New material of *Tapirus* (Perissodactyla: Tapiridae) from the Pleistocene of southern Brazil

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ABSTRACT

New material of Tapirus from the late Pleistocene of Rio Grande do Sul State is described, and other specimens previously collected are reviewed. The material comes from Alegrete (Sanga da Cruz Creek), Dom Pedrito (São Luiz cattle ranch), Iraí, Quaraí (Cerro da Tapera), and Santa Vitória do Palmar (Hermenegildo Beach). The specimens from Iraí are referred to the extant species, T. terrestris, on the basis of their size and morphology. Specimens from Sanga da Cruz Creek, Hermenegildo Beach, São Luiz cattle ranch and Cerro da Tapera are very fragmentary or present no diagnostic characters, and are tentatively assigned to Tapirus cf. T. terrestris. We *confirm the presence of the T. terrestris in the upper Pleistocene of Rio Grande do Sul state. Currently, there are neither archaeological nor historical records of this species for the southern region of this state.*

Key words: late Pleistocene, Perissodactyla, Tapirus, Rio Grande do Sul, Brazil.

RESUMEN

Nuevos materiales del género Tapirus de Pleistoceno tardío del Estado de Rio Grande do Sul son presentado, mientras otros especímenes previamente recolectados son revisados. El material descripto proviene de las municipalidades de Alegrete (Sanga da Cruz), Dom Pedrito (Estancia São Luiz), Iraí, Quaraí (Cerro da Tapera), y Santa Vitória do Palmar (Playa del Hermenegildo). Los especímenes de las localidades de Iraí fueron comparados con otras especies del género, y debido a su morfología y tamaño, ellos fueron referidos a la especie reciente, T. terrestris. Los especímenes de Sanga da Cruz, Playa del Hermenegildo, Estancia São Luiz y Cerro da Tapera están muy fragmentados o no presentan caracteres diagnósticos, y fueron tentativamente asignados a Tapirus cf. T. terrestris. Nosotros confirmamos la presencia de *T. terrestris en el Pleistoceno tardío del Estado de Rio Grande do Sul. Actualmente, no hay registros arqueológicos ni históricos de esta especie para la región sur de este estado.*

Palabras clave: Pleistoceno tardío, Perissodactyla, Tapirus, Rio Grande do Sul, Brasil.

INTRODUCTION

Family Tapiridae contains a single extant genus, *Tapirus* Brisson, 1762, with four extant species; one species inhabits southeastern Asia and three are found in Neotropical America (Brooks *et al.*, 1997). Tapirs reached South America during the Great American Biotic Interchange, where they are today the largest terrestrial mammals (Stehli and Webb, 1985). The species of *Tapirus* live in the neotropical zone and are associated with humid tropical and subtropical forest. They are browsers and frugivores, playing a critical role in structuring of tropical forests as seed dispersers (Fragoso and Huffman, 2000), and are indicators of ancient forested environments (DeSantis and MacFadden, 2007).

Some species of *Tapirus* have been described from Pleistocene deposits of South America based on mandibular and dentary fragments. These are *T. tarijensis* Ameghino, 1902 (Tarija, Bolivia, dubious stratigraphic provenance), *T. rioplatensis* Cattoi, 1957 (Buenos Aires Province, Argentina - early Pleistocene) and *T. oliverasi* Ubilla, 1983 (Department of Montevideo, Libertad Formation, Uruguay – early Pleistocene).

Three late Pleistocene species have been described based on cranial material; *T. cristatellus* Winge, 1906 from Minas Gerais and Bahia states, Brazil (Cartelle, 1999; Holanda *et al.*, 2007), *T. mesopotamicus* Ferrero and Noriega, 2007 from the Mesopotamia region of Entre Rios Province, Argentina, and *T. rondoniensis* Holanda, Ferigolo and Ribeiro, 2011 from southwestern Amazonia.

Late Pleistocene records of *T. terrestris* (Linnaeus, 1758) are known from many places in Argentina, Brazil, Uruguay and Venezuela (Paula Couto, 1980; Rancy, 1981; Simpson and Paula Couto, 1981; Tonni, 1992; Ubilla, 1996; Hyrooka, 2003; Porpino and Santos, 2003; Salles *et al.,* 2006; Ferrero *et al.,* 2007; Holanda and Rincón, 2009; Oliveira, 2010). In addition to these records, fragmentary material from the late Pleistocene of Uruguay, Argentina, Brazil, Peru and Venezuela have been referred to *Tapirus,* but without specific determination (Rusconi, 1928; Cattoi, 1951; Rolim, 1974; Ubilla, 1983; Marshall *et al.*, 1984; Sedor *et al.*, 2004; Holanda and Cozzuol, 2006; Holanda and Rincón, 2009).

Previous studies of *Tapirus* in southern Brazil

Specimens of *Tapirus* from Rio Grande do Sul state are scarce, incomplete, and comprised almost exclusively of dental fragments and postcranial remains. Bombin (1976) referred late Pleistocene material from the Touro Passo Formation (Uruguaiana Municipality) to the species *T. terrestris*, but specimens mentioned by the author could not be located in any collection. The presence of fossil tapirs from Touro Passo Creek was confirmed by Kerber and Oliveira (2008) at the Ponte Velha I outcrop (Figure 1), based on lower molar remains.

Soliani (1973) identified remains of *T. terrestris* at Arroio Chuí, and Oliveira (1992) cites *T. terrestris* from the Coastal Plain, but specimens mentioned by these authors could not be located in any collection, and at moment, it is not possible to confirm the presence of tapirs at this site. Paula Couto (1943) recorded the first fossil tapir from Iraí Municipality, a lower molar, probably m3. Souza Cunha (1959) reported postcranial fragments of *T. terrestris*, also from Iraí; specimens that are re-described in this study. Holanda *et al.* (2005) recorded the first tapir from Dom Pedrito Municipality, described herein.

