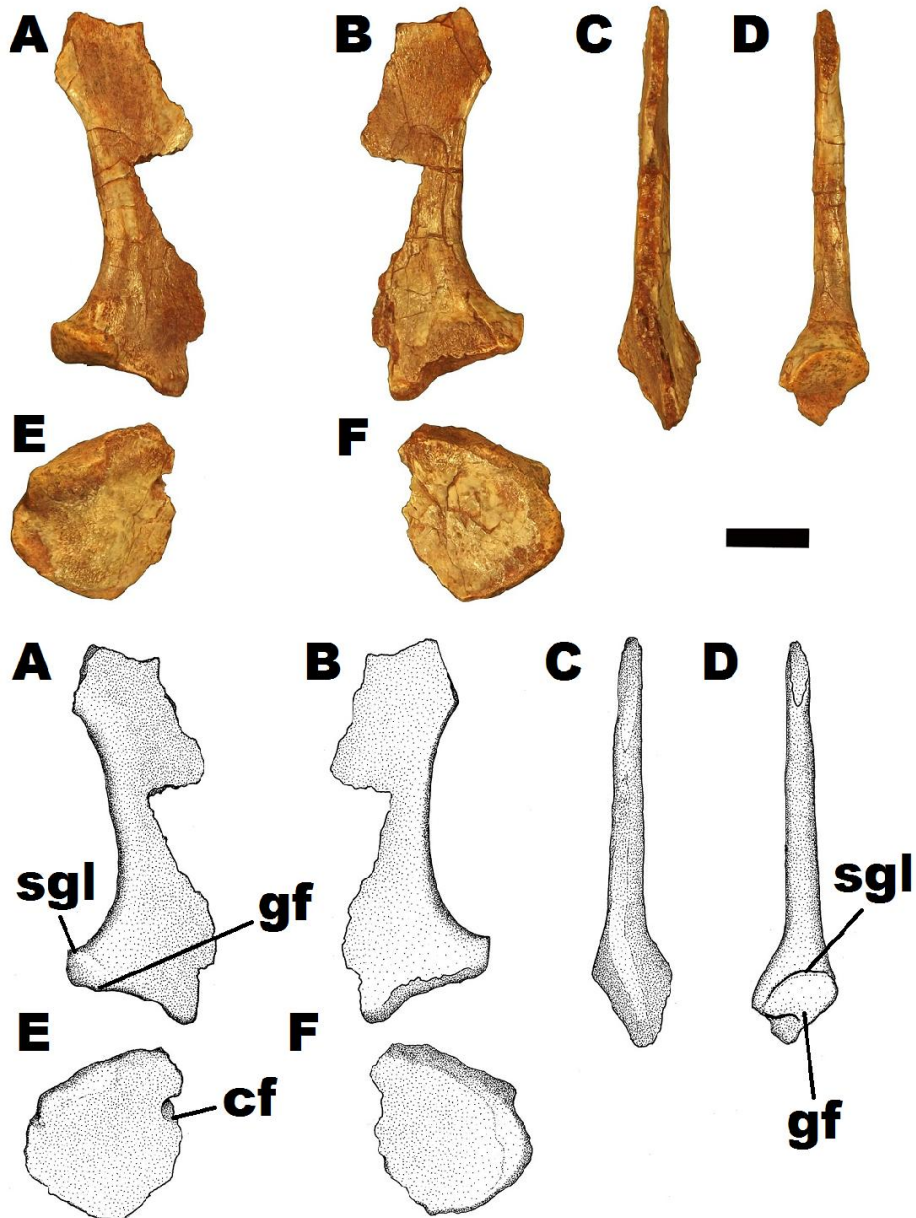


FIGURE 28. Right scapula and coracoid *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, lateral view; **B**, medial view; **C**, posterior view and **D**, anterior view; **E**, right coracoid in lateral view and **F**, right coracoid in medial view. Abbreviations: **ap**, acromial process; **cf**, coracoid foramen; **gf**, glenoid fossa; **sgl**; supra glenoid lip. Scale bar equals 10mm.

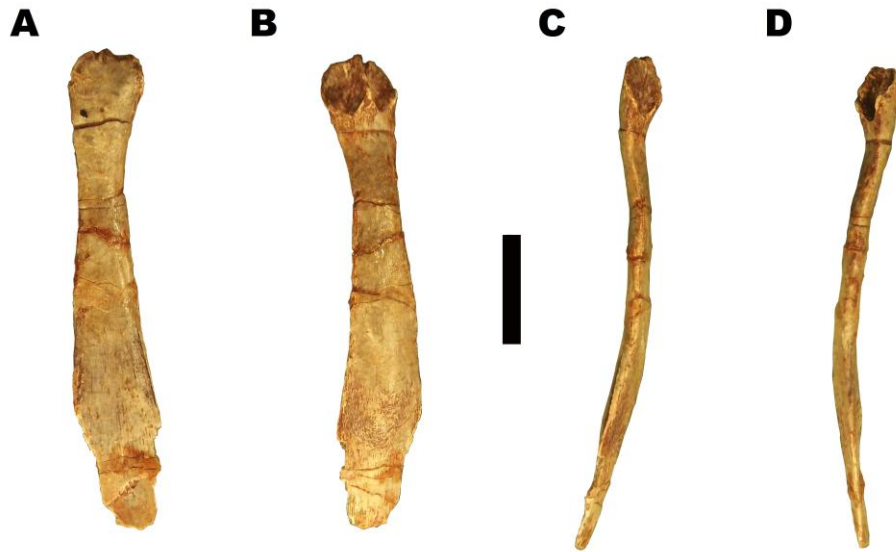


FIGURE 29. Interclavicle of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, dorsal view; **B**, ventral view and **C-D**, lateral views. Scale bar equals 10mm.

