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NOTA PALEONTOLÓGICA

THE TEIID LIZARD *TUPINAMBIS* IN THE MIOCENE–PLIOCENE OF CÓRDOBA AND ENTRE RÍOS PROVINCES (ARGENTINA)

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The extant teiid genus *Tupinambis* Daudin, 1803, is well represented in the paleontological record of Argentina since the early Miocene onwards (Albino, 1996; Brizuela and Albino, 2004, 2008; Albino *et al.*, 2006, 2009). However, some of the records are old and refer to fossils that were never revised, as is the case of the materials detailed below.

Kraglievich and Reig (1954) reported the presence of a maxilla of *Tupinambis* coming from exposures of the La Playa Formation at Cantera Tuclame (Tuclame Quarry), Córdoba Province (Fig. 1). Later, Donadío (1983, 1984) mentioned this specimen as *T. merianae* (Duméril and Bibron, 1839), although not describing the material nor justifying the taxonomic allocation. Moreover, a formal description of the specimen and discussion of its characters are still wanting. On the other hand, Ambrosetti (1890) described an extinct lizard genus on the basis of two partially preserved hemimandibles coming from the Ituzaingó Formation, in the cliffs along the Paraná River, Entre Ríos Province (Fig. 1). This lizard was nominated *Propodinema* Ambrosetti, 1890, and considered ancestor of *Tupinambis* (cited as *Podinema* Wagler, 1830, by Ambrosetti, 1890). Ambrosetti (1890) diagnosed each hemimandible as two different species, *i.e.*, *P. paranensis* Scalabrini, 1890 (in Ambrosetti, 1890) and *P. oligocena* Ambrosetti, 1890. Romer (1956) synonymized *Propodinema* with *Teius* Merrem, 1820, but Báez and Gasparini (1977) suggested that at least the dentary of *P. paranensis* could be referred to *Tupinambis*. Later, *Propodinema* was synonymized with *Tupinambis* by Estes (1983), although devoid of a discussion of characters and considering *T. paranensis* as valid Donadío (1983) cited this record as *Tupinambis* cf. *T. merianae*. The remains studied by Ambrosetti (1890) are lost at present; nevertheless, the detailed description made by this author elicits the discussion of some characters to aid in its taxonomic allocation.

The aim of this contribution is to describe the lizard material from the La Playa Formation and to discuss for first time the taxonomic affinities of this material and that recovered from the Ituzaingó Formation and described by Ambrosetti (1890).

MATERIALS AND METHODS

The material from the La Playa Formation is deposited at the Museo Municipal de Ciencias Naturales "Lorenzo Scaglia", Mar del Plata, Buenos Aires Province, Argentina (**MMP**). It was directly compared with osteological specimens of extant teiids deposited in the Herpetological collection of the Universidad Nacional de Mar del Plata-Sección Osteología (**UNMdP-O**). In the description and figures, the letters between parentheses designate relative positions of the teeth along the tooth row. The populations of the species *T. teguixin* (Linnaeus, 1758) living south of Amazonia are presently considered *T. merianae* (Ávila-Pires, 1995); thus, references by authors relating to Argentine *T. teguixin* are considered as *T. merianae* herein.

GEOLOGICAL CONTEXT

Olsacher (1960) described the La Playa Formation with sediments outcropping south of the locality known as La Playa, and exposed as the La Argentina plateau further south. These two localities lie within Minas Department, in northwestern Córdoba Province. The La Playa Formation includes travertines, mainly composed of hydrothermally originated cal-

