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NOTA PALEONTOLÓGICA

FIRST RECORD OF MESOTHERIIDAE IN THE LATE OLIGOCENE OF MENDOZA PROVINCE, ARGENTINA

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THE knowledge of the late Oligocene fauna from Mendoza Province (central-west Argentina) has significantly increased over the past few years based on material recovered in the Quebrada Fiera locality, located at the south of the province (Gorroño *et al*., 1979; Bond and Pascual, 1983). Fossils were recovered from sediments nowadays interpreted as the base of the Agua de la Piedra Formation (Combina and Nullo, 2008, 2011). New research since 2006 has provided abundant new material of this Deseadan mammal assemblage, revealing important differences with other roughly coeval faunas from both higher and lower latitudes (Cerdeño and Vera, 2010, 2014; Cerdeño *et al*., 2010; Cerdeño and Reguero, in press; Forasiepi *et al*., 2013). Until now, an outstanding feature of the Quebrada Fiera fauna was the absence of remains of the Family Mesotheriidae, even though notoungulates are very well represented by different groups (Cerdeño, 2011). Nevertheless, field work in 2013 provided a single specimen that can be accurately identified as a mesotheriid and is the object of the present study.

MATERIAL AND METHOD

The studied specimen, MCNAM-PV 4936, belongs to the Vertebrate Paleontological Collection of the Museo de Ciencias Naturales y Antropológicas "Juan Cornelio Moyano" (**MCNAM-PV**) in Mendoza city, although it is temporarily curated at the IANIGLA (CCT-CONICET-Mendoza). It consists of two fragments of the same individual (they could fit, but not precisely because the contact surface is too abraded); one corresponds to the premaxilla bearing right and left first incisors (I1) and the other preserves part of the maxillary bones with one premolar (P) and several molars (M): left series P4–M2 and right M1 and M2 fragment. All teeth are incomplete, but allow an adequate description.

The study was based on comparisons with the Patagonian and Bolivian species of late Oligocene mesotheriids, which are represented by *Trachytherus spegazzinianus* Ameghino, 1889a, *T. subandinus* Villarroel, Sempere and Marshall, 1994, and *T. alloxus* Billet, Muizon and Mamaní Quispe, 2008, which were fully described and compared to each other by Billet *et al*. (2008). I also counted on original photographs of the specimen MLP 52-XI-2-1 of *T. spegazzinianus* curated at the Museo de La Plata (**MLP**) and personal data of several mesotheriid remains from Salla and Lacayani (Bolivia) in the Vertebrate Paleontology collection at the Museo Nacional de Historia Natural de La Paz (**MNHN-Bol-V**).

SYSTEMATIC PALEONTOLOGY

Order NOTOUNGULATA Roth, 1903

Familiy MESOTHERIIDAE Alston, 1876

Genus ***Trachytherus*** Ameghino, 1889a

Type species. *Trachytherus spegazzinianus* Ameghino, 1889a.

Trachytherus cf. ***T. spegazzinianus*** Ameghino, 1889a

Figure 1

Remarks. According to Billet *et al*. (2008) and references therein, the Subfamily Trachytheriinae Simpson, 1945 would be a paraphyletic group in contrast with the monophyletic Mesotheriinae. Following these authors, the only non-mesotheriine genus *Trachytherus* is not allocated at the subfamily level. Billet *et al*. (2008) also considered the species *Trachytherus*? *mendocensis* Simpson and Minoprio, 1949, but this taxon was taxonomically and stratigraphically related to the mesotheriine cf. *Altitypotherium chucalensis* Croft, Flynn and Wyss, 2004, from the early Miocene levels of the Mariño Formation (Cerdeño, 2007; Cerdeño *et al*., 2008).

Description. The incisors of MCNAM-PV 4936 (Fig. 1.1–2)

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are incomplete but maintain the whole length of the crown, showing very hypsodont and curved teeth. Both I1 contact at their occlusal, mesial end, but separate upward into the maxilla. In occlusal view (Fig. 1.1), they form an acute angle between them, the main axis of each one at about 35° with the sagittal plane. The occlusal face is long and labiolingually narrow (Tab. 1), ellipsoidal in outline.

