FIRST PALEOGENE FOSSIL MAMMAL FROM MAGALLANES, PATAGONIA, CHILE

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Abstract. Paleogene fossil mammals mark the initial steps towards the assembly of the highly autochthonous Cenozoic South American faunas, and the rise of evolutionary and ecological novelties within lineages that spread across the continent. Although common to many areas, their greatest diversity and knowledge undoubtedly comes from central Patagonia, where superb exposures in Argentina's extra-Andean and Atlantic coastal zones have been profusely studied since the second half of the 19th century. In harsh contrast, Paleogene mammals from Chilean Patagonia have only recently begun to be known, based on novel discoveries mostly conducted in the Aysén Region. Here we present the first detailed description of a Paleogene mammal from the austral, Magallanes Region, composed of an isolated lower molar identified as a left m1 or m2. The tooth was exhumed from estuarine deposits of the Upper Member of the Río Turbio Formation in Sierra Baguales, along with thousands of chondrichthyan teeth, and other fossil remains belonging to bony fishes, aquatic mammals, and diverse sauropterygians. The particular morphology and dimension of the tooth allow its recognition as *Albertogaudrya unica* Ameghino 1901, a large, middle to early late Eocene member of the order Astrapotheria, previously recorded in central Patagonia of the Chubut Province, Argentina, and the Aysén Region, in Chile. The occurrence of *A. unica* in Sierra Baguales extends by more than 400 kilometers to the south the presence of this iconic Casamayoran through Mustersan age species, also providing a new element to the biogeographic discussions about the cohesive character of the austral faunas, and the early conformation of the regional provincialism that has characterized Patagonia during much of the Cenozoic. It also helps to constrain a 40-37 Ma age for the fossiliferous levels of the Upper Member of the Río Turbio Formation at Sierra Baguales, consistent with previous biochronologic and geochronologic results. Along with the detailed morphological description of the new specimen, we also comment on taphonomic aspects of the depositional context, its regional chronological and zoogeographic importance, and some particularities of the occlusal morphology of the molar, which shows an interesting and unusual pattern of enamel wear whose development and functionality are also discussed.

Key words. Middle Eocene, Casamayoran and Mustersan SALMAs, Río Turbio Formation, accessory dental cusps, Astrapotheria, Sierra Baguales.

Resumen. Primer mamífero Paleógeno de Magallanes, Patagonia, Chile. Los mamíferos fósiles del Paleógeno marcan los pasos iniciales hacia el establecimiento del marcado autoctonismo de las faunas del Cenozoico sudamericano, y el surgimiento de novedades evolutivas y ecológicas entre linajes extendidas a través del continente. Aunque comunes a muchas áreas, su mayor diversidad y conocimiento proviene de la Patagonia central, donde los magníficos afloramientos de la región extra-Andina y la costa Atlántica, en Argentina, han sido profusamente estudiados desde la segunda mitad del siglo XIX. En contraste, los mamíferos paleógenos de la Patagonia chilena han comenzado a ser conocidos sólo recientemente, en base a nuevos descubrimientos realizados en la Región de Aysén. En este trabajo se presenta la primera descripción detallada de un mamífero del Paleógeno para la Región de Magallanes, compuesto por un molar inferior aislado identificado como un m1 o m2 izquierdo. El diente fue exhumado en los depósitos estuarinos del Miembro Superior de la Formación Río Turbio, en Sierra Baguales, junto con miles de piezas dentales de condrictios y otros restos fósiles pertenecientes a peces, mamíferos acuáticos y diversos sauropterigios. La particular morfología y dimensión del diente permite su reconocimiento como *Albertogaudrya unica* Ameghino 1901, un miembro del orden Astrapotheria, del Eoceno medio a tardío temprano, registrado previamente en la Patagonia central de la Provincia de Chubut, Argentina, y la Región de Aysén, en Chile. El descubrimiento de *A.*

unica en Sierra Baguales extiende por más de 400 kilómetros al sur la presencia de esta icónica especie Casamayorense a Mustersense, proporcionando también un nuevo elemento a la discusión biogeográfica sobre el carácter cohesivo de las faunas australes y la conformación temprana del provincialismo regional que ha caracterizado a la Patagonia durante gran parte del Cenozoico. Este nuevo registro también ayuda a establecer una edad de entre 40-37 Ma para los niveles fosilíferos del Miembro Superior de la Formación Río Turbio en Sierra Baguales, concordante con resultados biocronológicos y geocronológicos previos. Junto con la descripción morfológica detallada del nuevo espécimen, se comentan algunos aspectos tafonómicos del contexto depositacional, su importancia cronológica y zoogeográfica, y algunas particularidades de la morfología oclusal del molar, que muestra un interesante e inusual patrón de desgaste del esmalte cuyo desarrollo y funcionalidad son también discutidas**.**

Palabras clave. Eoceno medio, EMAs Casamayorense y Mustersense, Formación Río Turbio, cúspides dentales accesorias, Astrapotheria, Sierra Baguales.

Introduction

South American Paleogene mammals document the definitive establishment and subsequent modernization of early stocks of therian immigrants, that quickly gave rise to the highly autochthonous Cenozoic continental fauna (Simpson, 1980; Pascual *et al.*, 2007; Croft, 2016). Important innovations and biotic dynamics were attained or arose during this period, including the rise in body size disparities within and among clades (Vizcaíno *et al.*, 2012); the diversification of ecological partitioning through marked morphological specializations (Croft *et al.*, 2008; Goin *et al.*, 2012a); and the establishment of the continental biogeographic distinctiveness (Marshall and de Muizon, 1988; Pascual and Ortiz Jaureguizar, 1990; Flynn *et al.*, 2007). These patterns and processes were built and maintained through the interplay of regional-wide diversification dynamics (Buffan *et al.*, 2025), including trans-continental dispersalist events, through episodic migrations (Bond *et al.*, 2015; Goin *et al.*, 2016; Gelfo *et al.*, 2009a; 2019). Additionally, the Paleocene-Eocene also witnessed the final demise of much of the South American endemic Mesozoic non-therian lineages that survived through the K-Pg global extinction event, being the last remnants of a past and still enigmatic Gondwanan radiation (Gelfo and Pascual, 2001; Goin *et al.*, 2012b; Martinelli *et al.*, 2021; Rougier *et al.*, 2021).