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cites related to Cenozoic volcanic events (Bondesio and Pascual, 1981). The travertines in the vicinities of La Playa constituted a wethered lithologic formation, now appearing as isolated banks (Vullo, 1951). Gordillo and Lencinas (1979) correlated these deposits with similar outcrops in Valle El Pantano, San Luis Province, where the faunal composition confirms that they are contemporary (Bondesio and Pascual, 1981). Kraglievich and Reig (1954) recorded various vertebrate elements from the La Playa Formation (*i.e.*, "Las Playas" Formation according to them). The denomination of the Formation given by Kraglievich and Reig (1954) and followed by other authors (Bondesio, 1978; Bondesio and Pascual, 1981; Donadío, 1984) would be erroneous because the type locality is La Playa (in singular) in Minas Department. The material studied comes from Cantera Tuclame, in Minas Department (Kraglievich and Reig, 1954; Bondesio and Pascual, 1981), although Donadío (1984) placed it near the locality of Tuclame, in Cruz del Eje Department (Fig. 1). According to the Secretaría de Minería de la Nación (Programa de Asistencia Técnica para el Desarrollo del Sector Minero – Inventario de Recursos Naturales [http://www.mineria.gov.ar/estudios/irn/cordoba/x-6agn.asp]), the fossil was collected at 31°00′47,6″S– 65°21′31″W, in Minas Department (Fig. 1). At this site, the fossiliferous levels are one meter below the top of the formation, at an height of 941 m. above sea level. A procyonid carnivore and a hydrochoerid rodent were recognized among the fossil fauna of this formation (Bondesio, 1978; Bondesio and Pascual, 1981). Most taxa from this site characterize the Huayquerian South American Land Mammal age (SALMA), although some of them are also present in the Montehermosan SALMA. Thus, the age of the travertines ranges between the late Miocene and early Pliocene (Bondesio and Pascual, 1981).