The premolar and molars show advanced wear (Fig. 1.3). The P4 has no remains of central fossette, but carries two tiny lingual, centered grooves that differentiate protoloph from metaloph; the latter is slightly more projected lingually. Although it lacks the ectoloph, the preserved part suggests that the transverse dimension of P4 was greater than the anteroposterior diameter (Tab. 1). The M1s show very hypsodont and curved ectolophs. They are longer than wider at this wear stage (Tab. 1). The paracone fold of M1 is poorly developed. The Y-shaped central valley has the anterior branch rather long and the posterior one very short in such a way that the median lobe appears reduced. The protoloph and metaloph come close but not into contact; their lingual ends are subequal, the former more convex and a little shorter. Protoloph and metaloph are very inclined posterolingually. The lack of bone allows seeing the extension of the labial wall of right M1 (though lacking most enamel) reaching a height of 58 mm to the remaining maxillary bone. The ectoloph preserved on M1s is smoothly undulated and bears thin remains of cement. The M2 fragment shows that the posterior branch of the Y-valley is somewhat longer than in M1 and the lingual opening is a little wider, both features probably due to its lesser degree of wearing.

Comparison and discussion. Concerning first incisors, both *Trachytherus alloxus* from Salla, Bolivia, and *T. spegazzinianus* (holotype) from Patagonia have I1 separated mesially, more triangular in outline, pointing distally, and forming a wider angle between them than in MCNAM-PV 4936; however, the specimen MLP 52-XI-2-1 of *T. spegazzinianus* has a more oval I1 (Billet *et al.*, 2008, figs. 2, 8, 16). *Trachytherus alloxus* has a more conspicuous paracone fold and much more developed protoloph than MCNAM-PV 4936. The specimens illustrated by Billet *et al.* (2008), such as SAL 280, as well as those directly revised MNHN-Bol-V 004335 and MNHN-Bol-V 009986, present an expanded protoloph with its lingual wall long and straight whereas the metaloph is shorter and lingually convex. This morphology is present in specimens of *Trachytherus alloxus* with different ontogenetic stages (Billet *et al.*, 2008) and is one of the diagnostic characters of this species with respect to the Patagonian *T. spegazzinianus*. In addition, the coexistence of a featureless lingually open P4 and a M1 precludes referral to *T. alloxus*, according to the ontogenetic stages established by Billet *et al.* (2008: app. 2). MCNAM-PV 4936 would be equivalent to stage 11, in which *T. alloxus* has P3–4 and M1 with isolated central fossettes; in the prior stage (10) in this species, M1 is still open lingually, but P4 is weakly worn with an isolated fossette.

The other Bolivian species, *T. subandinus*, coming from Río Pluma (Villarroel *et al.*, 1994), is closer to MCNAM-PV 4936 in the shape of the protoloph, but differs in the pentagonal outline of P4, which points lingually. Besides, *T. subandinus* is significantly smaller (see below).

MCNAM-PV 4936 shows clear similarities in both the development of paracone fold and protoloph with *T. spegazzinianus*. This species presents tiny folds on the lingual end of the protoloph of M1 (holotype and MLP 52-XI-2-1), which are considered to be present only at a certain level of wear (Billet *et al.*, 2008). These folds are not present in MCNAM-PV 4936, but could be due to the ontogenetic stage. The lingual folds observed on the P4 are also observable on the P3 of MLP 52-XI-2-1 and would reflect the separation between protoloph and metaloph of younger stages. On the

Table 1 – Measurements of* Trachytherus *cf.* T. spegazzinianus *from Quebrada Fiera, Mendoza. Abbreviations. I, upper incisor; L, length; l., left; M, upper molar; P, upper premolar; r., right; W, width.

MCNAM- PV 4936	*r. I1 l.*	*r. P4 l.*	*r. M1 l.*	*r. M2 l.*
L	*<26.2 22.3*	*>17 -*	*(23.0) (22.8)*	*>24 -*
*W**	*(11.9) 11.0*	*- -*	*17.0 18.7*	*- -*