While Paleogene fossil mammals are presently recorded across the continent (Marshall *et al.*, 1983; Woodburne *et al.*, 2014; Antoine *et al.*, 2016), most of the current knowledge on the processes of emergence, diversification, and extinction of lineages comes from the superb deposits of central Patagonia in Argentina, especially those located in the provinces of Chubut and northeastern Santa Cruz (Simpson, 1941a, 1967a; Pascual et al., 2002; Carlini *et al.*, 2022). There, sedimentary exposures including notable early Paleocene sites like Punta Peligro, type locality of the Peligran South American Land Mammal Age (SALMA) (Bonaparte *et al.*, 1993; Goin *et al.*, 2022), or the late Paleocene to early Eocene Río Chico Group (Simpson, 1935; Raigemborn *et al.*, 2010), documents faunistic arrangements and turnovers, illustrating evolutionary patterns of community assembly during fluctuating tectonic and climatic conditions. Outstanding in this taxonomic, ecologic, and geographic diversity are the thick volcaniclastic exposures occurring south of Lake Colhué Huapi, Chubut Province, Argentina, commonly referred to as Gran Barranca (Ameghino, 1901, 1904; Simpson, 1948, 1967a; Madden *et al.*, 2010a). There, the middle Eocene through late Oligocene superposed fossiliferous levels of the Sarmiento Formation have yielded one of the most remarkable records of terrestrial mammals of the continent, profusely studied since the end of the 19th century (Ameghino, 1897, 1902; Simpson, 1948, 1967a; Madden *et al.*, 2010b).

In Chile, Paleogene mammals have been described from late Eocene to late Oligocene volcaniclastic deposits along the Andean mountain range of the central zone of the country (Flynn *et al.*, 2005, 2012; Charrier *et al.*, 2015; 2024), including those allowing for the recognition of the early Oligocene Tinguiririca*n* SALMA (Flynn *et al.*, 2003); a relevant component for the understanding of the evolutionary and ecological transformations of South American mammals during the global-scale Eocene-Oligocene environmental transition (Croft *et al.*, 2008; Goin *et al.*, 2010, 2012b; Buffan *et al.*, 2025). Recently, Bostelmann *et al.* (2017, 2021) reported the discovery of middle Eocene mammals in the Aysén Region, Patagonia, including at least seven species representing three different orders. This new fossil assemblage, in turn, represents the oldest therians known in Chile, opening a promising research avenue for the study of the austral zoogeography and its relationship with tectonism, climatic reconfiguration, and biotic responses associated with the Andean orogeny (Pascual *et al.,* 1996; Goin *et al.*, 2012a).

During the last 15 years, paleontological and stratigraphic work carried out in Magallanes, in the Chilean Patagonia, has allowed us to recover hundreds of new fossils, largely expanding our understanding of the evolution in the austral ecosystems (Bostelmann *et al.*, 2013, 2022). Sierra Baguales, located in the northeastern corner of the Última Esperanza Province, next to the Chilean-Argentine border, is one of the most relevant and best-studied areas along this region (Fig. 1). The homonymous mountain range made of eroded Miocene basaltic flows and intercalated volcaniclastic deposits, unconformably overlies a thick stratigraphic succession composed of several lithostratigraphic units, ranging from the Late Cretaceous to the Early Miocene (Gutiérrez *et al.*, 2017; Ugalde *et al.*, 2018), hosting one of the largest, diverse, and best-preserved fossiliferous concentrations in Chile (Otero *et al.*, 2013; Gutiérrez *et al.*, 2019). Previous fieldwork in Neogene outcrops of Sierra Baguales recovered an abundant record of fossil vertebrates, especially mammals (Marshall and Salinas, 1990; Bostelmann *et al.*, 2013). However, Paleogene deposits, composed almost entirely by middle Eocene marginal marine facies (Gutiérrez *et al.*, 2017), deltaic systems (Le Roux *et al.*, 2010; Morales, 2020; Morales *et al.*, 2022), and estuarine complexes (Alarcón, 2020; Alarcón *et al.*, 2023), have only yielded plants, invertebrates, fishes, and sauropsids remains (Otero *et al.*, 2012, 2013; Alarcón *et al.*, 2022). The recent discovery of mammals belonging to both marine and continental taxa (Bostelmann *et al.*, 2022) adds a new Eocene local fossil mastofauna for Chile, contributing to the paleontological knowledge of a period that is barely known on the westernmost flank of the Patagonian foreland.

In this communication we present a detailed description of the first Paleogene fossil mammal of Magallanes, briefly introduced by Bostelmann *et al.* (2022). The fossil, consisting of an isolated lower molar, is assigned to *Albertogaudrya unica* Ameghino 1901, a medium-sized member of the order Astrapotheria, previously recorded in localities of central Patagonia in Argentina and Chile (Ameghino, 1901; Simpson, 1967a; Bostelmann *et al.*, 2021). Astrapotheres were a particular clade of mid-size to gigantic South American native ungulates (SANUs), first recorded during the earliest Eocene Itaboarian/Riochican SALMAs (Paula Couto, 1963; Soria, 1988; Croft *et al.*, 2020) and becoming extinct after the late Middle Miocene Laventan SALMA (Johnson and Madden, 1997; Vallejo-Pareja *et al.*, 2015). Their particular skeleton with graviportal rhino-like proportions in the larger forms, coupled with the development of a small proboscis and hypertrophied canines, undisputedly makes them one of the most bizarre groups of endemic mammals of the continent (Scott, 1928; Riggs, 1935; Croft *et al.*, 2020). By middle Eocene times, astrapotheres attained high diversity, with coexistence of large-sized taxa with derived characters like *Astraponotus* or *Isolophodon* (Kramarz *et al.*, 2010; Kramarz and Bond, 2013) and smaller, basal ones, like *Trigonostylops* and *Tetragonostylops* (Simpson, 1933; Soria, 1982; Kramarz *et al.*, 2019a). The Patagonian endemic *Albertogaudrya unica* was one of these primitive species, constituting the largest of the ancestral, brachydont forms, and certainly, an enigmatic taxon from which little is known other than its general dentition (Ameghino, 1901, 1904; Simpson, 1967a).

Materials and methods

The fossil was collected as surface material over a deflationary exposure at Loma Tiburón Locality 2, a north-south directed flat area south of the Bandurrias River valley (Fig. 2A). The recovered vertebrate assemblage included a large set of chondrichthyan teeth, fish scales, and other tetrapod remains (Otero *et al.*, 2013; Alarcón *et al.*, 2022). Mammals are represented by a few dental pieces, including a lower molar, which is the focus of this communication, and large vertebral centra of cetaceans, all presently under investigation (Bostelmann *et al.*, 2022).

Observations and detailed descriptions of the tooth were performed using a Wild M5 Optical magnifier, while all measurements were taken using a digital Ubermann Vernier caliper, with a ±0.02 mm precision. Images of the fossil were taken at the photo studio facilities of the Millennium Nucleus Early Evolutionary Transitions of Mammals (EVOTEM) in Santiago, using a Nikon Z2 camera with a 50 mm Nikkor Z MC lens, mounted in a Kaiser rs1 Fotostand.