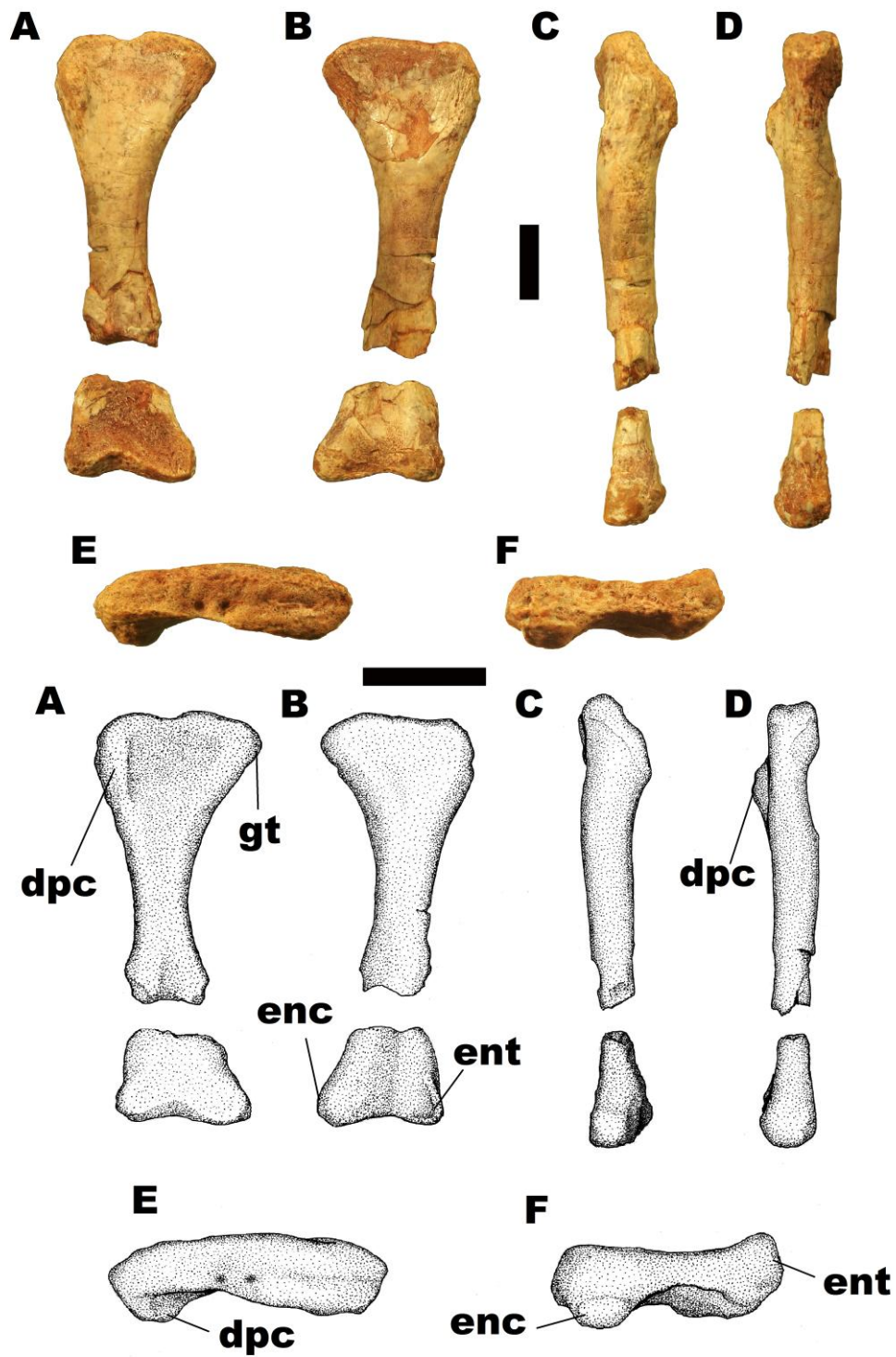


FIGURE 30. Right humerus of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, dorsal view; **B**, ventral view; **C**, lateral view and **D**, medial view. **E**, proximal and **F**, distal views. Abbreviations: **dpc**, deltopectoral crest; **enc**, entepicondyle; **ect**, ectepicondyle; **gt**, greater trochanter; Scale bar equals 10mm.

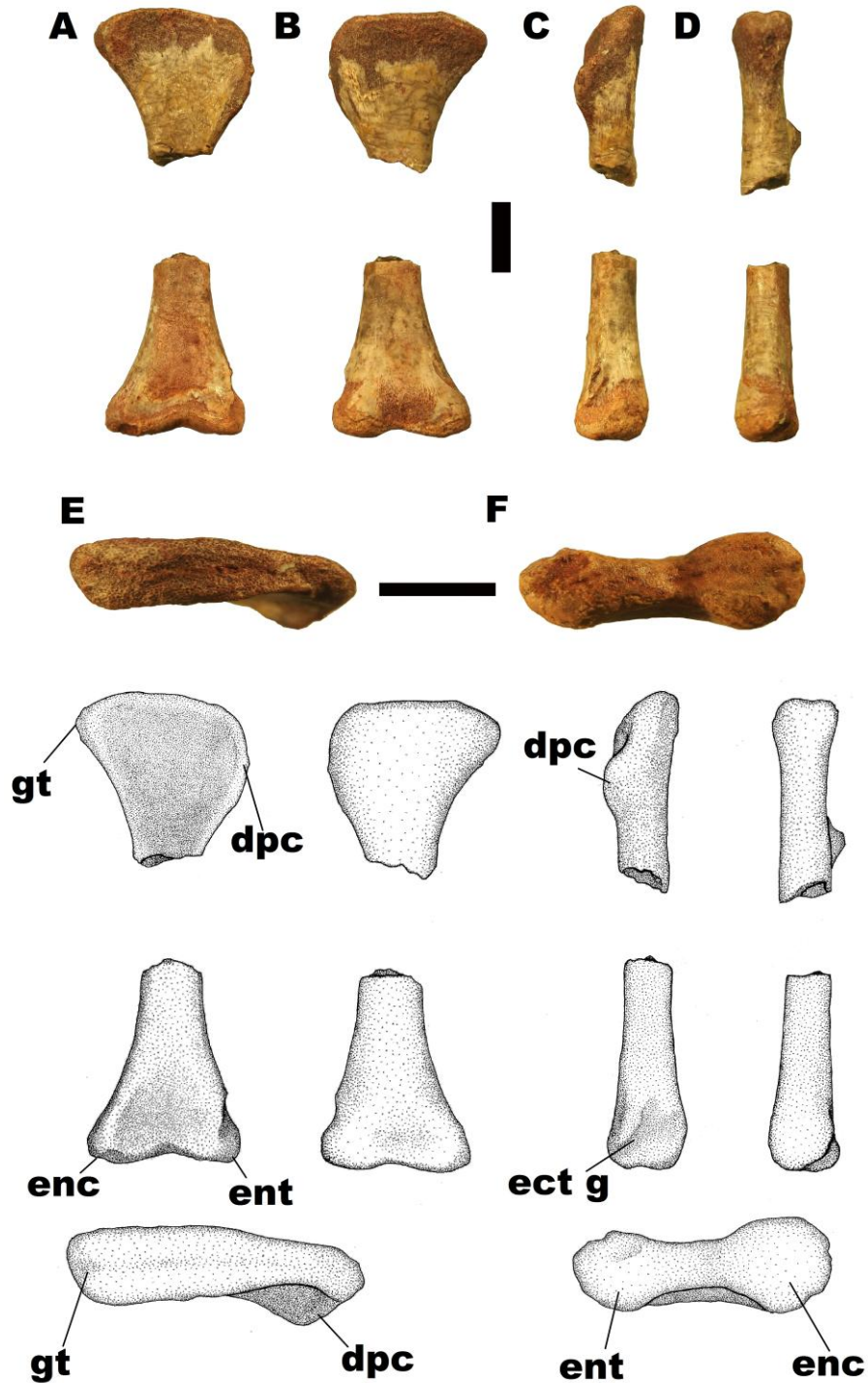


FIGURE 31. Left humerus of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, dorsal view; **B**, ventral view; **C**, lateral view and **D**, medial view. **E**, proximal and **F**, distal views. Abbreviations: **dpc**, deltopectoral crest; **enc**, entepicondyle; **ect**, ectepicondyle; **ect g**, ectepicondylar groove; **gt**, greater trochanter; Scale bar equals 10mm.

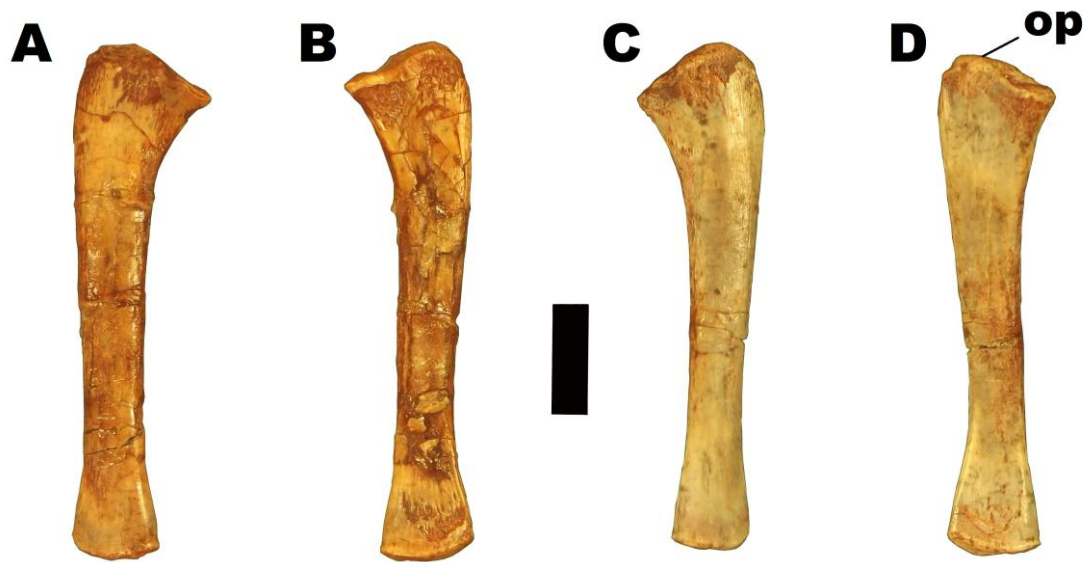


FIGURE 32. Ulnae of *Polesinesuchus aurelioi* holotype (ULBRAPVT003). A-B, right ulna in lateral and medial views. C-D, left ulna in lateral and medial views. Abbreviation: **op**: olecranon process. Scale bar equals 10mm.