**Measurement taken perpendicular to ectoloph.*

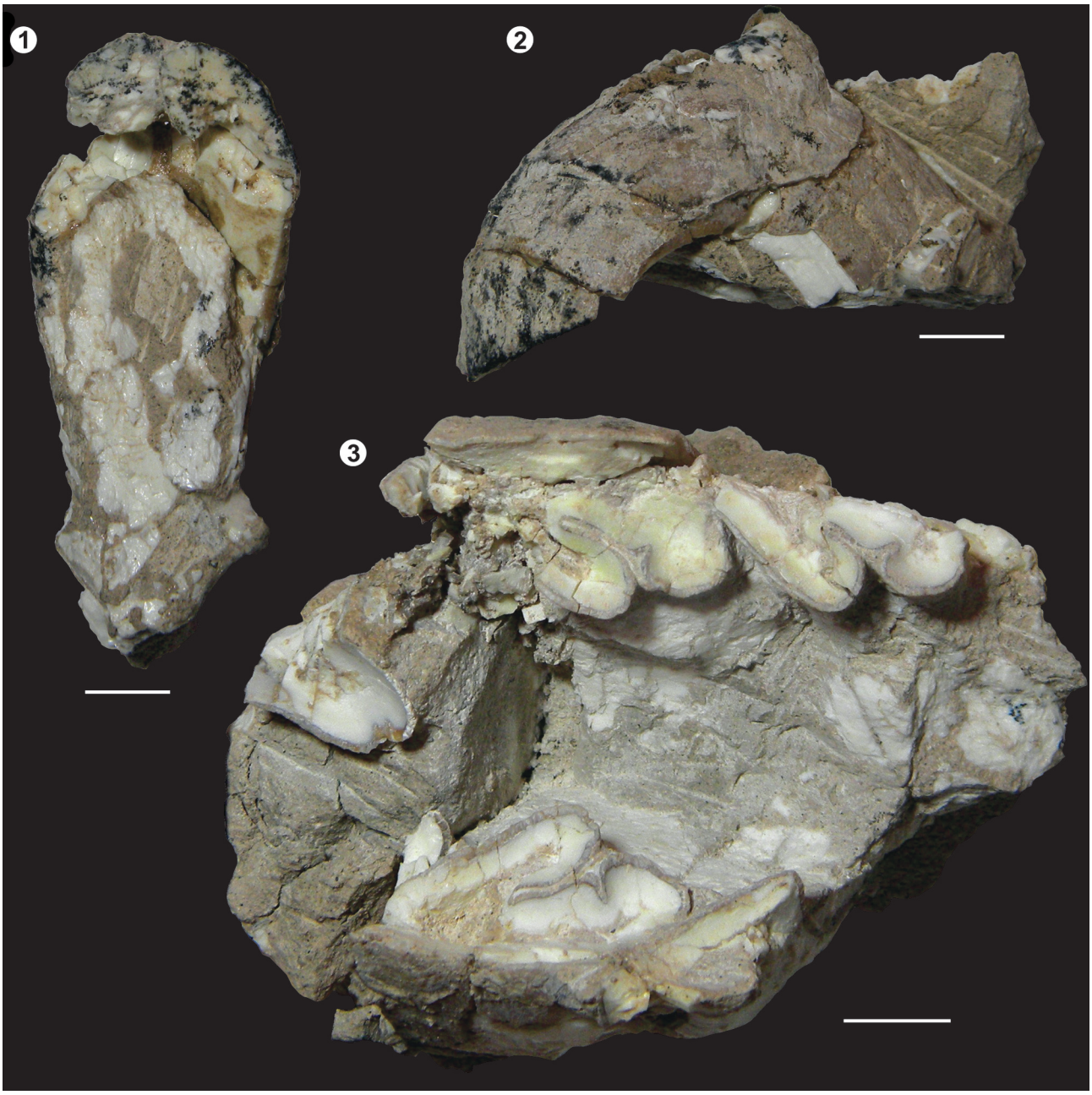

Figure 1. ***Trachytherus* cf. *T. spegazzinianus***, MCNAM-PV 4936. **1–2,** first incisors, occlusal and left lateral views; **3,** left P4–M2 and right M1 and fragment of M2 in occlusal? view. Scale bars = 10 mm.

other hand, MCNAM-PV 4936 differs from *T. spegazzinianus* in the great inclination of protoloph and metaloph, which are more transverse to the ectoloph in the Patagonian material as well as in the specimens from Lacayani (Bolivia) assigned to this species (Billet *et al.*, 2008; personal observation of MNHN-Bol-V-010725). The combination of a featureless P4 and a lingually open M1 is not known in *T. spegazzinianus*, but its ontogenetic stage remains to be determined; specimen MLP 52-XI-2-1 has a P4 with a reduced central fossette, a condition that is closer to MCNAM-PV 4936 than to *T. alloxus*.