GEOLOGICAL SETTING

The tapir material described herein comes from five localities in Rio Grande do Sul state. Sanga da Cruz Creek is a tributary of the Ibicuí River, situated 23 km north of Alegrete City (Da Rosa, 2003; Ribeiro and Scherer, 2009; Figure 1). The specimen described here comes from Sanga da Cruz, however the precise point of collection is lacking. Most mammals from Sanga da Cruz are found in conglomeratic facies that yielded a thermoluminescence date between 14,925 ± 800 and 14,830 ± 750 years BP (Milder, 2000; Da Rosa, 2003). At another point near the outfall of the Ibucuí River is a mudstone facies where Miller (1987) reported *Glossotherium robustum,* and this yielded a ^{14}C date of 12,770 ± 220 years BP.

The Cerro da Tapera outcrop is situated on the right margin of the Quaraí River, Quaraí Municipality, about 200 m downstream from the outfall of Cati Creek (30º51'98"S, 56º29'30"W; Figure 1). The deposit here is typically fluvial, with several levels of fine to medium sandstone and brown mudstone (Ribeiro *et al.,* 2008). The fossils collected at this locality are isolated fragments of *Propraopus grandis*, *Morenelaphus* sp., Glyptodontidae, Mylodontinae, Toxodontidae, Cervidae, Carnivora and indeterminate fragments (Ribeiro and Scherer, 2009). According to Ribeiro *et al.* (2008) these deposits yielded thermoluminescence dates from two levels of 11,000 ± 2,000 and 13,000 ± 2,150 years BP.

The São Luiz cattle ranch is a private property within the limits of the Dom Pedrito Municipality, in southern Rio Grande do Sul state. A fossil tapir specimen was found here associated with *Stegomastodon waringi*. Many Glyptodontidae osteoderms were recovered at the same locality. At Iraí, tapir fossils were found during an excavation for extraction of mineral water in 1936 (Tupi Caldas, 1939); material here was also associated with *S. waringi* according to Gadens Marcon (2008). No biostratigraphic or geochronologic studies have been done for these two sites, but both are stated to be late Pleistocene in age (Ribeiro and Scherer, 2009).

"Hermenegildo Beach" on the Coastal Plain, is part of the Pelotas Basin that contains deposits of an extensive system of alluvial fans, and four lagoon-barrier systems, known

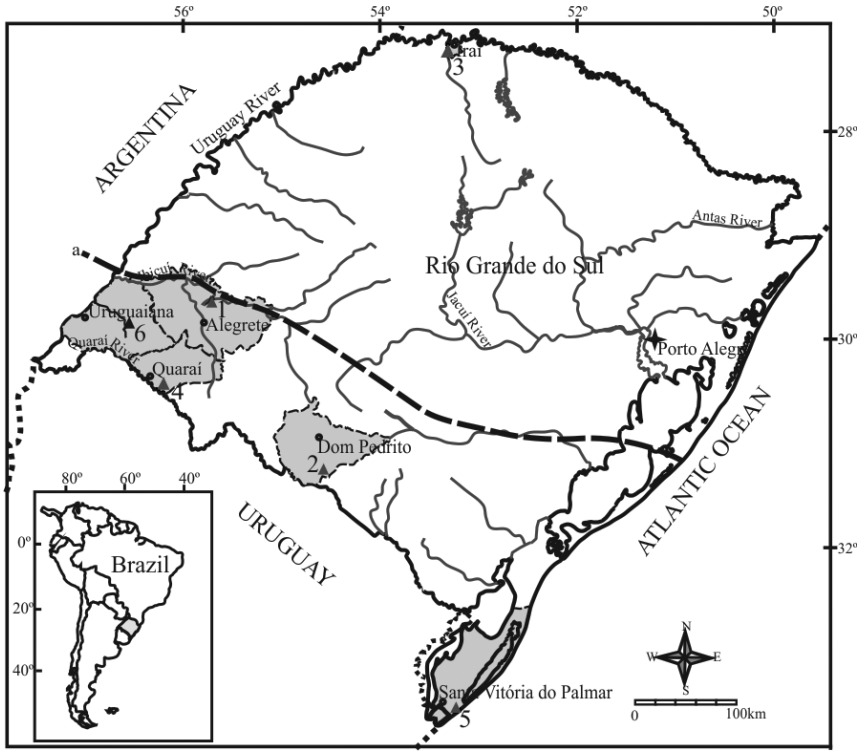

Figure 1. Map of the localities where reported fossil tapir were in Rio Grande do Sul state. Black triangle is previously known locality and grey triangles are localities reported here. 1. Sanga da Cruz Creek; 2. São Luiz cattle ranch; 3. Iraí; 4. Cerro da Tapera; 5. Hermenegildo Beach; 6. Ponte Velha I; a. "line of Paca" of Ihering (1892).

as I to IV (Villwock and Tomazelli, 1995). Lagoon-Barrier System III represents the third transgression/regression sequence of the Pleistocene. Tapir fossils were exhumed at the beach, on Hermenegildo's parcel (53°15'S and 33°42'W; Lopes *et al.*, 2001). The lagoonal depression that is now drained by the Chuí Creek, where mammalian fossils are found, is correlated with this system (Villwock and Tomazelli, 1995). Recently, Lopes *et al.* (2010) performed Electron Spin Resonance dating on fossils from Chuí Creek and the coastline. The Chuí Creek specimens yielded ages between 42 and 38 ka, much younger than previously estimated (Lopes *et al.,* 2001). Specimens from the coastline produced a wide age range, around 6 x 10^4 years, indicating, according to the authors, that the fossils came from deposits of different ages that were successively reworked and redeposited in younger sediments by sea-level oscillations. The associated mammalian fauna includes the following: Tardigrada, Cingulata, Litopterna, Notoungulata, Carnivora, Rodentia, Proboscidea, Artiodactyla and Perissodactyla (Oliveira, 1992; Buchmann, 2002; Ribeiro and Scherer, 2009).

MATERIALS AND METHODS

New material described herein is housed in the paleovertebrate collections of Museu de Ciências Naturais (MCN) and Museu de Ciências e Tecnologia (MCP). The specimens from Iraí reported by Souza Cunha (1959) are re-described here. The material was compared to both recent and fossil specimens (see Appendix). The dental terminology follows Butler (1952) and the taxonomy follows Colbert (2005). The measurements follow Simpson (1945), Hue (1907) and Hulbert (2005). The descriptive statistics were done using the most recent available version of Palaeontological Statistics – PAST software (Hammer *et al.*, 2001).