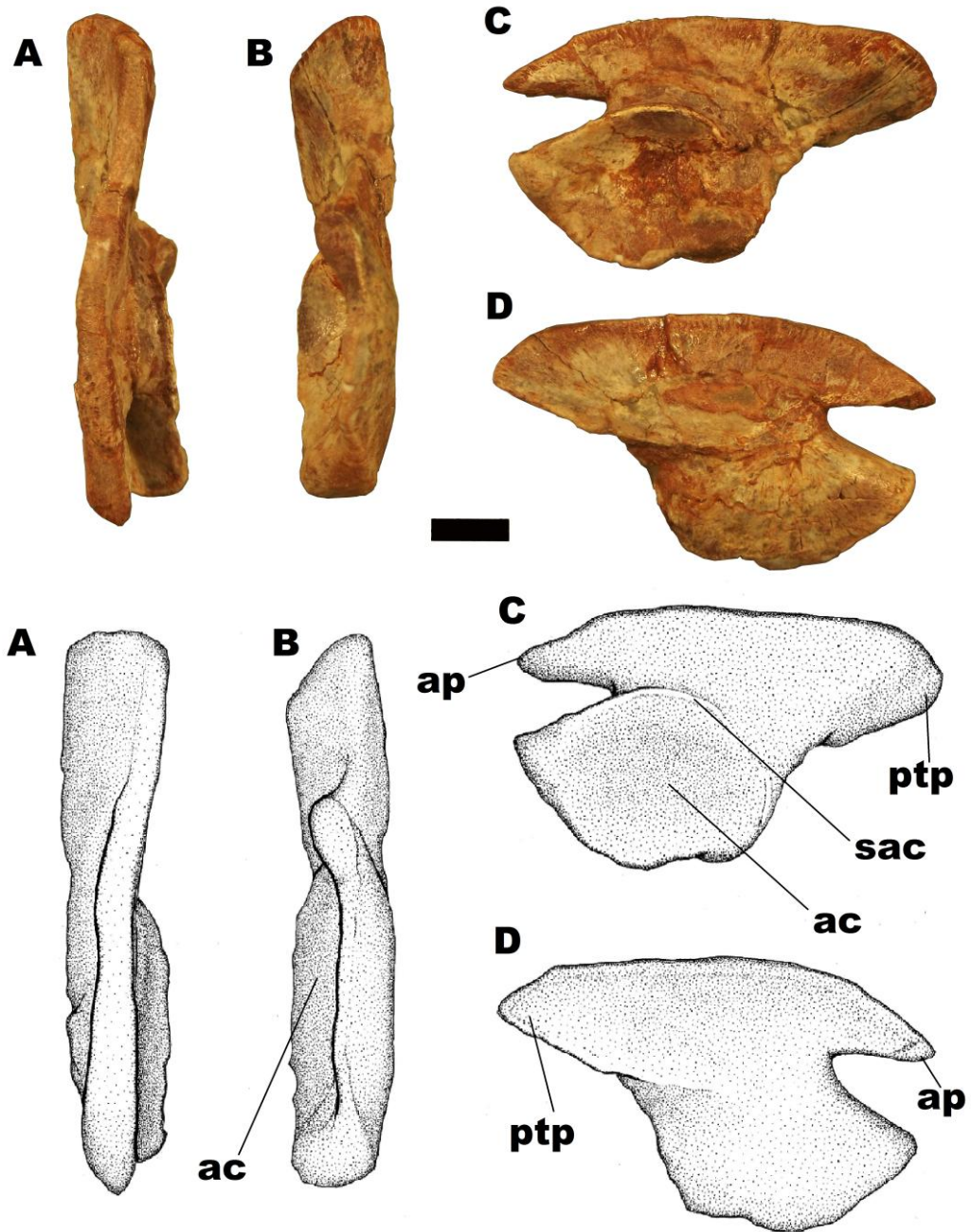


FIGURE 33. Left ilium of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, dorsal view; **B**, ventral view; **C**, lateral view and **D**, medial view. Abbreviations: **ap**, anterior process; **ac**, acetabulum; **ptp**; posterior process; **sac**, supra acetabular crest. Scale bar equals 10mm

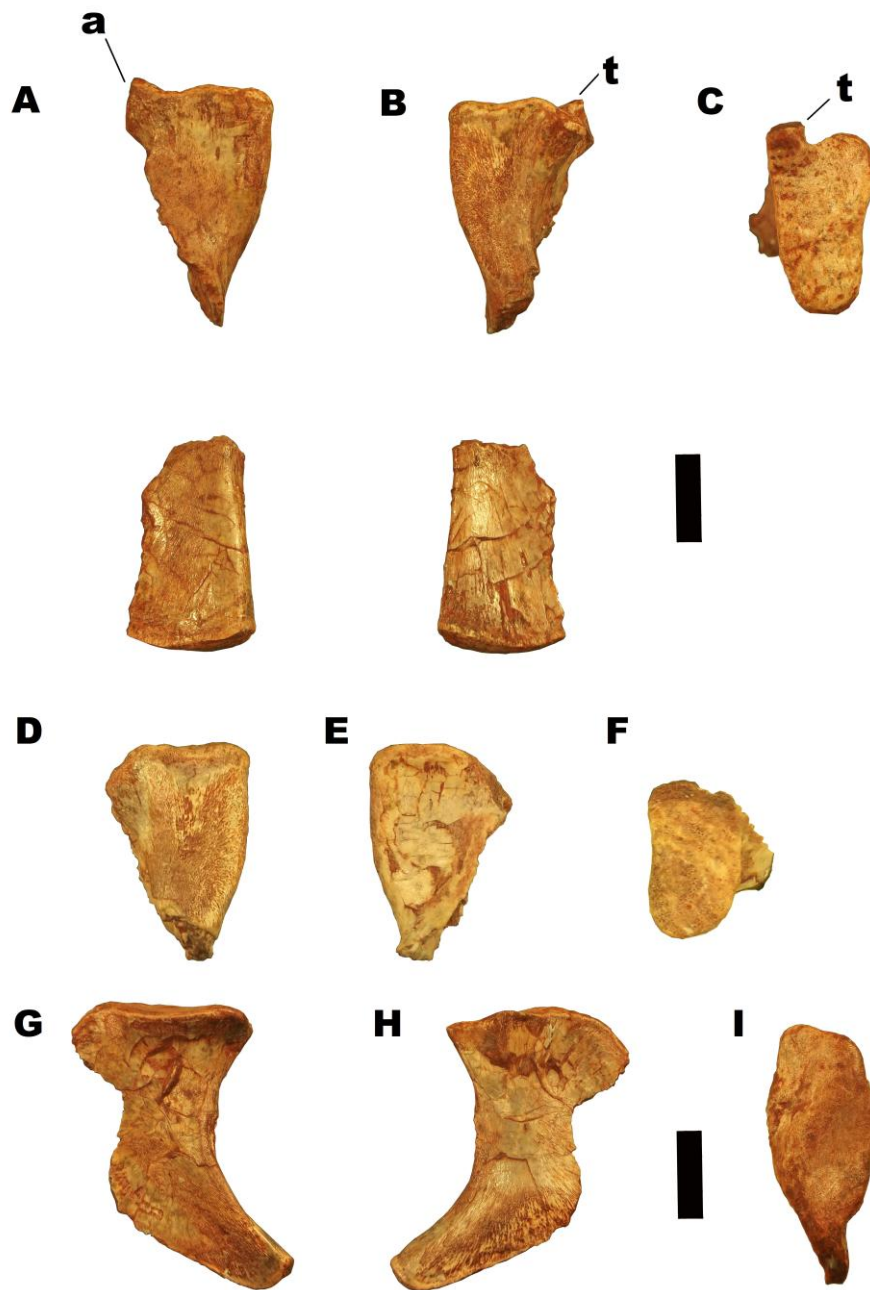


FIGURE 34. Left pubis of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, medial view; **B**, lateral view; **C** dorsal view. In a fragment of right pubis in **D** medial; **E** lateral and **F** dorsal views. Left isquium in **G** lateral; **H** medial and **I** dorsal views. Abbreviation: t, tongue. Scale bar equals 10mm.