Chronostratigraphic units followed Gradstein *et al.* (2020), and the International Chronostratigraphic Chart on its latest version v2024/12 (updated from Cohen *et al.*, 2013). Aubry *et al.* (2022) nomenclatural recommendations were applied for the Neogene subseries. Biostratigraphic and biochronologic units were recognized following the reasoning exposed in Lucas (2025). Temporal boundaries, extensions, and formal denominations of the biochronological units (SALMAs) followed the initial proposals of Simpson (1940), Pascual *et al.* (1965) and Pascual and Odreman Rivas (1971), amended and complemented by the works of Kay *et al.* (1999), Gelfo *et al.* (2009b), Tejedor *et al.* (2009), Madden *et al.* (2010b), Raigemborn *et al.* (2010), Ré *et al.* (2010), Dunn *et al.* (2013), Woodbourne *et al.* (2014), Clyde *et al.* (2014), Krause *et al.* (2017), and Gosses *et al.* (2021).

The studied specimen is housed in the vertebrate paleontology collection of the Fundación Museo de Historia Natural de Puerto Natales, at Puerto Natales, Magallanes, Chile, and was collected under the authorization provided by Ord. 4706/2010 of the National Monuments Council (Consejo de Monumentos Nacionales) of Chile, as part of the research activities conducted during the development of the Anillo de Ciencia Antártica ACT-105 project.

Taxonomic assignments, dental terminology, and phylogenetic placement of Astrapotheria

Detailed morphological descriptions of the dentition, phylogenetic relationships, and current taxonomic assignments at the generic/specific level within Astrapotheria, followed the works of Kraglievich (1930), Paula-Couto (1952, 1963), Simpson (1967a), Carbajal *et al.* (1977), Soria (1982, 1984, 1988), Soria and Powell (1982), Soria and Bond (1984), and Johnson and Madden (1997), which were reviewed, emended and/or expanded by Kramarz and Bond (2008, 2009, 2011, 2013), Kramarz (2009), Kramarz et al. (2010, 2017, 2019a,b), Bond *et al.* (2011), and MacPhee *et al.* (2021). Nevertheless, dental homologies for structures like crests/cristids and lophs/lophids, used the recommendations of Gelfo (2024). In this sense, the anterior crescent, as mentioned or recognized in previous works (i.e., Bond *et al.*, 2011; Kramarz and Bond, 2009), was here defined as the structure formed by the combination of the paralophid, protoconid, protolophid, and metaconid, while the posterior crescent is understood as the structure formed by the merging of the cristid obliqua, hypoconid, hypoconulid, and the entoconid (Gelfo, 2024). The general orientation of the dental elements followed the proposal of Smith and Dodson (2003), while wear facets were described and named using the terminology of the Modular Wear Facet Nomenclature system proposed by Shultz *et al.* (2018).

The Welker *et al.* (2015) definition of Panperissodactyla was followed here, recognizing the possible inclusion of the order Astrapotheria within this presently unranked group, as part of the Boreoeutheria radiation (for a discussion on this topic, see also Kramarz and MacPhee, 2023).

Specimens utilized for comparison were first-hand observed by E. Bostelmann and/or J. Gelfo in different collections of Argentina, Chile, Perú, Brazil, and the United States of America, or studied from figures in selected publications and high-quality photographs provided by colleagues. A detailed list of all the revised specimens is presented in the Appendix.

Quotation marks

Following international uses and recommendations, quotation marks were employed in this paper to denote informal stratigraphic units, unsolved phylogenetic status, or non-monophyletic taxa.

Institutional Abbreviations—**AMNH**, American Museum of Natural History, New York, United States of America; **DGM,** Divisao de Geologia e Mineralogia do Departamento Nacional da Produção Mineral, Brazil; **FMHN.PV.,** colección de paleontología de vertebrados, Fundación Museo de Historia Natural de Última Esperanza, Puerto Natales, Chile; **IAA-Pv,** repositorio Antártico de Colecciones Paleontológicas y Geológicas, Instituto Antártico Argentino, Colección Paleovertebrados, Argentina; **MACN-A** and **MACN-Pv,** Ameghino and Vertebrate Paleontology collections, respectively, Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina; **MHN,** Tournouër Collection of the Muséum National d'Histoire Naturelle, Paris, France; **MNHN**, colección de paleontología del Museo Nacional de Historia Natural, Montevideo, Uruguay; **MLP-PV,** División Paleontología de Vertebrados, Museo de La Plata, La Plata, Argentina; **MPEF PV,** palaeovertebrate collection, Museo Paleontológico Egidio Feruglio, Trelew, Argentina; **MURAY.PV.,** colección de paleontología de vertebrados, Museo Regional de Aysén, Coyhaique, Chile; **YPM PU**, Yale Peabody Museum, Princeton University Collection, New Haven, United States of America.

Anatomical abbreviations—**co**: cristid obliqua, **cus**: cuspule, **enf**: entoflexid, **ent**: entoconid, **hd**: hypoconid, **hd-db**: hypoconid distobuccal wear facet, **hd-mb**: hypoconid mesiobuccal wear facet, **hyf**: hypoflexid, **lac**: labial cingulid, **m**: lower molar, **md-d**: metaconid distal wear facet, **me**: metaconid, **pld**: paralophid, **pld-cr**: paralophid lingual cristid, **pld-mb**: paralophid mesiobuccal wear facet, **pr**: protoconid, **pr-db**: protoconid distobuccal wear facet, **prld**: protolophid, **wle**: wrinkled lingual enamel.

Other abbreviations—**CA-ID-TIMS**: Chemical Abrasion Isotope Dilution Thermal Ionization Mass Spectrometry. **FA**: Facies association. **Ma**: *megaannum*, million years ago. **MDA/s**: Maximum depositional age/s. **NWA**: Northwestern Argentina. **LA-ICP-MS**: Laser Ablation Inductively Coupled Plasma Mass Spectrometry. **PCM**: patterning cascade model of tooth morphogenesis. **SANU/s**: South American native ungulate/s. **SALMA/s**: South American Land Mammal Age/s. **YDZA/s**: Youngest detrital zircon age/s.

