

## CINGULATES (MAMMALIA, XENARTHRA) OF THE SANTA CRUZ FORMATION (EARLY–MIDDLE MIOCENE) FROM THE RÍO SANTA CRUZ, ARGENTINE PATAGONIA

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# CINGULATES (MAMMALIA, XENARTHRA) OF THE SANTA CRUZ FORMATION (EARLY–MIDDLE MIOCENE) FROM THE RÍO SANTA CRUZ, ARGENTINE PATAGONIA

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**Abstract.** In 1887 Carlos Ameghino carried out the earliest extensive exploration of the fossiliferous localities along the Río Santa Cruz (Patagonia). His brother Florentino erected more than 100 vertebrate species based on the remains that Carlos recovered. The faunal assemblage eventually came to be recognized as the Santacrucian South American Land Mammal Age (Early–Middle Miocene). Over the past several years, an interdisciplinary group from the Museo de La Plata, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (Argentina), and Duke University (USA) revisited the Río Santa Cruz localities, including Barrancas Blancas, Segundas Barrancas Blancas, and Yaten Huageno. This contribution presents a taxonomic list of cingulates based on the abundant material recovered during these expeditions. In Barrancas Blancas, we recorded the armadillos *Peltephilus pumilus* Ameghino, *Stenotatus patagonicus* Ameghino, *Proeutatus oenophorus* Ameghino, *Prozaedyus proximus* Ameghino, and *Stegotherium tessellatum* Ameghino, and the glyptodonts *Cochlops muricatus* Ameghino and *Eucinepeltus* sp. Ameghino. We did not record *St. tessellatum* in Segundas Barrancas Blancas and *St. tessellatum*, *P. pumilus* and *Eucinepeltus* sp. in Yaten Huageno. The comparative analysis between the faunal composition of the Santa Cruz Formation in the Río Santa Cruz and other areas to the west and the east reveals minor differences that, preliminarily, suggest environmental differences between the analyzed regions.

**Key words.** Santacrucian. Armadillos. Glyptodonts. Taxonomy. Carlos and Florentino Ameghino.

**Resumen.** CINGULADOS (MAMMALIA, XENARTHRA) DE LA FORMACIÓN SANTA CRUZ (MIOCENO TEMPRANO–MEDIO) DEL RÍO SANTA CRUZ, PATAGONIA ARGENTINA. En 1887 Carlos Ameghino llevó a cabo la expedición más importante que prospectó las localidades ubicadas a lo largo del Río Santa Cruz. Los fósiles recolectados le permitieron a su hermano Florentino erigir más de 100 especies de vertebrados. Este conjunto faunístico sería reconocido mundialmente como la Edad Mamífero Santacrucense (Mioceno Temprano–Medio). En los últimos años un grupo interdisciplinario del Museo de La Plata, el Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (Argentina) y la Duke University (USA) realizó expediciones a las localidades del Río Santa Cruz incluyendo Barrancas Blancas, Segundas Barrancas Blancas y Yaten Huageno. En esta contribución presentamos una lista taxonómica de los cingulados sustentada en la gran cantidad de especímenes recolectados en las expediciones arriba mencionadas. En Barrancas Blancas registramos los armadillos *Peltephilus pumilus* Ameghino, *Stenotatus patagonicus* Ameghino, *Proeutatus oenophorus* Ameghino, *Prozaedyus proximus* Ameghino y *Stegotherium tessellatum* Ameghino y los glyptodontes *Cochlops muricatus* Ameghino y *Eucinepeltus* sp. Ameghino. En Segundas Barrancas Blancas no registramos *St. tessellatum* y en Yaten Huageno no se registraron *St. tessellatum*, *P. pumilus* y *Eucinepeltus* sp. El análisis comparativo entre esta composición faunística y las registradas para la Formación Santa Cruz en otras áreas ubicadas al oeste y al este del Río Santa Cruz, permite reconocer pequeñas diferencias faunísticas que, en forma preliminar, sugieren diferencias ambientales entre las regiones evaluadas.

**Palabras clave.** Santacrucense. Armadillos. Gliptodontes. Taxonomía. Carlos y Florentino Ameghino.

CINGULATES (armadillos, including the specialized glyptodonts) are grouped with anteaters and sloths as Xenarthra, a group of mammals with only a modest current representation in the Americas, but that was much more diverse during the

Cenozoic. Their most conspicuous feature is the presence of armor composed of osteoderms covered with epidermal scales protecting the head, body, and tail. Extant cingulates include 10 genera of armadillos (Wetzel, 1985; Aguiar and

Fonseca, 2008; Castro *et al.*, 2015), whereas more than 65 extinct genera, including specialized armadillos such as peltephilids, pampatheres, and glyptodonts, have been described (Mones, 1986; McKenna and Bell, 1997). Except for the pampatheres, they were common during the Early–Middle Miocene, particularly as part of the Santacrucian South American Land Mammal Age (SALMA) faunas of the Santa Cruz Formation (SCF; Burdigalian–early Langhian).

The SCF is a continental sedimentary succession distributed over a large area of southern Patagonia, within the Austral-Magallanes Basin (Fosdick *et al.*, 2013; Cuitiño *et al.*, 2016; Ghiglione *et al.*, 2016; Parras and Cuitiño, 2018). The unit is composed of mudstones, tuffaceous sandstones, and tuffs deposited in fluvial environments under the influence of intense explosive pyroclastic input (Matheos and Raigemborn, 2012; Raigemborn *et al.*, 2015; Cuitiño *et al.*, 2016). In the Province of Santa Cruz, it is exposed in the northwest area (Cuitiño *et al.*, 2019a), in the central region along the Ríos Santa Cruz (Fericola *et al.*, 2014; Cuitiño *et al.*, 2016) and Chaliá (= Sehuén; Vizcaíno *et al.*, 2018), and in the southeastern area along the Atlantic coast (Vizcaíno *et al.*, 2012a,b). This unit contains the richest pre-Pleistocene assemblage of mammalian skulls and articulated skeletons on the continent (Kay *et al.*, 2008; Vizcaíno *et al.*, 2010, 2012a) and was seminal for the construction of the South American Land Mammal Age scheme in Patagonia (Pascual *et al.*, 1965; Vizcaíno *et al.*, 2012a). The Río Santa Cruz (RSC)

extends from Lago Argentino and flows from west to east through a broad and deeply incised valley stretching 230 km from west to east. Along the RSC two Miocene sedimentary units of the Austral-Magallanes Basin can be recognized: (1) the shallow marine to deltaic Early Miocene Monte León Formation (Sacomani and Panza, 2011; Parras and Cuitiño, 2018), and (2) the terrestrial Early–Middle Miocene SCF (Tauber *et al.*, 2008; Sacomani and Panza, 2011; Cobos *et al.*, 2014; Fericola *et al.*, 2014; Cuitiño *et al.*, 2016). The outcrops of the SCF along the southern margin of the RSC were described by Cuitiño *et al.* (2016, 2019b) and three fossil localities were recognized by Fericola *et al.* (2014, 2019); from east to west they are: Barrancas Blancas (BB), Segundas Barrancas Blancas (SBB), and Yaten Huageno (YH; Fig. 1). Based on radiometric ages, the entire SCF represents a span of ~18.0 to ~15.6 Ma; the localities along the Atlantic coast range between ~18.0 to ~16.0 Ma (Fleagle *et al.*, 2012; Perkins *et al.*, 2012; Trayler *et al.*, 2019), and between ~18.20 to ~15.6 Ma in the Río Bote and Río Santa Cruz localities (Cuitiño *et al.*, 2016).

