



A review of the Quaternary Scelidotheriinae (Mammalia, Xenarthra, Tardigrada) from the Tarija-Padcaya basin, Bolivia

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Abstract: The Mylodontidae Scelidotheriinae (Mammalia, Xenarthra, Tardigrada) are a diversified clade of South American fossil ground sloths, with a wide geographic distribution, especially in high and middle latitudes. According to the last revision, the Quaternary diversity includes the genera *Scelidotherium*, *Catonyx*, and *Valgipes*. The clade Scelidotheriinae is well represented in the Pleistocene of the Tarija-Padcaya basin, and the first mention of these ground sloths correspond to the middle of the XIX Century. Since then, several species (i.e., *Scelidotherium tarijensis*, *Scelidodon tarijensis*, *Scelidotherium capellini*) have been reported as inhabiting the Tarija-Padcaya basin during the Pleistocene. Despite the abundance of fossil records of Scelidotheriinae in this area, no modern taxonomic revisions are available. In consequence, in this contribution a revision of the remains assigned to Scelidotheriinae from the Tarija-Padcaya basin is accomplished, and some biostratigraphic and geographic implications are discussed. Our results show that one single species (*Catonyx tarijensis*) can be recognized in the studied area, whereas a supposed smaller one (*Scelidotherium patrium*) actually corresponds to juvenile specimens of *C. tarijensis*.

Key words: *Catonyx*, Diversity, Pilosa, Pleistocene, South America.

INTRODUCTION

The Tarija-Padcaya basin is located in southern Bolivia, 140 km north of Argentina (see map in Tonni et al. 2009). This locality is known for its high diversity of Pleistocene mammals since the

XIX Century, being one of the most important in South America (see, among others, Gervais 1855, Ameghino 1902, Boule and Thévenin 1920, Tonni et al. 2009).

According to Hoffstetter (1963) and Tonni et al. (2009) the main groups of Pleistocene mammals of Tarija are represented by Didelphimorphia, Xenarthra, Carnivora, Rodentia, Liptopterna, Notoungulata, Perissodactyla, and Artiodactyla. In this context, xenarthrans are one of the most

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conspicuous groups in the Quaternary palaeofauna from the Tarija-Padcaya basin, both in diversity and abundance (Boule and Thévenin 1920, Hoffstetter 1963, Takai et al. 1982, 1984). In recent times, the taxonomy of some groups was updated, especially the families Megatheriidae (De Iuliis et al. 2009), Glyptodontidae (Zurita et al. 2009), Pamphathiidae (Rodríguez-Bualó et al. 2014a), and Dasypodidae (Rodríguez-Bualó et al. 2014b, 2017).

In turn, the ground sloth clade Mylodontidae Scelidotheriinae (Xenarthra, Tardigrada) is represented by several records in the Pleistocene palaeofauna of Tarija-Padcaya (see Boule and Thévenin 1920, Hoffstetter 1963, Takai et al. 1982, 1984), which were studied in the Ph.D. theses of McDonald (1987) and Miño-Boilini (2012); however, their results are still in part unpublished.

From a taxonomic perspective, the clade Scelidotheriinae (typified by *Scelidotherium* Owen 1839) is one of the most diversified among Mylodontidae. In this context, the Quaternary taxa are represented by three genera: *Scelidotherium* Owen 1839, *Valgipes* Gervais 1874, and *Catonyx* Ameghino 1891 (see Corona et al. 2013, Miño-Boilini 2016). Scelidotherines are recorded from the middle Miocene to the early Holocene in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru, Paraguay, and Uruguay (Miño-Boilini and Carlini 2009). Despite their wide geographic distribution in South America, they are the only mylodontoids which did not migrate to Central and North America during the Great American Biotic Interchange (McDonald and Perea 2002).

From an anatomical viewpoint, scelidotherines are characterized by having a tubular and elongate skull (McDonald and Perea 2002), parallel dental series, laterally compressed molariforms (Pascual et al. 1966), and quadrangular and anteroposteriorly compressed femur, with concave facet of the astragalus for the cuboid (Pascual et al. 1966, McDonald and Perea 2002).

