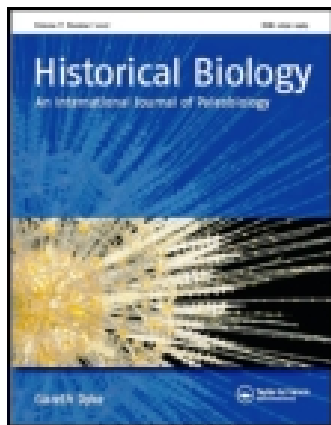


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Tayassu pecari (Link, 1795) (Mammalia, Cetartiodactyla): comments on its South American fossil record, taxonomy and paleobiogeography

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Tayassu pecari (Link, 1795) (Mammalia, Cetartiodactyla): comments on its South American fossil record, taxonomy and paleobiogeography

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Tayassu pecari is widely distributed across the Neotropical region, from northern Argentina to south-eastern Mexico. However, its fossil record is scarce; it is recorded since the middle Pleistocene to Holocene in Argentina, Brazil and Uruguay. This paper aims to: (1) update the systematic synonymy of this species; (2) review and update its geographic chronologic distribution and provide a new Lujanian record of *Tayassu pecari* in Buenos Aires Province and (3) discuss the paleoenvironmental and paleobiogeographical implications of this record. Considering the quantitative analysis performed, the fossil here recorded clearly integrates the group of *Tayassu pecari*. This specimen corresponds to the first record of *Tayassu pecari* in the central-northern region of the Buenos Aires Province. During Late Pleistocene, *Tayassu pecari* was distributed southern to its recent range, probably evidencing different paleoenvironment conditions. This species is the better adapted peccary to tropical and subtropical rainforests, but may also be present in arid environments. Consequently, *Tayassu* by itself is insufficient to infer the prevailing environmental conditions. However, according to the fauna associated with the specimen described here, it is possible to infer an open or semi-open and arid or semi-arid environment for the central-northern Buenos Aires region by Late Pleistocene times.

Keywords: white-lipped peccary; Tayassuidae; Bonaerian; Lujanian; Quaternary; South America

1. Introduction

After Tayassuidae (Mammalia, Cetartiodactyla) entered South America (coming from North America), they produced an extensive fossil record. They have been found in sediments of Argentina, Brazil, Uruguay, Bolivia, Colombia and Peru (Gasparini 2013). In this sense, Argentina has the major diversity and abundance of fossil species in South America. The records of the family within Argentina come from the Pampean Region (Buenos Aires Province), Mesopotamia (Entre Ríos, Corrientes and Misiones Provinces) and northern-central region (Santiago del Estero, Santa Fe, Córdoba and Jujuy Provinces) (Gasparini and Ferrero 2010; Gasparini et al. 2011; Gasparini 2013). The reliable oldest records of peccaries in South America were extended back to the middle Pliocene (~4.0–3.3 My; see Prevosti et al. 2006), and later 3.7 My (Woodburne 2010). However, new specimens of peccaries were recently registered in Peru (Madre de Dios Formation, ~9.5–9.0 My; Late Miocene of the western Amazon Basin of South America; see Frailey and Campbell 2012) referring to as the first pulse of the Great American Biotic Interchange, rather than the Plio-Pleistocene, from North America to South America (see Campbell et al. 2010; Frailey and Campbell 2012). We consider doubtfully both

the systematic assignation of those specimens as the age of the bearing sediments (Gasparini, pers. observ.).

Nowadays, the peccaries are widely distributed throughout the Americas, from the north-central Argentina to the south-western USA (Gasparini et al. 2006). Two extant genera are recognised: *Tayassu* Fischer, 1814 with at least two species: *Tayassu tajacu* (Linnaeus, 1758) and *Tayassu pecari* (Link, 1795); and *Catagonus* Ameghino, 1904 with only one species *Catagonus wagneri* (Rusconi, 1930) (Gasparini et al. 2006; Gasparini 2007; Góngora et al. 2011). Both genera are recorded as fossil in South America (*Catagonus* during the Late Pliocene?, early Pleistocene to Recent and *Tayassu* from the middle Pleistocene to Recent). Finally, the genus *Platygonus* Le Conte, 1848 is known in South America exclusively as fossil during the middle Pliocene to early Pleistocene (Gasparini 2007, 2008).

In South America, the diversity and the abundance of fossil finding of Tayassuidae are greater during the Pleistocene than in Pliocene and Holocene epochs. They experienced a remarkable decrease in diversity (~75%) near the Pleistocene–Holocene boundary (Gasparini 2007, 2013). Only two genera (*Catagonus* and *Tayassu*) and three species survived this boundary as it was pointed out above.

One of the extant species is *Tayassu pecari* (white-lipped peccary); it is widely distributed across the

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Neotropical region, from northern Argentina to south-eastern Mexico (Gasparini et al. 2006; Pautasso 2008; Gasparini et al. 2011). However, its fossil record is scarce: Argentina: Buenos Aires, Corrientes, Misiones and Santa Fe Provinces (Gasparini and Soibelzon 2003; Tonni 2004; Gasparini and Zurita 2005; Gasparini 2008; Gasparini and Ferrero 2010; Gasparini et al. 2011; Gasparini 2013); Brazil: Minas Gerais, Bahia, Rio Grande do Sul, Mato Grosso do Sul, Paraná, Ceará, Amazonas and Piauí States (Fonseca 1979; Faure et al. 1999; Rancy 1999; Schimdt 2005; Dias da Silva et al. 2010; Dantas et al. 2013); and Uruguay: Salto Department (Gasparini et al. 2009; Gasparini 2013).

This paper aims to (1) update the systematic synonymy of this species; (2) review and update the geographic chronologic distribution of *Tayassu pecari* and provide a new Lujanian record of *Tayassu pecari* (RMP002) in Buenos Aires Province, at 'Nicolás Vignogna III' Quarry, Los Pozos, Marcos Paz county; and (3) discuss the paleoenvironmental and paleobiogeographical implications of this record.

2. Geological and stratigraphic contexts

The study area is located at the southern margin of the Matanza river, Buenos Aires Province (Figure 2), more specifically in a Quarry named 'Nicolás Vignogna III'. The Matanza river debouches in the Río de La Plata estuary.

The paleoenvironmental evolution and geomorphological evolution of the Río de La Plata and its surrounding areas are strongly related to successive transgressive–regressive cycles, related to glacio-eustatic oscillations, that exerted their influence in the Río de La Plata from 2.4 My onwards (Parker 1990; Parker et al. 1994).

Based on out-crop and sub-surface information from the Atlantic coast and the Río de La Plata coastal floodplain, Cavallotto and Violante (2005) proposed at least five pre-Holocene transgressive–regressive cycles for the Río de La Plata area. The oldest cycle was related to the installation of the river in its present location, at circa 2.4 My, while the youngest cycle was related to the Marine Isotope Stage (MIS) 5e (ca. 0.12 My).

The units where the fossil materials studied herein were found registered the paleoenvironmental evolution of the area for at least the last 50,000 years. The succession starts with laminated mudstones and siltstones interpreted as inner estuary or tidal-flat deposits, and it culminates with sandstones and silty sandstones related to fluvial channels and floodplain deposits. It is believed that accumulation of the lower units took place during highstand or transgressive base-level (or sea-level) conditions of the MIS 3 and that the upper units correspond to regressive fluvio-alluvial deposits (Figure 3). Deposits of the same age and paleoenvironmental origin

were identified by Fucks et al. (2005) in a nearby area. At the same time, radiocarbon dating of some mollusk shells in Pilar city, another close location, provided age estimates of 26.000 ± 720 , 35.400 ± 1.800 and 40.000 RCYBP (Cavallotto et al. 2005). The authors related these ages to the Belgranense, classically assigned to the MIS 5e (Isla et al. 2000). Nevertheless, it is our belief that the radiocarbon dates provided are more consistent with the MIS 3e, in concordance with previously published ages (Fucks et al. 2005).

3. Systematics of South American Tayassuidae

According to Gasparini (2007), three genera of Tayassuidae are recognised in South America: †*Platygonus* Le Conte, 1848 [with five species: †*Platygonus kraglievichi* Rusconi, 1930; †*Platygonus scagliai* Reig, 1952; †*Platygonus marplatensis* Reig, 1952; †*Platygonus chapadmalensis* (Ameghino, 1908) and †*Platygonus cinctus* (Ameghino, 1886)]; *Catagonus* Ameghino, 1904 [with five species: †*Catagonus metropolitanus* Ameghino, 1904; †*Catagonus bonaerensis* (Ameghino, 1904); †*Catagonus carlesi* (Rusconi, 1930); †*Catagonus stenocephalus* (Lund in Reinhardt, 1880) and *Catagonus wagneri* (Rusconi, 1930)] and *Tayassu* Fischer, 1814 [with two species: *Tayassu pecari* (Link, 1795) and *Tayassu tajacu* (Linnaeus, 1758)]. '†' symbol means that they are extinct peccaries.

4. Materials and methods

Abbreviations. M1, first upper molar; M2, second upper molar; M3, third upper molar; PM3, third upper premolar; PM4, fourth upper premolar.

Institutional abbreviations. Ctes-PZ UNNE, Paleozoología Corrientes, Facultad de Ciencias Exactas y Naturales y Agrimensura, Universidad Nacional del Nordeste, Corrientes, Argentina; FC-DPV, Colección Paleontología de Vertebrados de la Facultad de Ciencias, Universidad de la República, Montevideo, Uruguay; MACN, Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia', Ciudad Autónoma de Buenos Aires, Argentina; MCN-P, Museu de Ciências Naturais do SCB, Universidade Federal do Paraná, Curitiba, PR, Brazil; MCTEM/UFOP, Museu de Ciência e Técnica da Escola de Minas/Universidade Federal de Ouro Preto, Minas Gerais State, Brazil; MFA-PV, Museo Provincial de Ciencias Naturales 'Florentino Ameghino', Paleontología de Vertebrados, Santa Fe, Argentina; MLP, Museo de La Plata, La Plata, Argentina; RMP, Repositorio de Marcos Paz, Museo de Ciencias Naturales 'Lucas Kraglievich', Marcos Paz, Argentina.

Measurements. LM1–M3, length of molar row, measured near the occlusal surface; LPM3, maximum

Table 1. Fossil materials assigned to *Tayassu pecari*: specific asigature, collection number and material, geographical and stratigraphical provenance.