Geological setting

Sierra Baguales contains one of the most extensive and continuous succession of Cenozoic epiclastic deposits in Última Esperanza, making it an important fossiliferous area in southern Chile (Otero *et al.*, 2013; Bostelmann *et al.*, 2013; Fig. 1). Stratigraphic units that crop out include alternations of shallow marine, deltaic, estuarine, and continental fluvial successions, with a total vertical thickness up to 600 m, across the Baguales and Bandurrias drainage basins. The geological units occur on the eastern flank of a wide regional monocline in the external domain of the Patagonian Andes fold-and-thrust belt (Ghiglione *et al.*, 2009, 2021). Temporally, these units range from the Late Cretaceous (Maastrichtian) marginal marine facies of the Dorotea Formation (Manríquez *et al.*, 2020; Morales, 2020; Alée *et al.*, 2023), through the Early Miocene volcanic and volcaniclastic deposits of the "Sierra Baguales Formation" (Bostelmann *et al.*, 2013; Gutiérrez *et al.*, 2017; Münthener, com. pers., 2025). Early Pleistocene volcanic necks and lava flows (Münthener, com. pers., 2025) here termed "Donoso Basalts", other subvolcanic bodies of unknown age, and poorly consolidated Quaternary fluvial and fluvio-glacial deposits, unconformably overlie or intrude the whole sedimentary succession.

Paleogene marginal marine conditions are represented by the Lutetian to Priabonian/Chattian? Río Turbio Formation, previously recognized as the Man Aike Formation in the area (Bostelmann *et al.*, 2013; Gutiérrez *et al.*, 2017). This unit was initially named as "Río Turbio Beds" in the homonymous Argentine coal mining district (Feruglio, 1938), and formally defined and described by Hünicken (1955), who gave a modern definition to the unit (Malumian *et al.*, 2000). Chilean exposures in Sierra Baguales (Morales, 2020) represent the northern geographical continuation of the type and auxiliary sections exposed in the localities of Río Guillermo, Route 40, and Río Turbio coal mine district (Hünicken, 1955; Rodríguez Raising, 2010).

The Río Turbio Formation is mainly composed of epiclastic deposits and is formally divided into a Lower Member dominated by coarse-grained levels, interpreted as deltaic deposits (Morales, 2020; Morales *et al.*, 2022), and an Upper Member, dominated by fine-grained levels, interpreted as estuarine deposits (Gutiérrez *et al.*, 2017; Alarcón, 2020; Alarcón *et al.*, 2022). Both members reflect tectonic and eustatic controls (Alarcón *et al.*, 2023; Morales *et al.*, 2023) during the middle and late Eocene, through the latest Oligocene. Exposures of the Upper Member of the Río Turbio Formation in Sierra Baguales crop out in a northwest-southeast trend along the Baguales river valley and adjacent tributaries, reaching a maximum thickness of up to 92 m (Fig. 3; Alarcón *et al.*, 2023). The unit presents lateral changes in the facies between the northwestern and southeastern exposures, reaching its maximum thickness southeast of Sierra Baguales, in Argentina (i.e., Cancha Carrera, Río Guillermo, Route 40, and Río Turbio village exposures; Rodríguez Raising, 2010; Pearson *et al.*, 2012; Albano *et al.*, 2023). Facies analysis suggests shallow marine to transitional environments developed in a coastal plain, interrupted by estuary mouths (Rodríguez Raising, 2010; Pearson *et al.*, 2012; Ugalde *et al.*, 2018; Alarcón, 2020).

Fossiliferous exposures in Sierra Baguales occur in abrupt cliffs and gullies, interrupted by flat morphologies and ledges, that create deflation planes, where abundant surface-exposed vertebrate fossils are found. The fossil material here described was collected at Loma Tiburón Locality 2 (50°43'41" S; 72°28'17" W), one of these active erosive surfaces forming a north-oriented valley that widens to the northeast, generating a slightly inclined plane, following the dip of the regional monocline (Fig. 2A, B). The erosional nature of this surface limits the precise placement of the tooth in the local stratigraphic scheme. However, the approximate stratigraphic position was constrained by direct correlation with two fossiliferous sections immediately north and south of Loma Tiburón Locality 2; the Chorrillo Jabón (50°42'32" S; 72°28'28" W) and El Encierro (50°44'6" S; 72°28'24" W) stratigraphic logs (Fig. 2B). In Chorrillo Jabón, sixteen lithofacies were described and grouped into eight facies associations (FA1-8; Alarcón, 2020), interpreted as marginal-marine gravel bars and sandbars (FA1 and FA4), tidal channels (FA3 and FA6) and creeks (FA2), intertidal flats (FA5), fluvial braided deposits alternating with overbank fines (FA7) and foreshore deposits (FA8), originated on a mainly tide-dominated estuary (Alarcón, 2020; Alarcón *et al.*, 2022, 2023). Fossil vertebrates were collected in the central portion of the succession, exclusively from massive, fine-grained sandstones and siltstones, grading to medium-grained heterolithic sandstones with subordinated cross-bedded sandstones to the top, with a maximum thickness of 32 m (Fig. 3). These beds were interpreted as tidal channels and creeks of the FA2 and FA3 (Alarcón, 2020; Alarcón *et al.*, 2022; Bostelmann *et al.*, 2022). The associated fossil content includes a diverse array of chondrichthyans, consisting of thousands isolated shark and ray teeth assigned to 19 species (Otero *et al.*, 2013), incomplete plates and postcranial fragments of large sized Testudines, and teeth and osteoderms assigned to Mesoeucrocodylia indet. (Otero *et al.*, 2012). In nearby localities, FA's 2 and 3 also bear bony fish scale agglomerates, disarticulated vertebrae, and bone fragments of at least two different species of Osteichthyes; incomplete bone remains of a large member of Sphenisciformes; and robust cetacean vertebral centra, among others (Bostelmann *et al.*, 2022; Fig. 3). Biochronological constraints, based on the chondrichthyo-fauna from Loma Tiburón localities 1, 2, and Chorrillo Jabón, support a middle to late Eocene age (Bartonian-Priabonian) for the fossiliferous beds (Otero *et al.*, 2013; Alarcón *et al.*, 2022).

Geochronologic control of the Upper Member of the Río Turbio Formation is also provided by several U-Pb ages on detrital zircons in the fossiliferous exposures and at the base and top of the unit in neighboring localities (Fig. 2B). George *et al.* (2020) provide a U-Pb detrital zircon maximum depositional age (MDA) of 40.47 ± 0.26 Ma, from a medium to coarse-grained sandstone ~25 m below the contact between the lower and upper members of the Río Turbio Formation, ~400 m west from the El Encierro site. Ages for the base of the Lower Member were also provided by George *et al.* (2020), from samples collected at the Tetas de Las Chinas hill and the El Encierro site (Fig. 2B). Further south, at the Río Guillermo Valley (Argentina), Fosdick *et al.* (2020) obtained, by the same method, MDAs of 36.6 ± 0.3 and 35.4 ± 0.2 Ma for the upper third of the Upper Member, coincident with a middle to late Eocene biozonation suggested by microfossils, as described in Malumián *et al.* (2000), Guerstein *et al.* (2014), González Estebenet *et al.* (2017), and Amenábar *et al.* (2022). Recently, Albano *et al.* (2023) also obtained a middle Eocene age for the top of the Lower Member at Arroyo Picana, near the international border, based on a U-Pb detrital zircon sample with an MDA of 41.0 ± 3.0 Ma (YDZA of 40.0 ± 1.0 Ma). The sum of all the available information suggests that the Upper Member of the Río Turbio Formation started its deposition immediately after 40 Ma, during the Bartonian age.