This paper aims to: a) carry out a taxonomic revision of the Scelidotheriinae specimens from the Tarija-Padcaya basin (Bolivia), including the descriptions of new specimens; b) discuss the chronostratigraphic and biogeographic implications.

PREVIOUS STUDIES AND REPORTS OF SCELIDOTHERIINAE IN BOLIVIA

The first mention of scelidotheres from Bolivia are those of Gervais (1855), Gervais and Ameghino (1880), Philippi (1893), and Sefve (1915a, b). More precisely the first Bolivian remains were exhumed by Weddell from the Tarija Valley (Weddell 1851), and were later mentioned and figured by Paul Gervais (1855: Plate 11 Figure 2, Plate 13 Figures 4-5). Sixty years later, Sefve (1915a) described and illustrated some specimens referred to *Scelidotherium capellini* from the same area.

In an outstanding contribution, Boule and Thévenin (1920) mentioned the presence of two scelidotheres in Tarija: *Scelidotherium tarijense* Gervais and Ameghino, 1880 (articulated skull and mandible, Plate XXIII, Figure 2, type of *Catonyx tarijensis*, and one calcaneus, Plate XXIV Figure 6), and *Scelidotherium patrium* Ameghino, 1888 (represented by a small partial dentary, which unfortunately was not figured).

Later, in an important field expedition to the Tarija-Padcaya basin carried out between 1924-1927, Riggs collected a large amount of remains that were assigned to *Scelidotherium* and are housed in the FMNH collections (Chicago, USA) (see Marshall 1978).

Hoffstetter (1963) reported the presence of *Scelidodon tarijensis*, and Takai et al. (1982, 1984) mentioned specimens referred to *Scelidotherium capellini* collected at the upper, middle, and lower members of the “Tarija Formation” (=Tolomosa Formation) (see Takai et al. 1982, Table I).

More recently, Werdelin (1991) mentioned specimens referred to *Scelidodon tarijensis*, which were collected by a Swedish expedition under the direction of Earland Nordenskiöld in 1901-1902 (Nordenskiöld 1902).

In summary and from a historical perspective, the scelidothers reported as part of the Pleistocene paleofauna of the Tarija-Padcaya basin are: *Scelidotherium tarijense*, *Scelidodon tarijensis*, *Scelidotherium capellini*, and *Scelidotherium patrium* (see Gervais and Ameghino 1880, Sefve 1915a, Boule and Thévenin 1920, Hoffstetter 1963, Takai et al. 1982, 1984, Werdelin 1991).

GEOLOGY AND AGE OF TARIJA-PADCAYA

The Tarija-Padcaya basin is located between 21° 19' and 21° 50' S and 64° 35' and 64° 50' 0 W, ranging from 1600 to 2200 m above sea level (see Tonni et al. 2009, Coltorti et al. 2010). It is part of a Quaternary basin filled with fluvial-lacustrine sediments that discordantly overlie the Paleozoic basement (Suárez-Montero 1996), showing a characteristic landscape of badlands, with irregular relief produced by differential sediment erosion (Oppenheim 1943, Suárez-Montero 1996). Recently Coltorti et al. (2010) included the entire Pleistocene sequence of the Tarija valley within the Tolomosa Formation, subdivided into three main sub-synthem named Ancon Grande, Puente Phayo, and San Jacinto.

The age of the Tarija palaeofauna is still problematic. Recent studies, including magnetostratigraphy dating, suggested very different interpretations for those levels bearing fossil mammals. When compared to the biochronologic framework of the Argentinean Pampean Region (see Cione et al. 2015), MacFadden et al. (2013) proposed they are exclusively Ensenadan in age (early to middle Pleistocene), but according to Coltorti et al. (2010) they are Lujanian (late Pleistocene), or

even Ensenadan-Lujanian according to Tonni et al. (2009).