Specific asigature	Collection number	Material	Geographical and stratigraphical provenance
<i>Tayassu pecari</i>	Ctes-PZ UNNE 1599	Left PM2	Argentina, Corrientes Province, 10 km South Bella Vista locality, Toropí stream, Yupoí Formation; Late Pleistocene
	Ctes-PZ UNNE 1603	Right PM3, PM4 and M3	Argentina, Corrientes Province, 10 km South Bella Vista locality, Toropí stream, Yupoí Formation; Late Pleistocene
	Ctes-PZ UNNE 3562	PM2, PM3 and PM4	Argentina, Corrientes Province, 10 km South Bella Vista locality, Toropí stream, Yupoí Formation; Late Pleistocene
	MACN 10512	Mandible fragment with PM3, M1, M2 and M3	Argentina, Buenos Aires Province, Necochea county, Punta Carballido, Quequén locality; Lujanian, Late Pleistocene–earliest Holocene
	MACN 10465	Partial mandible and maxillary	Argentina, Buenos Aires Province, General Alvarado county, del Moro stream, Miramar locality; Lujanian, Late Pleistocene–earliest Holocene
	MACN 7114	Partial skull	Argentina, Buenos Aires Province, General Alvarado county, Punta Hermengo, Miramar locality; Bonaerian, middle Pleistocene
	MACN 6427	Left lower molar	Argentina, Buenos Aires Province, General Pueyrredón county, Punta Piedras, Mar del Plata locality; Lujanian, Late Pleistocene–earliest Holocene
	MLP w/n	Right maxillary fragment with PM3, PM4 and M1	Argentina, Santa Fe Province, archaeological site Islas Las Lechiguanas, layer III; Holocene
	MFA-PV 1172	Left PM3, PM4, M1 and M2, and right deciduous PM4	Argentina, Santa Fe Province, San Martín, Las Petacas locality, Tezanos Pinto Formation; Lujanian, Late Pleistocene–earliest Holocene
	MCN-P-1124	Skull	Brazil, Parana State, between Adrianópolis and Doutor Ulysses, Gruta do Vale do Ribeira; Late Pleistocene
	FC-DPV-1057	Upper cheek teeth series	Uruguay, Salto Department, Sopas Formation; Lujanian, Late Pleistocene
	Unknown number	Unknown material	Brazil, Mato Grosso do Sul State; Late Pleistocene
	Unknown number	Unknown material	Brazil, Rio Grande do Sul State; Late Pleistocene
	Unknown number	Unknown material	Brazil, Ceará State; Late Pleistocene
	Unknown number	Unknown material	Brazil, Amazonas State; Late Pleistocene
	MCTEM/UFOP I010	M2	Brazil, Bahía State, Gruta Toca Fria (Iuiú and Malhada localities); Late Pleistocene–earliest Holocene
	MCTEM/UFOP I011	Partial skull	Brazil, Bahía State, Gruta Toca Fria (Iuiú and Malhada localities); Late Pleistocene–earliest Holocene
	MCTEM/UFOP I014	Right tibia	Brazil, Bahía State, Gruta Toca Fria (Iuiú and Malhada localities); Late Pleistocene–earliest Holocene
	Unknown number	Maxillary fragment and isolated teeth	Brazil, Tocantins State, Aurora do Tocantins; Late Pleistocene
	<i>Tayassu cf. Tayassu pecari</i>	Unknown number	Unknown material
Unknown number		Unknown material	Argentina, Misiones Province, Oberá Department, archaeological site Panambí; Holocene
Unknown number		Unknown material	Brazil, Minas Gerais State, archaeological sites Lapa do Boquete and Lapa dos Bichos; Holocene
Unknown number		Unknown material	Brazil, Piauí State, Toca do Serrote do Artur; Holocene

mesio-distal length of PM3; WPM3, maximum labio-lingual width of PM3; LPM4, maximum mesio-distal length of PM4; WPM4, maximum labio-lingual width of PM4; LM1, maximum mesio-distal length of M1; WM1, maximum labio-lingual width of M1; LM2, maximum mesio-distal length of M1; WM2, maximum labio-lingual width of M2; LM3, maximum mesio-distal length of M3; WM3, maximum labio-lingual width of M3.

Measurements were taken using Vernier callipers, with 0.01 mm accuracy; data are expressed in millimetres.

The chronostratigraphic and geochronologic references correspond to the schemes of Cione and Tonni (1999, 2005). The fossil materials of *Tayassu pecari* mentioned here are listed in Table 1.

We adopt the taxonomical arrangement proposed by Gasparini (2007) because this is the most current integrative review of the South American Tayassuidae.

In the descriptions of the main cusps of maxillary premolar, the names ‘paracone’, ‘metacone’, ‘protocone’ and ‘hypocone’ are used to indicate topographical position, and not to infer serial homologies with the cusps of the

molars, as there is no general agreement on this matter (Rusconi 1929; Wetzel 1977; Mones 1979; Gasparini 2001).

A total of 76 complete and incomplete adult specimens of the three extant species of peccaries were used for morphological comparisons: *Catagonus wagneri* ($n = 21$), *Tayassu pecari* ($n = 21$) and *Tayassu tajacu* ($n = 34$) (Table 2). It was measured for each specimen (= operational taxonomic unit, OTU) 11 quantitative characters corresponding to upper teeth (see the measurements listed above).

In order to perform the multivariate analysis, we selected an ordination method [principal component analysis (PCA)]. PCA was based on the Pearson product–moment correlation coefficient (Michener and Sokal 1957). The multivariate analysis was performed using Past V.2.5 (Hammer et al. 2009).

5. Systematic paleontology

Order **Cetartiodactyla** Montgelard, Catzeflis and Douzery, 1997

Suborder **Suiformes** Jaekel, 1911

Infraorder **Suoidea** Gray, 1821

Family **Tayassuidae** Palmer, 1897

Subfamily **Tayassuinae** Palmer, 1897

Genus **Tayassu** G. Fischer de Waldheim, 1814

Tayassu pecari (Link, 1795)

Sus pecari Link, 1795 Beiträge zur Naturgeschichte, 2: 104

5.1 Synonymy

Tayassu pecari Fischer, 1814: 284–287.

Sus albirostris Illiger, 1815: 108.

Dicotyles labiatus Cuvier, 1817: 238 (see Gray 1868: 43–45; Burmeister 1879: 474; Gervais and Ameghino 1880: 112; Ameghino 1889: 573; Cope 1889: 111–136; Winge 1906: 31; Miller 1912: 384; Husson 1978: 348).

Notophorus pecari Fischer, 1817: 373.

Adenonotus labiatus Brookes, 1828: 12(a).

Dicoteles labiatus Jardine, 1836: 236.

Tayassu albirostris Berg, 1900: 112.

Tayassu (Olidosus) albirostris Merriam, 1901: 120. Followed by Elliot (1904: 65–66); raised to generic status by Trouessart (1904: 658).

Dicotyles (Dicotyles) pecari Lydekker, 1915.

Tayassu pecari Allen, 1916: 559–610 (see Frenchkop 1955: 526; Hall and Kelson 1959: 996; Woodburne 1968: 1–48; Wetzel 1977: 11).

Tagassus albirostris Lahille, 1921: 6.

Tayassu pecari Tate, 1939: 151–229 (name unavailable).

Tayassu pecari Gasparini, 2007: 225–236 [= *Dicotyles platensis* Ameghino, 1904: 190–191].

Tayassu pecari Gasparini, 2007: 225–234 [= *Prosthennops valentini* Rusconi, 1930: 182–184, pl. 11, fig. 1].

Tayassu pecari Gasparini, 2007: 225–235 [= *Prosthennops doello-juradoi* Rusconi, 1930: 184–190, pl. 12, figs. 1 and 2].

Tayassu pecari Gasparini, 2007: 225–237 [= *Platygonus (Brasiliochoerus) platensis parodii* Rusconi, 1930: 162–163, pl. 7, figs. 1 and 2].

5.2 Type material

Unknown. Type locality Cayenne, French Guiana (see Hershkovitz 1963: 86, for both species selection and type locality).

5.3 Chronological and geographic distributions in South America

Middle Pleistocene to Holocene (Bonaerian, Lujanian and Platan Stages/Ages) in Argentina, Brazil and Uruguay; currently from northern Argentina to southern Mexico (Gasparini 2013).

5.4 Studied material

RMP 002, a partial right maxillary with PM3–M3 (Figure 1).

5.5 Geographical and stratigraphical provenance

‘Nicolás Vignogna III’ Quarry, Los Pozos locality, Marcos Paz county, Buenos Aires Province (S 34° 54′ 40.4″ and W 58° 42′ 11.9″) (Figure 2). Age: Lujanian (Late Pleistocene to earliest Holocene) (Figure 3).

5.6 Description

Cheek teeth are braquiodonts and bunodonts.

Third upper premolar. This tooth is subquadrangular. It bears three major cusps (‘paracone’, ‘protocone’ and ‘metacone’) on the trigon area and a smaller one (‘hypocone’) on the talon. The cingulum is well defined on the mesial and distal sides. The lingual side is slightly convex but the labial is straight that is why this tooth does not show the typical quadrangular outline of molars.

Fourth upper premolar. It is molariform, nearly large as the first molar. This tooth is quadrangular and larger than the PM3. It has four major cusps very similar in size; however, the ‘hypocone’ is slightly less developed than the others. The paracone and metacone are located primarily labial to the protocone and hypocone, respectively; this feature also occurs in the molars. The cingulum is developed in the mesial and distal sides.

First upper molar. The crown of this molar is quadrangular in outline, with two pairs of cusps developed

Table 2. Specimens of the three extant species of peccaries used for morphological comparisons: *Catagonus wagneri* ($n = 21$), *Tayassu pecari* ($n = 21$) and *Tayassu tajacu* ($n = 34$).