Results

Systematic paleontology

Mammalia Linnaeus, 1758

Eutheria Huxley, 1880

?Panperissodactyla Welker *et al.,* 2015

Astrapotheria Lydekker, 1864

Albertogaudrya Ameghino, 1901

Type species: *Albertogaudrya unica* Ameghino, 1901.

Referred species: The type, and *A.*? *carahuasensis* Carbajal *et al.*, 1977.

Comments: The known record of *Albertogaudrya* is restricted to continental deposits from the middle Eocene of Patagonia, in the Chubut Province of Argentina (Ameghino, 1904, 1906; Simpson, 1967a; Cifelli, 1985; Marshall *et al.*, 1986; Kramarz *et al.*, 2019a; Folino *et al.*, 2024), and the Aysén (Bostelmann *et al.*, 2021) and Magallanes regions of Chile (this work). Simpson´s monographic review presented a detailed account of the many taxonomic entities (species and genus) erected by Florentino Ameghino and Santiago Roth that were synonymized by him under *A. unica*, at that time the sole species of the genus (Simpson, 1967a). After this comprehensive work, only a few mentions of this species have been presented in the literature (i.e., Cifelli, 1985; Marshall *et al.*, 1986; Kramarz *et al.*, 2019a), most of them devoted to anatomical comparisons or zoogeographic analyses. Cifelli (1985) listed *Albertogaudrya* in his account of the faunistic assemblage of Cañadón Vaca (Cañadón Vaca Member of the Sarmiento Formation, Vacan subage of the Casamayoran SALMA) in Chubut Province, Argentina, but Kramarz *et al.* (2019a) expressed doubts on the validity of this assignment based on the uncertainty regarding the remains that would have sustained the identification.

On the other hand, *A.*? *carahuasensis* is known solely from its holotype specimen (CNS-PV 10000), composed of a poorly preserved mandible with associated incomplete dentition, collected from middle Eocene continental levels of the Lower Lumbrera Formation in Salta Province, NWA region (Carbajal *et al.*, 1977). Although the fragmentary condition of the type specimen limits comparisons, important differences in the lower dentition (p4-m1) are discernable, including the absence of cingulids in lower molars, a straighter crista obliqua and hypolophid, a narrow and elongated trigonid in m1, and less-marked flexids in the molars, suggesting that this taxon may not be congeneric with the Patagonian form, as previously discussed by others (Carbajal *et al.*, 1977; Kramarz *et al.*, 2019a). Although these differences may support the designation of a new genus for the type material of *A*? *carahuasensis*, the advanced tooth wear in CNS-PV 10000, the absence of better-preserved materials with informative dental characters, and our lack of a direct examination of the type material, make the recognition of a new generic entity inadvisable. López (1997) and Fernández *et al.* (2021) reported indeterminate Eocene astrapotherid dental remains from the NWA region that might resemble the size of *Albertogaudrya,* but their fragmentary nature and/or poor preservation prevent any generic assignment.

Albertogaudrya unica **Ameghino, 1901**

(Figs. 4-5).

Geographic distribution, stratigraphic provenance, and age: Unknown localities, Chubut Province, Argentina (lectotype MACN-A 12000 and MACN-A 12001; Simpson, 1967a). Tapera de López, localities III and VI (=Rinconada de Lopez of Simpson, 1967a, or Tapera de Lopez of Cifelli, 1985), Chubut Province, Argentina. Sarmiento Formation, middle Eocene, Bartonian age, Barrancan subage of the Casamayoran SALMA (Simpson, 1967a; Marshall *et al.*, 1986). Gran Barranca (including localities traditionally recognized as "Colhué-Huapi", "Barranca Sud of Lake Colhué-Huapí", and "Cerro Negro" of Tournouër, 1903 collections, see Simpson, 1964), Chubut Province, Argentina (Ameghino, 1902; Simpson, 1967a; Marshall *et al.*, 1986, Fig. 1). Gran Barranca Member of the Sarmiento Formation, middle Eocene, Bartonian age, Barrancan subage of the Casamayoran SALMA. Cerro Blanco and Cerro del Humo (="Colhué-Huapí Norte" of Ameghino, 1901, and "Cretáceo Superior Lago Muster" of Roth, 1904, collections), Chubut Province, Argentina. Sarmiento Formation, middle or late Eocene, Casamayoran or Mustersan? SALMAs (Simpson, 1967b; Bond and Deschamps, 2010). Cañadón Pelado, Chubut Province, Argentina. "Mustersan levels", middle or late Eocene, Priabonian? age, Mustersan SALMA (Folino *et al.*, 2024). Alto Río Simpson, Estancia La Frontera, Aysén Region, Chile. "Estancia La Frontera beds", middle Eocene, Bartonian age, Barrancan subage of the Casamayoran SALMA (Bostelmann *et al.*, 2021, 2024).

Comments: Although most researchers consider *A. unica* a representative taxon of the Barrancan subage of the Casamayoran SALMA (Simpson 1967a; Kramarz *et al.*, 2019a), it is difficult to rule out its potential occurrence in younger, Mustersan SALMA deposits. This ambiguity is related to the uncertainties on the provenance of historical remains collected at the end of the 19th century, in localities with imprecise geographic and lithostratigraphic information. These include Cerro del Humo (="Colhué-Huapí Norte") and probably Cerro Blanco, near Gran Barranca, where levels carrying both Barrancan and Mustersan faunal assemblages have been recognized (Simpson, 1967b; Bond and Deschamps, 2010). New collections and a detailed study of the fossilization and preservation of the historical specimens (i.e., MACN-A 12002, 12014) could help clarify whether *Albertogaudrya unica* should also be recognized as present in the Mustersan SALMA.

Referred specimen: FMHN.PV.850; left m1 or m2 with complete trigonid and partial talonid (Fig. 4A-D).

Locality and stratigraphic occurrence: western slope of Loma Tiburón Locality 2, Sierra Baguales, Última Esperanza Province, Magallanes, Chile. Upper Member of the Río Turbio Formation, middle Eocene, Bartonian age.