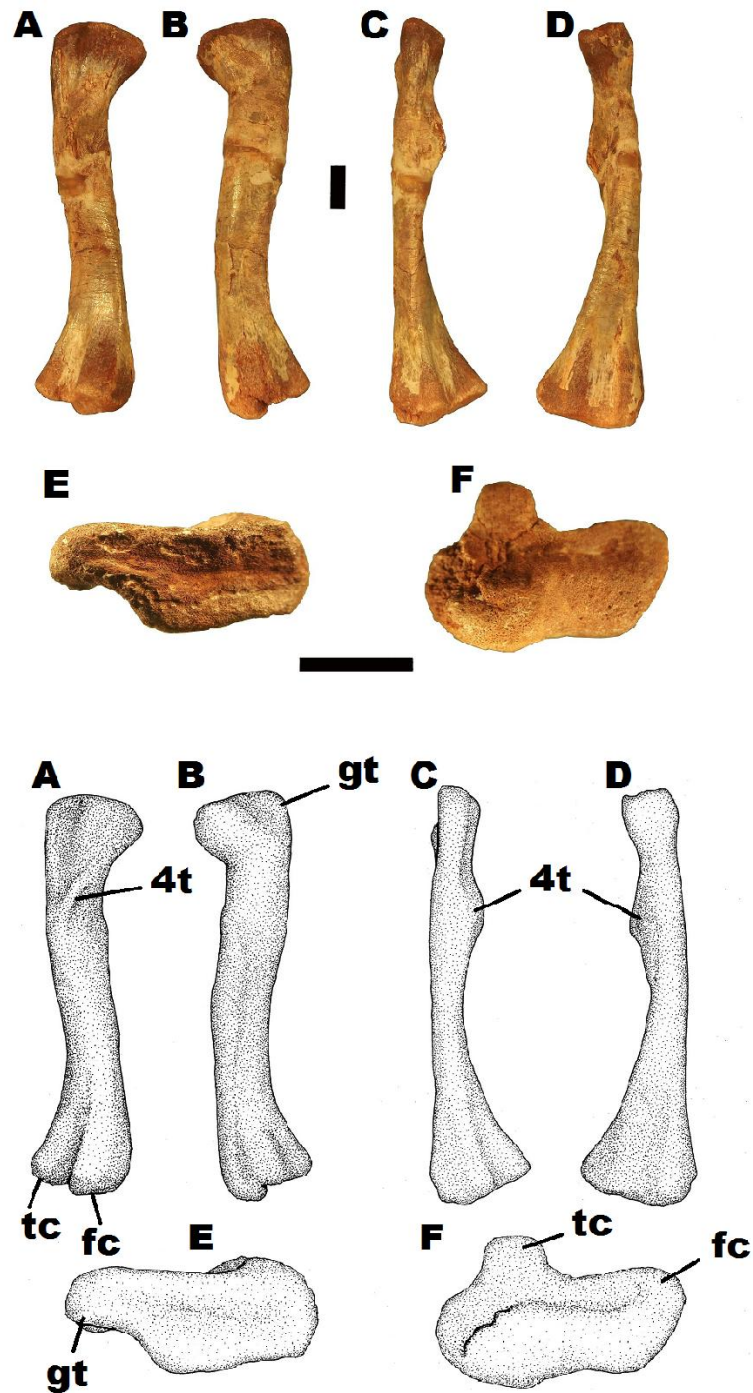


FIGURE 35. Right femur of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A-B**, posterior and anterior views; **C-D**, medial and lateral view, **E-F**, proximal and distal views. Abbreviations: **fc**, condyle for fibula; **gt**, greater trochanter; **tc**, condyle for tibia; **4t**, fourth trochanter. Scale bar equals 10mm.

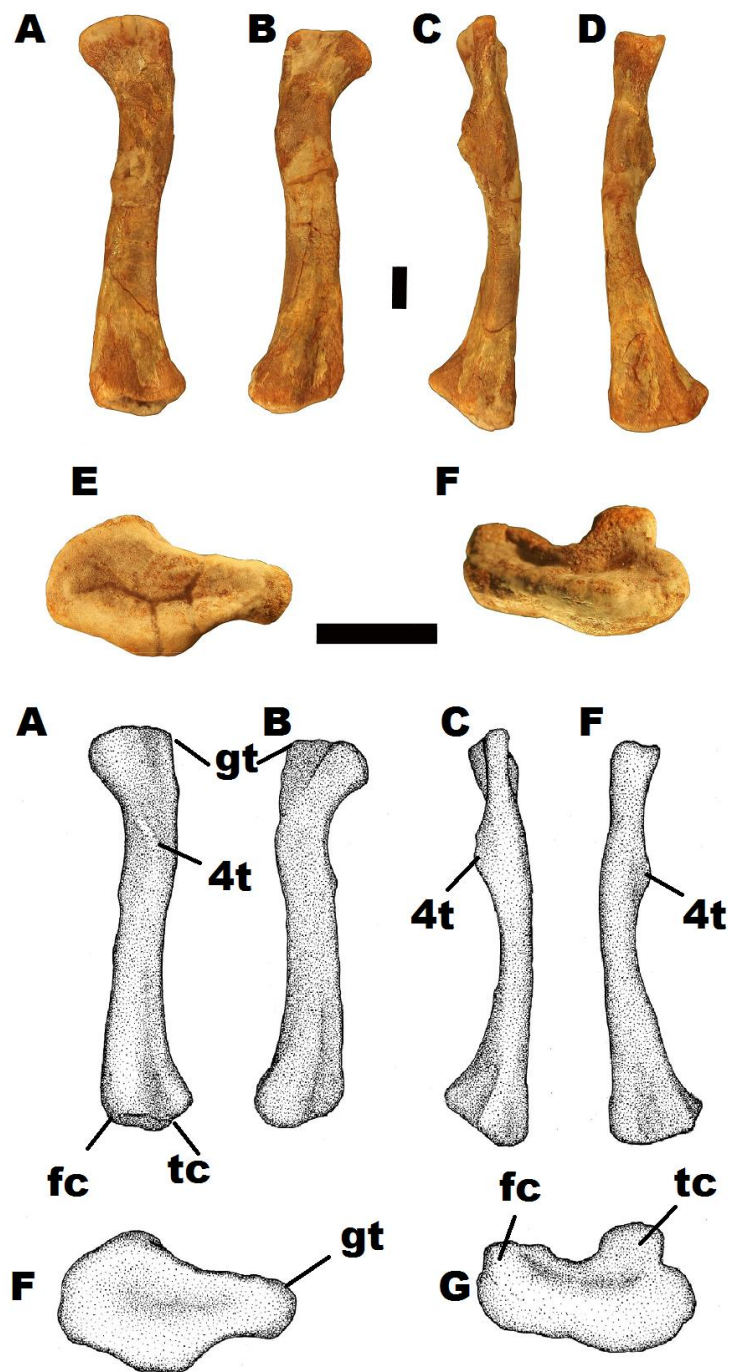


FIGURE 36. Left femur of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A-B**, posterior and anterior views; **C-D**, medial and lateral view, **E-F**, proximal and distal views. Abbreviations: **fc**, condyle for fibula; **gt**, greater trochanter; **tc**, condyle for tibia; **4t**, fourth trochanter. Scale bar equals 10mm.

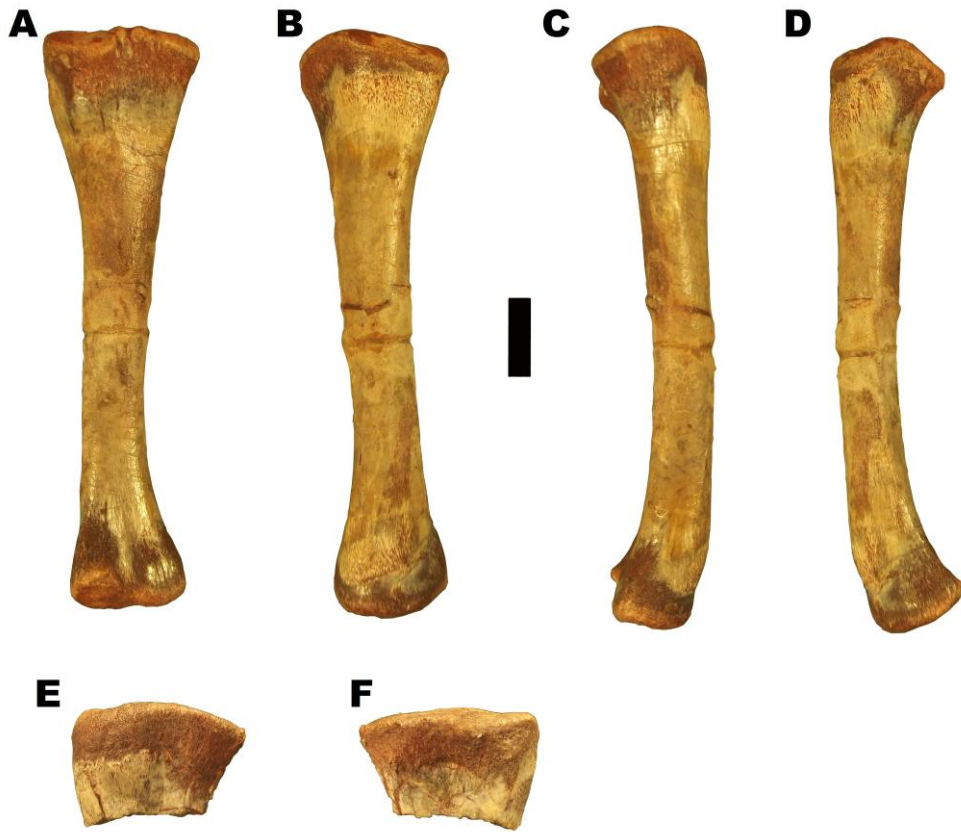


FIGURE 37. Left tibia of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A-B**, posterior and anterior views; **C-D**, medial and lateral views. Proximal right tibia in **E-F**, posterior and anterior views. Scale bar equals 10mm.