MATERIALS AND METHODS

The chronologic scale is based on Cione et al. (2015), whereas the stratigraphy follows Coltorti et al. (2007, 2010).

Recently, Miño-Boilini (2016) carried out a detailed anatomical description of the skull, mandible and other postcranial elements (e.g.: scapula, humerus, radius, ulna, femur, tibia, and astragalus) of *C. tarijensis*, including comparisons with other Quaternary Scelidotheriinae. Consequently, in this contribution only the diagnostic characters of the materials are considered in order to support the specific assignation.

Institutional abbreviations: FMNHP: Field Museum of Natural History, Chicago, USA; MACN: Sección Paleontología Vertebrados, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina; MNPA: Museo Nacional Paleontológico-Arqueológico, Tarija (ex MUT: Museo Universitario de Tarija), Bolivia; MNHN TAR: Muséum National d’Histoire Naturelle, Tarija collection, Paris, France; NRM-M: Swedish Museum of Natural History, Stockholm, Sweden, Nordenskiöld collection.

Anatomical abbreviations: Mf/mf: upper/lower molariform, respectively.

Other abbreviations: n/n: without official catalogue number.

SYSTEMATIC PALEONTOLOGY

Xenarthra Cope, 1889

Tardigrada Lathan and Davis in Forster, 1795

Scelidotheriinae Ameghino, 1904

Catonyx Ameghino, 1891

Included species: *Catonyx cuvieri* (Lund, 1839), *Catonyx tarijensis* (Gervais and Ameghino, 1880), and *Catonyx chiliensis* (Lydekker, 1886).

Catonyx tarijensis (Gervais and Ameghino, 1880)



Figure 1 - *Catonyx tarijensis* (Gervais and Ameghino 1880), **a**) skull in dorsal view (MNHN TAR 1260, holotype of *Scelidotherrium tarijense*); **b**) skull in dorsal view (FMNH P 14243); **c**) skull and mandible in lateral view (MNHN TAR 1260, holotype of *Scelidotherrium tarijense*); **d**) skull and mandible in lateral view (FMNH P 14243); **e**) upper dental series in occlusal view (FMNH P 14243); **f**) left upper dental series in occlusal view (MNPA-V n/n, ex MUT 452, juvenile); **g**) lower dental series in occlusal view (FMNH P 14243); **h**) right lower dental series in occlusal view (MNPA-V n/n, ex MUT 451, juvenile); **i**) right lower dental series in occlusal view (MNPA-V n/n, ex MUT 438, juvenile); **j**) left scapula in lateral view (MNPA-V 005752); **k**) left ulna and left radius in lateral view (FMNH P 14238); **l**) left humerus in anterior view (MNPA-V 005752); **m**) right femur anterior view (MNPA-V 005764).