Description and comparisons: The tooth is brachydont (low crowned) and bi-crescentic, preserving the complete trigonid and half of the talonid (Fig. 4). In size and general outlook it matches the right m1 and m2 of MACN-A 12001, *Albertogaudrya unica* (Table 1), being larger than the homologous tooth of *Eoastrapostylops, Antarctodon, Trigonostylops*, *Tetragonostylops, Maddenia,* and *Comahuetherium* (inferred); and smaller and less hypsodont than the molars of *Scaglia* (inferred), *Astraponotus*, *Isolophodon*, *Parastrapotherium*, and all known astrapotheriine and uruguaytheriine astrapotheres (Johnson and Madden, 1997; Kramarz *et al.*, 2009, 2019, 2021; Gelfo, 2024). The occlusal surface shows advanced wear, with wide and well-formed lophids and flattened cusps, attesting to its adult but non-senile condition. The trigonid is almost complete and the talonid lacks its posterior portion, preserving just half of both the entoconid and hypoconid (Fig. 4). The roots are missing, although their contact with the crown is discernible.

The general contour of the preserved portion of the tooth is sub-rectangular with its base constricted by the labial hipoflexid and the lingual flexid, which separates the trigonid from a larger talonid (Fig. 4A). The hypoflexid forms a deep vertical depression posterior to the protoconid and mesially to the level of the metaconid, while the lingual flexid is more pronounced, running straight from the lingual side of the tooth and then turning obliquely in anterolabial direction (Fig. 4A). This configuration separates the distal wall of the metaconid from the mesial border of the entoconid, forming a widely open entoflexid (Figs. 4, 5). As in *Albertogaudrya* and *Maddenia*, a marked labial cingulid is present at the base of the tooth, running uninterruptedly along the border and reaching at least the distal end of the hypoconid (Fig. 4B). The cingulid rises at the mesial edge, bordering the labial wall of the paralophid, becoming nearly obliterated by the wear facet of the paralophid (pld-mb; Fig. 4B, C). Similar to *Albertogaudrya*, *Astraponotus*, and *Maddenia*, a mesiolingual cristid (pld-cr; Fig. 4) is present, enclosing the trigonid basin as an extension of the paralophid. The lingual side of the tooth is uniform, lacking an evident lingual cingulid as in *Albertogaudrya*, *Antarctodon*, *Tetragonostylops,* and *Trigonostylops*, and distinct from *Astraponotus*, *Isolophodon*, *Maddenia,* and more advanced astrapotherines, which have well-developed lingual cingulids (Simpson, 1967a; Kramarz and Bond, 2009, 2013).

As is common in astrapotheriids, the posterior crescent was probably large and distally extended, while the anterior crescent is less developed, bearing a reduced paralophid, as in *Astraponotus*. In lower molars of *Trigonostylops* (MACN-A 10627, 12505)*, Tetragonostylops* (DGM 309-M, 263-M)*, Maddenia* (MPEF PV 7738) and *Isolophodon* (MPEF PV 7475, MLP-PV 12-2139), the paralophid is shorter or absent (Simpson, 1967a; Kramarz and Bond, 2009, 2013), while in *Antarctodon* (MLP-PV 67-II-27-168, IAA Pv 826), *Parastrapotherium* (MACN-A 52-503, 52-506, 52-604), *Astrapotherium* (MLP-PV 12-94, MACN-A 3207, 3209, 3210, 3274-3278), *Astrapothericulus* (MACN-A 52-410, 52-411, 52-605), and the uruguaytheriines it is larger (Bond *et al.*, 2011; Kramarz and Bond, 2008; Kramarz *et al.*, 2019b; Gelfo, 2024). Parallel Hunter-Schreger vertical bands are visible at the occlusal surface of the enamel labial and lingual walls, as recognized in other members of Astrapotheria (Fig. 4A-C).

The trigonid is short and wide, and higher than the preserved portion of the talonid. The metaconid is massive, forming a wide conical cusp that is higher and posteriorly positioned with respect to the protoconid. A broad, oblique, and distolingually directed protolophid connects these two cusps (Fig. 4A), as in *Tetragonostylops*, *Albertogaudrya*, *Astraponotus*, *Isolophodon*, *Astrapotherium*, and *Astrapothericulus*; and distinct from *Antarctodon*, *Trigonostylops*, *Maddenia,* and *Parastrapotherium*, in which the protolophid is less oblique. The protoconid is also massive and conical, although less robust than the metaconid, with labial walls that form an acute angle that gives a marked V-shape to the anterior crescent, similar to the observed condition in *Antarctodon* (IAA Pv 826) and some specimens of *Tetragonostylops* (i.e., DCM 309-M). Compared with *Trigonostylops, Tetragonostylops*, and *Antarctodon,* the combination of the extended paralophid and the labial angularity of the protoconid wall forms a particular morphology exclusive to *Albertogaudrya unica* (Figs. 4A), differing from the remaining members of the order which show protoconids with a rounded labial wall in their molars. The trigonid basin is well-defined and shallow, mostly enclosed by the protoconid and the transversally directed anterior crescent formed by the paralophid and protolophid. On the mesial face of the trigonid, the enamel is broken, exposing a portion of dentin from the paralophid, revealing the area of contact with the distal border of the anterior tooth. The basin opens lingually between the metaconid and the paralophid crest, distinct from homologous known molars of *Trigonostylops, Tetragonostylops*, *Albertogaudrya,* and *Islopohodon*, which present mesiolingually directed open basin as a result of the lack or reduced paralophid and an abbreviated cristid (but see discussion).

Wear facets are present on the labial wall of the protoconid and paralophid, similar to the ones described by Kramarz and Bond (2009) for *Maddenia*. An obliquely oriented mesiolabial facet (pld-mb) is extended mesial to the protoconid, affecting the labial wall of the paralophid and the upper border of the labial cingulid (Fig. 4B). A second wear facet distal to the protoconid cusp (pr-db), forms a small but deep distolabially directed notch. The development of these facets, particularly the pld-mb, certainly accentuates the angular shape of the protoconid wall (Fig. 4C). On the lingual side of the tooth, a wear facet occurs in the metaconid distal wall (md-d), affecting both the enamel band and dentine. It runs obliquely through the distal wall of the protolophid, simultaneously obliterating and smoothing the internal (lingual) wall of the cristid obliqua (Figs. 4A, C). This wear facet also extends into the enamel layer of the flexid, putting it in contact with the distal edge of the protolophid (Fig. 4C).