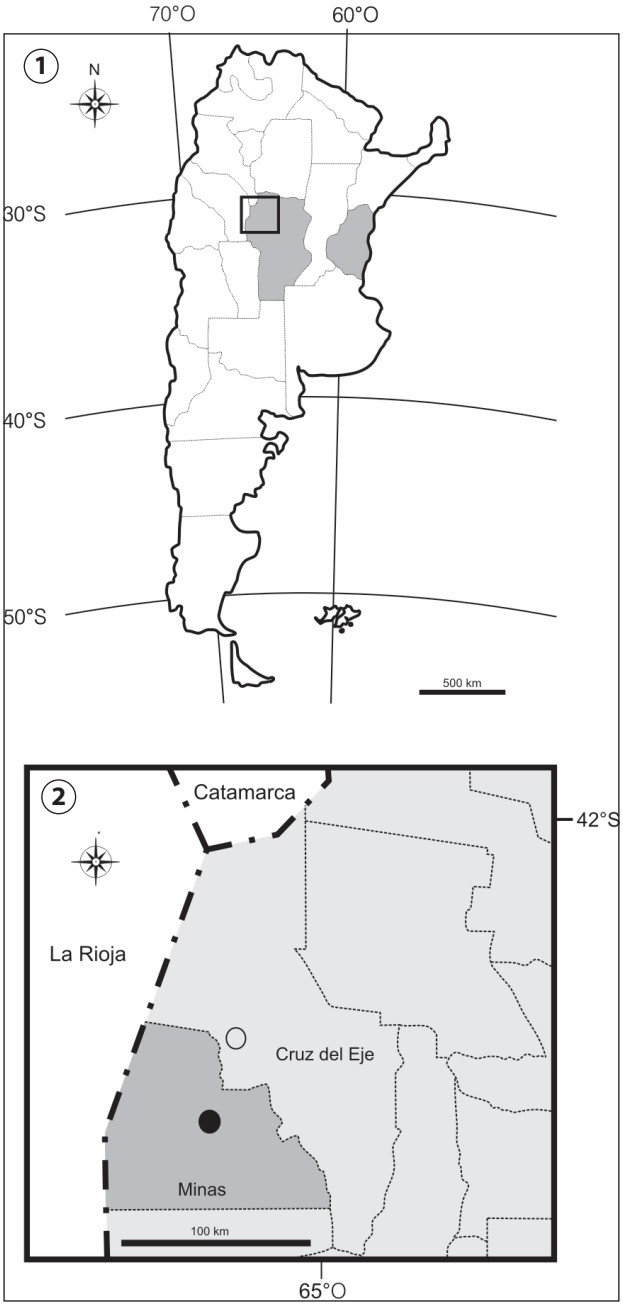

Figure 1.1–2, Córdoba and Entre Ríos provinces (Argentina), with location map of Cantera Tuclame; **1,** Córdoba and Entre Ríos provinces in grey; **2,** detailed map of northwestern Córdoba Province: Minas Department in dark grey, solid circle Cantera Tuclame (31°00′47,6″S–65°21′31″W) (vicinity of La Playa locality), open circle Tuclame, in Cruz del Eje Department/ *Provincias de Córdoba y Entre Ríos (Argentina), con mapa de la localización de la Cantera Tuclame;* ***1,*** *provincias de Córdoba y Entre Ríos en gris;* ***2,*** *mapa detallando del noroeste de la provincia de Córdoba: Departamento de Minas en gris oscuro, circulo sólido Cantera Tuclame (31°00′47,6″S–65°21′31″W) (vecindad de la localidad de La Playa), circulo abierto localidad de Tuclame en el departamento de Cruz del Eje.*

SYSTEMATIC PALEONTOLOGY

Order Squamata Oppel, 1811

Suborder Scleroglossa Estes, de Queiroz and Gauthier, 1988

Infraorder Scincomorpha Camp, 1923

Supefamily Teioidea Estes, de Queiroz and Gauthier, 1988

Family Teiidae Gray, 1827

Subfamily Tupinambinae Presch, 1974

Genus ***Tupinambis*** Daudin, 1803

Type species. *Tupinambis teguixin* (Linnaeus, 1758).

Tupinambis sp.

Figura 2

Referred material. MMP 637-S, a right maxilla.

Geographical and stratigraphical occurrence. Cantera

Tuclame (31°00′47,6″S–65°21′31″W), Minas Department, Córdoba Province (Fig. 1). La Playa Formation (Olsacher, 1960), Huayquerian–Montehermosian, late Miocene–early Pliocene (Bondesio and Pascual, 1981).

Description. The material consists of a right maxilla –poorly preserved and imbedded in the sedimentary matrix– showing only the labial face (Fig. 1.1). The maxilla is complete, labially smooth and with six labial foramina. The complete tooth row is 44.26 mm long. The number of tooth positions is uncertain due to the poor preservation of the material, but the minimum number is ten, with only four teeth well preserved. Anteriorly, it is possible to see the cylindrical bases of the most anterior teeth preserved (a and b). They are followed by a gap without tooth remains, which would have accommodated two or more tooth positions. Posteriorly, only the bases of teeth (c) and (d) are preserved. They are circular in section and slightly larger than those of teeth (a) and (b). The following tooth (e) has a robust base, with a circular section, and an apparently conic crown. Although the crowns of teeth (a) to (e) are not preserved, the circular sections suggest they were unicuspidate. Tooth (e) is separated from the following four teeth by one tooth position without tooth remains. The last tooth (j) is absent. Teeth (f) to (i) are robust, blunt, without defined cusps, transversely and longitudinally enlarged ("molariform"), and oval in occlusal outline. Among these, tooth (f) is the smallest. Only teeth (g) and (h) are completely preserved. These have a slight mesodistal crest in occlusal view, with a well-defined protuberance at the center (Fig. 2.1). Thin apical striae converge distally at the central protuberance.