Moreno (1882) provided the first mention of cingulates from the SCF in a brief list of terrestrial fossil mammals from the RSC. Among them, he included the glyptodont *Hoplophorus australis* Moreno, 1882, which is currently recognized as a *nomen nudum* (Ameghino, 1889). Florentino Ameghino (1887) studied the remains (osteoderms) noted by Moreno together with an assemblage of exo- and en-

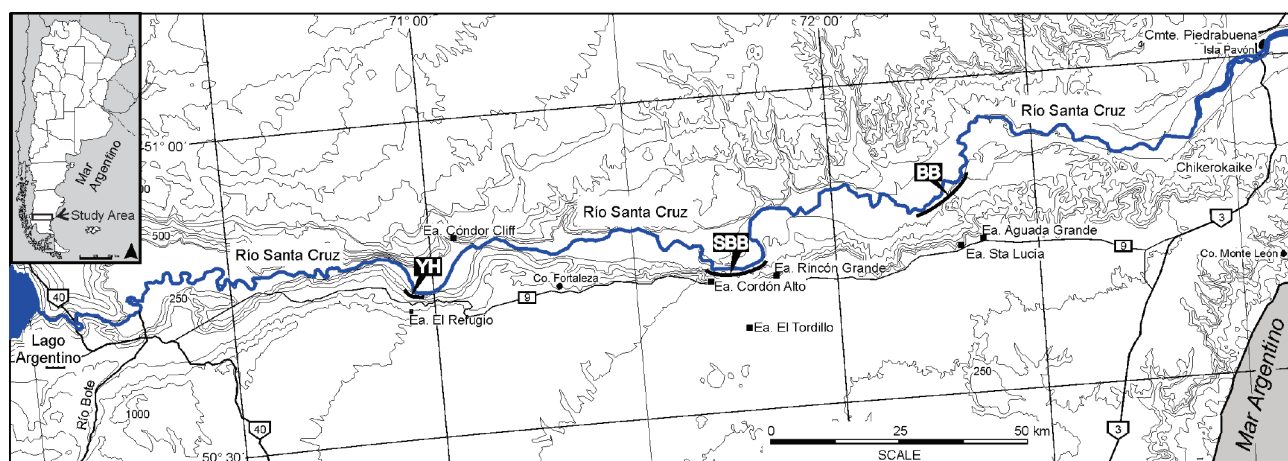


Figure 1. Map of the Río Santa Cruz with the prospected localities and estancias mentioned in the text. BB, Barrancas Blancas; SBB, Segundas Barrancas Blancas; YH, Yaten Huageno; Ea., Estancia. Modified from Fericola *et al.* (2014).

doskeletal remains collected from the same outcrops by Carlos Ameghino, and provided the first formal descriptions of Santacrucian cingulates. He named 11 species of armadillos, currently assigned to *Peltephilus* Ameghino, 1887, *Stegotherium* Ameghino, 1887, *Prozaedyus* Ameghino, 1891a, *Proeutatus* Ameghino, 1891a, and *Stenotatus* Ameghino, 1891a, and two species of the glyptodont *Propalaehoplophorus* Ameghino, 1887. Later, Ameghino (1889, 1891a, 1894, 1898, 1900–02) erected other genera of Santacrucian cingulates, three armadillos and four glyptodonts, based on specimens collected from other regions. Moreno and Mercerat (1891) and Mercerat (1890, 1891) named different taxa that Ameghino (1891b, 1894) did not accept. Lydekker (1894) synonymized most of the Santacrucian taxa proposed by Ameghino and Mercerat. In an extensive work, the first part of which was published in 1895 and the second posthumously, Ameghino (1895, 1920) rejected, sometimes without providing evidence, nearly all the synonymies proposed by Lydekker (1894). Scott (1903) validated most of the taxa originally erected by Florentino Ameghino. Subsequently published taxonomic revisions have dealt with only a very few taxa (see below).

Recent exhaustive fieldwork (Fernicola *et al.*, 2019) has provided new material of cingulates from Santacrucian localities along the RSC, allowing, after over a century, new views on the taxonomic richness of this group of mammals. These new remains were recovered by collaborative expeditions involving the Museo de La Plata (MLP) and Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (MACN; Argentina), and Duke University (USA). This contribution reviews the taxonomic richness of Santacrucian cingulates collected by the MLP-MACN-Duke expeditions along the RSC and evaluates it with regard to that recorded from other Santacrucian localities.

## SANTACRUCIAN CINGULATES

The taxonomy of the Santacrucian Cingulata proposed during the late 19<sup>th</sup> century was highly controversial until Scott’s (1903) revisions. In addition to the thorough descriptions and extensive taxonomic breadth, quality, and abundance of figured specimens, Scott’s contribution gained wide acceptance also because he studied all of the most

important collections of Santacrucian cingulates then available. His work described, for the first time, the specimens collected by John B. Hatcher and Barnum Brown between the years 1886 and 1890, housed in Princeton University and the American Museum of Natural History, and compared them with the type and reference specimens in the MLP and Ameghino’s personal collection (the latter currently housed in the MACN) (Vizcaíno *et al.*, 2012a).

A century would pass before González Ruiz (2010) performed the next, albeit unpublished, comprehensive taxonomic revision of the Santacrucian cingulates. Other revisions were limited to peltephilids (Bordas, 1936, 1938) and *Stegotherium* (Fernicola and Vizcaíno, 2008; González Ruiz and Scillato-Yané, 2008, 2009).

The current taxonomic scheme, according to the published literature (Scott, 1903; Bordas, 1936, 1938; Fernicola and Vizcaíno, 2008; González Ruiz and Scillato-Yané, 2008, 2009; Vizcaíno *et al.*, 2012c) and followed here, of Santacrucian cingulates recognizes six genera of armadillos: *Peltephilus*, *Proeutatus*, *Prozaedyus*, *Stegotherium*, *Stenotatus*, and *Vetelia* Ameghino, 1891c. The species level systematics, which has not been considered since Scott (1903), is less certain, and we do not agree with several of this author’s taxonomic actions. These species are considered in the Systematic Paleontology section. Three other genera have been erected based on remains from Santacrucian deposits, *Anatiosodon* Ameghino, 1891a, *Eodasyus* Ameghino, 1894, and *Pareutatus* Scott, 1903. The status of these genera is controversial due largely and variably to the limited material on which the taxon was erected, poor original descriptions, unsupported by proper illustrations, and the type specimen is either of ambiguous identity or lost. *Anatiosodon* is represented by *Anatiosodon rarus* Ameghino, 1891a. Scott (1903) assigned this species, with reservation, to *Peltephilus*, but Bordas (1938) did not accept this taxonomic decision and retained the species in *Anatiosodon*. Vizcaíno and Fariña (1997) suggested that the type specimen, a mandibular fragment, may represent a juvenile individual, and Vizcaíno *et al.* (2012c) agreed (although without providing supporting evidence) with Scott’s (1903) assignment to *Peltephilus*. The possible juvenile condition of the specimen prevents considering its status beyond *Peltephilus* sp. The second genus, *Eodasyus*, was

considered by Scott (1903) and Scillato-Yané (1980) as *incertae sedis*. Further, as the type specimens of the two species assigned to *Eodasypus*, *E. nanus* (Ameghino, 1891b) and *E. limus* (Ameghino, 1891b), cannot be located in the Ameghino collection and they are poorly described (Ameghino 1891b), this genus will not be considered in this study. Finally, the specimen used by Scott (1903) to support the taxonomic identity of *Pareutatus distans* (Ameghino, 1887) includes osteoderms and a skull and mandible (MACN-A 7972-7974). A perfunctory examination of the cranial features provided by Scott (1903) might allow its recognition as a different genus from the remaining Santacrucian taxa, but a more thorough analysis reveals many similarities with the skull of *Stenotatus* and the osteoderms purportedly associated with the skull are very similar to those of *Proeutatus*. Although Ameghino's catalog at the MACN notes that all the remains cataloged as MACN-A 7972-7974 belong to the same individual, their association according to Scott (1903, p. 68) is doubtful. Given the ambiguous status of *Pareutatus distans*, and doubts about the association of the fossil remains it is not considered in this study.

Scott (1903) recognized five glyptodont genera, *Propalaehoplophorus*, *Eucinepeltus* Ameghino, 1891a, *Cochlops* Ameghino, 1889, *Asterostemma* Ameghino, 1889 and *Metopotoxus* Ameghino, 1898. The last two genera were based on small fragments of osteoderms that do not allow identification beyond Propalaehoplophoridae (*sensu* Fernicola, 2008). Again, at the species level we disagree with some taxa proposed by Scott (1903), and treat them in the Systematic Paleontology.

## MATERIALS AND METHODS

The approximately 370 specimens of cingulates studied here were collected between 2013–2014 by the MLP-MACN-Duke University expeditions (Fernicola *et al.*, 2019), and belong to the Museo Regional Provincial "Padre M. Jesús Molina" of Río Gallegos (Province of Santa Cruz, Argentina) (Appendix 1). These specimens were identified through comparison with the type specimens and with more complete remains of specimens housed in the institutions mentioned below. Quotation marks indicate that there is a lack of consensus on the monophyly of a suprageneric group.