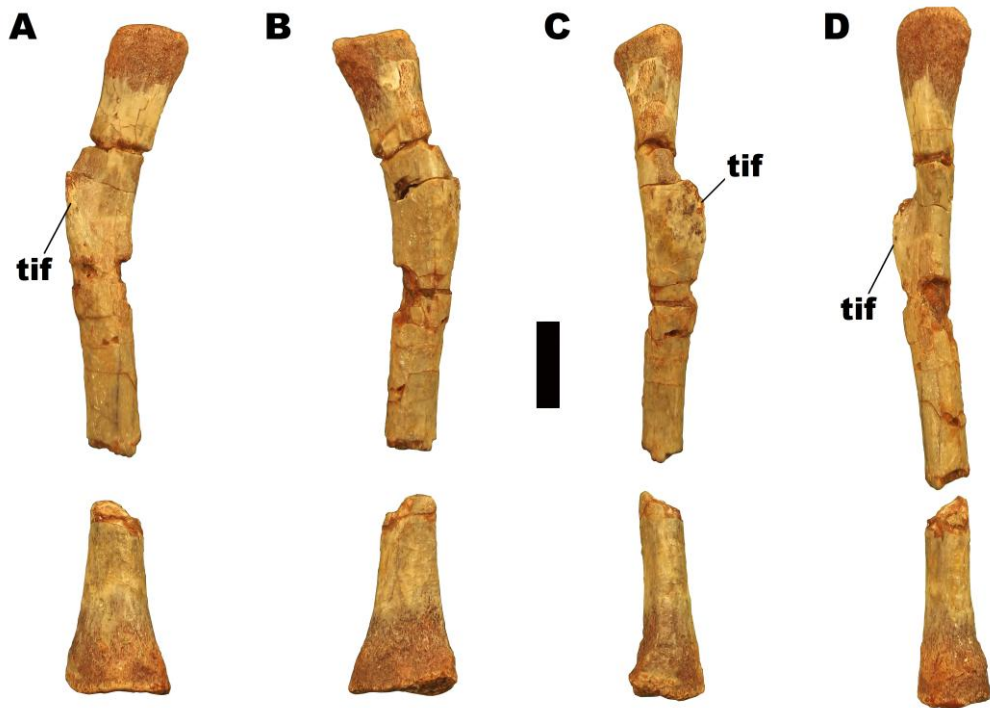


FIGURE 38. Left fibula *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, lateral view; **B**, medial view; **C**, anterior view and **D**, posterior view. Abbreviation: **tif**, trochanter for iliofibulares muscle. Scale bar equals 10mm.

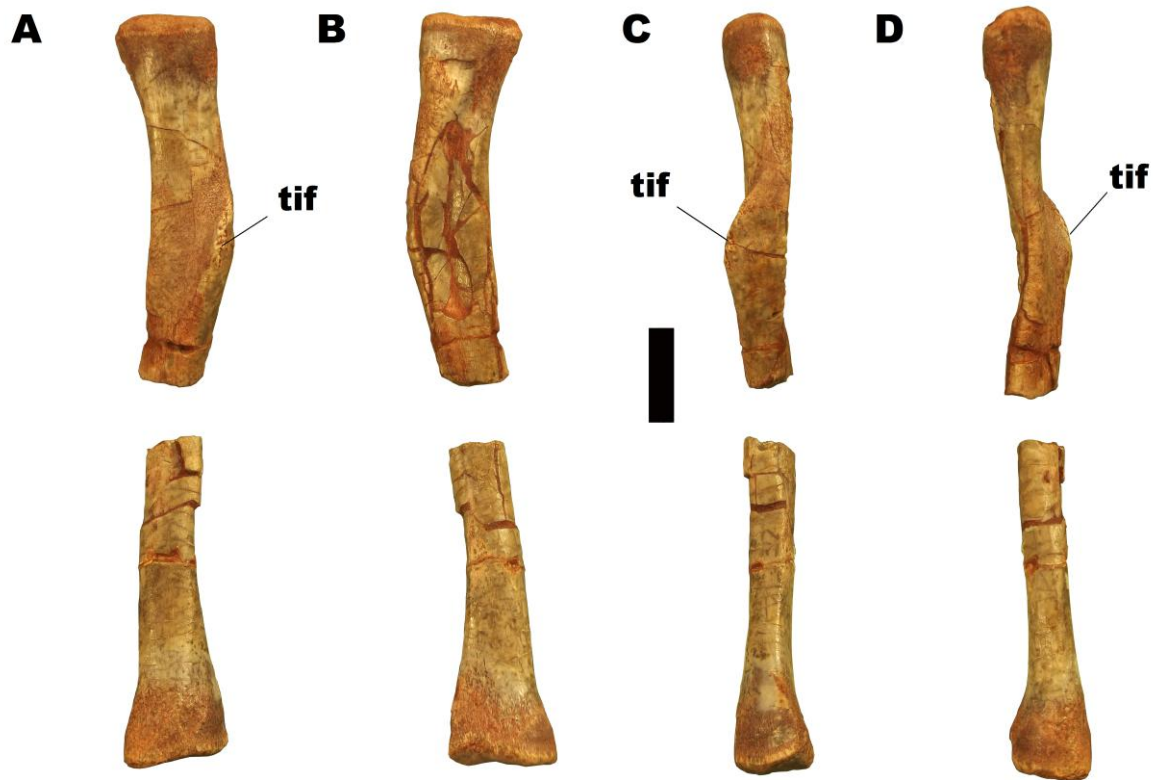


FIGURE 39. Right fibula of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, lateral view; **B**, medial view; **C**, anterior view and **D**, posterior view. Abbreviation: **tif**, trochanter for iliofibulares muscle. Scale bar equals 10mm.

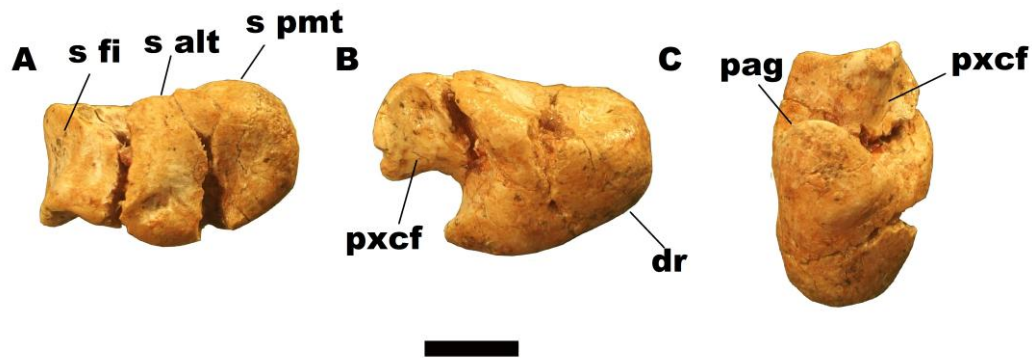


FIGURE 40. Right astragalus of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, proximoanterior; **B**, distoposterior; **C**, lateral views. Abbreviantons: **dr**, distal roller; **pag**, posterior astragalar groove; **pxcf**, proximal calcaneal facet; **s alt**, anterolateral articular surface; **s fi**, articular surface for the fibula; **s pmt**, posteromedial articular surface for the fibula. . Scale bar equals 10mm.