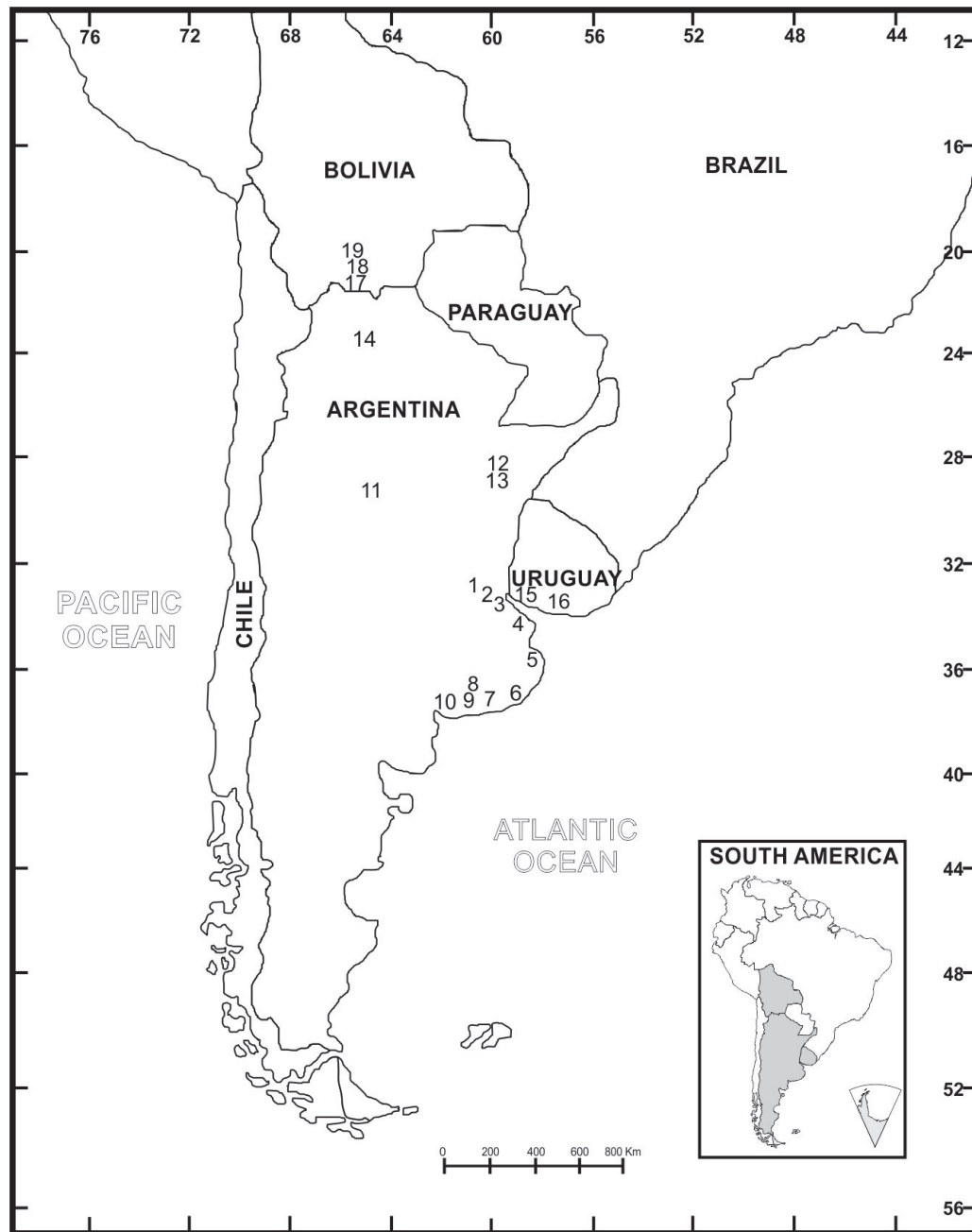


Figure 2 - Geographic distribution of *Catonyx tarijensis* (Gervais and Ameghino, 1880) in South America. 1) Arroyo Maciel, Buenos Aires Province, Argentina; 2) “Toscas” del Río de La Plata, Buenos Aires Province, Argentina; 3) Ciudad Autónoma de Buenos Aires, Buenos Aires Province, Argentina; 4) La Plata, Buenos Aires Province, Argentina; 5) Mar del Plata, Buenos Aires Province, Argentina; 6) Miramar, Buenos Aires Province, Argentina; 7) Necochea, Buenos Aires Province, Argentina; 8) Olavarría, Buenos Aires Province, Argentina; 9) río Quequén, Buenos Aires Province, Argentina; 10) Playa del Barco, Buenos Aires Province, Argentina; 11) Río Tercero, Córdoba Province; 12) Bella Vista, Corrientes Province; 13) Lavalle, Corrientes Province; 14) Guachipas, Salta Province; 15) Puerto Arazatí, Department of San José, Uruguay; 16) San Ramón, Department of Canelones, Uruguay; 17) Padcaya, Tarija, Bolivia; 18) Tarija, Bolivia; 19) Turamayo, Tarija, Bolivia. [1 - 14, see Miño-Boilini (2016); 15 and 16, see McDonald and Perea (2002), Corona et al. (2013)].