Osteoderms were measured with manual calipers; the descriptive terminology follows Fernicola and Vizcaíno (2008), Krmpotic *et al.* (2009), Ciancio *et al.* (2013), and Francia and Ciancio (2013) (Fig. 2).

The geographic references for the localities reported for the SCF are grouped as follows: 1) eastern area, including the Atlantic coast, 2) central area, including RSC and Río Chalfá (= Sehuen), 3) western area, including the Lago Argentino and Lago Posadas regions (see Fernicola *et al.*, 2019, fig. 1). The localities along the RSC are BB (~17.45 to ~16.49 Ma; S 50° 9' 38.31" W 69° 40' 23.40" to S 50° 12' 31.70" W 69° 43' 10.66"), SBB (~16.43 to ~15.63 Ma; S 50° 16' 12.48" W 70° 22' 23.21" to S 50° 16' 51.90" W 70° 17' 54.76") and YH (~17.22 to ~16.67 Ma; S 50° 15' 17.48" W 71° 4' 9.56" to S 50° 15' 17.48" W 71° 4' 9.56") (Fernicola *et al.*, 2014, 2019; Cuitiño *et al.*, 2016, 2019b).

The comparative study on the taxonomic richness of the RSC cingulates includes three levels of analysis. The first considers the taxonomic richness referred to the RSC by Ameghino (1887, 1889) with that obtained based on the new remains. The second considers the richness among the three localities BB, SBB, and YH, based only on the new remains, as previous works that provided faunal lists from the RSC did not discriminate among the three localities (*e.g.*, Ameghino, 1887). The third level of analysis includes com-

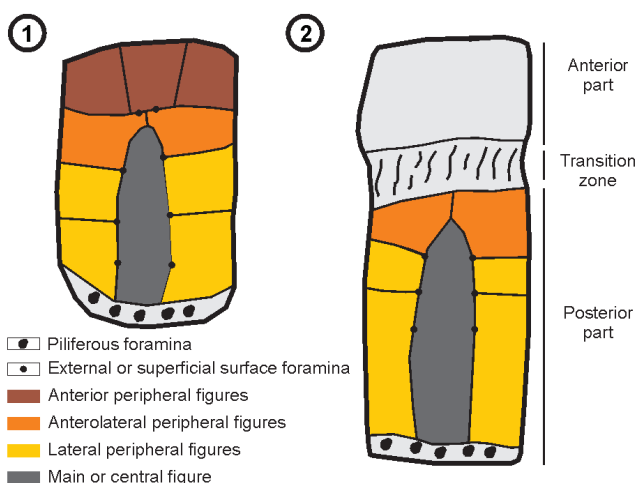


Figure 2. Terminology of the osteoderm features mentioned in the text. 1, fixed osteoderm; 2, moveable osteoderm.

parison of the taxonomic richness of the RSC with that recognized for the remaining SCF locations in the eastern, central and western regions. This last level includes information related to the geographical distribution of the Santacrucian cingulates as compiled from Ameghino (1887, 1889, 1891a–d, 1894, 1900–02, 1906), Scott (1903), Tauber (1999), González Ruiz and Scillato-Yané (2008, 2009), and Vizcaíno *et al.* (2012c). Comparison of the taxonomic richness in each level of analysis is based on the presence or absence of each taxon listed in each locality.

**Institutional abbreviations.** **MPM-PV**, Museo Regional Provincial “Padre M. Jesús Molina”, Río Gallegos, Argentina. **MACN-A**, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Colección Nacional Ameghino, Buenos Aires, Argentina. **MACN-Ma**, Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Colección Nacional de Mastozoología, Buenos Aires, Argentina. **YPM-VPPU**, Yale Peabody Museum, Vertebrate Paleontology, New Haven, USA.

## SYSTEMATIC PALEONTOLOGY

Order XENARTHRA Cope, 1889

Suborder CINGULATA Illiger, 1811

Family PELTEPHILIDAE Ameghino, 1894

Genus *Peltephilus* Ameghino, 1887

**Type species.** *Peltephilus strepens* Ameghino, 1887. Santa Cruz Formation, Barrancas del Río Santa Cruz, Province of Santa Cruz, Argentina.

**Species recognized in the Santa Cruz Formation in this paper.**

*P. strepens*, *P. pumilus* Ameghino, 1887, *P. giganteus* Ameghino, 1894, *P. nanus* Ameghino, 1898, and *P. ferox* Ameghino 1891a.

*Peltephilus pumilus* Ameghino, 1887

Figure 3.1

**Type specimen.** MACN-A 866–870 (Mones, 1986).

**Referred material.** See Appendix 1.

**Geographic distribution.** BB and SBB.

**Description.** The osteoderms collected are approximately intermediate in size compared to those of the *Peltephilus* species considered. Those of the movable bands vary from

9.03–11.45 mm in width, and 11.46–15.12 mm in length (Fig. 3.1). The osteoderms of *P. nanus* are ca. 30 % smaller; those of *P. ferox* and *P. giganteus* are at least 20 % larger, whereas those of *P. strepens* are 40 to 50 % larger. The superficial surface is rough; there is a row of moderately developed tubercles in the anterior part, and posterior to it two pair of large and oval foramina (1.2 to 1.7 mm × 1.3 to 1.8 mm), separated from each other by a narrow septum.

*Peltephilus* sp.

**Referred material.** See Appendix 1.

**Geographic distribution.** BB and SBB.

Family “DASYPODIDAE” Gray, 1821

Subfamily “DASYPODINAE” Gray, 1821

Tribe STEGOTHERIINI Ameghino, 1889

Genus *Stegotherium* Ameghino, 1887

**Type species.** *Stegotherium tessellatum* Ameghino, 1887. Santa Cruz Formation, Barrancas del Río Santa Cruz, Province of Santa Cruz, Argentina.

**Species recognized in the Santa Cruz Formation in this paper.** *St. tessellatum*, *St. simplex* (Ameghino, 1887), *St. notohippidensis* González Ruiz and Scillato-Yané, 2009, *St. tauberi* González and Scillato-Yané, 2008.

**Comments.** The holotype of *Stegotherium simplex* is a mandibular portion with only two teeth and it is lost (Mones 1986, p. 231). Scott’s photographic album of fossil specimens that this researcher examined in Argentina (Vizcaíno *et al.*, 2017, suppl. files, appendix 1, p. 1b, figs. 168 and 169) illustrates a mandibular fragment labeled as the type of *St. simplex* that broadly coincides with the original description of Ameghino (1887). Unfortunately, the image is insufficiently clear to allow determination of whether the condition of its anterior part is due to loss of its teeth or corresponds to the presence of predental ridges described by Vizcaíno (1994) in the skulls and mandibles of *St. tessellatum*. According to Fernicola and Vizcaíno (2008), if the latter were the case, then the presence of two teeth in *St. simplex* vs. six in *St. tessellatum* would support the recognition of two different genera.