The abbreviations used in this study are as follows: DGM, Departamento Nacional de Produção Mineral, Rio de Janeiro, Brazil; MACN, Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina; MCN, Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil; MCP, Museu de Ciências of Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil; MLP, Museo de La Plata, Argentina; MN, Museu Nacional do Rio de Janeiro, Brazil; MZUSP, Museu de Zoologia of Universidade de São Paulo, Brazil.

SYSTEMATIC PALEONTOLOGY

Order Perissodactyla Owen, 1848
Family Tapiridae Burnett, 1830
Genus *Tapirus* Brisson, 1762
***Tapirus terrestris* (Linnaeus, 1758)**
(Figure 2, Tables 1-3)

Referred material and provenance. MN2099-V, incomplete left humerus; MN2098-V, right tibia; DGM79M, left calcaneum, Iraí Municipality.

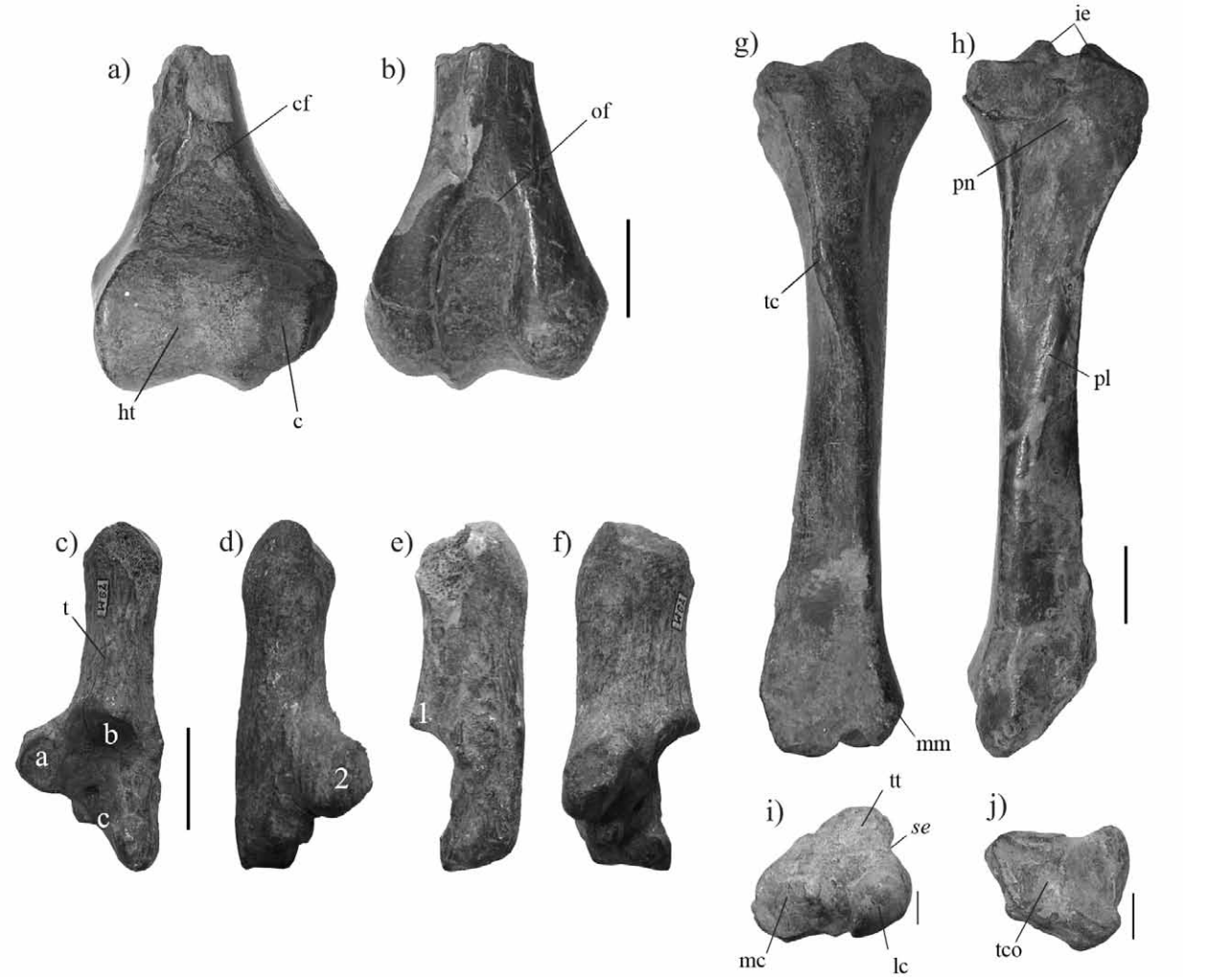

Figure 2. *Tapirus terrestris,* a - b: MN2099-V, left humerus in cranial and caudal views (left to right); c-f: DGM79M, left calcaneum in dorsal, plantar, medial and lateral views (left to right); g-j: MN2098-V, right tibia in cranial, caudal, proximal and distal views (left to right and top to bottom). Abbreviations: c: capitulum; cf: coronoid fossa; ht: humeral trochlea; ie: intercondylar eminence; lc: lateral condyle; mc: medial condyle; mm: medial malleolus; of: olecranon fossa; pl: popliteal linea; pn: popliteal notch; *se: sulcus extensorius;* tc: tibial crest; tco: cochlea; tt: tuberosity tibial; a: medial astragalar facet; b: proximal astragalar facet; c: distal astragalar facet; t: tuberosity; 1: coracoid process; 2: sustentacular process. Scale bar = 30 mm.

Description. The distal end of a left humerus MN2099-V has the condyles slightly worn (Figure 2a - b, Table 1); the distal articular face is semi-cylindrical and oblique, higher medially than laterally. The humeral trochlea is slightly rectangular, has a pronounced constriction on its centre, and is wider and higher than the capitulum, which is narrow and low. Both the coronoid and olecranon fossae are covered by sediment, but it is possible observe that the olecranon fossa is narrower and higher than the coronoid fossa. The ectepicondyle is low and prominent, and is lateral directed. The lateral supracondyloid crest extends to the caudodistal margin of the ectepicondyle. The entepicondyle is robust and high.