Figure 1 and 2

Holotype: MNHN TAR 1260, articulated skull and mandible.

Type locality and age: Department of Tarija, Bolivia, Tolomosa Formation, Pleistocene.

Description of the holotype: MNHN TAR 1260 (Figure 1a and c) is composed of an articulated partial skull and mandible, which precludes detailed descriptions. The narrow and elongate skull belongs to a large specimen, with an approximate length of 580 mm from the posterior end of the occipital condyles to the anterior end of the maxillaries.

In dorsal view, the parasagittal crests form an evident sagittal crest; the supraoccipital and occipital crests, as well as the external protuberances of the occipital, which are very developed, can also be observed. There is also a slight postorbital narrowing. The fronto-parietal suture is located behind the anterior part of the zygomatic process of the squamosal. In lateral view, the zygomatic process of the squamosal is very robust, whereas the lacrimal preserves a vestige of the suture with the frontal and the parietal. In anterior view, the contour formed by the nasals, maxillaries, and the palate is sub-circular. Finally, in posterior view, the *foramen magnum* is sub-circular. The left hemimandible is robust; in lateral view, the horizontal ramus is high and ventrally convex. The mandibular condyle is slightly above the occlusal surface of the dental series.

REFERRED MATERIAL, GEOGRAPHIC AND STRATIGRAPHIC PROVENANCE

Department of Tarija, Bolivia, Tolomosa Formation, Pleistocene: FMNH P 14238: skull, mandible, left scapula, right and left humeri, left ulna, left radius and left femur; MNPA-V 005752: left scapula, left humerus, left ulna, and left radius; MNPA-V 005769: skull and mandible dorso-ventrally compressed by lithostatic pressure; MNPA-V 005750 (ex MUT-V 32): skull and mandible; MNPA-V n/n (ex MUT 166): articulated

skull and mandible; MNPA-V 005766 (ex MUT 298): skull and partial left mandible; MNPA-V n/n (ex MUT 299): partial skull; MNPA-V n/n (ex MUT 368): partial mandible; MNPA-V n/n (ex MUT 446): partial mandible; MNPA-V n/n (ex MUT 447): partial left mandible; MNPA-V n/n (ex MUT 448): partial right mandible; MNPA-V n/n (ex MUT 449): partial right mandible; MNPA-V n/n (ex MUT 007): partial mandible; MNPA-V s/n (ex MUT 451): partial mandible belonging to a juvenile specimen; MNPA-V s/n (ex MUT 452): partial left maxillary belonging to a juvenile specimen; MNPA-V s/n (ex MUT 443 and 438): partial mandible of a juvenile specimen; MNPA-V n/n (ex MUT 338): partial left mandible; MNPA-V n/n (ex MUT 450): partial left mandible; FMNH P 13733: partial skull; NRM-M 4678: anterior part of right mandible; NRM-M 4731: partial left mandible; NRM-M 4444: skull and mandible; MACN 1138: posterior part of skull; MACN 1137: partial right mandible; and MACN 1139: left femur. Padccaya, Department of Tarija, Pleistocene: FMNH P 14243: skull and mandible.

Turamoyo, Department of Tarija, Pleistocene: FMNH P 13646: partial mandible; FMNH P 13741: isolated teeth and vertebrae.