DISCUSSION

La Playa Formation. Donadío (1983, 1984) did not explain which characters were used to assign the maxilla from the La Playa Formation to *Tupinambis merianae.* The size of the maxilla, and the blunt and "molariform" posterior teeth are like those observed in the extant species *T. duseni* Lönnberg and Anderson 1910, *T. merianae*, *T. rufescens* (Günther, 1871) and *T. teguixin*. Dentitions in these species do not show marked differences (Brizuela and Albino, 2010), rendering specific allocation of the fossil impossible. Blunt and robust posterior teeth are present in specimens of *T. merianae* with maxillary tooth-row lengths surpassing 37.9 mm. However, these teeth are preceded only by unicuspid teeth with cylindrical bases in large-sized individuals of *T. merianae*, when maxillary tooth-row length surpasses 44.48 mm. The tooth-row length of the fossil specimen is very close to this value, supporting a correspondence between this character and the dentition of large, adult individuals (Brizuela and Albino, 2010).

The two species of *Tupinambis* currently living in Córdoba Province are *T. rufescens* in the northwest and *T. merianae* in the southeast, with sympatry in the north (Cei, 1986, 1993). This distribution reflects the ecological preferences of each species, as *T. rufescens* lives in more arid environments than does *T. merianae* (Donadío, 1984). *Tupinambis rufescens* is the only species inhabiting the surroundings of the fossiliferous site, in a warm-climate xerophytic forest. Based on the assignation of the maxilla from the La Playa Formation to *T. merianae*, Donadío (1984) inferred climatic conditions different from the present ones in the area. As stated above this author considered that Tuclame locality was located in

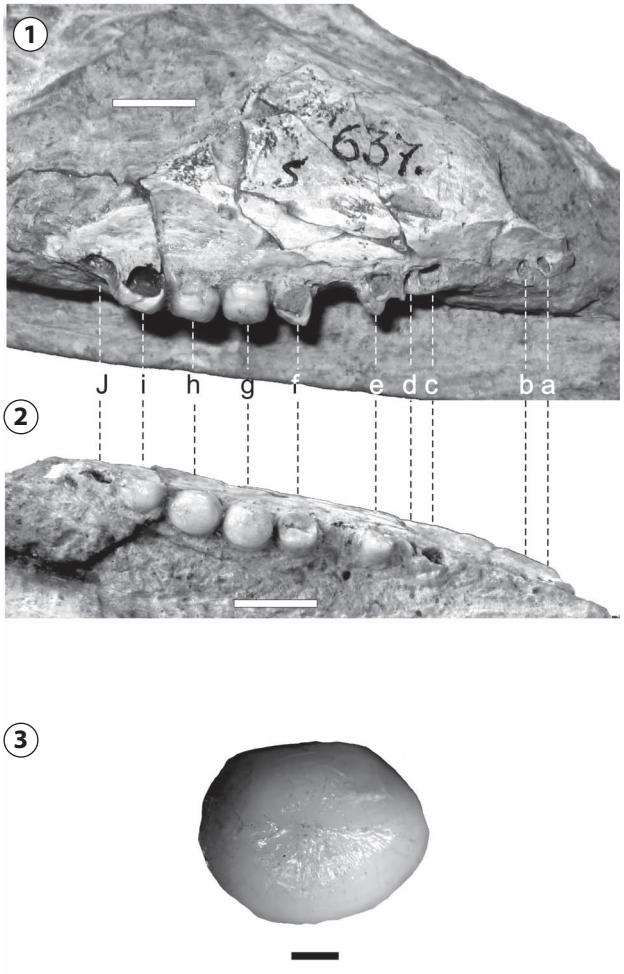

Figure 2.1–3, Maxilla (MMP 637-S) of ***Tupinambis*** sp. from La Playa Formation in Cantera Tuclame, Córdoba; **1,** labial view; **2,** occlusal view; **3,** amplified image of tooth (h) in occlusal view/ *Maxilar (MMP 637-S) de* ***Tupinambis*** sp. *de la Formación La Playa en Cantera Tuclame, Córdoba*; ***1,*** *vista labial;* ***2,*** *vista oclusal;* ***3****, imagen ampliada del diente (h) en vista oclusal.* Scale bar/ *escalas* = 10 mm in A and B, 1 mm in C.