The tibia MN2098-V is more complete but the extremities are slightly abraded (Figure 2g-j; Table 2). Its proximal half is slightly triangular and nearly cylindrical. The proximal end is relatively broad. The medial condyle is oval and flat, and is thicker and narrower than the lateral one, which is nearly circular and craniocaudally convex. The condyles are separated posteriorly by a poorly visible popliteal notch, and axially by the intercondylar eminence. The intercondylar eminence is formed by a high and laminated medial tubercle, and by a low and robust lateral tubercle, which are separated by an irregular central depression. The tibial tuberosity is large and rounded. Extending distally from the tibial tuberosity is the tibial crest, which has a noticeable medial inclination. The lateral surface of the tibia is smooth and slightly sprained in spiral. The medial surface is broad and flat on the proximal half, and narrow and convex on the distal half. The caudal surface is narrow and is divided in two parts by an oblique popliteal line. The proximal region of the popliteal line has a rugous concave area. The distal region of the popliteal line has a smooth and convex area. The distal end is slightly rectangular

Table 1. Measurements from the humeri of *Tapirus*. Abbreviations: CDD: craniocaudal diameter of distal portion; MDD: mediolateral diameter of distal portion; TMD: mediolateral diameter of humeral trochlea; where N > 1, first line is mean ± standard deviation, second line is observed range, and third line is number of observations (N). Data of *T. cristatellus* from Winge (1906) and the cave provenance.

	CDD	MDD	TMD
T. terrestris	60.38 ± 3.45 55.3 - 67 (16)	68.64 ± 2.92 64.4 - 75.24 (16)	41.05 ± 2.33 37.5 - 46 (16)
MN2099-V	63.1	70	42
T. cristatellus Escrivania 1	--	64.5	--
T. cristatellus Escrivania 5	--	62	--

and much smaller than the proximal end. In the astragalar notch, facets for the proximal trochlea of the astragalus are deep and asymmetric. These facets are separated sagittally by a low and convex ridge. This ridge extends between two processes located at the cranial and caudal margins of the cochlea. The medial malleolus is very prominent and forms the craniomedial wall of the astragalar notch, which is slightly inclined in the direction of the facet.

The calcaneum DGM79M is long and thin, and its ends are lightly abraded (Figure 2c-f, Table 3). The distal half is transversely wide, and the axial portion is thickened on the facet for the cuboid. The tuberosity is quite prominent, mediolaterally compressed and dorsoplantarly thick. On the more axial face, the tuberosity is rugose and convex. On the distal half, the dorsal surface has three facets for the astragalus. The sustentacular process is a medial projection and has an oval concave facet for the astragalus. Dorsoproximally, the coracoid process holds a concave proximal facet, and its proximomedial border is convex. The distalmost and smallest articular surface for the astragalus is narrow and nearly flat. The distal end of the calcaneum is narrower lateromedially than the rest of the body and bears the cuboid facet. The groove between the articular facets is deep and rugose. In the plantar surface there is a slightly visible groove. On lateral surface, distal to the coracoid process, there is a rough and slightly rounded projection for the insertion of the external ligament.

Remarks. The distal end of the left humerus (MN2099-V) was erroneously considered by Souza Cunha (1959) to be a femur. The postcranial materials from Iraí are similar in size and morphology to those of *T. terrestris.* The only fossil tapir with preserved postcranium known from the Pleistocene of South America is *T. cristatellus*. Almost all measurements of *T. cristatellus* are much larger than for *T. terrestris* (Tables 1-3).

Comparing the humerus (MN2099-V), tibia (MN 2098 PV) and calcaneum (DGM79M) measurements, this material is similar in size with *T. terrestris* in all measurements (Tables 1-3). The specimens are very gracile, as in *T. terrestris*. The tibia and calcaneum measurements are smaller than for *T. cristatellus* (Tables 2-3). Although *T. pinchaque* and *T. bairdii* have considerable overlap in their dental measurements with *T. terrestris* (Simpson, 1945), the postcranium of *T. pinchaque* (Roulin, 1829) has been described as smaller than in *T.terrestris*. *T. bairdii* (Gill, 1865) and *T. indicus* Desmarest, 1819 are larger than *T. terrestris* (Simpson, 1945 – including measures from *T. bairdii*; Eisenmann and Guérin, 1992).

Tapirus cf. *T. terrestris*

(Figures 3-5, Tables 4-5)

Referred material and provenance. MCP-4290-PV, fragment of left maxilla, São Luiz cattle ranch; MCN-PV-3515, MCN-PV-6968, MCN-PV-8085-8087, dental crowns, MCN-PV-8843, symphyseal portion of mandible, MCN-PV-10069, proximal portion of left metatarsal III, Hermenegildo Beach; MCN-PV-9700, right scapula, Cerro da Tapera; MCN-PV-7071, left metacarpal II, Sanga da Cruz Creek.

Description. The incomplete left maxilla (MCP-4290-PV) bearing M2 and M3, is from an adult. Both molars show considerable occlusal wear (Figure 3a). Only parts of the

Table 2. Measurements from the tibia of *Tapirus*. Abbreviations: L: length; MDP: mediolateral diameter of proximal portion; CDP: craniocaudal diameter of proximal portion; MDB: mediolateral diameter of the body; MDD: mediolateral diameter of distal portion; CDD: craniocaudal diameter of distal portion; MDDA: mediolateral diameter of distal articular surface; LTC: length of tibial crest. Where N > 1, first line is mean ± standard deviation, second line is observed range, and third line is number of observations (N). Data of *T. cristatellus* from Winge (1906) and the cave provenance.