The talonid presents a wide, short, and rounded crescent as in *Tetragonostylops*, *Albertogaudrya*, *Maddenia*, and *Astraponotus*, and more extended than in *Antarctodon* (Bond *et al.*, 2011; Gelfo, 2024). The tooth is broken through the entoconid and hypoconid, leaving only the anterior half of both cusps and completely missing the distal wall. Despite this, it is possible to infer that the entoconid probably formed a robust and wide cusp, slightly lower than the hypoconid, as in *Albertogaudrya* and *Astraponotus*. The mesial flank of the entoconid is somewhat straighter than that observed in the m1 and m2 of other specimens of *Albertogaudrya* (MACN-A 12001), likely due to more pronounced wear that significantly affects the talonid basin (Figs. 4, 5). The anterior part of the cristid obliqua meets the posterior edge of the protolophid, close to the inner side of the protoconid, as in most Astrapotheria. The talonid basin seems to be wide and shallow and opens lingually in a distal direction (Figs. 4A, C). Similar to the trigonid area, the most noticeable wear facets occur on the labial wall of the tooth. A mesiolabial and a distolabial wear facet are identified on the hypolophid. The first one (hd-mb; Fig. 4C) mainly affects a portion of the hypoconid and the cristid obliqua. In contrast to pld-mb, it does not reach the labial cingulid ending before its contact, closing mesially and following the invagination of the hypoflexid. The second facet, hd-db, is distally interrupted by the tooth fracture but the preserved extension reveals it as shallower than hd-mb, although it seems to widen distally (Figs. 4B, C).

Discussion

Although Magellanic Cenozoic fossil mammals were first discovered in 1895 (Roth 1899; Martinic, 1996), their study has been highly discontinuous and heterogeneous, with knowledge still far from being complete or even satisfactory. Currently almost all published records refer to late Pleistocene species and faunal associations in archaeo-paleontological contexts (Massone, 2004; Borrero, 2009), or brief reports of Early Miocene specimens (Hemmer, 1935; Simpson, 1941b; Marshall and Salinas, 1990; see Bostelmann *et al.*, 2013 for a more ample faunistic description). The discovery of *Albertogaudrya unica* in Sierra Baguales partially fills a temporal gap between the Neogene and younger Magellanic mastofaunas and the recently discovered latest Cretaceous Las Chinas non-therian mammals (Goin *et al.*, 2019; Martinelli *et al.*, 2021), bringing opportunities for the regional correlation during important geobiotic changes. Together with the Aysén discoveries (Bostelmann *et al.*, 2021), the recognition of *A. unica* in Sierra Baguales also represents the oldest occurrence of the order Astrapotheria in Chile, raising the known Chilean diversity of SANUs and contributing to the knowledge on the zoogeography of the austral portion of the continent. South American Paleogene mammals are indeed poorly known south of 48°S, being the present record the first extended description of a terrestrial mammal in the Eocene shallow marine deposits of southern Patagonia and Tierra del Fuego (Malumián *et al.*, 2011; see also Bostelmann *et al.*, 2022, and Kaempfe *et al.*, 2024). Although scarce, the occurrence of other dental elements belonging to a different species, currently under study, demonstrates that the estuarine facies of the Upper Member of the Río Turbio Formation in Sierra Baguales still holds unexplored potential for the search and recovery of continental mammals. However, the environmental and taphonomic settings involved in the formation of these deposits allow us to assume that, if present, these fossils will be scarce and fragmentary.

Taphonomic attributes of the fossil terrestrial vertebrates in shallow-marine and estuarine contexts

Detailed stratigraphic analyses and modes of preservation of the fossil materials need to be considered as fundamental elements when prospecting for inland mammals in marginal marine settings. Unlike previous records of *Albertogaudrya* recovered from fully continental environments, the Magellanic specimen was exhumed from marine transitional levels, interpreted as tidal creeks and channels belonging to an estuarine system (Alarcón *et al.*, 2023). Other fossil vertebrates collected from these exposures in Sierra Baguales include a vast array of aquatic forms (e.g., Fig. 3). Preserved skeletal elements were found disarticulated, mostly formed by dental pieces and incomplete postcranial bones. Aquatic taxa are dominant, with fully marine and estuarine forms including thousands of chondrichthyan teeth, representing over 19 species (Otero *et al.*, 2013; Garrido *et al.*, 2024), scales and vertebral centra of bony fishes, fragmented teeth and miscellaneous bones of crocodilians, and few postcranial elements of turtles, birds, and cetaceans (Alarcón *et al.*, 2022; Bostelmann *et al.*, 2022). While almost all these fossils have been recovered as surface elements in wind-deflection plains lacking a defined lithological context, the occurrence of few *in situ* materials suggests that the bearing beds were part of tidal bars and channels, grouped in the FA3 (Fig. 3). Continental vertebrates are extremely infrequent in the assemblage, represented only by few isolated mammal teeth and maxillary fragments, being the one of *A. unica* here presented the first to be described in detail.

From the perspective of preservational attributes, the low degree of rounding and abrasion, the absence of scratches, and the good general condition of the dental crown, suggest a relatively nearby continental source for the origin of the fossil. Subsequent disarticulation and secondary transport occurred during a relatively short period, likely from marginal fluvial systems adjacent to the estuarine complex. The absence of other bone remains assignable to the same animal suggests that the disarticulation process occurred before the final transport and deposition of the remains. In this context, the presence of a continental mammal in this coastal unit can be interpreted as an allochthonous or parautochthonous component, potentially originating at a short distance from the other vertebrate remains. The greater resistance of the dental enamel to transport and abrasion would have favored the displacement of this tooth from the continental to the transitional environment. Similar situations have been reported in other localities with shallow marine-coastal systems, where continental mammals are equally scarce and represented mostly by isolated incomplete dental pieces or mandibles as in the Argentine deposits of the Banco Negro Inferior bed of the Salamanca Formation at Punta Peligro (Bonaparte *et al.*, 1993; Comer *et al.*, 2015), the Danian levels of the Lefipán Formation at Paso del Sapo (Goin *et al.*, 2006), or the *Cucullaea* 1 Member of the Meseta Formation on Seymour Island, Antarctica (Gelfo, 2009, 2024).

Dental variability and accessory structures in the lower molars of *Albertogaudrya unica*

Dental elements usually form the bulk of the mammalian fossil record, and astrapotheres are not the exception. Nevertheless, lower molars of *Albertogaudrya unica* are certainly infrequent, and inadequately published or figured in the past scientific literature. The detailed description of FMHN.PV.850 allows a preliminary analysis of the variability observed in the other, few well-preserved lower molariforms assigned to this genus, which includes a handful of isolated teeth, and a pair of more complete and associated premolar-molar series (Simpson, 1967a; Appendix).