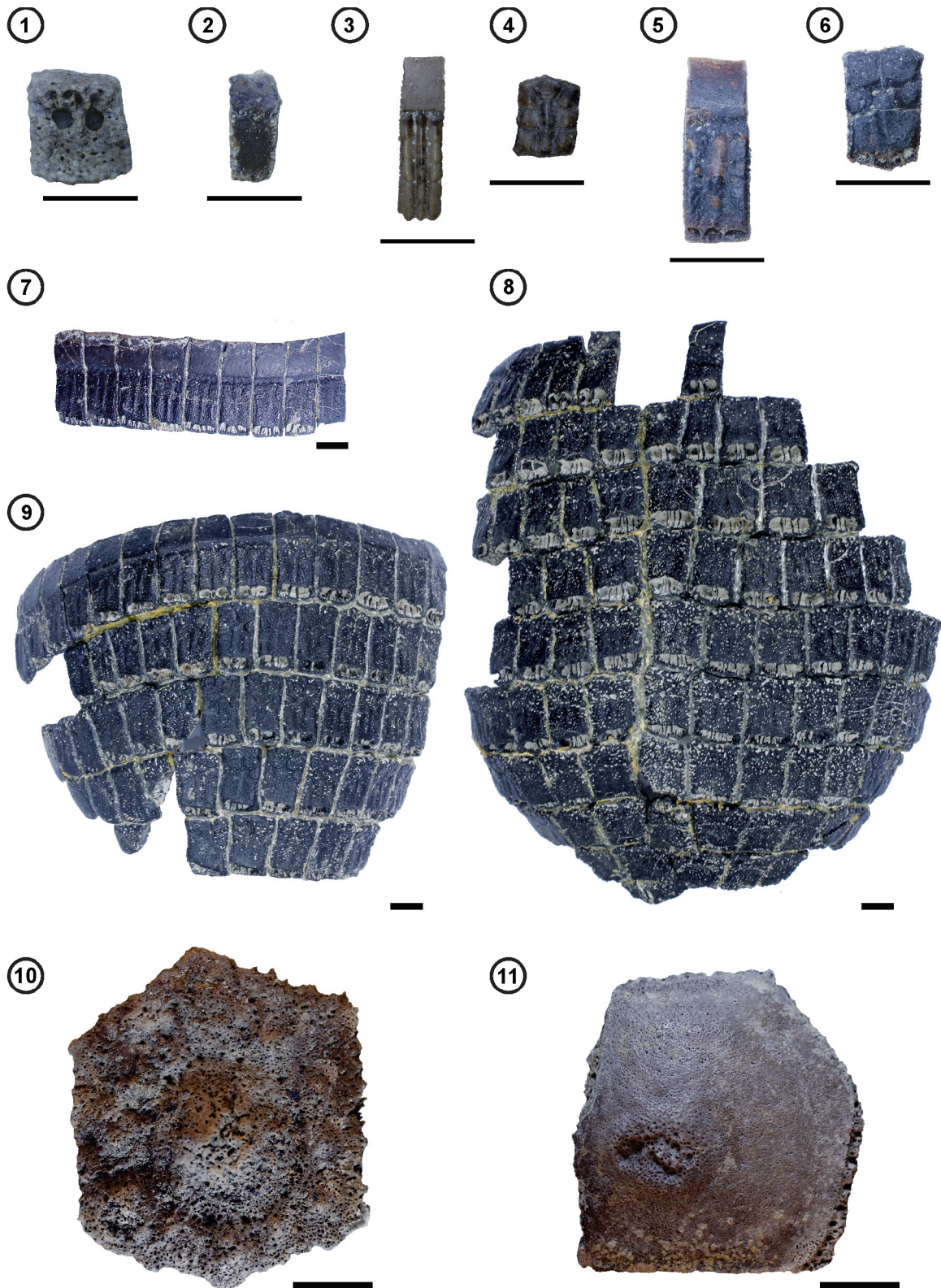


Figure 3. 1, *Peltephilus pumilus*, MPM-PV 20832, osteoderm of the moveable band; 2, *Stegotherium tessellatum*, MPM-PV 20832, osteoderm of the moveable band; 3–4, *Prozaedyus proximus*, MPM-PV 20859; 3, osteoderm of the moveable band; 4, fixed osteoderm; 5–6, *Stenotatus patagonicus*, MPM-PV 20946; 5, osteoderm of the moveable band; 6, fixed osteoderm; 7–9, *Proeutatus oenophorus*, MPM-PV 21023; 7, portion of the moveable band; 8–9, pelvic shield; 10, *Cochlops muricatus*, MPM-PV 21071, osteoderm; 11, *Eucinepeltus* sp., MPM-PV 21091 cephalic shield osteoderm. Scale bars= 10 mm.

*Stegotherium tessellatum* Ameghino, 1887

Figure 3.2

**Lectotype.** MACN-A 781 (Fernicola and Vizcaíno, 2008).**Paralectotype.** MACN-A 782–785 (Fernicola and Vizcaíno, 2008).**Referred material.** See Appendix 1.**Geographic distribution.** BB.**Description.** The three osteoderms assigned to this species are similar in size compared to those of the *Stegotherium* considered here. Those of the moveable bands vary from 4.48 to 5.53 mm in width, and from 9.13 to 12.28 mm in length (Fig. 3.2). These osteoderms have a rough superficial surface that lacks the pronounced longitudinal ridge (YPM-VPPU 15565) surrounded by a large number of foramina present in *St. tauberi*. In the anterior part, there is a large foramen, whereas in *St. notohippidensis* (MLP 84-III-5-10) there are at least two.

Subfamily "EUPHRACTINAE" Winge, 1923

Tribe "EUPHRACTINI" Winge, 1923

Genus *Prozaedyus* Ameghino, 1891a**Type species.** *Prozaedyus proximus* (Ameghino, 1887). Santa Cruz Formation, Barrancas del Río Santa Cruz, Province of Santa Cruz, Patagonia, Argentina.**Species recognized in the Santa Cruz Formation in this paper.***Pr. proximus*.**Comments.** Based on size, Scott (1903) recognized, with reservation, two species of *Prozaedyus*: *Pr. proximus* and *Pr. exilis* (Ameghino, 1887). However, several of the metric differences noted by Scott (1903) do not support specific distinction; for example, the "skull length on medial basal line" is 55 mm in *Pr. exilis* and 56 mm in *Pr. proximus*, whereas the "skull extreme length" is 66 mm in *Pr. exilis* and 70 mm in *Pr. proximus* (Scott, 1903, p. 77, 79 respectively). Concerning this last feature, in *Chaetophractus vellerosus* (Gray, 1865) the value measured in MACN-Ma 50.39 is 60 mm and in MACN-Ma 14.821 is 67.2 mm. With respect to the mandible, Scott (1903) mentioned that the toothless portion of the mandible in *Pr. exilis* is 6 mm, while it is about 5.3 mm in *Pr. proximus*. Once again, these differences are minimal and this feature may vary within an individual. Forexample, in *Chaetophractus vellerosus* (MACN-Ma 48.360) its length is 3.1 mm in the left dentary and 4.1 mm in the right one. Finally, with regard to the superficial morphology of the osteoderms, Scott (1903, p. 77) considered the differences between *Pr. proximus* and *Pr. exilis* as only minor and, probably, inconsistent. According to Scott (1903) a moveable band osteoderm of *Pr. exilis* is 4 mm in width by 15 mm in length, while in *Pr. proximus* it is 5.5 mm in width by 20 mm length (Scott, 1903, p. 77, 78 respectively). In *Zaedyus pichiy* (Desmarest, 1804) the osteoderms of the moveable bands vary from 4.47 to 5.87 mm in width and from 16.45 to 22.00 mm in length. With respect to the fixed osteoderms, the measurements provided by Scott (1903, p. 77, 78, respectively) for *Pr. exilis* are 6 mm in width by 8 mm in length, and 6 mm in width by 9 mm in length for *Pr. proximus*. In *Zaedyus pichiy* (MACN-Ma 25295) the fixed osteoderms vary from 4.99 to 7.73 mm in width and from 7.90 to 9.60 mm in length. Indeed, the metric and morphological differences provided by Scott (1903) for these two species are slight and within the range of variation of different species of other cingulates such as the extant *Chaetophractus vellerosus* and *Zaedyus pichiy*. Thus, only the type species, *Prozaedyus proximus*, is recognized here.*Prozaedyus proximus* (Ameghino, 1887)

Figure 3.3–4

**Type specimen.** Lost (Mones, 1986).**Referred material.** See Appendix 1.**Geographic distribution.** BB, SBB, and YH.**Description.** The collected osteoderms assigned to this species are smaller than in *Stenotatus* and their overall morphology coincides with the description of the osteoderms of *Pr. proximus* provided by Ameghino (1887, 1889) and Scott (1903). The osteoderms of the moveable bands vary from 4.02 to 4.89 mm in width and from 12.98 to 18.89 mm in length (Fig. 3.3). The superficial surface of the moveable band osteoderms bears three convex longitudinal figures of similar width, separated by two longitudinal sulci, which extend posteriorly to reach its posterior border. The sulci are parallel along their anterior two-thirds but tend to converge toward each other posteriorly. The lateral figures are divided by two to four transverse sulci each, resulting in three to



five pairs of small lateral figures. Generally, a very small foramen is present at each intersection between the main and the transverse sulci. Along the posterior border there are two foramina, larger than those on the superficial surface, that are usually aligned with the main sulci. Some osteoderms have three posterior foramina. The fixed osteoderms vary from 4.73 to 6.58 mm in width, and from 8.46 to 8.93 mm in length (Fig. 3.4). Each fixed osteoderm bears an elongated main figure surrounded by four to eight markedly convex peripheral figures. An external foramen is generally present at the intersection between the main figure and each radial sulcus. Along the posterior margin are two piliferous foramina, each aligned with the one of the sulci that define the main figure; a third foramen may be present.