Specific assignature	Collection number	Relative ages	Sexual dimorphism	Locality
CW1	MACN 36-695	Adult	Female	Salta Province, Agua Linda, near Dragones, Argentina; Recent
CW2	MACN 36-719	Adult	Male	Salta Province, Dragones, Argentina; Recent
CW3	MNHNP 0942	Adult	Male	Boquerón Department, Paraguay; Recent
CW4	MNHNP 0943	Adult	Female	Boquerón Department, Paraguay; Recent
CW5	MLP 25.III.02.2	Adult	Unknown	Chaco Province: General Güemes Department, Puerto San Alfonso, Argentina; Recent.
CW6	MLP 25.III.02.3	Adult	Unknown	Chaco Province: General Güemes Department, Puerto San Alfonso, Argentina; Recent.
CW7	MLP 25.III.02.4	Adult	Unknown	Chaco Province: General Güemes Department, Puerto San Alfonso, Argentina; Recent.
CW8	MNHNP 1216	Adult	Female	Boquerón Department, 60 km from Neuland, Estancia Gran Siete, Paraguay; Recent
CW9	MNHNP 0937	Adult	Female	Boquerón Department, Estancia Ganadera, 48 km west from Colonia Neuland, Paraguay; Recent
CW10	MNHNP 0944	Adult	Male	Boquerón Department, Estancia Paraíso, 48 km from Colonia Neuland, Paraguay; Recent
CW11	MNHNP 0936	Adult	Male	Boquerón Department, Estancia Ganadera, 48 km from Colonia Neuland, Paraguay; Recent
CW12	MNHNP 0948	Adult	Female	Boquerón Department, Estancia Waldbrunner, 25 km south from Colonia Neuland, Paraguay; Recent
CW13	MNHNP 0941	Adult	Male	Boquerón Department, Estancia Ganadera, 48 km west from Colonia Neuland, Paraguay; Recent
CW14	MNHNP 0935	Adult	Male	Boquerón Department, Estancia Paraíso, 48 km from Colonia Neuland, Paraguay; Recent
CW15	MNHNP 0945	Adult	Male	Boquerón Department, Estancia Ganadera, 48 km west from Colonia Neuland, Paraguay
CW16	MNHNP 0949	Adult	Female	Boquerón Department, Estancia Ganadera, 48 km west from Colonia Neuland, Paraguay; Recent
CW17	MNHNP 0952	Adult	Male	Boquerón Department, Fortín Teniente, Acosta, Estancia Los Caminantes, Paraguay; Recent
CW18	MNHNP 0950	Adult	Male	Boquerón Department, Filadelfia, Paraguay; Recent
CW19	MNHNP 0946	Adult	Male	Boquerón Department, Estancia Ganadera, 48 km west from Colonia Neuland, Paraguay; Recent
CW20	MNHNP 0947	Adult	Female	Boquerón Department, Estancia Ganadera, 48 km west from Colonia Neuland, Paraguay; Recent
CW21	MNHNP 0951	Adult	Female	Boquerón Department, Estancia San Ramón, 48 km west from Colonia Neuland, Paraguay; Recent
TP1	MLP 420	Adult	Unknown	Misiones Province, Argentina; Recent
TP2	MACN 1073	Adult	Unknown	Misiones Province, Argentina; Recent
TP3	MACN 49-340	Adult	Unknown	Misiones Province, Aguará-í river, 30 km Pto. Bemberg, Argentina; Recent
TP4	MACN 49-342	Adult	Unknown	Misiones Province, Aguará-í river, 30 km Pto. Bemberg, Argentina; Recent

(Continued)

Table 2 – continued

	Specific asiganture	Collection number	Relative ages	Sexual dimorphism	Locality
TP5	<i>Tayassu pecari</i>	MACN 39–422	Adult	Unknown	Chaco Province, Las Palmas and El Perdido; Recent
TP6	<i>Tayassu pecari</i>	MACN 48-350	Adult	Male	Misiones Province, Aguará-í Guazú river, Argentina; Recent
TP7	<i>Tayassu pecari</i>	MACN 3-55	Adult	Unknown	Santa Fe Province, Colonia Mocoví, Argentina; Recent
TP8	<i>Tayassu pecari</i>	MACN 25-57	Adult	Unknown	Beni river, Bolivia; Recent
TP9	<i>Tayassu pecari</i>	MACN 35-32	Adult	Unknown	Jujuy and Formosa Provinces, Argentina; Recent
TP10	<i>Tayassu pecari</i>	MACN 32-97	Adult	Unknown	Bolivia; Recent
TP11	<i>Tayassu pecari</i>	MNHNP 0981	Adult	Male	Boquerón Department, Estancia Paraíso, 58 km west of Colonia Neuland, Paraguay; Recent
TP12	<i>Tayassu pecari</i>	MNHNP 0985	Adult	Male	Alto Paraguay Department, P.N. Defensores del Chaco, Paraguay; Recent
TP13	<i>Tayassu pecari</i>	MNHNP 1179	Adult	Unknown	Presidente Hayes Department, Reserva Laguna Porá, Paraguay; Recent
TP14	<i>Tayassu pecari</i>	MNHNP 2219	Adult	Unknown	Paraguay; Recent
TP15	<i>Tayassu pecari</i>	MNHNP 0989	Adult	Unknown	Paraguay; Recent
TP16	<i>Tayassu pecari</i>	MNHNP 0977	Adult	Female	Boquerón Department, Estancia Paraíso, 48 km from Colonia Neuland, Paraguay; Recent
TP17	<i>Tayassu pecari</i>	MNHNP 0991	Adult	Unknown	Boquerón Department, 80 km north from Mcal Estigarribia, Aguada Verde, Paraguay; Recent
TP18	<i>Tayassu pecari</i>	MNHNP 0979	Adult	Female	Boquerón Department, Estancia Paraíso, 58 km west Colonia Neuland, Paraguay; Recent
TP19	<i>Tayassu pecari</i>	MNHNP 0986	Adult	Unknown	Nueva Asunción Department, Transchaco route, 15 km north-eastern Agrochaco, Paraguay; Recent
TP20	<i>Tayassu pecari</i>	MNHNP 0988	Adult	Female	Boquerón Department, Estancia San Ramón, 48 km west of Colonia Neuland, Paraguay; Recent
TP21	<i>Tayassu pecari</i>	MNHNP 0983	Adult	Male	Presidente Hayes Department, Estancia Rosillo, 90 km south-east of General Díaz, Paraguay; Recent
TT1	<i>Tayassu tajacu</i>	MACN 36-693	Adult	Unknown	Salta Province, Agua Linda, 15 km from Dragones, Argentina; Recent
TT2	<i>Tayassu tajacu</i>	MACN 31-70	Adult	Unknown	Ecuador
TT3	<i>Tayassu tajacu</i>	MACN 36-723	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT4	<i>Tayassu tajacu</i>	MACN 47-379	Adult	Unknown	Alto Paraná, Argentina; Recent
TT5	<i>Tayassu tajacu</i>	MACN 36-721	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT6	<i>Tayassu tajacu</i>	MACN 36-724	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT7	<i>Tayassu tajacu</i>	MACN 36-709	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT8	<i>Tayassu tajacu</i>	MACN 36-706	Adult	Unknown	Salta Province, Dragones, Argentina; Recent

TT9	<i>Tayassu tajacu</i>	MACN 35-9	Adult	Unknown	Misiones Province, Loreto, Argentina; Recent
TT10	<i>Tayassu tajacu</i>	MACN 38-46	Adult	Unknown	Jujuy Province, Argentina; Recent
TT11	<i>Tayassu tajacu</i>	MACN 36-722	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT12	<i>Tayassu tajacu</i>	MACN 49-319	Adult	Female	Misiones Province, Aguará-í river, 30 km Pto. Bemberg, Argentina; Recent
TT13	<i>Tayassu tajacu</i>	MACN 36-720	Adult	Unknown	Salta Province, Argentina; Recent
TT14	<i>Tayassu tajacu</i>	MACN 51-19	Adult	Male	Misiones Province, Aguará-í river, Argentina; Recent
TT15	<i>Tayassu tajacu</i>	MACN 4-401	Adult	Unknown	Córdoba Province, Argentina; Recent
TT16	<i>Tayassu tajacu</i>	MACN 36-714	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT17	<i>Tayassu tajacu</i>	MACN 36-707	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT18	<i>Tayassu tajacu</i>	MACN 36-696	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT19	<i>Tayassu tajacu</i>	MACN 35-31	Adult	Unknown	Jujuy and Formosa Provinces, Argentina; Recent
TT20	<i>Tayassu tajacu</i>	MACN 36-705	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT21	<i>Tayassu tajacu</i>	MACN 36-717	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT22	<i>Tayassu tajacu</i>	MACN 50-546	Adult	Female	Misiones Province, Aguará-í river, Argentina; Recent
TT23	<i>Tayassu tajacu</i>	MACN 50-130	Adult	Male	Santa Cruz Department, Bolivia; Recent
TT24	<i>Tayassu tajacu</i>	MACN 36-704	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT25	<i>Tayassu tajacu</i>	MACN 45-27	Adult	Unknown	Paraguay; Recent
TT26	<i>Tayassu tajacu</i>	MACN 36-698	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT27	<i>Tayassu tajacu</i>	MACN 36-690	Adult	Unknown	Salta Province, Agua Linda, from 15 km of Dragones, Argentina; Recent
TT28	<i>Tayassu tajacu</i>	MACN 36-702	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT29	<i>Tayassu tajacu</i>	MACN 30-13	Adult	Unknown	Chaco Province, El Zapallar, Argentina; Recent
TT30	<i>Tayassu tajacu</i>	MACN 36-713	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT31	<i>Tayassu tajacu</i>	MACN 36-716	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT32	<i>Tayassu tajacu</i>	MACN 36-703	Adult	Unknown	Salta Province, Dragones, Argentina; Recent
TT33	<i>Tayassu tajacu</i>	MACN 20-811	Adult	Unknown	San Luis Province, Junín Department, Quebrada de Cautana, Argentina; Recent
TT34	<i>Tayassu tajacu</i>	MACN 30-397	Adult	Male	Salta Province, Argentina; Recent

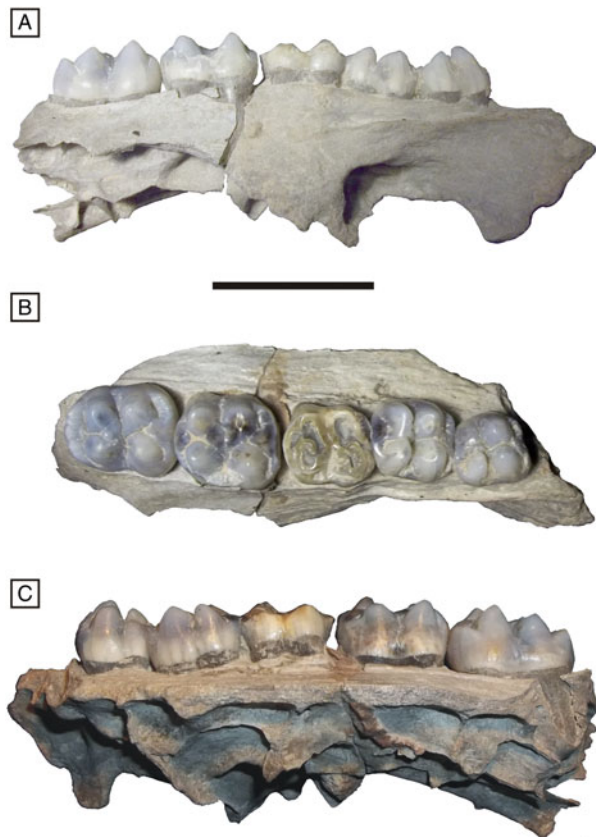


Figure 1. (Colour online) Right maxillary fragment with PM3–M3 of *Tayassu pecari* (RMP 002) described here: (A) labial view; (B) occlusal view and (C) lingual view. Scale bar = 1 cm.

one in front of the other (paracone–protocone mesially and metacone–hypocone distally) separated by a labio-lingually orientated valley. The valley is narrow, deeper on both sides of the tooth and shallow in the middle of the crown. The mesial and distal cingulum is interrupted at a mid-point by several cusps. As in the other upper cheek teeth, the labial cingulum is poorly developed and continuous with the mesial and distal cinguli. The protocone is slightly oriented posterolabially to the paracone.