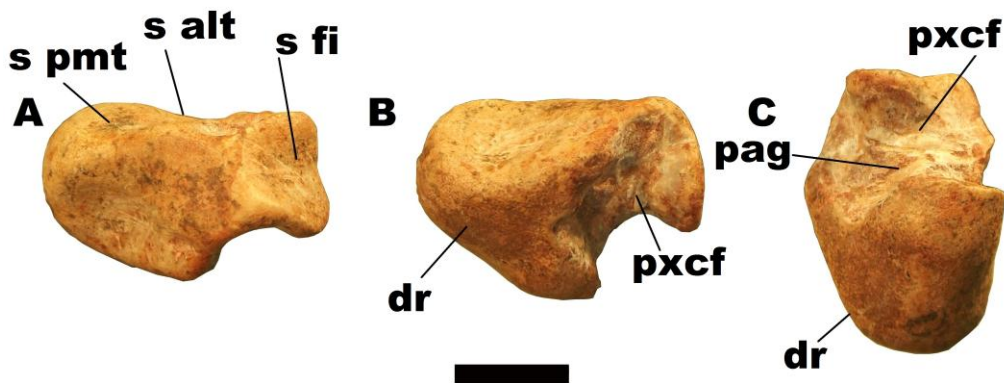


FIGURE 41. Left astragalus of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, proximoanterior; **B**, distoposterior; **C**, lateral views. Abbreviantons: **dr**, distal roller; **pag**, posterior astragalar groove; **pxcf**, proximal calcaneal facet; **s alt**, anterolateral articular surface; **s fi**, articular surface for the fibula; **s pmt**, posteromedial articular surface for the fibula. . Scale bar equals 10mm.

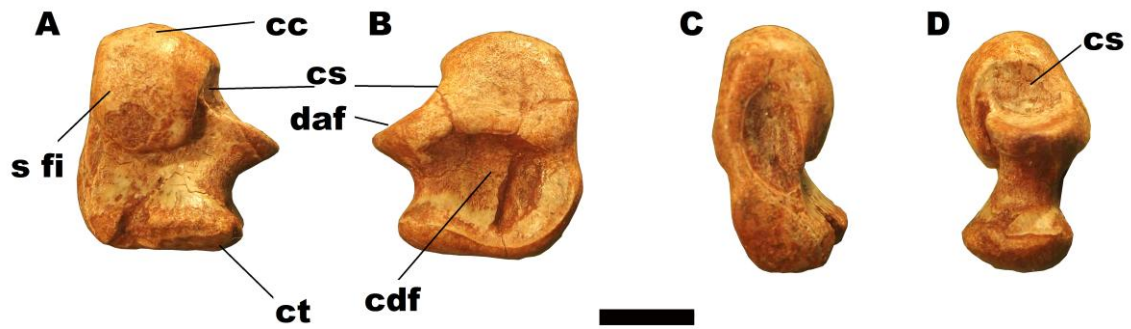


FIGURE 42. Left calcaneum of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, proximal view; **B**, distal view; **C**, lateral view and **D**, medial view. Abbreviations: **cc**, calcaneal condyle; **cs**, calcaneal socket; **cdf**, calcaneal distal fossa; **daf**, distal astragalar facet; **s fi**, articular surface for fibula. Scale bar equals 10mm.



FIGURE 43. Metatarsal III of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, dorsal view and **B**, ventral view. Scale bar equals 10mm.

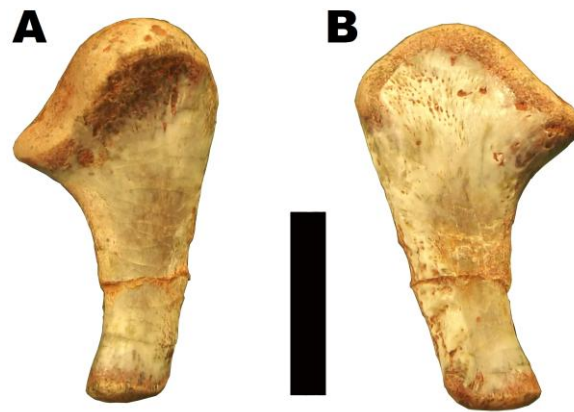


FIGURE 44. Pedal phalange V of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A** dorsal and **B** ventral views. Scale bar equals 10mm.

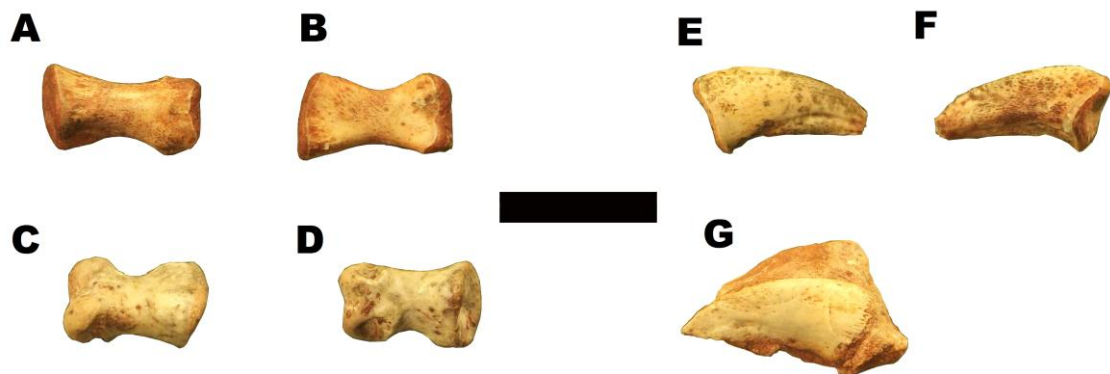


FIGURE 45. Indeterminate phalanges of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A** dorsal; **B** ventral views. **C** dorsal; **D** ventral views. Ungual phalanges in **E** medial; **F** lateral views. **G** lateral view. Scale bar equals 10mm.

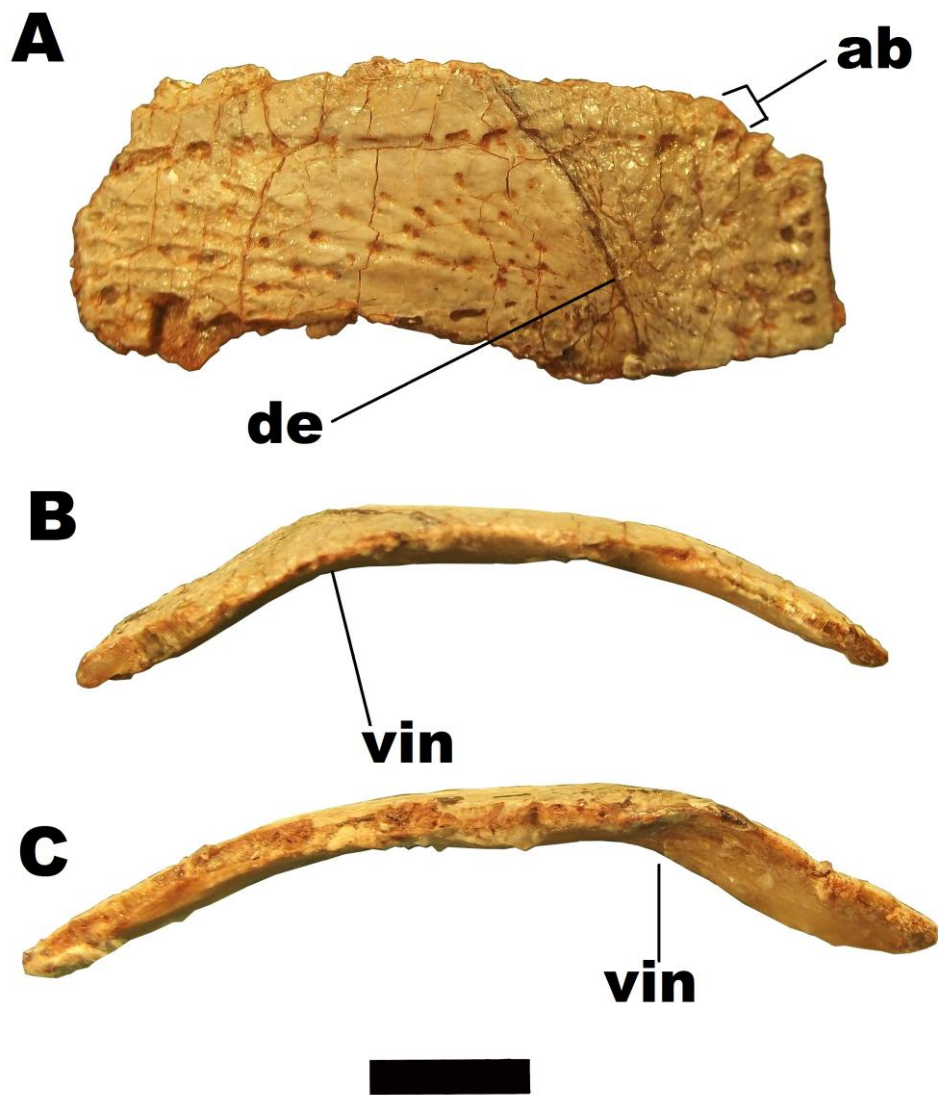


FIGURE 46. Left cervical paramedian osteoderm (**A**) of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, dorsal view; **B**, anterior view and **C**, posterior view. Abbreviations: **ab**, anterior bar; **de**, dorsal eminence; **vin**, ventral inflexion. Scale bar equals 10mm.