Family "DASYPODIDAE" Gray, 1821

Subfamily "EUPHRACTINAE" Winge, 1923

Tribe "EUTATINI" Bordas, 1933

Genus *Stenotatus* Ameghino, 1891a

**Type species.** *Stenotatus patagonicus* (Ameghino, 1887). Santa Cruz Formation, Barrancas del Río Santa Cruz, Province of Santa Cruz, Argentina.

**Species recognized in the Santa Cruz Formation in this paper.** *S. patagonicus* and *S. hesternus* (Ameghino, 1889).

*Stenotatus patagonicus* (Ameghino, 1887)

Figure 3.5–6

**Type specimen.** Lost (Mones, 1986).

**Referred material.** See Appendix 1.

**Geographic distribution.** BB, SBB, and YH.

**Description.** The collected osteoderms assigned to this species are larger than *Prozaedyus* and smaller than *Proeutatus*. The osteoderms of the moveable bands vary from 5.29 to 7.33 mm in width and from 17.63 to 21.05 mm in length (Fig. 3.5). The superficial surface of the moveable band osteoderms bears three convex longitudinal figures that are defined by two longitudinal sulci, which extend posteriorly to reach the posterior border. The main figure is somewhat wider than the two figures, one on either side, that flank it. The main figure is undivided, while the two

lateral figures may be divided by one or two transverse sulci into two or three smaller figures, respectively. The posterior border of the moveable band osteoderms bears two types of piliferous foramina, differing in size and position and alternating with each other. The three or four large posterior foramina are located less peripherally than the small foramina, each of which lies midway between two large foramina. Small piliferous foramina are present at the intersection between the main and the radial sulci. By contrast, in *S. hesternus* these foramina are conspicuous. The fixed osteoderms vary from 7.20 to 8.69 mm in width and from 11.54 to 12.99 mm in length (Fig. 3.6). They bear an elongated main figure, which does not reach the posterior border and may be anteriorly wider or of constant width. The anterior and lateral regions are divided by three to five radial sulci that delimit four to six peripheral figures surrounding the main figures. The posterior two peripheral figures on each side contact each other at the midline of the osteoderm, forming a larger U-shaped figure. In some osteoderms this contact is narrow, whereas it is wide in others. The pattern of the foramina at the posterior border is similar to that of the moveable osteoderms, but there may be as many as six large and five small foramina. The latter are present at the intersection between the main and the radial sulci.

Genus *Proeutatus* Ameghino, 1891a

**Type species.** *Proeutatus oenophorus* (Ameghino, 1887). Santa Cruz Formation, Barrancas del Río Santa Cruz, Province of Santa Cruz, Patagonia, Argentina.

**Species recognized in the Santa Cruz Formation in this paper.** *Pro. oenophorus*, *Pro. deleo* (Ameghino, 1891b), and *Pro. carinatus* (Ameghino, 1891b).

**Comments.** Scott (1903) recognized five species, *Pro. oenophorus*, *Pro. lagena* (Ameghino, 1887), *Pro. carinatus*, *Pro. deleo*, and *Pro. robustus* Scott, 1903. This author considered the morphology of the osteoderms of *Pro. oenophorus* and *Pro. lagena* identical (Scott, 1903, p. 65), and that neither species exhibits marked differences compared with *Pro. robustus* (Scott, 1903, p. 43). Scott (1903) noted that the feature that best differentiates *Pro. lagena* from *Pro. oenophorus* is the presence, in the former, of an elongated and tubular rostrum that widens anteriorly but without

achieving the spatulate condition present in the latter. However, the value of this difference for specific distinction is unreliable, as both conditions occur in adult specimens of the extant *Euphractus sexcinctus* (Linnaeus, 1758) (MACN-Ma 50.121, MACN-Ma 34.592). Another difference noted by Scott (1903) refers to the presence of a longer mandibular symphysis in *Pro. lagena* (22 mm) with respect to *Pro. oenophorus* (15 mm). However, in *E. sexcinctus* the symphysis ranges between 17 (MACN-Ma 42.104) and 25 mm in length (MACN-Ma 31.88). Scott (1903) also reported that *Pro. robustus* is characterized by a larger size and notably heavier proportions compared to *Pro. oenophorus*. The tables of measurements of the femur provided by Scott (1903) for these two species reveals that the difference in size of these two species is approximately 10–15 %. This difference is within the range of variation of several other cingulates species (e.g., *E. sexcinctus* ~12 %, Fernicola pers. obs.). The status of *Pro. lagena* and *Pro. robustus* with respect to each other and whether either is distinguishable specifically from *Pro. oenophorus* is uncertain. In the context of the present report, a decision cannot be taken, because the type specimen of *Pro. lagena* is lost (Mones, 1986) and the authors were unable to access part of the holotype of *Pro. robustus* (YPM-VPPU 15214). Clearly, the metric and morphological differences noted by Scott (1903) in differentiating among the species are within the range of variation of at least one species of living armadillos, *Euphractus sexcinctus* (see above), and their taxonomic utility is doubtful. As well, the osteoderms of these three species, as described by Scott (1903), cannot be distinguished by the current authors. It is worth noting, in this regard, that the carapace of *Pro. robustus* on which Scott (1903, p. VIII; YPM-VPPU 15957) based his description was assigned to this species with a question mark by the author himself. In this context, we have only compared the superficial morphology of the osteoderms among *Pro. oenophorus*, *Pro. deleo* and *Pro. carinatus*, which morphology is in fact different (see below).

*Proeutatus oenophorus* (Ameghino, 1887)

Figure 3.7–9

**Type specimen.** Lost (Mones, 1986).

**Referred material.** See Appendix 1.

**Geographic distribution.** BB, SBB, and YH.

**Description.** The osteoderms assigned to *Proeutatus oenophorus* are similar in size to other species of this genus. Those of the moveable bands vary from 9.22 to 10.44 mm in width and 27.80 to 32.5 mm in length (Fig. 3.7). The superficial surface of the moveable band osteoderms is rugose and bears a main lageniform figure, narrow on the middle part of the osteoderm and widening posteriorly. The main figure bears a prominent keel along its midline and lateral figure lies on either side of the narrowed part of the main figure. The external surface of the osteoderms is pierced posteriorly by three or four large foramina, separated from each other and from the posterior margin of the osteoderms by a thin bony septum. The fixed osteoderms vary from 10.84 to 15.26 mm in width and from 18.87 to 19.34 mm in length (Figs. 3.8–9). They are rectangular with a distinctly lageniform main figure. By contrast in the fixed osteoderm of *Pro. deleo* (MACN-A 4800–4802; see Vizcaíno *et al.*, 2017, suppl. files, appendix 1, p. 34, fig. 71c) this main figure is much less marked. The midline of the lageniform main figure of *Pro. oenophorus* shows a well-developed keel, but the keel in *Pro. carinatus* (MACN-A 561; see Vizcaíno *et al.*, 2017, suppl. files, appendix 1, p. 34, fig. 70) is even more prominent. Anteriorly, there are one or two well-developed figures, and a lateral figure is present on either side of the narrow part of the main figure. The posterior part of the osteoderm is similar to that described for the moveable osteoderms.

Family PROPALAEHOPLOPHORIDAE Ameghino, 1891c

Genus *Cochlops* Ameghino, 1889

**Type species.** *Cochlops muricatus* Ameghino, 1889. Santa Cruz Formation, Río Chico, Province of Santa Cruz, Argentina.

**Species recognized in the Santa Cruz Formation in this paper.** *Cochlops muricatus*.

**Comments.** Scott (1903) recognized two species, *Cochlops muricatus* and *Cochlops debilis* Ameghino, 1891a. *Cochlops muricatus* was based on osteoderms of the carapace with the central figure raised into a high cone, while the peripheral figures form a ring of lower conical tubercles around it (Ameghino, 1889). *Cochlops debilis* was based on a mandible (Ameghino, 1891a), but Scott (1903) assigned a skull with a

cephalic shield to this species; in other words, based on nonhomologous elements. The specimens assigned by Ameghino (1891a) and Scott (1903) to *Cochlops debilis* lack carapace osteoderms, and it is not therefore possible to confirm this taxonomic assignment. In this context, we have only recognized *Cochlops muricatus*.

*Cochlops muricatus* Ameghino, 1889

Figure 3.10

**Type specimen.** Lost. According to Mones (1986) the type is MACN-A 4751, but this specimen is a mandible and Ameghino (1889) only described osteoderms. These osteoderms, despite extensive searches, have not been found in the Ameghino collection.