Second upper molar. The crown of this molar is quadrangular and larger than M1. Pronounced cusps are developed medially at the mesial and distal borders of the crown. The cingulum surrounds the mesial and distal sides. M2 is generally smaller than M3; however, in some cases, it is equal or larger than M3.

Third upper molar. The crown of the third upper molar is subquadrangular in outline. The paracone and protocone are wider and more distanced than the metacone and hypocone. At the distal portion of the crown, there is a cingulum where several small accessory cusps can be recognised. The cingulum surrounds the mesial and distal margins of the tooth.

Measurements. PM3: (LPM3) 10.8 mm × (WPM3) 10.31 mm; PM4: (LPM4) 11.93 mm × (WPM4) 11.35 mm; M1: (LM1) 12.59 mm × (WM1) 11.34 mm; M2: (LM2) 14.8 mm × (WM2) 12.67 mm; M3: (LM3) 16.08 mm × (WM3) 13.1 mm; LM1–M3: 43.95 mm.

5.7 Multivariate analysis

In the PCA (Figure 4), the three living species of peccaries occupy different locations in the multidimensional space involved and can be clearly identified. The first two principal components encompass 91.42 of the total variance (PCI: 86.449 and PCII: 4.9746). The fossil specimen RMP 002 is included inside the group of the species *Tayassu pecari*.

The quantitative data confirm the observed scale of measurement (*Catagonus wagneri* > *Tayassu pecari* > *Tayassu tajacu*) (Table 3).

It is noteworthy to mention that although the multivariate analysis was performed considering few characters, every extant species were distinguished from each other and the fossil RMP002 clearly integrates the group of *Tayassu pecari*.

6. Discussion

6.1 Anatomical comparisons with South and North American tayassuids

According to the latest systematic scheme for South American Tayassuidae (see above), the morphological features that allow us to determine this specimen as *Tayassu pecari* are the following: the crown is braquiodont and bunodont; the PM3 and PM4 are molariform; the ‘hypocone’ is markedly reduced in PM3 and it is slightly smaller than the three major cusps of PM4; and the cingulum is only developed in the mesial and distal sides of the crown. In turn, the quantitative analysis performed (Figure 4) reinforces the systematic determination, as it clearly included the specimen RMP 002 among the comparative sample of *Tayassu pecari*.

The species *Tayassu pecari* differs from the mesodont and ‘zygodont’ morphology (e.g. *Catagonus wagneri*) or bunodont morphology (e.g. *Catagonus carlesi*, *Catagonus metropolitanus*, *Catagonus bonaerensis* and *Catagonus stenocephalus*) observed in *Catagonus* species, and from the mesodont and bunolophodont morphology observed in *Platygonus*. On the other hand, the development of a cingulum at the mesial and distal sides only observed in the specimen described here allows us to identify it with *Tayassu*, because in *Catagonus* the cingulum is developed in the mesial, labial and distal sides of the crown, and in *Platygonus* it surrounds the crown entirely.

A molariform PM3 is observed in *Mylohyus*, *Prosthennops* and *Catagonus brachyodontus* among North American fossil taxa and *Catagonus metropolitanus* and

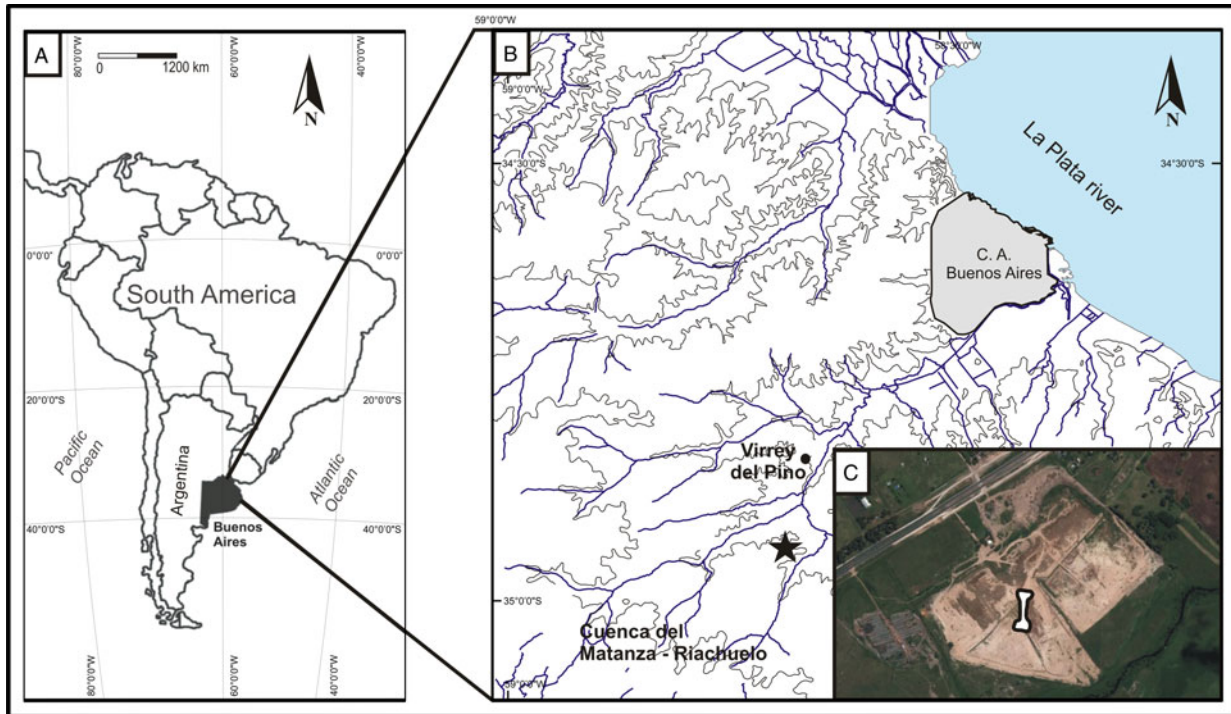


Figure 2. (Colour online) Geographic map showing the paleontological site studied. 'Nicolás Vignogna III' Quarry, Los Pozos locality, Marcos Paz county, Buenos Aires Province (★).

Catagonus stenocephalus among South American fossil species. This morphology is also present in the extant *Catagonus wagneri* and *Tayassu pecari*. However, the 'hypocone' is less developed in the two later species in comparison with the fossil taxa.

Besides this, it is possible to differentiate each other because of its crown morphology (i.e. bunodont, zygodont or bunolophodont) and height of the crown (braquiodont or mesodont), as it was mentioned earlier, and *Catagonus wagneri* has teeth larger than *Tayassu pecari*. In turn, PM3 of *Tayassu tajacu* presents only three main cusps ('paracone', 'metacone' and 'protocone'). In addition, it differs from *Platygonus* by having simpler premolars, not molariforms, with only two cusps labio-lingually aligned.

The molarisation (presence of three main cusps well developed plus a 'hypocone' and a quadrangular outline) evident on the PM4 of *Tayassu pecari* is equivalent to that of *Catagonus wagneri* among living species, and to that of *Catagonus bonaerensis*, *Catagonus carlesi* and *Catagonus brachydontus* among fossil species. However, the PM4 of *Tayassu pecari* is markedly smaller than that of *Catagonus* species and have different crown morphology and crown height as it was mentioned before. In contrast, taxa which have four principal cusps with equal development include *Catagonus metropolitanus* and *Catagonus stenocephalus* (among South American taxa) and *Prosthennops* and *Mylohyus* species among North American taxa. In

contrast, *Platygonus* has much smaller PM4 with only two major cusps.

6.2 Distributional and stratigraphic patterns of *Tayassu pecari* in South America

Nowadays, the species *Tayassu pecari* is widely distributed from northern Argentina to southern Mexico (Gasparini et al. 2006; Pautasso 2008; Gasparini et al. 2011), reaching its most southern distribution in the north-eastern of Santiago del Estero Province, central Chaco Province and possibly north of Corrientes and north of Santa Fe Provinces (Figure 5) (Gasparini et al. 2006; Pautasso 2008; Pautasso and Mastropaolo 2008; Gasparini et al. 2011). However, its fossil record is scarce; it is recorded since the middle Pleistocene to Holocene (Bonaerian, Lujanian and Platan Ages) in Argentina, Brazil and Uruguay (Figure 5) (see Gasparini 2013).

Fossil records of *Tayassu pecari* are particularly abundant during middle Pleistocene–earliest Holocene. In Argentina, this species is recorded at Buenos Aires Province, in sediments of Bonaerian Age (middle Pleistocene) outcropping in Miramar, General Alvarado county (MACN 7114), and Lujanian Age (Late Pleistocene–earliest Holocene) at Mar del Plata, General Pueyrredón county (MACN 6427), at Quequén, Necochea county (MACN 10512) and at Miramar (MACN 10465)