	L	MDP	CDP	MDB	MDD	CDD	MDDA	LTC
T. terrestris	258.44 ± 9.0 244 -275 (16)	75.55 ± 3.4 70.25 -84.3 (16)	65.90 ± 5.1 57.1 – 75 (16)	26.05 ± 1.89 23.2 -28.7 (16)	47.97 ± 2.2 44.9 – 53 (16)	40.56 ± 2.8 35.8 – 45 (16)	39.26 ± 3.28 34.3 - 46.8 (16)	96.01 ± 7.04 85 - 105.5 (16)
MN2098-V	268	66.62	54	28.9	52	44.8	37.3	92
T. cristatellus Escrivania 1	--	--	--	--	57	--	--	--
T. cristatellus Escrivania 5	--	--	--	--	55	--	--	--

Table 3. Measurements of the calcaneus in *Tapirus*. Abbreviations: L: length; MDB: mediolateral diameter of the body; MDD: mediolateral diameter of distal portion; where N > 1, first line is mean ± standard deviation, second line is observed range, and third line is number of observations (N). Data of *T. cristatellus* from Winge (1906) and the cave provenance.

	L	MDT	CDP	MW
T. terrestris	100.79 ± 4.8 94.1 - 110.6 (11)	43.06 ± 1.17 39 - 48.82 (11)	24.41 ± 1.43 22.5 – 27 (11)	35.44 ± 2.79 33.04 – 38 (11)
DGM79M	101	45.6	22.2	33
T. cristatellus Escrivania 1	113	--	--	--
T. cristatellus Escrivania 5	111	--	--	--

alveolar and jugal processes of the maxilla are preserved. The fragment is broken anterior to M2, and extends posterior to M3. The posterior portion of the jugal process is a lateroposteriorly directed blade, forming a concavity in the posteroventral border of the maxilla.

The M2 and M3 (MCP-4290-PV) have a trapezoidal form, with the protoloph wider than the metaloph. The protocone of M2 is fractured and exhibits much wear on the lophs (Figure 3). The protoloph and metaloph are separated lingually by a transverse groove, but buccally the paracone and metacone are united due to wear, forming a pronounced longitudinal crest (ectoloph). The mesial cingulum is worn completely and the distal cingulum is still sharp. The M2 parastyle is well developed. The M3 protocone is also fractured and shows less wear than the M2. The M3 metaloph and protoloph have wear on the mesial face. The M3 parastyle is smaller than in the M2. The M3 has a greater subcingulum, and is separated from the paracone by a conspicuous buccal groove. The mesial cingulum shows wear and the distal cingulum is much more defined. Both the M2 and M3 have a lingual cingulum on the metalophs.

The mandible fragment (MCN-PV-8843) preserves alveoli for the canines and right p2 (Figure 4a). The diastema is 35 mm long, and the portion bearing alveoli for incisors is lacking. The symphysis is solidly fused, concave and very robust (46.5 mm in width), extending posteriorly to a point anterior to p2. The labial wall of the mental foramen is located posteroventral to the p2 alveolus.

Specimen MCN-PV-3515 is a left protoloph, probably a DP4, showing little wear or abrasion (Figure 4b-c). The protocone is higher than the paracone; the parastyle is small and separated from the paracone by a transverse groove. The mesial cingulum is very visible. Specimen MCN-PV-6968 is a right protoloph, probably a DP3/P4 (Figure 4d-e). It displays only the protocone and part of the cross crest with little wear. The mesial cingulum is hardly visible. Specimen MCN-PV-8087 is a crown fragment of an upper molar, showing wear in the protoloph and metaloph, and much abrasion (Figure 4f). The cingulum and parastyle are absent. MCN-PV-8085 is a fragment of a left protolophid, probably from a dp3 (Figure 4g-h). The mesial cingulum is very well marked. The protoconid and metaconid are higher than the cross crest that unites them, forming a slightly V-shaped protolophid. MCN-PV-8086 is also a crown fragment, but a hypolophid, probably of a right m2, showing little wear and abrasion (Figure 4i-j). Its distal cingulum and subcingulum are conspicuous. The entoconid is higher than the hypoconid, and the cross crest is lower, forming a V-shaped hipolophid.

The scapula (MCN-PV-9700) is well preserved and has the robust form with deep musculature fossae indicative of a full adult (Figure 5a-b). The specimen is elongate and narrow. The lateral surface is divided into two slightly asymmetric fossae by a prominent scapular spine. The free crest of the spine is thickened, directed caudally, and bears no acromion. There is a prominent and robust tuber in the middle of the free crest of the spine. The supraspinous fossa is wider than the infraspinous fossa, and slightly triangular. On the surface of the supraspinous fossa there is a muscular line, very thickened, that divides it into two slightly deep

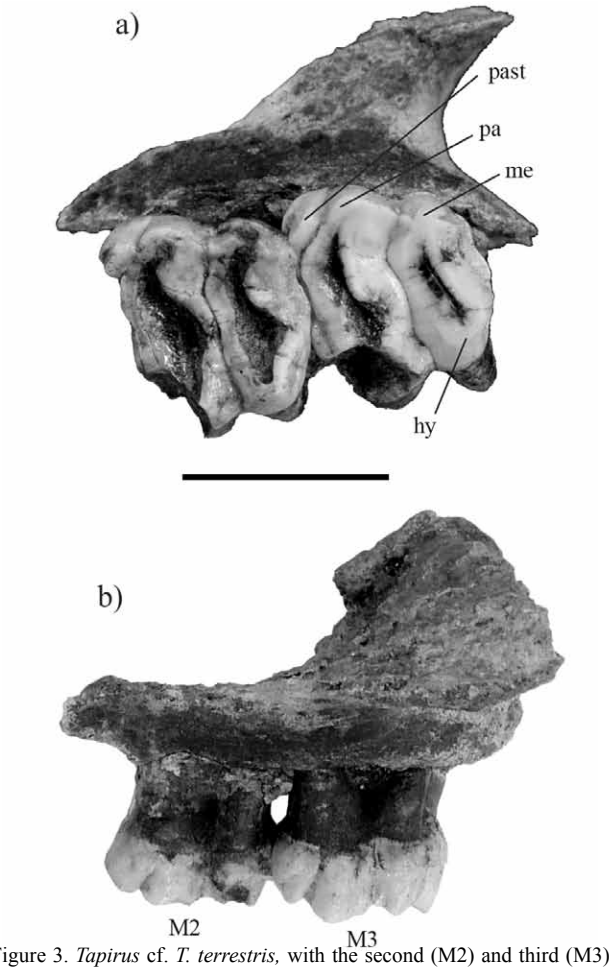

Figure 3. *Tapirus* cf. *T. terrestris,* with the second (M2) and third (M3) upper molar, a - b: MCP-4290PV, left maxilla in occlusal and lateral views. Abbreviations: hy: hypocone; me: metacone; pa: paracone; past: parastyle. Scale bar = 30 mm.