DESCRIPTION OF THE REFERRED MATERIAL

Skull

In anterior view, the nasal opening of *C. tarijensis* is sub-circular in cross section [MNHN TAR 1260, FMNH P 14238, FMNH P 14243, FMNH P 13733, MNPA-V n/n (ex MUT 166), MNPA-V n/n (ex MUT 299), NRM-M 4444]. In dorsal view (Figure 1a and b), the skull shows a sub-rectangular contour, while the sagittal crest is much more developed in *C. tarijensis* [MNHN TAR 1260, FMNH P 13733, MNPA-V 005769, MNPA-V 005750 (ex MUT-V 32), MNPA-V n/n (ex MUT 166), MNPA-V n/n (ex MUT 299), NRM-M 4444, MACN 1138] than in *C. chiliensis* and *Valgipes bucklandi* (see Miño-

Boilini 2016). In lateral view (Figure 1c and d), the pterygoid is like a plane leaf as observed in all scelidotheres, with this structure much more developed in *C. tarijensis* than in *Scelidotherium* spp. and *Valgipes bucklandi* (see Miño-Boilini 2016). In palatal view (Figure 1e), the palatal plane has a strong groove along the mid longitudinal ridge [FMNH P 14238, FMNH P 14243, MNPA-V 005750 (ex MUT-V 32), MNPA-V 005766 (ex MUT 298), MNPA-V n/n (ex MUT 299), NRM-M 4444]. In occlusal view (Figure 1e and f), the Mf1 of *C. tarijensis* is more mesiodistally extended than the rest of Quaternary scelidotheres, whereas the lingual lobe is well developed as in Quaternary scelidotheres (McDonald 1987, Miño-Boilini 2012, Plate 1, 2016); the Mf2, Mf3, and Mf4 are sub-triangular, with a lingual groove delimiting two defined lobes (see Miño-Boilini 2012, Plate, 1; Miño-Boilini 2016). As in other Quaternary scelidotheres, the Mf5 of *C. tarijensis* has a shallow lingual groove (Miño-Boilini 2016).

Dentary

In lateral view (Figure 1c and d), the horizontal ramus of *C. tarijensis* is higher than in Quaternary scelidotheres (e.g.: *Scelidotherium* spp., *V. bucklandi*), with the ventral margin markedly convex [MNHN TAR 1260, FMNH P 14238, MNPA-V 005769, MNPA-V 005750 (ex MUT-V 32), MNPA-V n/n (ex MUT 166), MNPA-V 005766 (ex MUT 298), among other specimens] (see McDonald 1987, Miño-Boilini 2012). In occlusal view, the mandibular symphysis is transversally wider than in the remaining Quaternary scelidotheres (e.g.: *Scelidotherium* spp., *V. bucklandi*, and *C. chiliensis*) (Miño-Boilini 2012, 2016) [FMNH P 14243, MNPA-V 005769, MNPA-V n/n (MUT 368)]. The mf1 (Figure 1g, h and i) of *C. tarijensis* is much more extended mesiodistally than the homologous of the other Quaternary scelidotheres (e.g.: *Scelidotherium* spp., *V. bucklandi*, and *C.*

chiliensis) (see McDonald 1987, Miño-Boilini 2012, Plate 2, 2016). This species has a lingual lobe with a slightly developed longitudinal groove; the mf2 and mf3 are sub-rectangular in cross section, with its maximum diameter oblique to the sagittal plane, as in all Scelidotheriinae, and that of mf4 is trilobated, as in the remaining scelidotheres (see McDonald 1987, Miño-Boilini 2012, Plate 2).

Postcranial elements

According to McDonald (1987) there are little anatomical differences among scapulae of Mylodontidae. The scapula of *C. tarijensis* (Figure 1j) has an isosceles triangle shape, as those of Quaternary scelidotheres (*Scelidotherium* spp., *Catonyx* spp., *V. bucklandi*) (see Miño-Boilini 2012 Plate 3, 2016). In lateral view, the scapula of *C. tarijensis* is antero-posteriorly wide and its lamina is thin. The suprascapular fossa is sub-triangular in shape, and the infrascapular fossa is slightly sub-rectangular, both characters as in the other Quaternary Scelidotheriinae species (see Miño-Boilini 2012, Plate 3). In *C. tarijensis* the spinal of the acromion is more massive than in *C. cuvieri*, *C. chiliensis*, *Valgipes bucklandi*, *Scelidotherium leptcephalum*, and *S. bravardi*.