Cruz del Eje Department instead of at Cantera Tuclame in Minas Department. Both localities are in northwestern Córdoba Province, sharing the same environmental conditions, but, as the fossil maxilla cannot be referred to any species in particular, the inferences of Donadío (1984) are invalid. Nonetheless, the hydrothermal origin of the sediments at Cantera Tuclame –and the presence of fossil remains of a procyonid and a hydrochoerid– indicate an aquatic environment during the late Miocene–early Pliocene (Bondesio and Pascual, 1981). This paleoenvironment contrasts with the present-day situation that favors the presence of the most xerophylous species of *Tupinambis* (*T. rufescens*). The three other species of *Tupinambis* –with blunt and "molariform" posterior teeth as in the fossil– could have exploited a more humid palaeoenvironment than *T. rufescens*, such as that suggested by Bondesio and Pascual (1981) for the La Playa Formation. at Cantera Tuclame.

Ituzaingó Formation. As mentioned above in the introduction, the description of the lizards found by Ambrosetti (1890) in sediments of the Ituzaingó Formation was never revised. The materials come from the cliffs along the Paraná River, near the city of Paraná, in Entre Ríos Province. The mammals from the Ituzaingó Formation have been considered characteristic of the "Mesopotamian" (Miocene–Pliocene). Estes (1983) considered the fossils studied by Ambrosetti (1890) as *Tupinambis paranaensis*, although suggesting it was a senior synonym of *T. preteguixin* Rovereto, 1914, from the Monte Hermoso Formation. Additionally, he suggests the synonymy of all known extinct *Tupinambis* species with the extant *T. merianae*. The description of the hemimandibles given by Ambrosetti (1890) allows the assumption that both extinct species shared the same distributional pattern of tooth morphology types in the dentaries that can be observed in large individuals of *T. merianae*. The first seven teeth of *T. paranensis* –named "incisives" by Ambrosetti (1890)– are unicuspid, delicate and conical. The eighth tooth ("canine" for Ambrosetti, 1890) is more robust, with a pointed and distally inclined crown. Ambrosetti (1890) recognized two types of robust posterior teeth. The three teeth following the "canine" are enlarged and present small grooves laterally delimiting a central main cusp. The grooves mentioned by Ambrosetti (1890) are interpreted as the intercuspidal grooves separating the main cusp from the tiny secondary cusps in robust tricuspid teeth of some *Tupinambis* species (Brizuela and Albino, 2008, 2010). The six robust posteriormost teeth were named "molars" by Ambrosetti (1890). They are blunt, with a central protuberance in occlusal view and striations convergent towards it. These characters correspond with the tooth-morphology type described and illustrated in the maxilla from the La Playa Formation (Fig. 2.3). The other hemimandible (*P. oligocena* of Ambrosetti) from the Ituzaingó Formation has the same distribution of tooth types, but the number of each type (those of Ambrosetti) varies (4-1-3-5) and the total number of teeth is 13 instead of 17. When compared with an ontogenetic series of *T. merianae*, the specimens from the Ituzaingó Formation. would have been relatively young individuals, because they have both tricuspid and blunt posterior teeth along the dentary tooth-row, contrasting with largest individuals which have only blunt posterior teeth (Brizuela and Albino, 2010). The number of dentary teeth is variable among specimens of *Tupinambis* (13–21), and also among specimens of *T. merianae* (13–18), not supporting two different fossil species. Thus, the synonymy of *Propodinema* with *Tupinambis* proposed by Estes (1983) is accepted, but not the validity of the species *T. paranensis*. The fossils described by Ambrosetti (1890) should be considered *Tupinambis* sp.

The geographic area along the cliffs of the Paraná River is presently inhabited by *T. merianae*; thus, the presence of individuals referred to the same genus in the Ituzaingó Formation is not contradictory with the current environment in the area.

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