**Referred material.** See Appendix 1.

**Geographic distribution.** BB and YH.

**Description.** The osteoderms bear marked central and peripheral figures; in some cases, the central figure raised into a high cone reaching 20 mm in height (Fig. 3.10). This kind of osteoderm is located in the posterodorsal region of the carapace.

Genus *Eucinepeltus* Ameghino, 1891a

**Type species.** *Eucinepeltus petesatus* Ameghino, 1891a. Santa Cruz Formation, Cerro Observatorio, Province of Santa Cruz, Argentina.

**Species recognized in the Santa Cruz Formation in this paper.** *Eu. petesatus*, *Eu. crassus* Scott, 1903, and *Eu. complicatus* Brown, 1903.

**Comments.** Scott (1903) recognized three species, *Eu. petesatus*, *Eu. crassus*, and *Eu. complicatus*. The shape and number of osteoderms of the cephalic shield were used to diagnose these species. Unfortunately, only isolated cephalic shield osteoderms were collected by the MLP-MACN-Duke expeditions, so it is not possible to evaluate the number of osteoderms and shape of the cephalic shield.

*Eucinepeltus* sp.

Figure 3.11

**Referred material.** See Appendix 1.

**Geographic distribution.** BB and SBB.

**Description.** The osteoderms of the cephalic shield recovered by us show the typical fossa in middle of the superficial surface, which is a diagnostic feature of this genus (Ameghino, 1891a; Scott, 1903; Brown, 1903) (Fig. 3.11).

PROPALAEHOPHORIDAE indet.

**Referred material.** See Appendix 1.

**Geographic distribution.** BB, SBB, and YH.

## TAXONOMIC RICHNESS

According to the taxonomic assignments presented here of the new specimens from the SCR, five species of armadillos are recognized in BB, *Peltephilus pumilus*, *Stegotherium tessellatum*, *Stenotatus patagonicus*, *Proeutatus oenophorus*, and *Prozaedyus proximus*, and two glyptodonts, *Cochlops muricatus* and *Eucinepeltus* sp. In SBB we recognized four armadillos, *Peltephilus pumilus*, *Stenotatus patagonicus*, *Proeutatus oenophorus*, and *Prozaedyus proximus*, and one glyptodont *Eucinepeltus* sp., while in YH the armadillos *Stenotatus patagonicus*, *Proeutatus oenophorus*, and *Prozaedyus proximus*, and the glyptodont *Cochlops muricatus* (Tab. 1) are present.

The first level comparison, that between the taxa reported from the RSC by Ameghino (1887, 1889) with those based on the new specimens reported here, reveals the presence of the same five genera of armadillos initially reported by Ameghino (1887): *Stegotherium*, *Peltephilus*, *Proeutatus*, *Prozaedyus*, and *Stenotatus*. Remains assignable to the glyptodont *Propalaeophorus*, noted by Ameghino (1887), were not recovered during the course of the recent expeditions to the RSC; however, the first record from this area of *Eucinepeltus* and *Cochlops* are reported. At the specific level, the taxonomic richness of the armadillos is similar to that mentioned by Ameghino (1887, 1889), five species, with *Peltephilus strepens* being the only species not recorded. Regarding the glyptodonts, the species richness increased from one to at least three taxa (Tab. 2).

In the second level of comparison, the richness among BB, SBB, and YH based only on the new remains, seven cingulate species of (Tab. 1) are recognized from BB. The difference between BB and SBB is the absence in the latter of *Stegotherium tessellatum* and *Cochlops muricatus*. The differ-

**TABLE 1 – Distribution of cingulates in Barrancas Blancas, Segunda Barrancas Blancas, and Yaten Huageno recorded in this contribution**

<i>Taxa</i>	<i>Barrancas Blancas</i>	<i>Segundas Barrancas Blancas</i>	<i>Yaten Huageno</i>
<i>Peltephilus pumilus</i>	X	X	
<i>Stegotherium tessellatum</i>	X		
<i>Stenotatus patagonicus</i>	X	X	X
<i>Proeutatus oenophorus</i>	X	X	X
<i>Prozaedyus proximus</i>	X	X	X
<i>Cochlops muricatus</i>	X		X
<i>Eucinepeltus sp.</i>	X	X	
<i>Total number of species</i>	7	5	4

ence between BB and YH is the absence in YH of *Peltephilus pumilus*, *Stegotherium tessellatum*, and *Eucinepeltus sp.* Finally, SBB and YH shared the following taxa: *Stenotatus patagonicus*, *Proeutatus oenophorus*, and *Prozaedyus proximus*, while *Peltephilus pumilus* and *Eucinepeltus sp.* are in SBB, and *Cochlops muricatus* in YH (Tab. 1).

The third level of analysis, excluding the taxa that we considered doubtful (see above), reveals that the seven genera recorded along the RSC have been recorded in other areas (Tab. 2). The only difference is the absence of *Vetelia* and *Propalaeohoplophorus* from the outcrops along the RSC. *Vetelia* was recorded by Ameghino (1891c) based on material collected from exposures northwest of the RSC, and assigned by (Ameghino, 1902) to the “Notohippidian” —the oldest Santacrucian faunal assemblage according to Marshall *et al.* (1983)—. Fernicola *et al.* (2009) reported this genus from the SCF in the Atlantic coast. At the specific level, only seven species were recorded of the 21 recognized from the SCF (Tabs. 1, 2). Among peltephilines, this report records *Peltephilus pumilus* and *Peltephilus strepens*, which were mentioned by Ameghino (1887) for the RSC. In addition to these two species, *P. ferox* and *P. nanus* have also been recorded from the Atlantic coast (see Vizcaíno *et al.*, 2012c). From the western area, Ameghino (1900–02) listed the peltephilines *P. giganteus* and *P. pumilus*. The first species and *P. ferox* have also been reported from the central area

(see Vizcaíno *et al.*, 2012c). Regarding *Stegotherium*, the only recorded species in the RSC is *Stegotherium tessellatum*, which is also present in the western (Ameghino, 1887, 1900–02, 1906). González Ruiz and Scillato-Yané (2008, 2009) identified two new stegotherines: *Stegotherium tauberi* from the eastern and *Stegotherium notohippidensis* from the western areas. Among eutatines *Stenotatus patagonicus* is recorded all along the SCF from the eastern to the western areas (Ameghino, 1887, 1900–02, 1906), whereas *S. herternus* has only been reported from the Atlantic coast (Vizcaíno *et al.*, 2012c). With regard to *Proeutatus*, *Pro. oenophorus* has been reported throughout the SCF, *Pro. deleo* from the western region and the Atlantic coast, and *Proeutatus carinatus* only from the latter region (Vizcaíno *et al.*, 2012c). The euphractine *Prozaedyus proximus* has been recorded from all outcrops of the SCF. With respect to glyptodonts, *Propalaeohoplophorus australis* and *Cochlops muricatus* have been noted from all three areas, while *Eucinepeltus* was reported in the RSC and the Atlantic coast (Vizcaíno *et al.*, 2012c).

## DISCUSSION AND CONCLUSION

The new specimens collected with precise geographic provenance allowed evaluation of the taxonomic richness of the cingulates of the SCF outcropping along the southern banks of the RSC. In total, seven species, each belonging to different genera, were recognized here (Tab. 1).

All the genera of armadillos reported by Ameghino (1887) and six of the seven species of this group were recovered by the MLP-MACN-Duke expeditions. Among glyptodonts, the presence of *Eucinepeltus* and *Cochlops* is novel, but remains of *Propalaeohoplophorus*, reported by Ameghino (1887), were not recovered. Indeed, at the species level, the difference between the composition and taxonomic richness between the remains noted by Ameghino (1887) and those reported here are very few, and is likely due to sampling. The presumed absence of *Propalaeohoplophorus* remains may be an artifact due to the lack of diagnostic features in the material collected by us. The osteoderms that we assigned to *Eucinepeltus* and *Cochlops* correspond to two small parts of the exoskeleton: the cephalic shield and a small portion located in the posterior region of the carapace, respectively. The osteoderms that were not assigned to

TABLE 2 – Distribution of cingulates of the Santa Cruz Formation in different areas of the Province of Santa Cruz (see Systematic Paleontology)