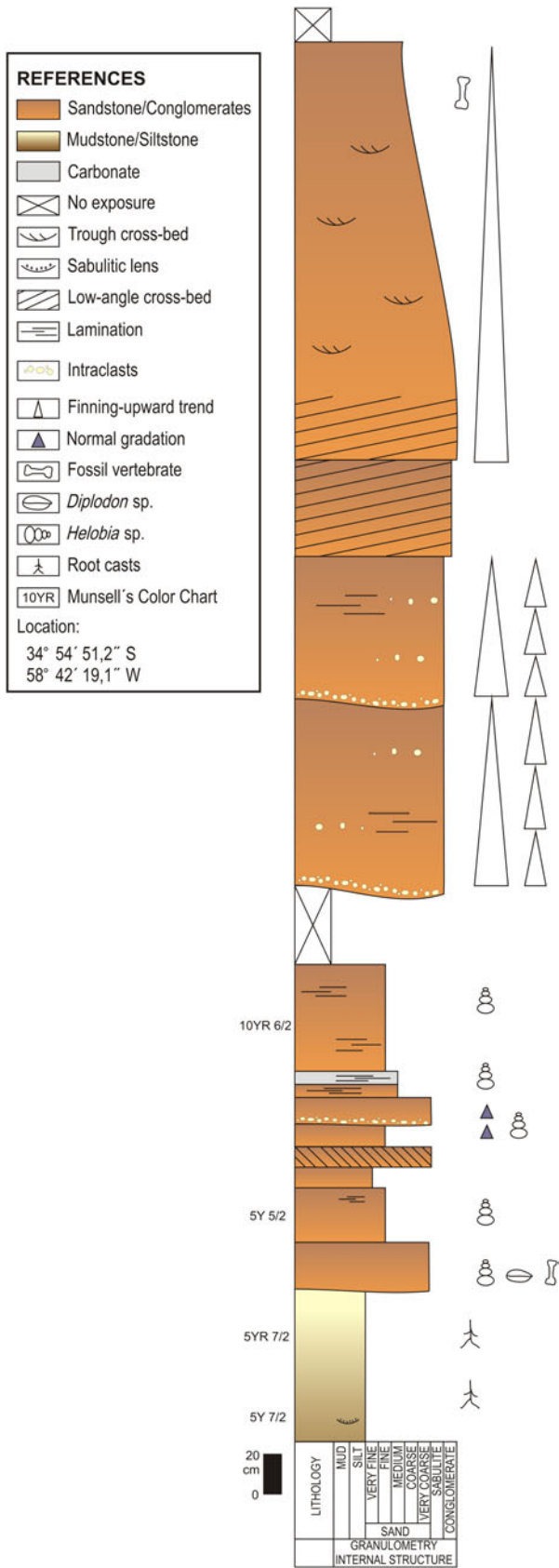


Figure 3. (Colour online) Integrated stratigraphic column of the units studied.

(see Gasparini 2013). The finding of the material described here (RMP 002) corresponds to the first record of *Tayassu pecari* in the central-northern region of the Province, because of this, as mentioned earlier, all the records come from the southern coastal. In the Argentinean Mesopotamia, precisely in Corrientes Province, this species is registered at Bella Vista locality [Ctes-PZ UNNE 1599, 1603, 3562; Yupoí Formation (Late Pleistocene); see Gasparini and Zurita 2005]. In turn, in Santa Fe Province, it is recorded at Las Petacas locality [MFA-PV 1172; Tezanos Pinto Formation (Late Pleistocene to earliest Holocene); see Gasparini et al. 2011].

In Brazil, there are records of *Tayassu pecari* in Late Pleistocene sediments outcropping at Lagoa Santa (Minas Gerais State; Fonseca 1979); Rio Grande do Sul and Mato Grosso do Sul States (Paula Couto 1975); Gruta do Vale do Ribeira (Paraná State; MCN.P.1124; see Dias da Silva et al. 2010); Aurora do Tocantins (Tocantins State; Müller et al. 2013); Gruta Toca Fria (Iuiú and Malhada localities, Bahia State; MCTEM/UFOP I010, I011, I014; see Dantas et al. 2013); and Piauí, Ceará and Amazonas States (Rancy 1999).

In Uruguay, *Tayassu pecari* (FC-DPV-1057) is registered in Sopas Formation [$>45,000$ RCYBP; $43,500 \pm 3600$ and $58,300 \pm 7400$ CALYBP (thermoluminescence dates); see Ubilla 2004] outcropping in the central region (Salto Department) (Gasparini et al. 2009; Gasparini and Ubilla 2010).

The diversity and the abundance of tayassuids in South America markedly decrease during the Holocene, only registering in Argentina and Brazil. In Argentina, records of *Tayassu* cf. *Tayassu pecari* appear in archaeological sites of the Chacoan region at Santiago del Estero Province [Rusconi 1930; Kraglievich and Rusconi 1931; 730 ± 60 and 530 ± 90 RCYBP ($1200-1400$ CALYBP; see Tonni 2006)]. In Santa Fe Province, *Tayassu pecari* (unknown number MLP) is documented from the archaeological site 'Islas Las Lechiguas I'; the ages of the level from which these remains were found are 2740 ± 80 and 2550 ± 90 RCYBP ($2926-2759$ and $2755-2475$ CALYBP, respectively; see Gasparini and Soibelzon 2003; Gasparini 2013). In the Argentinean Mesopotamian, *Tayassu pecari* is cited in the archaeological site Panambí (Department of Oberá, Misiones Province) (Tonni 2004). The fauna from this archaeological site includes mammalian species that still occur in the area (*Alouatta* sp., *Procyon cancrivorus*, *Mazama* sp., *Mazama rufina* and *Tapirus terrestris*) (Tonni 2004). The level of the remains was dated to 920 ± 70 RCYBP (LP-176) ($732-925$ CALYBP, and $1025-1218$ AD) (Tonni 2004). There are traveller's stories making reference to the presence of 'peccaries' inhabiting the Mesopotamian and Pampean regions up to (middle of the eighteenth century) Balcarce city in Buenos Aires Province and possibly further south (Galliari et al. 1991).

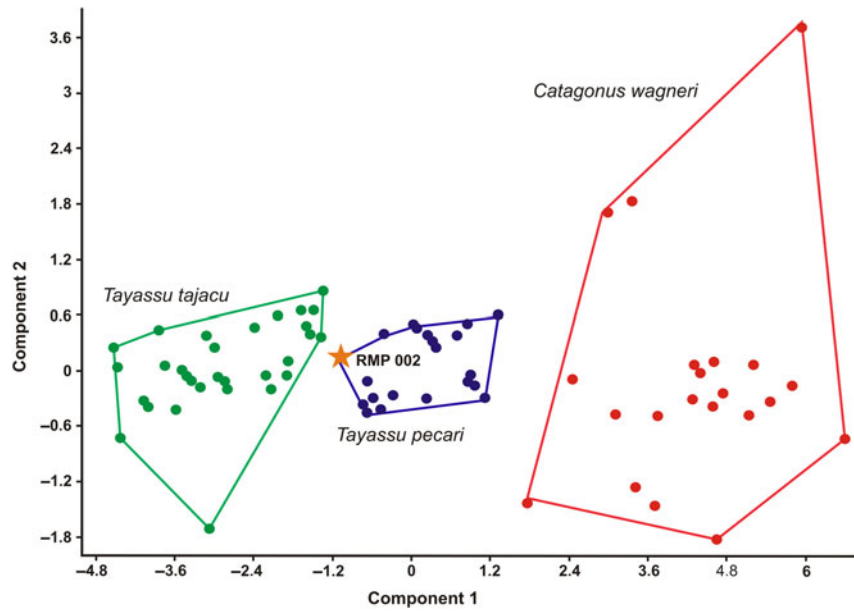


Figure 4. (Colour online) PCA: *Tayassu tajacu* (green ●), *Tayassu pecari* (blue ●) and *Catagonus wagneri* (red ●); studied material RMP 002 (orange ★).



Figure 5. (Colour online) *Tayassu pecari* (Link, 1795). Current geographic distribution (light grey colour portion), historical record (dark grey colour portion), paleontological record (red ●), current doubtful record?. Studied paleontological site: ‘Nicolás Vignogna III’ Quarry, Los Pozos locality, Marcos Paz county, Buenos Aires Province (green ★).

In Brazil, remains of *Tayassu pecari* are registered in Lapa do Boquete ($12,070 \pm 170$ and 9350 ± 80 RCYBP) and Lapa dos Bichos ($10,450 \pm 70$ and 8640 ± 90 RCYBP), both archaeological sites located in Minas Gerais State (Schmidt 2005), and it is cited in Toca do Serrote do Artur (8490 ± 120 and 6890 ± 60 RCYBP), in Piauí State (Faure et al. 1999).

6.3 Anatomical and ecological specialisations

The white-lipped peccaries are currently found primarily in the moist tropical forest and warm and humid environments; however, they are also found in seasonally and xeric environments of southern South America, such as the savannas of Venezuela, xerophilous woodland of the eco-region of Dry Chaco and the tropical dry forest of Costa Rica (Gasparini et al. 2006). Throughout its entire geographic distribution, they range altitudinally from sea level to over 1900 m on the eastern slopes of the Andes (Osgood 1914). Also, they were found at altitudes of 1500 m in Venezuela (Rol 1959), Panamá (Anthony 1916), Guatemala (Alston 1879) and in Argentina over 1700 m (Jujuy) (Parera 2002). However, despite its wide geographical distribution, its preferred habitat is the tropical rainforest lowland.

The species of *Tayassu* are small- to medium-sized mammals with some morphological characters [e.g. orbits located anteriorly to the posterior border of M3 due to shortening of the rostrum, poor development of the nasal sinuses and chambers, a little basicranial flexure, lateral

Table 3. Basic data matrix.