The diaphysis of the humerus of *C. tarijensis* (Figure 1k) is more robust and massive with the deltoid tuberosity more developed than those of other Quaternary scelidotheres (e.g., *Scelidotherium* spp., *V. bucklandi*, and *C. chiliensis*) (see Miño-Boilini 2012, Plate. 4, 2016) [FMNH P 14238, MNPA-V 005752].

Catonyx tarijensis has entepicondylar foramen as in most of the Plio-Pleistocene scelidoterines (see Miño-Boilini 2012, Plate 4; Miño-Boilini 2016), except for *C. cuvieri* in which it is absent. In anterior view, it can be seen that the major tuberosity and the deltoid crest are well developed in *C. tarijensis*. As in all Scelidotheriinae the

smaller tuberosity is slightly below the line of the humeral head (see Miño-Boilini 2012, Plate 4).

The ulna and radius (Figure 1l) of *C. tarijensis* are clearly robust and massive (e.g.: *Scelidotherium* spp., *V. bucklandi*, and *C. chiliensis*) (see Miño-Boilini 2012, Plates 5 and 6, 2016) [FMNH P 14238, MNPA-V 005752]. The olecranon process of the ulna of *C. tarijensis* is more robust than that of *Scelidotherium* spp., *Valgipes bucklandi*, and *Catonyx* spp. (see Miño-Boilini 2016). The styloid process of the ulna is more robust in *C. tarijensis* than in *Scelidotherium leptocephalum*, *S. bravardi*, *V. bucklandi*, *C. cuvieri*, and *C. chiliensis* (see Miño-Boilini 2012, Plate 5). The inner border of the radius of *C. tarijensis* is more sinuous compared to *Scelidotherium leptocephalum*, *S. bravardi*, *V. bucklandi*, *C. cuvieri*, and *C. chiliensis* (see Miño-Boilini 2012, Plate 6).

The femur of *C. tarijensis* (Figure 1m) is rectangular, massive and transversely wide, with short femoral neck (see Miño-Boilini 2016). In anterior view, the patellar trochlea of *C. tarijensis* is more anteriorly positioned than in *C. cuvieri*, *C. chiliensis*, *C. cuvieri*, *Scelidotherium leptocephalum*, and *S. bravardi*. In proximal view, the femoral head is hemispherical, as observed in all Quaternary Scelidotheriinae. Its lateral epicondyle is more acute than in *Scelidotherium* spp. and *Valgipes bucklandi* (see Miño-Boilini 2012, Plate 8, 2016) [FMNH P 14238, MACN 1139].

In distal view, the patellar trochlea of *C. tarijensis* is continuous with the lateral and medial condyles, as in *C. cuvieri*, *C. chiliensis*, *Scelidotherium leptocephalum* and *S. bravardi*. However, in *V. bucklandi* they are separated by non-articular bone (Miño-Boilini 2012). In *C. tarijensis*, the medial condyle is more massive than in *C. cuvieri*, *C. chiliensis*, *Scelidotherium leptocephalum* and *S. bravardi*.

DISCUSSION AND CONCLUSIONS

MORPHOLOGY AND TAXONOMY

All the scelidothere remains of Tarija-Padcaya basin are assigned to a single species, *Catonyx tarijensis*, on the basis of the following morphological characteristics: 1) skull with evident temporal ridges and sagittal crest, much better developed than in other Quaternary scelidotherines; 2) Mf1 mesiodistally extended with well-developed lingual lobe; 2) robust mandible, high horizontal ramus and ventral margin markedly convex; 3) mfl with labial lobe having a slightly longitudinal groove; 4) robust and massive humerus with deltoid tuberosity more developed than in the remaining species; and 5) femur with short femoral neck.