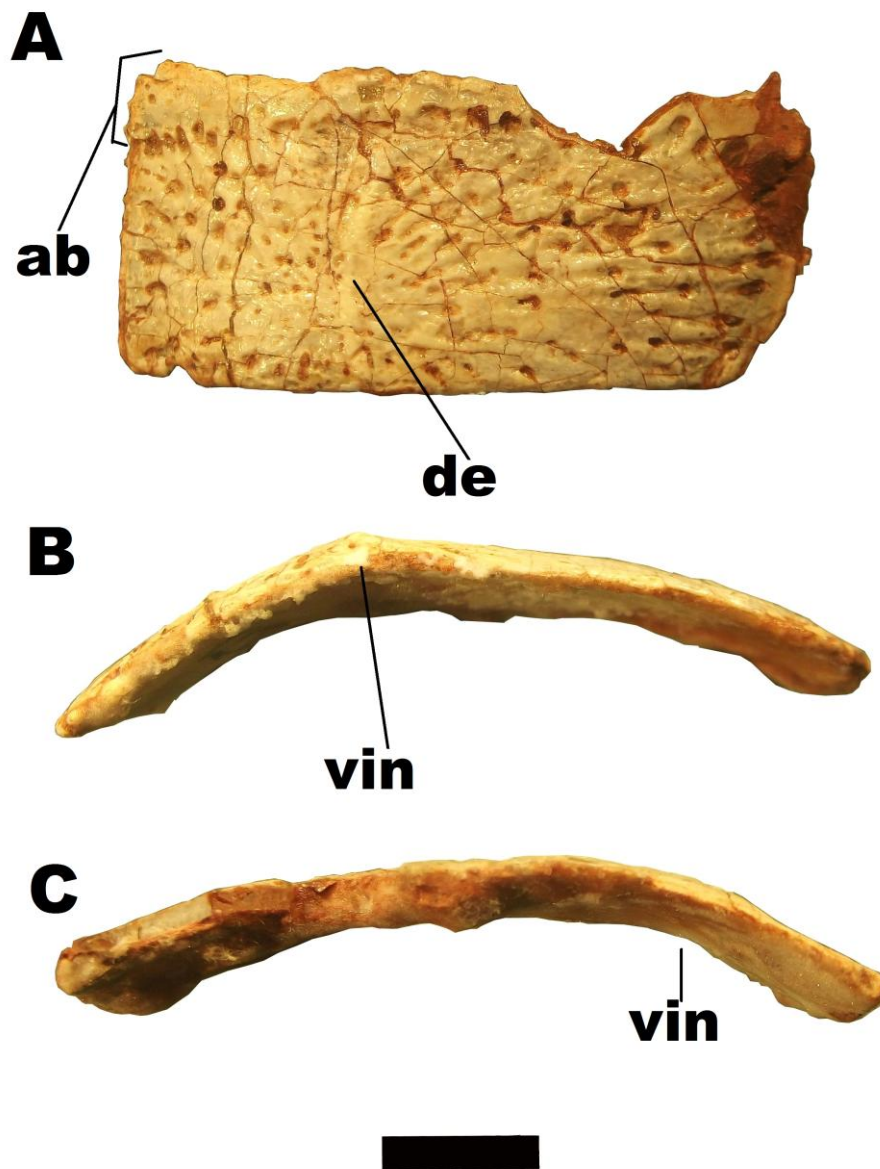


FIGURE 47. Left cervical paramedian osteoderm (**B**) of *Polesinesuchus aurelioi* holotype (ULBRAPVT003) in **A**, dorsal view; **B**, anterior view and **C**, posterior view. Abbreviations: **ab**, anterior bar; **de**, dorsal eminence; **vin**, ventral inflexion. Scale bar equals 10mm.

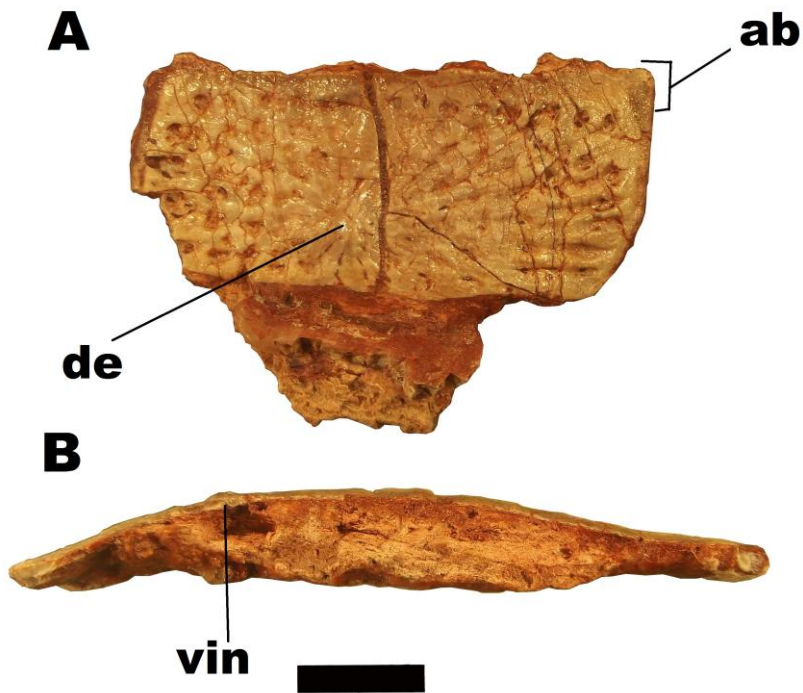


FIGURE 48. Right posterior paramedian osteoderm (C) of *Polesinesuchus aurelioii* holotype (ULBRAPVT003) in **A**, dorsal view; **B**, anterior view. Abbreviations: **ab**, anterior bar; **de**, dorsal eminence. Scale bar equals 10mm.

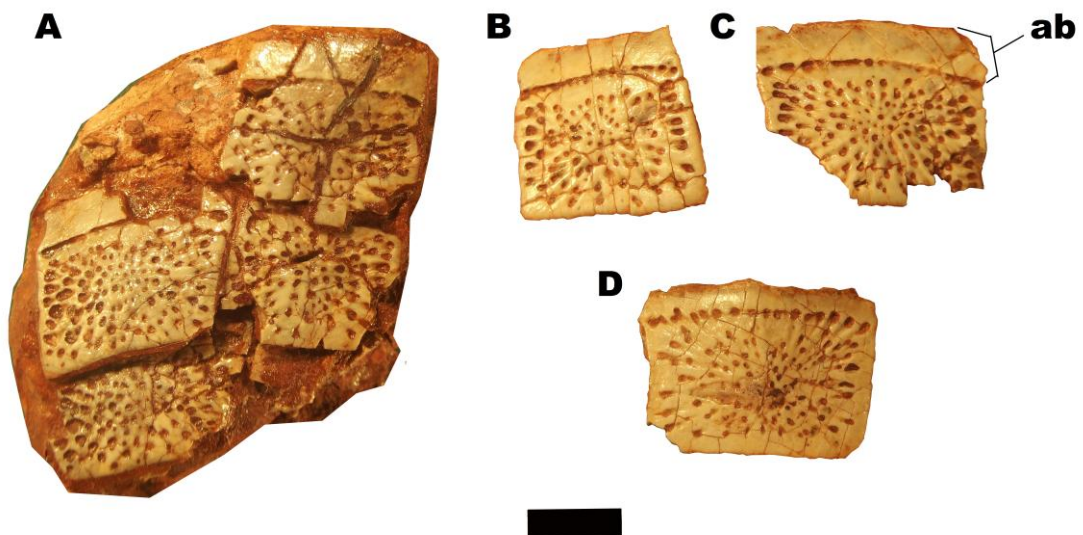


FIGURE 49. Ventral osteoderms of *Polesinesuchus aurelioii* holotype (ULBRAPVT003) in **A-D** and apendicular osteoderm in **E**. Abbreviation: **ab**, anterior bar. Scale bar equals 10mm.