<i>Taxa</i>	<i>Eastern</i>	<i>Central</i>	<i>Western</i>
<i>Peltephilus strepens</i>	X <sup>3</sup>	X <sup>1</sup>	
<i>Peltephilus pumilus</i>	X <sup>1</sup>	X <sup>1</sup>	X <sup>2</sup>
<i>Peltephilus giganteus</i>		X <sup>3</sup>	X <sup>2</sup>
<i>Peltephilus nanus</i>	X <sup>3</sup>		
<i>Peltephilus ferox</i>	X <sup>3</sup>	X <sup>3</sup>	
<i>Stegotherium tessellatum</i>		X <sup>1</sup>	X <sup>2</sup>
<i>Stegotherium tauberi</i>	X <sup>4</sup>		
<i>Stegotherium notohippidensis</i>			X <sup>5</sup>
<i>Stenotatus patagonicus</i>	X <sup>3</sup>	X <sup>1</sup>	X <sup>2</sup>
<i>Stenotatus hesternus</i>	X <sup>3</sup>		
<i>Proeutatus oenophorus</i>	X <sup>3</sup>	X <sup>1</sup>	X <sup>2</sup>
<i>Proeutatus deleo</i>	X <sup>3</sup>		X <sup>2</sup>
<i>Proeutatus carinatus</i>	X <sup>3</sup>		
<i>Prozaedyus proximus</i>	X <sup>3</sup>	X <sup>1</sup>	X <sup>2</sup>
<i>Vetelia puncta</i>	X <sup>6</sup>		X <sup>2</sup>
<i>Propalaeohoplophorus australis</i>	X <sup>3</sup>	X <sup>1</sup>	X <sup>2</sup>
<i>Propalaeohoplophorus minor</i>	X <sup>6</sup>		
<i>Cochlops muricatus</i>	X <sup>3</sup>	X <sup>9</sup>	X <sup>2</sup>
<i>Eucinepeltus petesatus</i>	X <sup>3</sup>	X <sup>9</sup>	
<i>Eucinepeltus crassus</i>	X <sup>7</sup>		
<i>Eucinepeltus complicatus</i>	X <sup>6</sup>		
<i>Total number of species</i>	18	12	11

X<sup>1</sup>: Ameghino (1887); X<sup>2</sup>: Ameghino (1900-02); X<sup>3</sup>: Vizcaíno et al. (2012); X<sup>4</sup>: González Ruiz and Scillato-Yané (2009); X<sup>5</sup>: González Ruiz and Scillato-Yané (2008); X<sup>6</sup>: Fericola et al. (2009); X<sup>7</sup>: Scott (1903); X<sup>8</sup>: Brown (1903); X<sup>9</sup>: Fericola and Vizcaíno, this work

*Eucinepeltus* or *Cochlops* can only be assigned to Propalaeohoplophoridae due to the similarity among the three genera in osteoderm morphology over a large part of the carapace.

The second level of analysis considers the taxonomic richness among the localities of the RSC (Tab. 1) based on the new remains recovered. The only difference between

BB and SBB is the presence of the armadillo *Stegotherium tessellatum* and the glyptodont *Cochlops muricatus* in the former. *Stegotherium tessellatum* is represented by only three osteoderms, suggesting that this species may not have been particularly abundant, thus reducing the probability of recovering its remains in other localities, which have yielded fewer specimens. The absence of *Cochlops muricatus*

in SBB may, as in the case of *Propalaeohoplophorus*, be attributable to sampling, given that this taxon has been reported in the other regions of the SCF (see below). The lower taxonomic richness registered in YH, three armadillos and one glyptodont species, could be due to sampling size, given that this locality is the smallest of the three. Although Carlos Ameghino claimed that this was the richest fossiliferous site in the area (letter 166 in Torcelli, 1935; Vizcaíno, 2011), in 1889 Clemente Onelli had the opposite impression, recovering only a few armadillo osteoderms and a toxodont skull over several days (Vizcaíno *et al.*, 2013; Brinkman and Vizcaíno, 2014). The new collections in YH confirm Onelli's view.

The third level of analysis considers the taxonomic richness of cingulates recognized from the SCF in the RSC and other central areas, such as Río Chaliá, compared with that previously recognized in the western and eastern localities of the SCF (Tab. 2). All the genera recorded in the western and eastern areas are also known from the central area, with the exception of *Vetelia*; indeed, this cingulate is scarce in the SCF. Fernicola *et al.* (2009) reported the first and only record of this genus from the coast of the Province of Santa Cruz, 3 km south of the mouth of the Río Coyle, based on a single osteoderm. Given this circumstance, evaluation of its absence in the central areas is not particularly meaningful. At the specific level, the taxonomic differences compared with other regions of the SCF are more pronounced. In the three areas defined for the SCF there are at least 21 species of cingulates, of which six are glyptodonts (Tab. 2). The highest taxonomic richness is recorded in the eastern region (Atlantic coast), while in the other two regions it is approximately one third lower (Tab. 2), a difference that may be due to the much more intensive collecting efforts along the Atlantic coast (Vizcaíno *et al.*, 2013).

The number of shared species among the three areas decreases from east to west (east-center: ten spp.; center-west: eight spp.; east-west: six spp.). This taxonomic gradient may coincide with an environmental gradient produced by the elevation of the Andes. Evaluation of this hypothesis requires analyses of specific climatically or environmentally sensitive morphological features such as, for example, piliferous foramina size (Ciancio *et al.*, 2017), and of exhaustive abiotic and biotic evidence, as by Kay *et al.* (2012).

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**Appendix 1.** List of the cingulates recorded in Barrancas Blancas (Estancia Aguada Grande and Estancia Santa Lucía), Segundas Barrancas Blancas (Estancia Cordón Alto and Estancia El Tordillo) and Yaten Huageno (Estancia El Refugio).

#### BARRANCAS BLANCAS (170 specimens)

*Peltephilus pumilus*. MPM-PV 20818, osteoderm of the cephalic shield and carapace; MPM-PV 20816, MPM-PV 20819, MPM-PV 20821, and MPM-PV 20822, carapace osteoderms.

*Peltephilus* sp. MPM-PV 20820, fragment of cephalic shield osteoderm, MPM-PV 20817, fragment of cephalic shield osteoderm.

*Stegotherium tessellatum*. MPM-PV 20832, three osteoderms.

*Prozaedyx proximus*. MPM-PV 20844, small carapace fragment; MPM-PV 20845, small carapace fragment; MPM-PV 20848, osteoderms and small carapace fragment; MPM-PV 20833, MPM-PV 20834, MPM-PV 20835, MPM-PV 20836, MPM-PV 20837, MPM-PV 20838, MPM-PV 20839, MPM-PV 20840, MPM-PV 20841; MPM-PV 20842, MPM-PV 20843, MPM-PV 20846, MPM-PV 20847, MPM-PV 20849, MPM-PV 20850, MPM-PV 20851, MPM-PV 20852, MPM-PV 20853, MPM-PV 20854, MPM-PV 20855, MPM-PV 20856, MPM-PV 20857, MPM-PV 20858, MPM-PV 20859, MPM-PV 20860, MPM-PV 20861, MPM-PV 20862, MPM-PV 20863, MPM-PV 20864, MPM-PV 20865, MPM-PV 20866, MPM-PV 20867, MPM-PV 20868, MPM-PV 20869, MPM-PV 20870, MPM-PV 20871, MPM-PV 20872, MPM-PV 20873, MPM-PV 20874, MPM-PV 20875, MPM-PV 20876, MPM-PV 20877, MPM-PV 20878, and MPM-PV 20879, carapace osteoderms.

*Stenotatus patagonicus*. MPM-PV 20932, MPM-PV 20933, MPM-PV 20934, MPM-PV 20935, MPM-PV 20936, MPM-PV 20937, MPM-

PV 20938, MPM-PV 20939, MPM-PV 20940, MPM-PV 20941, MPM-PV 20942, MPM-PV 20943, MPM-PV 20944, MPM-PV 20945, MPM-PV 20946, MPM-PV 20947, MPM-PV 20948, MPM-PV 20949, MPM-PV 20950, MPM-PV 20951, MPM-PV 20952, MPM-PV 20953, MPM-PV 20954, MPM-PV 20955, MPM-PV 20956, and MPM-PV 20957, carapace osteoderms.