In summary, *Catonyx tarijensis* is the only Scelidotheriinae recorded in the Tarija-Padcaya basin. It is represented by several skulls, mandibles and postcranial elements. In turn, the hypothetical presence of the small Scelidotheriinae *Scelidotherium patrium* (see Boule and Thévenin 1920: 222) is rejected, according to the current evidence. Noteworthy, the materials assigned to this latter species (*Scelidotherium patrium*), currently housed in the MHNH TAR, were not figured (see Boule and Thévenin 1920). The preservation of these materials is bad, hindering a specific taxonomic assignation (C. Argot, pers. comm.), but very likely they belong to juveniles of *C. tarijensis* [MNPA-V s / n, ex MUT 452 (Figure 1f), MNPA-Vs / n, ex MUT 451 (Figure 1h and i), MNPA-V s / n, ex MUT 443 and 438]. On the other hand it is important to remark that *Scelidotherium patrium* (currently *Proscelidodon patrius*) is recorded in Pliocene sediments of Argentina and Bolivia (Anaya and MacFadden 1995, Miño-Boilini et al. 2011). In this scenario, the analyzed material (a left maxilla; MNPA-V s / n, ex MUT 452 (Figure 1f) shows evident sutures, which clearly indicate the early ontogenetic stage of the specimen. The taxonomic assignment to

the species *C. tarijensis* is based on the particular morphology of the Mf1, which is mesiodistally extended, showing a very well developed lingual lobe. In turn, the hemimandibles (MNPA-V s / n, ex MUT 443 and 438) have a bulge in the body of the mandible; in addition, the lingual lobe of mf1 has a slightly marked longitudinal sulcus. This particular morphology is only observed in juvenile specimens of *C. tarijensis*.

The other species mentioned for the Tarija Valley is *Scelidotherium capellini* (see Sefve 1915a and Takai et al. 1982), a taxon recognized by Gervais and Ameghino (1880) on the basis of a left dentary from the Pleistocene of the Buenos Aires province (Argentina) (see Miño-Boilini 2016, Figure 1g). In the type material of *Scelidotherium capellini* the ventral border of the mandible is convex, and the lingual lobe of mf1 shows a slightly marked longitudinal sulcus, as observed in *C. tarijensis*. This taxonomic interpretation is in agreement with the proposal of Hoffstetter (1963) and McDonald and Perea (2002) according to which this species is a junior synonym of *C. tarijensis* (see also Miño-Boilini 2016). Moreover, this interpretation is also in agreement with McDonald (1987) who supports that the only recorded species in the Tarija Valley is *C. tarijensis*.

BIOGEOGRAPHY AND CHRONOSTRATIGRAPHY

According to Miño-Boilini (2012) the biogeographic history of the Scelidotheriinae was restricted with certainty to South America, so far this clade has not been found in Central or North America. Scelidotherines are recorded from the middle Miocene to the early Holocene in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Peru, Paraguay, and Uruguay (Miño-Boilini and Carlini 2009).

More precisely, *C. tarijensis* has a wide paleontological record in South America (Miño-Boilini 2016). In Argentina, it is recorded in Buenos

Aires, Córdoba, Corrientes, and Salta provinces, from the Ensenadan to Lujanian ages (early-middle Pleistocene to late Pleistocene) (see McDonald 1987, Miño-Boilini 2012, 2016). The first records of *C. tarijensis* come from early-middle Pleistocene sediments of several localities (e.g. "Toscas" del Río de La Plata, Olivos, Florida; see Miño-Boilini 2016). In Uruguay, *C. tarijensis* is recorded from the early-middle Pleistocene (Ensenadan Stage) to the late Pleistocene (Lujanian Stage) of the departments of San José and Canelones, respectively (McDonald and Perea 2002, Corona et al. 2013).

Taking into account that the age of the Tarija-Padcaya basin is controversial (see Tonni et al. 2009, MacFadden et al. 2013), with ages that range between the Ensenadan and Lujanian (MacFadden et al. 2013, Coltorti et al. 2007, 2010, Zurita et al. 2009, Tonni et al. 2009), the presence of *C. tarijensis* supplies no information to support any of the chronological hypotheses mentioned above.

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