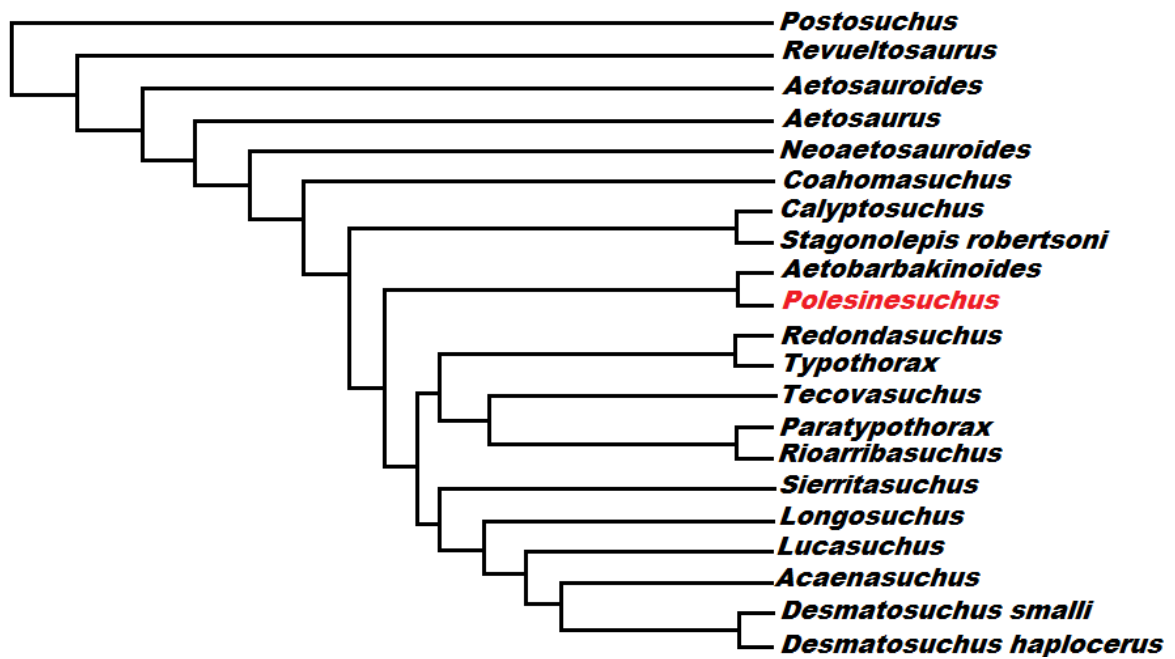


FIGURE 50. The first most parsimonious tree of 67 steps and consistency index of 0,686 recovered in the analysis. Note the position of *Polesinesuchus* as sister group of the *Aetobarbakinoides*, and the sister group relationship between them and *Desmatosuchinae* plus *Typothoracisinae*

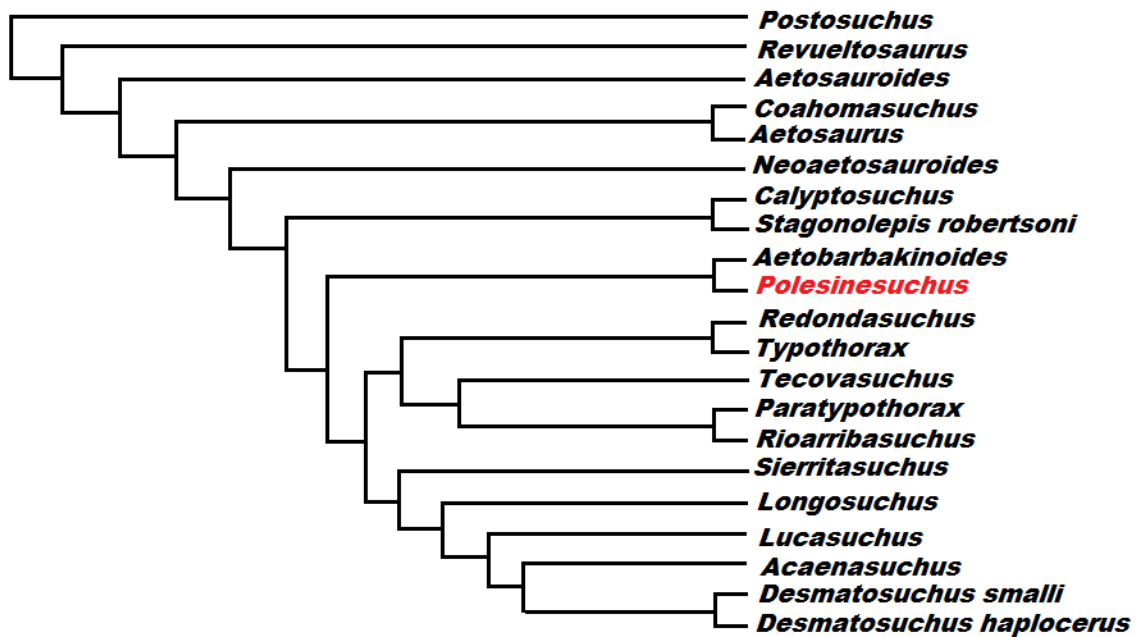


FIGURE 51. The second tree recovered in the present analysis. Note the position of *Polesinesuchus* as sister group of the *Aetobarbakinoides* and the sister group relationship between them, *Desmatosuchinae* plus *Typothoracisinae*

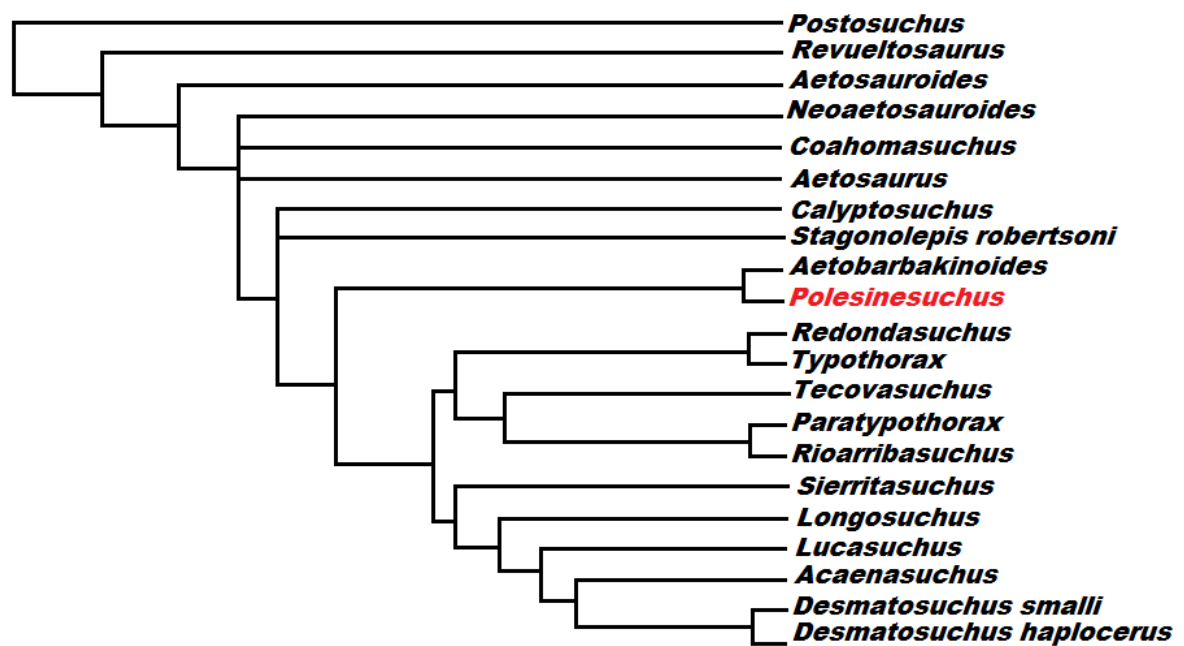


FIGURE 52. Strict consensus tree recovered in the present analysis. Note the unresolved polytomies among basal stagonolepidids, and also sister group relationship between *Polesinesuchus* plus *Aetobarbakinoides* and *Desmatosuchinae* plus *Typothoracisinae*.