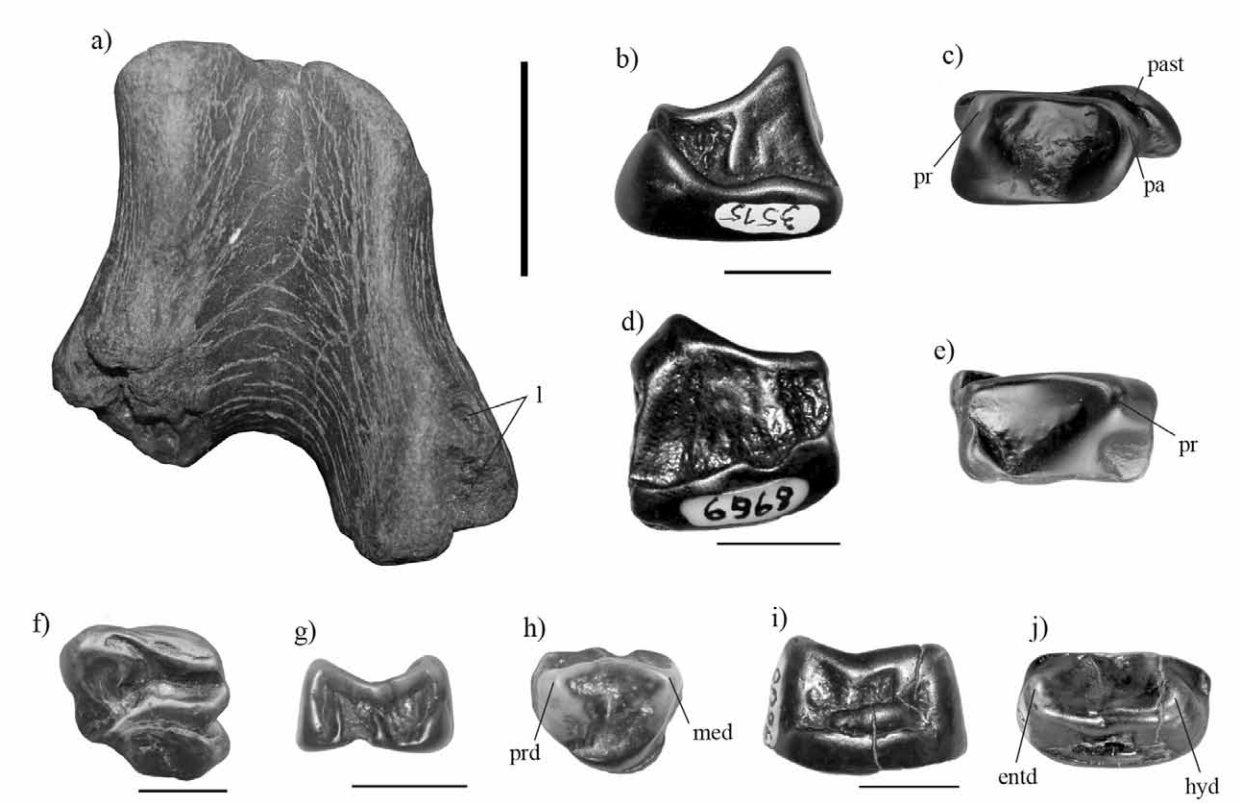

Figure 4. *Tapirus* cf. *T. terrestris,* a: MCN- PV-8843, symphyseal portion of mandible in occlusal view; b-c: MCN-PV-3515, left protoloph in mesial and occlusal views; d-e: - MCN-PV-6968, right protoloph in mesial and occlusal views; f: MCN-PV-8087, fragment of an upper molar in occlusal view; g-h: MCN-PV-8085, left protolophid in mesial and occlusal views; i-j: MCN-PV-8086, right hypolophid in distal and occlusal views. Abbreviations: entd: entoconid; hyd: hypoconid; med: metaconid; pa: paracone; past: parastyle; pr: protocone; prd: protoconid; 1**:** p2 alveolus. Scale bar in a = 30 mm and b - f = 10 mm.

fossae. The medial surface is irregular, and presents the slightly rugose *facies serrata*. The subscapular fossa is much deeper and larger.

The cranial border is thickener and more rounded than the caudal border, and slightly oblique in relation to the spine. Distal to the cranial border, it forms a deep and high scapular notch. The dorsal border is much thickened in the most axial portion, which is most prominent and inclined medially. The ventral border is the most robust part of the scapula. The glenoid cavity is shallow; its lateral border forms a larger arc than the medial border, and it extends cranially around the contour of the lateral supraglenoid tuberosity. The supraglenoid tuberosity projects ventrally, with a medial inclination. Dorsal to supraglenoid tuberosity is the robust and rugose coracoid process.

The scapula measurements (in millimeters) are: maximum length: 299; craniocaudal diameter: 142; maximum width of supraspinous fossa: 65.6; craniocaudal diameter of neck: 47.2; craniocaudal diameter of articular surface: 78; craniocaudal diameter of glenoid cavity: 43; lateromedial diameter of glenoid cavity: 46.5.

The metacarpal II (MCN-PV-7071) has a proximal end slightly narrower than the distal (Figure 5d). There are two proximal facets separated by a high ridge; the medial facet for the trapezoid, thicker than broad, slightly rectangular, concave dorsally and convex palmarly, and the lateral facet for the magnum, narrower, flat lateromedially, and slightly convex dorsopalmarly (Figure 5f). Medially and palmarly to the trapezoid facet is a small facet, slightly convex to the trapezium. Lateral to facet for the magnum is a low but thick, slightly flat facet for metacarpal III. The body has two faces: one dorsal, slightly flat and turned dorsomedially; and one palmar, more convex and very rough. The distal condyle is robust, dorsally convex, and palmarly divided by a high crest in two convexities. Lateral to each condyle is a small semicircular notch.