Taxa/characters	1	2	3	4	5	6	7	8	9	10	11
CW1	?	12.30	12.00	13.30	13.60	16.30	15.50	19.00	17.80	?	?
CW2	52.20	11.45	12.35	14.00	14.60	13.70	14.20	18.95	17.85	20.10	17.80
CW3	60.00	12.35	12.00	15.25	15.00	17.00	15.50	22.25	21.90	22.35	19.00
CW4	57.05	12.05	12.00	13.85	14.30	16.85	15.60	19.75	19.25	20.65	19.00
CW5	54.40	11.45	12.00	13.75	14.70	16.30	15.85	19.65	18.00	19.65	16.55
CW6	55.00	12.25	12.15	13.95	14.25	16.35	15.10	19.50	18.10	20.85	18.40
CW7	54.60	12.80	12.00	13.80	15.00	16.15	15.10	18.80	17.70	19.65	18.25
CW8	57.85	13.00	13.00	14.00	15.00	16.45	15.00	20.15	18.85	22.30	18.90
CW9	?	11.55	11.90	12.70	13.50	?	?	19.60	17.85	19.00	17.00
CW10	51.90	?	?	14.15	14.80	14.70	15.30	18.40	18.75	20.00	19.30
CW11	?	11.75	12.40	14.00	14.70	16.70	15.15	19.35	18.00	?	?
CW12	?	13.80	14.50	16.00	16.30	18.80	16.15	21.00	20.00	?	?
CW13	46.35	?	?	13.30	13.95	10.60	14.60	17.00	17.95	18.45	17.80
CW14	54.85	12.35	12.75	13.35	14.40	15.30	14.85	19.00	17.70	20.75	17.55
CW15	53.00	12.00	13.55	13.80	14.85	13.50	15.15	18.10	18.55	21.60	18.70
CW16	52.50	12.00	12.70	13.30	14.60	14.20	15.85	18.00	18.75	20.25	18.50
CW17	52.00	11.00	12.00	12.80	14.00	15.00	14.60	17.50	17.00	19.85	17.50
CW18	57.45	?	?	13.15	14.80	16.00	16.00	20.45	19.60	22.15	18.90
CW19	54.30	?	?	14.30	14.30	14.70	14.50	19.15	18.30	20.00	17.50
CW20	57.40	12.35	13.00	13.45	14.75	17.00	15.00	19.65	18.20	21.60	17.80
CW21	54.50	12.30	13.30	14.00	15.40	14.20	16.55	19.35	19.50	21.00	19.45
RMP002	43.95	10.80	10.31	11.93	11.35	12.59	11.34	14.80	12.67	16.08	13.10
TP1	51.20	11.50	11.25	12.65	12.00	15.35	13.00	17.15	15.00	?	?
TP2	48.50	11.20	10.50	12.40	11.50	14.50	13.40	16.85	15.15	17.65	14.65
TP3	48.28	10.90	10.75	12.00	11.90	14.55	13.40	16.70	15.30	18.00	14.90
TP4	45.50	10.05	10.10	11.25	10.90	13.65	12.85	15.80	14.45	16.65	13.75
TP5	?	10.70	10.70	12.25	11.95	15.60	13.80	17.00	15.65	?	?
TP6	47.40	10.70	10.60	12.00	11.50	14.75	13.45	16.45	14.45	16.50	13.70
TP7	48.60	10.80	10.80	11.80	11.60	14.75	13.80	16.35	15.15	18.00	14.60
TP8	44.85	10.00	11.15	10.70	11.80	13.75	13.35	15.25	14.85	14.55	14.25
TP9	46.50	10.35	10.50	11.80	11.55	13.45	13.00	14.80	13.55	17.15	14.25
TP10	47.15	10.70	10.45	11.85	11.70	13.35	13.00	16.25	14.80	17.65	14.15
TP11	45.25	10.75	11.00	10.70	12.35	14.20	13.35	15.75	14.55	16.00	13.80
TP12	45.70	9.90	10.00	11.00	11.30	13.20	12.85	15.85	14.55	16.40	14.00
TP13	47.40	11.00	11.00	11.80	12.20	14.60	13.40	16.30	15.00	16.70	14.15
TP14	42.85	9.25	10.20	11.40	12.45	13.20	13.55	15.45	15.00	15.20	13.70
TP15	46.25	10.40	10.60	12.00	12.50	15.00	13.25	15.85	14.00	16.00	13.90
TP16	45.80	10.75	11.00	10.70	12.35	14.20	13.35	15.75	14.55	16.00	13.80
TP17	46.50	10.70	10.60	12.00	11.50	14.75	13.45	16.45	14.45	16.50	13.70
TP18	48.25	11.20	10.50	12.40	11.50	14.50	13.40	16.85	15.15	17.65	14.65
TP19	51.00	11.50	11.25	12.65	12.00	12.35	13.00	17.15	15.00	18.00	14.90
TP20	43.85	9.90	10.00	11.00	11.30	13.20	12.85	15.85	14.55	16.40	14.00
TP21	42.65	9.50	10.00	12.30	11.30	13.00	12.85	16.85	15.15	16.50	14.00
TT1	38.75	9.00	9.95	10.00	11.00	11.25	10.35	13.15	12.20	14.80	12.15
TT2	40.15	9.95	10.15	10.40	10.85	11.25	11.30	14.70	13.40	14.90	13.00
TT3	37.80	9.15	9.80	9.90	10.75	10.45	11.10	13.20	12.50	13.55	12.00
TT4	40.00	9.95	10.15	10.40	10.85	11.25	11.30	14.70	13.40	14.90	13.00
TT5	39.40	10.40	10.35	10.65	11.25	12.65	11.85	14.80	13.80	15.55	12.80
TT6	39.70	9.20	9.50	10.60	10.55	12.00	10.80	14.30	12.60	14.55	12.00
TT7	41.60	10.35	10.90	10.90	11.50	12.85	12.30	15.00	13.60	14.55	12.00
TT8	38.00	8.20	9.10	9.65	10.30	11.50	10.75	13.00	11.70	13.60	11.70
TT9	33.40	8.50	9.20	10.15	10.20	10.40	10.20	12.65	12.00	12.40	11.40
TT10	37.85	8.65	9.30	10.00	10.25	11.85	10.90	14.20	12.20	11.80	10.50
TT11	42.00	10.00	10.85	10.60	11.45	12.40	12.00	14.50	13.40	15.20	12.15
TT12	37.50	8.20	9.10	9.65	10.30	11.50	10.75	13.00	11.70	13.60	11.70
TT13	40.30	9.85	10.20	10.45	11.20	12.60	11.15	13.90	12.30	14.55	11.80
TT14	36.35	8.85	9.00	9.45	10.10	11.45	10.25	12.30	11.30	12.65	10.25
TT15	42.00	9.85	10.25	10.60	11.35	12.50	11.10	14.60	13.15	15.25	12.65
TT16	48.40	9.40	10.20	9.55	10.40	11.80	10.50	13.40	11.95	13.75	11.25
TT17	41.35	10.35	10.90	10.90	11.50	12.85	12.30	15.00	13.60	14.55	12.00

(Continued)

Taxa/characters	1	2	3	4	5	6	7	8	9	10	11
TT18	38.00	9.25	10.15	10.35	10.90	11.00	12.25	12.75	11.95	14.20	10.80
TT19	40.90	9.20	9.50	10.60	10.55	12.00	10.80	14.30	12.60	14.55	12.00
TT20	38.75	9.00	9.95	10.00	11.00	11.25	10.35	13.15	12.20	14.80	12.15
TT21	38.85	9.70	10.40	9.75	11.20	11.35	10.45	12.85	12.00	15.45	11.35
TT22	?	8.80	8.75	10.00	9.70	11.60	10.20	12.55	12.30	?	?
TT23	38.45	8.35	8.20	9.55	9.85	11.60	10.00	12.65	11.50	14.15	11.30
TT24	40.95	9.00	11.10	11.80	11.75	12.75	11.65	14.80	13.00	14.20	12.00
TT25	36.95	9.15	9.80	9.90	10.75	10.45	11.10	13.20	12.50	13.55	12.00
TT26	42.30	10.00	10.95	11.40	11.95	12.65	11.40	13.75	13.25	15.70	12.75
TT27	41.85	10.00	10.45	10.85	11.55	11.45	11.15	14.10	12.65	16.30	12.40
TT28	38.80	9.30	9.40	9.80	11.00	11.50	10.85	13.00	11.65	14.45	11.65
TT29	40.10	8.75	8.15	9.80	10.10	12.40	11.50	14.35	12.00	13.45	11.45
TT30	41.00	9.65	10.20	10.10	11.35	11.10	12.55	13.50	13.45	15.00	13.00
TT31	41.20	10.25	10.55	9.90	11.25	12.50	11.35	14.65	13.00	14.70	11.85
TT32	42.55	10.50	10.80	10.50	11.25	12.50	12.00	14.80	13.65	14.75	12.15
TT33	40.15	9.95	10.15	10.40	10.85	11.25	11.30	14.70	13.40	14.90	13.00
TT34	36.85	8.35	9.60	10.00	10.55	10.60	11.55	13.75	12.60	12.40	11.30

digits well developed (four digits on the front feet and three digits on the hind feet) that indicate that they are adapted mainly to humid climates and woodland and forest environments (Gasparini 2007, 2013; Gasparini et al. 2011).

In summary, this species is the better adapted peccary to tropical and subtropical rainforests, and may also be present in arid environments, such as the Venezuelan savannas or the Chaco forest that are nearby areas close to watercourses (Wetzel 1977; Mayer and Brandt 1982; Nowak and Paradiso 1983; Oliver 1993; Gasparini and Zurita 2005).

6.4 Paleoenvironmental conditions at the Quarry

The material described here corresponds to the first record of *Tayassu pecari* in the central-northern region of Buenos Aires Province; the previous records come from south-east Buenos Aires. During Late Pleistocene, *Tayassu pecari* was distributed southern to its current range, probably evidencing different paleoenvironmental conditions. However, *Tayassu* by itself is insufficient to infer the prevailing environmental conditions, because of its wide current geographical distribution and broad ecological tolerance (Menegaz and Ortiz Jaureguizar 1995; Gasparini and Zurita 2005; Gasparini 2007).

From a paleoenvironmental point of view, the fauna outcropped at 'Nicolás Vignogna III' shows taxa mainly adapted to open or semi-open and arid or semi-arid environments (e.g. *Panochthus* Burmeister, 1866; *Doedicurus* Burmeister, 1874; *Glyptodon* Owen, 1838; *Eutatus* Gervais, 1867; *Megatherium* Cuvier, 1796; *Lestodon* Gervais, 1855; *Notiomastodon* Cabrera, 1929; *Macrauchenia* Owen, 1838; *Lestodelphis* cf. *L. juga*; *Toxodon* Owen, 1837 and *Hippidion* Owen, 1869). In addition, there are extant taxa at the same stratigraphic level (e.g. *Chaetophractus* Fitzinger, 1871; *Ctenomys* Blainville, 1826;

Dolichotis Desmarest, 1820; *Lagostomus* Brookes, 1828b and *Lama* Cuvier, 1800). The level of the remains was dated to $31,950 \pm 830$ RCYBP made over *Ostrea* sp. (LP2729).

This faunal assemblage supports the paleoenvironmental scenario that appears to extend over the Lujanian in the Pampean area and north-central Argentina, Paraguay and part of Bolivia, while, in the Argentinean Mesopotamia, western Uruguay and southern Brazil, the conditions were mainly warm and more humid at the same age (Carlini et al. 2004).

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References

- Allen JA. 1916. Mammals collected on the Roosevelt Brazilian expedition, with field notes by Leo E. Miller. Bull Am Mus Nat Hist. 35:559–610.