Concerning size (Tab. 1), the specimen from Mendoza is significantly larger than *T. subandinus*; both P4 and molars of this species show much lower values (Villarroel *et al.*, 1994: tab. 1) than the homologous teeth in MCNAM-PV 4936 (Tab. 1), and the series P2–M2 occupies the same length as M1–2 of the specimen from Mendoza. Comparing with *T. alloxus*, dimensions of MCNAM-PV 4936 (Tab. 1) exceed

the maximum values obtained by Billet *et al*. (2008, tab. A1a, b), but with less difference than with respect to *T. subandinus*, which closes the minimum values of *T. alloxus*. The same is true for the length of P4 in *T. spegazzinianus* (just estimated in MCNAM-PV 4936), although measurements of M1 and M2 (Tab. 1) fit in the range established for the Patagonian and Lacayani material of this species after Billet *et al*. (2008, tab. A4a). It is worth noting that these values are lower than those provided by Reguero (1999, tab. 6.18) for the same specimens of *T. spegazzinianus* from Patagonia, reflecting a different way of measuring specimens; nevertheless, it can be stated that MCNAM-PV 4936 does not differ significantly in size from *T. spegazzinianus* (Patagonian localities with this species are updated in Reguero and Prevosti, 2010).

Shockey *et al*. (2006) reported numerous mesotheriid remains within the Deseadan fauna of the Moquegua Formation (Pan de Azúcar and Cerro Mono localities, southern Peru). The authors figured one cranium, but they did not describe the material, and identified the Peruvian taxon as *Trachytherus* sp. They emphasized its small size with respect to *T. spegazzinianus*, but did not compare with *T. subandinus*. The I1–M3 length provided by Shockey *et al*. (2006, p. 206) is 100 mm whereas this length is estimated around 150 mm (probably longer) in MCNAM-PV 4936, that is around 35% longer.

FINAL REMARKS

The previous paragraphs evidence a closer similarity of MCNAM-PV 4936 to *Trachytherus spegazzinianus* than to *T. alloxus* or *T. subandinus*. Taking into account, however, that the only recovered specimen does not allow an in-depth comparison, and some differences are observed on the first incisors and in the inclination of transverse lophs of M1, I prefer to identify it as *Trachytherus* cf. *T. spegazzinianus*.

This determination adds to other elements from the Quebrada Fiera fauna shared with Deseadan taxa from Patagonia, but also with those from lower latitudes, because *T. spegazzinianus* has been also recognized in Bolivia at the Lacayani locality (Billet *et al*., 2008). In this sense, its presence in Mendoza fills a gap in the expected geographical distribution of this mesotheriid. On the other hand, similarities between Patagonia and Lacayani have been previously noticed, for instance among rodents (Vucetich, 1989, 1991), highlighting instead differences between faunas from Salla and Lacayani, even though the causal factor is not yet well established, as summarized by Billet *et al*. (2008).

The mammal assemblage from Quebrada Fiera also presents similarities with Salla, as it includes the archaeohyracid *Archaeohyrax suniensis* Billet, Patterson and Muizon, 2009 (Cerdeño and Vera, 2010), which is so far unknown at any other locality. Besides, both sites have in common the hegetotheriid *Prohegetotherium schiaffinoi* (Kraglievich, 1932) (Cerdeño and Reguero, in press), which is also known from the Fray Bentos Formation (Uruguay and Argentina). Other mammals are typical Deseadan taxa from Patagonia, such as *Prohegetotherium sculptum* Ameghino, 1897 (Cerdeño and Reguero, in press), *Proboryhaena gigantea* Ameghino, 1897 (Bond and Pascual, 1983) or *Pharsophorus* Ameghino, 1897 (Forasiepi *et al*., 2013). The *Pyrotherium* Ameghino, 1889b and Intheratheriidae remains from Quebrada Fiera (Gorroño *et al*., 1979; Cerdeño, 2011) still lack a detailed enough study to define their affinities with the Patagonian or Salla species. In addition, all these taxa are accompanied in Quebrada Fiera by exclusive genera and/or species of different groups: notohippids (Cerdeño and Vera, 2010, in press), metatheria (Forasiepi *et al*., 2013), hegetotheriids (Cerdeño and Reguero, in press), homalodotheriids (Seoane, 2013,) and probably others (toxodontids –Hernández Del Pino *et al*., 2013–, rodents). The fauna from Quebrada Fiera provides new data shedding light on the biogeographical distribution of Deseadan mammals. The scanty record of mesotheriids in Quebrada Fiera contrasts with the representation of other notoungulates within the recovered sample, such as archaeohyracids or hegetotheriids, as well as with other Deseadan faunas. This could be a peculiarity of this assemblage, but could also be due to taphonomic factors. Explaining similarities and differences among the mentioned localities is not easy (see discussion in Billet *et al*., 2008, or Cerdeño and Reguero, in press) and the lack of absolute dates for Quebrada Fiera makes it difficult to establish accurate temporal correlations with the Deseadan associations from lower and higher latitudes.

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