The metatarsal III (MCN-PV-10069) has one larger facet for the ectocuneiform in the proximal end. The ectocuneiform facet is slightly triangular and concave, with the lateral margin higher than medial margin (Figure 5i). Lateral to the ectocuneiform facet are two facets for metatarsal IV; the dorsal facet is slightly triangular and the plantar one is oval, these separated by a deep groove. The plantar facet is on a prominent process, although partly broken, and is directed lateroplantarly. Medial to the ectocuneiform facet there are two smaller facets for metatarsal II, separated by a shallow groove. The dorsal facet is larger than plantar facet, and slightly oval.

Remarks. The specimen from Dom Pedrito (São Luiz cattle ranch) was compared to material from other species of

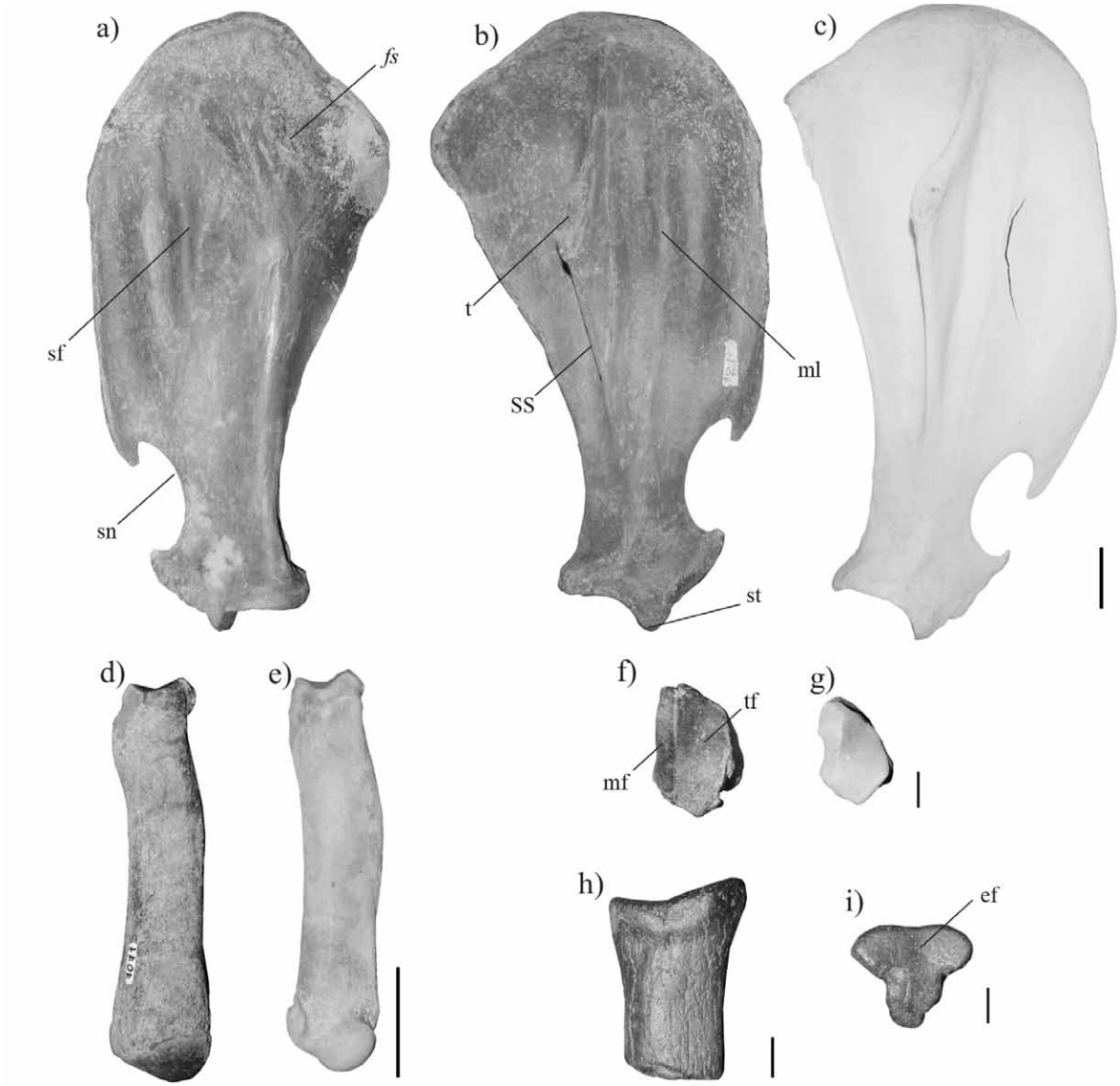

Figure 5. *Tapirus* cf. *T. terrestris*, a - b: MCN- PV-9700, right scapula in medial and lateral views (left to right); d and f: MCN-PV-7071, left metacarpal II in dorsal and proximal views; h - i: MCN-PV-10069, left metatarsal III in dorsal and proximal views. *T. terrestris,* c: MCN 2848, right scapula in lateral view; e and g: MCN 2532, left metacarpal II in dorsal and proximal views. Abbreviations: ef: ectocuneiform facet; *fs: facies serrata;* mf: magnum facet; ml: muscular line; sf: suprascapular fossa; sn: scapular notch; ss: spine of the scapula; st: supraglenoid tuberosity; t: tuber; tf: trapezoid facet. Scale bar in a - e = 30 mm and f - i= 10 mm.

Tapirus wherever possible. The dental characters in MCP-4290-PV are very similar to those found in *T. terrestris*. Considering its size, the M2 is smaller than that in *T. indicus* or in *T. cristatellus*, but is similar in size to that in *T. terrestris* and *T. mesopotamicus* (Table 4). Regarding the M3, all compared species overlap, although *T. indicus* and *T. cristatellus* specimens are larger than those of *T. terrestris*.