- Alston ER. 1879. *Biología Centrali-Americana*. London: Taylor and Francis.
- Ameghino F. 1886. Contribuciones al conocimiento de los mamíferos fósiles de los terrenos terciarios antiguos del Paraná. *Bol Acad Nac Cienc Córdoba*. 9(2):5–228.
- Ameghino F. 1889. Contribución al conocimiento de los mamíferos fósiles de la República Argentina. *Acta Acad Nac Cienc Córdoba*. 6:1–1027.
- Ameghino F. 1904. Nuevas especies de mamíferos cretáceos y terciarios de la República Argentina. *An Soc Cien Argent*. 58:1–188.
- Ameghino F. 1908. Las formaciones sedimentarias de la región litoral de Mar del Plata y Chapalmalán. *An Mus Nac Bs As*. 10(3):343–428.
- Anthony BB. 1916. Panama mammals collected in 1914–1915. *Bull Am Mus Nat Hist*. 35:357–375.
- Berg C. 1900. Notas sobre los nombres de algunos mamíferos sudamericanos. Volumen I. Buenos Aires, Argentina: Comunicaciones del Museo de Historia Natural de Buenos Aires.
- Blainville HMD. 1826. *Bulletin des Sciences par la Société Philomatique*. París; 62 p.
- Brookes J. 1828a. A prodromus of a synopsis animalium, comprising a catalogue raisonné of the Zootomical Collection of Joshua Brookes. London: Brookesian Museum. 20 p.
- Brookes J. 1828b. A new genus of the order Rodentia. *Transactions of the Linnean Society*. 16:96–105.
- Burmeister G. 1866. Lista de los mamíferos fósiles del terreno diluviano. *An Mus Públ Buenos Aires*. 1:121–232.
- Burmeister G. 1874. Monografía de los glyptodontes en el Museo Público de Buenos Aires. *Anales del Museo Público de Buenos Aires*. 2:355–412.
- Burmeister G. 1879. Description physique de la République Argentine d'après des observations personnelles et étrangères. Traduit de l'allemand avec le concours de E. Daireaux. Tome troisième: Animaux vertébrés. Première partie: Mammifères vivants et éteints. Buenos Aires. 3(1):1–556.
- Cabrera A. 1929. Una revisión de los mastodontes argentinos. *Rev Mus La Plata*. 32:61–144.
- Campbell KE, Prothero D, Romero-Pittman L, Hertel F, Rivera N. 2010. Amazonian magnetostratigraphy: dating the first pulse of the Great American Faunal Interchange. *J S Am Earth Sci*. 29:619–626.
- Carlini AA, Zurita AE, Gasparini GM, Noriega JL. 2004. Los mamíferos del Pleistoceno de la Mesopotamia argentina y su relación tanto con aquellos del Centro-Norte de la Argentina, Paraguay y Sur de Bolivia, como con los del Sur de Brasil y Oeste de Uruguay: Paleobiogeografía y Paleoambientes. *INSUGEO, Miscelánea*. 12:83–90.
- Cavallotto JL, Violante R. 2005. Geología y geomorfología del Río de la Plata. Paper presented at: 16° Congreso Geológico Argentino. *Relatório del 16° Congreso Geológico Argentino*; La Plata, Argentina.
- Cavallotto JL, Violante RA, Colombo F. 2005. Evolución y cambios ambientales de la llanura costera de la cabecera del Río de la Plata. *Rev Asoc Geol Argent*. 60(2):353–367.
- Cione AL, Tonni EP. 1999. Biostratigraphy and chronological scale of upper-most Cenozoic in the Pampean area. *Quat S Am Antarctic Peninsula*. 12:22–51.
- Cione AL, Tonni EP. 2005. Bioestratigrafía basada en mamíferos del Cenozoico superior de la provincia de Buenos Aires, Argentina. Paper presented at: 16° Congreso Geológico Argentino. *Relatório del 16° Congreso Geológico Argentino*; La Plata, Argentina.
- Cope ED. 1889. The Artiodactyla. *Am Nat*. 23:111–136.
- Cuvier G. 1796. Notice sur le squelette d'une très grande espèce de quadrupède inconnue jusqu'à présent, trouvé au Paraguay, et déposé au Cabinet d'Histoire naturelle de Madrid. *Mag Encycl J Sci Lett Arts*. 1(3):303–310.
- Cuvier G. 1800. *Leçons d'Anatomie Comparée*. Recueillies et publiées sous ses yeux par C. Dumeril. 5 Volumes. París: Baudouin.
- Cuvier G. 1817. *L'histoire naturelle de Paris*. Tome I. París: Masson. 540 p.
- Dantas MAT, Missagia RV, Dutra RP, Raugust T, Silva LA, Delicio MP, Reno R. 2013. Identificação taxonômica dos fósseis de mamíferos da caverna Toca Fria e Jatobá, Iuiuí, Bahia: inferências paleoecológicas e temporais. Paper presented at: 32° Congresso Brasileiro de Espeleologia. *Anais do 32° Congresso Brasileiro de Espeleologia*; Campinas.
- Desmarest AG. 1820. Note sur un Mammifere peu connu. *J Phys Chim Hist Nat Arts*. 88:205–211.
- Dias da Silva D, Sedor FA, Oliveira EV. 2010. A presença de *Catagonus* e *Tayassu* (Artiodactyla, Tayassuidae) no Pleistoceno do Estado do Paraná, Brasil. Presented at: 7° Simpósio Brasileiro de Paleontologia de Vertebrados. *Boletim de Resumos do 7° Simpósio Brasileiro de Paleontologia de Vertebrados*; Rio de Janeiro, Brazil.
- Elliot DG. 1904. The land and sea mammals of Middle America and the West Indies. Vol. 4. Chicago: Field Columbian Museum; p. 1–423.
- Faure M, Guérin C, Parenti F. 1999. The Holocene megafauna from the Toca do Serrote do Artur (São Raimundo Nonato archaeological area, Piauí, Brazil). *C R Acad Sci Paris*. 329:443–448.
- Fischer G. 1814. *Zoognosia tabulis synopticus illustrata*. Pt. III. Moscow: Nicolai Sergeidis Vsevolozsky.
- Fischer G. 1817. *Adversaria zoologica*. Mem Soc Impérial Nat. 5:357–446.
- Fitzinger LJ. 1871. Die natürliche Familie der Gürteltiere (Dasypodes). *Sitz Math Naturwiss Klasse Akad Wissenschaften Wien Abt*. 64:209–276, 329–390.
- Frailley CD, Campbell KE, Jr. 2012. Two new genera of Peccaries (Mammalia, Artiodactyla, Tayassuidae) from Upper Miocene deposits of the Amazon Basin. *J Paleontol*. 86(5):852–877.
- Frenchkop S. 1955. *Traité de Zoologie*. Paris. Chapter 17, Sous-ordre des Suiformes Masson et Cie. p. 509–535.
- Fonseca JS. 1979. *Taiassuídeos do Pleistoceno de cavernas calcárias de Minas Gerais* [master thesis]. Rio Grande do Sul: Universidade Federal do Rio Grande do Sul.
- Fucks E, Aguirre M, Deschamps CM. 2005. Late Quaternary continental and marine sediments of northeastern Buenos Aires province (Argentina): fossil content and paleoenvironmental interpretation. *J S Am Earth Sci*. 20(1–2):45–56.
- Galliari CA, Berman WD, Goin FJ. 1991. Situación ambiental de la provincia de Buenos Aires. Recursos y rasgos naturales en la evaluación ambiental. Buenos Aires: Comisión de Investigaciones Científicas de la provincia de Buenos Aires. *Mamíferos*. p. 1–35.
- Gasparini GM. 2001. Morfología dentaria comparada entre *Tayassu pecari* y *Tayassu tajacu* (Tayassuidae, Artiodactyla, Mammalia). *Ameghiniana*. 38(4):33.
- Gasparini GM. 2007. Sistemática, biogeografía, ecología y bioestratigrafía de los Tayassuidae (Mammalia, Artiodactyla) fósiles y actuales de América del Sur, con especial énfasis en las especies fósiles de la provincia de Buenos Aires [unpublished doctoral thesis]. La Plata: Universidad Nacional de La Plata.
- Gasparini GM. 2008. Sistemática, biogeografía, bioestratigrafía y ecología de los Tayassuidae (Mammalia, Artiodactyla) fósiles y vivientes de América del Sur, con especial énfasis en las especies fósiles de la provincia de Buenos Aires. *Rev Mastozool Neotrop Res Tesis*. 15(1):144–146.
- Gasparini GM. 2013. Records and stratigraphic ranges of South American Tayassuidae (Mammalia, Artiodactyla). *J Mammal Evol*. 20(1):57–68. doi:10.1007/s10914-011-9172-z
- Gasparini GM, Ferrero B. 2010. The Tayassuidae (Mammalia, Artiodactyla) from the Quaternary of Entre Ríos province. A palaeofaunal review in Argentina. *Neues Jahrb Geol Paläontol Abhandlungen Stuttgart*. 256:151–160.
- Gasparini GM, Ferrero B, Vezzosi R, Brunetto E. 2011. El registro de *Tayassu pecari* (Link, 1795) (Artiodactyla, Tayassuidae) en el Pleistoceno Tardío de la provincia de Santa Fe, Argentina. Aspectos biogeográficos y de distribución de una especie en retracción. *Rev Mexi Cienc Geol*. 28(2):203–211.
- Gasparini GM, Ortiz Jaureguizar E, Carlini AA. 2006. Familia Tayassuidae. In: Bárquez RM, Díaz MM and Ojeda RA, editors. *Los Mamíferos de Argentina: Sistemática y distribución*. Mendoza, Argentina: Special publication of the Sociedad Argentina para el Estudio de los Mamíferos (SAREM); p. 114–115.
- Gasparini GM, Soibelzon E. 2003. Primer registro de *Tayassu pecari* Link, 1795 (Mammalia, Artiodactyla) en la provincia de Buenos Aires. Paper presented at: XVIII Jornadas Argentinas de Mastozología; La Rioja, Argentina.
- Gasparini GM, Ubilla M. 2010. Primeros ungulados inmigrantes norteamericanos: los Tayassuidae (Mammalia, Artiodactyla) del