*Proeutatus oenophorus*. MPM-PV 20981, osteoderms and postcranial elements; MPM-PV 21006, osteoderms and postcranial elements; MPM-PV 20982, MPM-PV 20983, MPM-PV 20984, MPM-PV 20985, MPM-PV 20986, MPM-PV 20987, MPM-PV 20988, MPM-PV 20989, MPM-PV 20990, MPM-PV 20991, MPM-PV 20992, MPM-PV 20993, MPM-PV 20994, MPM-PV 20995, MPM-PV 20996, MPM-PV 20997, MPM-PV 20998, MPM-PV 20999, MPM-PV 21000, MPM-PV 21001, MPM-PV 21002, MPM-PV 21003, MPM-PV 21004, MPM-PV 21005, MPM-PV 21007, MPM-PV 21008, MPM-PV 21009, MPM-PV 21010, MPM-PV 21011, MPM-PV 21012, MPM-PV 21013, MPM-PV 21014, MPM-PV 21015, MPM-PV 21016, MPM-PV 21017, MPM-PV 21018, MPM-PV 21019, MPM-PV 21020, MPM-PV 21021, and MPM-PV 21022, carapace osteoderms.

*Cochlops muricatus*. MPM-PV 21070, MPM-PV 21071, MPM-PV 21072, MPM-PV 21073, MPM-PV 21074, MPM-PV 21075, MPM-PV 21076, MPM-PV 21077, MPM-PV 21078, MPM-PV 21079, MPM-PV 21080, and MPM-PV 21081, carapace osteoderms.

*Eucinepeltus* sp. MPM-PV 21084, cephalic shield osteoderm; MPM-PV 21085, cephalic shield osteoderm.

*Propalaeohoplophoridae*. MPM-PV 21111, osteoderms and postcranial elements; MPM-PV 21116, osteoderms and postcranium; MPM-PV 21123, osteoderms and postcranial elements; MPM-PV 21096, MPM-PV 21097, MPM-PV 21098, MPM-PV 21099, MPM-PV 21100, MPM-PV 21101, MPM-PV 21102, MPM-PV 21103, MPM-PV 21104, MPM-PV 21105, MPM-PV 21106, MPM-PV 21107, MPM-PV 21108, MPM-PV 21109, MPM-PV 21110, MPM-PV 21112, MPM-PV 21113, MPM-PV 21114, MPM-PV 21115, MPM-PV 21117, MPM-PV 21118, MPM-PV 21119, MPM-PV 21120, MPM-PV 21121, MPM-PV 21122, MPM-PV 21124, MPM-PV 21125, MPM-PV 21126, MPM-PV 21127, MPM-PV 21128, and MPM-PV 21129, carapace osteoderms.

#### SEGUNDAS BARRANCAS BLANCAS (186 specimens)

*Peltephilus pumilus*. MPM-PV 20823, fragment of mandible and osteoderms; MPM-PV 20824, osteoderms and postcranial elements; MPM-PV 20828, MPM-PV 20830, MPM-PV 20825, MPM-PV 20831, and MPM-PV 20826, carapace osteoderms.

*Peltephilus* sp. MPM-PV 20827, cephalic shield osteoderm; MPM-PV 20829, fragment of mandible.

*Prozaedyx proximus*. MPM-PV 20882, osteoderms and postcranial elements; MPM-PV 20880, MPM-PV 20881, MPM-PV 20883, MPM-PV 20884, MPM-PV 20885, MPM-PV 20886, MPM-PV 20887, MPM-PV 20888, MPM-PV 20889, MPM-PV 20890, MPM-PV 20891, MPM-PV 20892, MPM-PV 20893, MPM-PV 20894, MPM-PV 20895, MPM-PV 20896, MPM-PV 20897, MPM-PV 20898, MPM-PV 20899, MPM-PV 20900, MPM-PV 20901, MPM-PV 20902, MPM-PV 20903, MPM-PV 20904, MPM-PV 20905, MPM-PV 20906, MPM-PV 20907, MPM-PV 20908, MPM-PV 20909, MPM-PV 20910, MPM-PV 20911, MPM-PV 20912, MPM-PV 20913, MPM-PV 20914, MPM-PV 20915, MPM-PV 20916, MPM-PV 20917, MPM-PV 20918, MPM-PV 20919, MPM-PV 20920, MPM-PV 20921, MPM-PV 20922, MPM-PV 20923, MPM-PV 20924, MPM-PV 20925, MPM-PV 20926, MPM-PV 20927, MPM-PV 20928, MPM-PV 20929, MPM-PV 20930, and MPM-PV

21185, carapace osteoderms.

***Stenotatus patagonicus***. MPM-PV 20958, MPM-PV 20959, MPM-PV 20960, MPM-PV 20961, MPM-PV 20962, MPM-PV 20963, MPM-PV 20964, MPM-PV 20965, MPM-PV 20966, MPM-PV 20967, MPM-PV 20968, MPM-PV 20969, MPM-PV 20970, MPM-PV 20971, MPM-PV 20972, MPM-PV 20973, MPM-PV 20974, MPM-PV 20975, MPM-PV 20976, MPM-PV 20977, MPM-PV 20978, and MPM-PV 20979, carapace osteoderms.

***Proeutatus oenophorus***. MPM-PV 21037, osteoderms and postcranial elements; MPM-PV 21044, osteoderms and postcranial elements; MPM-PV 21053, fragment of mandible; MPM-PV 21049, fragment of maxilar; MPM-PV 21023, MPM-PV 21024, MPM-PV 21025, MPM-PV 21026, MPM-PV 21027, MPM-PV 21028, MPM-PV 21029, MPM-PV 21030, MPM-PV 21031, MPM-PV 21032, MPM-PV 21033, MPM-PV 21034, MPM-PV 21035, MPM-PV 21036, MPM-PV 21038, MPM-PV 21039, MPM-PV 21040, MPM-PV 21041, MPM-PV 21042, MPM-PV 21043, MPM-PV 21045, MPM-PV 21046, MPM-PV 21047, MPM-PV 21048, MPM-PV 21050, MPM-PV 21051, MPM-PV 21052, MPM-PV 21054, MPM-PV 21055, MPM-PV 21056, MPM-PV 21057, MPM-PV 21058, MPM-PV 21059, MPM-PV 21060, MPM-PV 21061, MPM-PV 21062, MPM-PV 21063, MPM-PV 21064, and MPM-PV 21065, carapace osteoderms.

***Euclipeatus*** sp. MPM-PV 21086, cephalic shield osteoderm; MPM-PV 21087, MPM-PV 21088, MPM-PV 21089, MPM-PV 21090, MPM-PV 21091, MPM-PV 21092, MPM-PV 21093, MPM-PV 21094, and MPM-PV 21095, carapace osteoderms, and a cephalic shield osteoderm; and MPM-PV 21169, carapace osteoderms.

**Propalaeohoplophoridae**. MPM-PV 21139, fragment of mandible; MPM-PV 21140, osteoderms, fragment of skull, and postcranial elements; MPM-PV 21165, osteoderms and a molariform; MPM-PV 21130, MPM-PV 21131, MPM-PV 21132, MPM-PV 21133, MPM-PV 21134, MPM-PV 21135, MPM-PV 21136, MPM-PV 21137, MPM-PV 21138, MPM-PV 21141, MPM-PV 21142, MPM-PV 21143, MPM-PV 21144, MPM-PV 21145, MPM-PV 21146, MPM-PV 21147, MPM-PV 21148, MPM-PV 21149, MPM-PV 21150, MPM-PV 21151, MPM-PV 21152, MPM-PV 21153, MPM-PV 21154, MPM-PV 21155, MPM-PV 21156, MPM-PV 21157, MPM-PV 21158, MPM-PV 21159, MPM-PV 21160, MPM-PV 21161, MPM-PV 21162, MPM-PV 21163, MPM-PV 21164, MPM-PV 21166, MPM-PV 21167, MPM-PV 21168, MPM-PV 21170, MPM-PV 21171, MPM-PV 21172, MPM-PV 21173,; MPM-PV 21174, MPM-PV 21175, MPM-PV 21176, MPM-PV 21177, MPM-PV 21178, and MPM-PV 21179, carapace osteoderms.

#### YATEN HUAGENO (12 specimens)

***Prozaedyx proximus***. MPM-PV 20931, carapace osteoderms.

***Stenotatus patagonicus***. MPM-PV 20980, carapace osteoderms.

***Proeutatus oenophorus***. MPM-PV 21066, MPM-PV 21067, MPM-PV 21068, and MPM-PV 21069, carapace osteoderm.

***Cochlops muricatus***. MPM-PV 21082, and MPM-PV 21083, carapace osteoderms.

**Propalaeohoplophoridae**. MPM-PV 21181, ungual phalanx; MPM-PV 21183, osteoderms and postcranial elements; MPM-PV 21182, and MPM-PV 21180, carapace osteoderms.