The Hermenegildo Beach materials are very fragmentary, abraded, and show signs of reworking, but they do not differ from *T. terrestris*. The postcranial specimens (MCN-PV-7071, MCN-PV-9700, and MCN-PV-10069) are robust, but are within of large end of the size range in *T. terrestris,* except for craniocaudal diameter of the proximal portion of metacarpal II (MCN-PV-7071) and the mediolateral diameter of proximal portion of metatarsal III (MCN-PV-10069; Table 5). All other measures of metacarpal II and metatarsal III are as in *T. terrestris*, MCN-PV-7071 and -10069 are both smaller than in *T. cristatellus* (Table 5).

These specimens are here tentatively assigned to *Tapirus* cf. *T. terrestris* despite having a somewhat larger size, considering that there is otherwise no difference with *T. terrestris, T. mesopotamicus* shows an overlap in some dental measurements with *T. terrestris*, although the length total of the skull is 390 mm (Ferrero and Noriega, 2007), whereas *T. terrestris* has a mean length of 351.7 mm (Simpson, 1945). There is no difference in the dental morphology or size between *T. terrestris* and *T. mesopotamicus*.

Table 4. Measurements in millimetres from the second (M2) and third (M3) upper molar of *Tapirus*. Abbreviations: L: length; AW: maximum width of anterior loph; PW: maximum width of posterior loph; where N > 1, first line is mean ± standard deviation (SD), second line is observed range (OR), and third line is number of observations (N). Data of *T. cristatellus* from Winge (1906) and the cave provenance.

	M2			M3		
	L	**AW**	**PW**	**L**	**AW**	**PW**
T. terrestris	22.85 ± 1.42 19.1 -25.36 (48)	25.85 ± 1.59 22.84 - 30.9 (48)	22.44 ± 1.31 19 - 25.7 (48)	22.88 ± 1.57 20 - 26 (26)	26.13 ±1.44 23.75 - 29.7 (26)	21.44 ± 1.27 20 - 25.5 (26)
MCP-4290PV	23.26	28.14	24.78	23.14	27.24	22.38
T. cristatellus Escrivania 1	26	28.75	-	26	28.75	-
T. cristatellus Escrivania 5	26.5	29	-	-	-	-
T. mesopotamicus	23.74	28.74	25.3	24.3	28.1	22.54
T. indicus	27.85 ± 1.34 26 – 29.2 (4)	30.45 ± 0.77 29.4 – 31.2 (4)	26.02 ± 0.35 25.6 – 26.4 (4)	25.7	29.7	23

DISCUSSION AND CONCLUSIONS

The material described herein confirms the presence of *Tapirus terrestris* in the late Pleistocene of Rio Grande do Sul state. Currently, *T. terrestris* occurs in Rio Grande do Sul state, in some remnants of the Atlantic Forest in the Upper Uruguay River, specifically at Parque Estadual do Turvo (Kasper *et al.,* 2007), in the northwestern part of the state. Historical records are known from the Taquari-Antas River (Ferri, 1991), but with no localities specified. In addition, Ihering (1892) and Rambo (2000) report the occurrence of this species on the slopes of Serra Geral, Araucaria Plateau. Recently, Rosa and Jacobus (2009) recorded *T. terrestris* from archaeological sites dated between ± 2,000 and 8,790 years B.P. at Maquiné, Santo Antônio da Patrullha, Torres, Porto Alegre, and Candelária Municipalities, in the central and east regions of the state. However, popular names of villages and cartographic toponyms, such as "Poço das Antas" and "Anta Gorda", indicate the occurrence of this species in the central region of Rio Grande do Sul before colonization. Ihering (1892) proposed that 32ºS latitude (Figure 1), which he called the "line of Paca", was the southern distribution limit of some species, including *T. terrestris*, which was the same as the limit of virgin forest at that time.

In either case, regarding the southern area of Rio Grande do Sul state, there are hitherto neither historical nor recent records of this species. However, the fossil record indicates that during the late Pleistocene in Rio Grande do Sul, as well as in Argentina and Uruguay (Tonni, 1992; Ubilla, 1996), this species had a more southern distribution, perhaps reflecting of a better climate and more southerly distribution of forest that ceased at the end of Pleistocene time and lead to its local extinction.

Table 5. Measurements from the metatarsal and metacarpal of *Tapirus*. Abbreviations: L: length; MDP: mediolateral diameter of proximal portion; CDP: craniocaudal diameter of proximal portion; MDB: mediolateral diameter of the body; MDD: mediolateral diameter of distal portion; where N > 1, first line is mean ± standard deviation (SD), second line is observed range (OR), and third line is number of observations (N). Data of *T. cristatellus* from Winge (1906) and the cave provenance.

	L	**MDP**	**CDP**	**MDB**	**MDD**
Metacarpal II					
T. terrestris	103.57 ± 3.38 99 – 110 (11)	19.68 ± 2.27 16 - 22.74 (11)	17.66 ± 0.98 16.3 - 19.52 (11)	18.57 ± 1.95 15.3 - 21.2 (11)	25 ± 2.67 21 - 28.4 (11)
MCN-PV-7071	102.8	18	24.6	18	22.2
T. cristatellus Escrivania 5	--	27	--	--	--
Metatarsal III					
T. terrestris	--	28.98 ± 1.33 27.2 – 31 (13)	26.76 ± 1.45 24.3 – 29 (13)	--	--
MCN-PV-10069	--	32.4	27.6	--	--
T. cristatellus Escrivania 1	--	35	--	--	--
T. cristatellus Escrivania 5	--	37	--	--	--

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APPENDIX

Material used for anatomical comparisons: *T. terrestris*: MLP 01, 754, 755, 1349, 1402, 1681, 4IV0013; MACN 7.6, 31211, 33276, 50559; MCN 1315, 2532, 2750, 2848; MN18, 600, 1605, 53701, 57062, 57067, 64437, 64572, 64652, 70698, 71599; MZUSP 106, 3232, 3266, 3268, 3269, 3727, 3728, 3758, 5701, 6139, 6140, 6575, 7005, 7006, 7007, 7700, 9604, 9712, 9714, 22421, 22422, 29085, 20035, 20037, 10715, 20034, 31983; UNIR 17, 20, 68, 83. *T. indicus*: MACN 129, 2553, 4347, 29926, 30351.

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