- Cuatenario de Uruguay. Paper presented at: 7° Simposio Brasileiro de Paleontología de Vertebrados. Boletim de Resumos do 7° Simposio Brasileiro de Paleontologia de Vertebrados; Rio de Janeiro, Brazil.
- Gasparini GM, Ubilla M, Tonni EP. 2009. Tres especies de tayasuidos (*Catagonus wagneri*, *C. stenocephalus* y *Tayassu pecari*) en el Pleistoceno tardío del norte de Uruguay (Fm. Sopas). *Ameghiniana Suplemento-Resúmenes*. 46(4):80.
- Gasparini GM, Zurita AE. 2005. Primer registro fósil de *Tayassu pecari* (Link) (Mammalia, Artiodactyla) en la Argentina. *Ameghiniana*. 42(2):473–480.
- Gervais P. 1855. Recherches sur les mammifères fossiles propres à l'Amérique méridionale. *C R Séances Acad Sci*. 40(20):1112–1114.
- Gervais P. 1867. Sur une nouvelle collection d'ossements fossiles de Mammifères recueilli par M. Fr. Seguin dans la Confédération Argentine. *Comptes rendus des séances de l' Académie des Sciences*. 65:279–282.
- Gervais P, Ameghino F. 1880. Los mamíferos fósiles de la América del Sur. París-Buenos Aires: Sabih and Igon (Ed.). 225 p.
- Góngora J, Biondo C, Cooper JD, Taber A, Keuroghlian A, Altrichter M, Do Nascimento FF, Chong AY, Miyaki CY, Bodmer R, et al. 2011. Revisiting the species status of *Pecari maximus* van Roosmalen et al., 2007 (Mammalia) from the Brazilian Amazon. *Bonn Zool Bull*. 60:95–101.
- Gray JE. 1821. On the natural arrangement of vertebrate animals. *Lond Med Repository*. 15(1):296–306.
- Gray JE. 1868. Synopsis of the species of pigs (Suidae) in the British Museum. *Proc Zool Soc London*. (2):17–49.
- Hall ER, Kelson KR. 1959. The mammals of North America. New York (NY): The Ronald Press Co. 1083 p.
- Hammer O, Harper DAT, Ryan P. 2009. PAST. Palaeontological statistics, Version 2.5. Available from: <http://folk.uio.no/ohammer/past>
- Hershkovitz P. 1963. The nomenclature of South American peccaries. *Proc Biol Soc Washington*. 76:85–87.
- Husson AM. 1978. The mammals of Suriname. *Zoologische Monographieën van het Rijksmuseum van Natuurlijke Historie*. Leiden: E.J. Brill. 729 p.
- Illiger C. 1815. Ueberblick der Saugthiere nach ihrer Vertheilung über die Welttheile. *Abhandl Akad Wiss Berlin*. 1804–1881:39–159.
- Isla FI, Rutter NW, Schnack EJ, Zárate MA. 2000. La transgresión belgranense en Buenos Aires. Una revisión a cien años de su definición. *Rev Cuat Cienc Ambien Spec Publ*. 4:3–14.
- Jaeckel O MJ. 1911. Die Wirbeltiere. Eine Übersicht über die fossilen und lebenden Formen. Berlin: Gebrüder Bornträger; 252 p.
- Jardine WB. 1836. The naturalist's library, I. Mammalia. Thick-skinned quadrupeds. Vol. 23, p. 1–248. London: Henry G. Bohn.
- Kraglievich L, Rusconi C. 1931. Restos de vertebrados vivientes y extinguidos hallados por los señores E. R. Wagner y hermano en tómulos precolombinos de Santiago del Estero. *Physis*. 10:553–564.
- Lahille F. 1921. Los nombres científicos de los ungulados argentinos. Ministerio de Agricultura de la Nación, Dirección de Laboratorios e Investigaciones Agrícola-Ganaderas, Laboratorio de Zoología; p. 1–13.
- Le Conte JL. 1848. On *Platygonus compressus*: a new fossil pachyderm. *Mem Am Acad Arts Sci*. 3(8):257–274.
- Link DHF. 1795. Beiträge zur Naturgeschichte. Rostock und Leipzig. 2:1–126.
- Linnaeus C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. 10th ed. Stockholm: Laurentii Salvii.
- Lydekker R. 1915. Catalogue of the ungulate mammals in the British Museum (Natural History). Vol IV. Artiodactyla, families Cervidae (deer), Tragulidae (chevrotains), Camelidae (camels and llamas), Suidae (pigs and peccaries), and Hippopotamidae (hippopotamuses). Vol. 4, p. 1–438. London, UK: Trustees of the British Museum (Natural History).
- Mayer JJ, Brandt PN. 1982. Identity, distribution and natural history of the peccaries, Tayassuidae. In: Mares MA, Genoways HH, editors. *Mammalian biology in South America*. Special Publication Series. Pittsburgh (PA): Pymatuning Laboratory of Ecology, University of Pittsburgh. p. 433–455.
- Menegaz AN, Ortiz Jaureguizar E. 1995. Evolución Biológica y Climática de la Región Pampeana durante los Últimos Cinco Millones de Años. Un Ensayo de Correlación con el Mediterráneo Occidental. Madrid: Monografías Museo Nacional de Ciencias Naturales. Los artiodáctilos. p. 311–335.
- Merriam CH. 1901. Description of four new peccaries from Mexico. *Proc Biol Soc Washington*. 14:119–124.
- Michener CD, Sokal RR. 1957. A quantitative approach to a problem in classification. *Evolution*. 11:130–162.
- Miller GS. 1912. List of North American land mammals in the United States National Museum, 1911. *Bull US Natl Mus*. 79:1–455.
- Mones A. 1979. Los dientes de los vertebrados. Una introducción a su estudio. Montevideo: División Publicaciones y Ediciones, Universidad de la República.
- Montgelard C, Catzeffli F, Douzery E. 1997. Phylogenetic relationships of artiodactyls and cetaceans as deduced from the comparison of cytochrome b and 12S rRNA mitochondrial sequences. *Mol Biol Evol*. 14(5):550–559.
- Müller L, Avilla LS, Gasparini GM. 2013. Considerações taxonômicas e paleoclimáticas sobre os tayassuideos (Mammalia, Cetartiodactyla) fósseis registrados nas cavernas de Aurora do Tocantins, Norte do Brasil. Paper presented at: XXIII Congresso Brasileiro de Paleontologia. XXIII Congresso Brasileiro de Paleontologia; Gramado, Rio Grande do Sul, Brasil.
- Nowak RM, Paradiso JL. 1983. Walker's mammals of the world. 4th ed. Baltimore, MD. 1362 p. The John Hopkins University Press.
- Oliver WLR. 1993. Pigs, peccaries, and hippos: status survey and conservation action plan. Switzerland: NYZS The Wildlife Conservation Society and UICN-SUR. 202 p.
- Osgood WH. 1914. Mammals of an expedition across northern Peru. *Field Mus Nat Hist Zool*. 10:143–185.
- Owen R. 1837. A description of the cranium of the *Toxodon platensis*, a gigantic extinct mammiferous species, referrible by its dentition to the Rodentia, but with affinities to the Pachydermata and the herbivorous Cetacea. *Proc Geol Soc London*. (2):541–542.
- Owen R. 1838. Fossil Mammalia. In: Darwin CR, editor. *Zoology of the voyage of H.M.S. Beagle, under the command of Captain Fitz Roy, RN., during the years 1832 to 1836*. London: Smith, Elder and Co. Vol. 1; p. 1–40.
- Owen R. 1869. On fossil teeth of equines from Central and South America, referable to *Equus conversidens*, *Equus tau* and *Equus arcidens*. *Proc Roy Soc Lond*. 17:267–268.
- Palmer TS. 1897. Notes on the nomenclature of four genera of tropical American mammals. *Proc Biol Soc Washington*. 11:173–174.
- Parera A. 2002. Los Mamíferos de La Argentina y La región austral de Sudamérica. 1st ed. Buenos Aires: El Ateneo. 453 p.
- Parker G. 1990. Estratigrafía del Río de la Plata. *Rev Asoc Geol Argent*. 40(3–4):193–204.
- Parker G, Paterlini CM, Violante RA. 1994. Edad y Génesis del Río de la Plata. *Rev Asoc Geol Argent*. 49(1–2):11–18.
- Paula Couto C. 1975. Mamíferos fósseis do Quaternário do sudeste brasileiro. *Boletim Paranaense Geociências*. 33:89–132.
- Pautasso AA. 2008. Mamíferos de la provincia de Santa Fe, Argentina. *Comun Mus Prov Cienc Nat Florentino Ameghino*. 13(2):1–248.
- Pautasso AA, Mastropalo JM. 2008. Notas acerca de los peccaries (Mammalia: Tayassuidae) en la provincia de Santa Fe, Argentina. *APRONA Bol Científico*. 40:33–37.
- Prevosti F, Gasparini GM, Bond M. 2006. On the systematic position of a specimen previously assigned to Carnivora from the Pliocene of Argentina and its implication for the Great American Biotic Interchange. *Neues Jahrb Geol Paläontol Abhandlungen*. 242(1):133–144.
- Rancy A. 1999. Fossil mammals of the Amazon as a portrait of a Pleistocene environment. In: Eisenberg JF, Redford KH, editors. *Mammals of the Neotropics*. Chicago: The University of Chicago Press; p. 20–26.
- Reig OA. 1952. Descripción previa de nuevos ungulados y marsupiales fósiles del Plioceno y del Eocuatario argentinos. *Rev Mus Mar Plata*. 1(1):119–129.
- Reinhardt J. 1880. De I de brasilianske koglehuler fundne Navlesvin-Arter. Copenhagen: Videnskabelige Meddelelser fra den Naturhistoriske Forening I Kjoberhavn. p. 271–301.

- Rol E. 1959. Fauna descriptiva de Venezuela. 4th ed. Madrid: Nuevas Gráficas S.A 516 p.
- Rusconi C. 1929. Anatomía craneodental de los tayassuinos vivientes. An Soc Cient Argent. 107(66–82):177–242.
- Rusconi C. 1930. Las especies fósiles argentinas de pecaríes y sus relaciones con las del Brasil y Norteamérica. An Mus Nac Hist Nat Bernardino Rivadavia. 36:121–241.
- Schmidt A. 2005. Diversificar para poblar: El contexto arqueológico brasileño en la transición Pleistoceno-Holoceno [Internet]. Available from: <http://www.rupestreweb2.tripod.com/arqueobrasil.html>
- Tate GHH. 1939. The mammals of the Guiana Region. Am Mus Nat Hist Bull. 76:151–229.
- Tonni EP. 2004. Faunas y clima en el Cuaternario de la Mesopotamia argentina. Misc INSUGEO. 12:31–38.
- Tonni EP. 2006. Cambio climático en el Holoceno tardío de la Argentina. Una síntesis con énfasis en los últimos 1000 años. Folia Hist Nordeste. 16:187–195.
- Trouessart EI. 1904. Catalogus mammalium tam viventium quam fossilium: Quinquennale supplementum anno 1904. Berlin: R. Friedländer & Sohn. 929 p.
- Ubilla M. 2004. Mammalian biostratigraphy of Pleistocene fluvial deposits in northern Uruguay. South America. Proc Geol Assoc. 115:1–11.
- Wetzel RM. 1977. The Chacoan peccary, *Catagonus wagneri* (Rusconi). Bull Carnegie Mus Nat Hist. 3:1–36.
- Winge H. 1906. Jordfundne og nulevende Hovdyr (Ungulata) fra Lagoa Santa, Minas Geraes, Brasilien. Copenhagen Museo Lundii. 3:1–239.
- Woodburne MO. 1968. The cranial myology and osteology of *Dicotyles tajacu*, the collared peccary, and its bearing on classification. Mem S California Acad Sci. 7:1–48.
- Woodburne MO. 2010. The Great American biotic interchange: dispersals, tectonics, climate, sea level and holding pens. J Mammal Evol. 17(4):245–264.