MACN-A 12001 represents the best-preserved known lower cheek teeth of *A. unica*, and includes both horizontal rami with left p4 and m3, and right p2-m3. FMHN.PV.850 shows the general size and proportions of the right m1 and m2 (Figs. 5B, E), but is lower-crowned due to an advanced occlusal wear, characterized by less prominent cusps (especially the protoconid), and an extended paralophid (Figs. 5A, B, C). The wear pattern of the Chilean tooth is indeed intermediary between the m1 and m2 of MACN-A 12001 (Figs. 5D, E), being closer to the condition observed in the p4 (Fig. 5C). The conspicuous pr-db notch of FMHN.PV.850 is nevertheless absent in all other lower teeth known of the genus (Figs. 5B-E, Appendix).

FMHN.PV.850 bears a cristid obliqua with continuity of the dentine to the protolophid. This connection is narrow, giving an acute angle termination to the cristid. In contrast, the m2 of MACN-A 12001 exhibits the anterior part of the cristid obliqua with extensive wear at the contact with the distal wall of the trigonid, although without a continuous connection between the dentin of the cristid obliqua and the protolophid (Fig. 5B). This, on the contrary, is observed in the m1 of the same specimen. These differences can be explained not only by differential wear among the different parts of the tooth but also by variations in the relative height of the protolophid and the cristid obliqua itself.

A notable morphological difference, which cannot be attributed either to an ontogenetic stage or differential occlusal wear pattern, involves the extension of the paralophid and its descending anterolingual crest. In the Chilean specimen, these structures reach the lingual wall of the tooth, flanking and closing off the mesial border of the trigonid basin (Fig. 5A). In MACN-A 12001, the lophid is shorter (especially on m2 and m3, Figs. 5B, E), and has an internally curved crest that descends into the mid anterior border of the tooth, allowing the opening of a wider, antero-lingually oriented, trigonid basin (Fig. 5B, C, E). This morphology is common in basal astrapotheres, which lack or have reduced paralophids, like *Trigonostylops*, *Tetragonostylops,* and *Antarctodon* (Simpson, 1967; Soria, 1988; Gelfo, 2024). Short paralophids have also been described in more derived forms, like *Maddenia* and *Isolophodon* (Kramarz and Bond, 2009, 2013). The extended paralophid of FNHM.PV.850 mirrors the condition present in *Astraponotus* and later, post-Oligocene forms, in which the structure runs along the complete anterior margin of the molars (Kramarz and Bond, 2008; Kramarz, 2009). These differences are interpreted as part of the intraspecific variability within *Albertogaudrya unica*, given that similar variations in the extent of the paralophid have also been documented in other members of the group (Simpson, 1967a).

The short paralophid of basal astrapotheres is sometimes accompanied by a small conical anterior cuspule. This structure is visible in the p4-m2 of MACN-A 12001, rising from the base of the paralophid crest, and facing the lingual wall of the tooth (Fig. 5B, C, D). In the Chilean specimen, this cusp seems to be absent (Fig. 5A), and no evidence of an early obliteration of it can be noted. Indeed, the uniform thickness and regular dimensions of the base at the lingual wall of the paralophid suggest the lack of this cuspule in FNHM.PV.850. Anterolingual cuspules have also been reported in some specimens of *Trigonostylops* and *Tetragonostylops* (Simpson, 1933; Paula Couto, 1963; Soria,1984), and more recently in *Antarctodon* (Bond *et al.*, 2011; Gelfo, 2024). Simpson (1933) wondered if the rather unusual dental structure in *Trigonostylops* could represent the paraconid, a conjecture also suggested by Paula Couto (1952) for mesiolingual cuspules in lower molars of *Tetragonostylops apthomasi*. Using a non-cladistic approach, Soria (1988) considered this cuspule to be a neomorph structure, proposing the name "neoparaconid", but Gelfo (2024) discussed this concept within a phylogenetic framework in *Antarctodon sobrali*, dismissing Soria´s (1988) suggestion. In MACN-A 12001, these small cuspules seem to be placed in the area in which a paraconid could be expected (anteriorly facing the metaconid, Figs. 5 B, C), supporting Simpson´s (1933) and Paula Couto´s (1952) conjectures for basal astrapotheres. This stands in accordance with the reported evolvability of mammalian dental cusps and development models of tooth morphogenesis (Hunter and Jernvall, 1995; Jernvall, 2020). An alternative explanation for the origin of this structure, which warrants further exploration using a larger sample, may involve a rudimentary, incipient, or aborted expression of the lingual cingulid. This hypothesis may be further supported by recognizing the paralophid crest and the anterior cuspule as marginal extensions of the precingulid; with both elements exhibiting symmetry relative to the position of the opposing mesiolabial cingulid. The latter, in turn, displays a slightly crenulated surface formed by irregular bony projections, which are also visible at the posterior portion of the lingual side in specimen MACN-A 12001, forming an incipient cingulid on the m2, and specially the m3 (wrinkled lingual enamel, Fig. 5D). This interpretation suggests that the developmental pathway of this anterior cuspule may parallel that of other accessory external structures like the lingual shelf or Carabelli's cusps in upper molars, extensively studied in hominid dental development (van Reenen and Reid, 1995; Ortiz *et al*., 2012, 2018).

Accessory dental structures like cuspules, crests, and tubercles have been described in lower and upper definitive molars of basal and derived astrapotheres, and upper deciduous premolars in *Parastrapotherium*, *Astrapothericulus,* and *Astrapotherium* (Kramarz, 2009). Individuals in these genera also display lower molariforms with tall bunoid accessory dental columns attached to the posterior wall of the protolophid, forming what Scott (1937) called "pillars" (Kramarz and Bond, 2008; Kramarz, 2009; Gelfo, 2024). Some upper deciduous premolars (and infrequently molars) in *Astrapothericulus* and *Astrapotherium* display accessory cuspules in the form of a small tubercle attached to the central valley or the labial wall of the crista, which can also be associated with a small crest (Kramarz, 2009). These accessory structures achieved taxonomic value in the past (Ameghino, 1904; Scott, 1937) and even Kramarz (2009), in his detailed revision of the genus *Astrapothericulus*, avoided the synonymy of *Astrapothericulus emarginatus* Ameghino 1904, based on the existence of the accessory tubercle in the type upper molar. He also suggested that the occurrence of the small ridge aligned with the protocone, metacone, and accessory cusp in the type material of *A. peninsulatus* (junior synonym of *A. emarginatus* sensu Kramarz, 2009) and other Astrapotheriidae, such as *A. iheringi*, could represent vestigial elements of the postprotocrista.

While differentially positioned, we speculate that the small cuspules observed in specimens of *Albertogaudrya* (and *Trigonostylops* and *Tetragonostylops*) may share a similar origin with other accessory cuspules, tubercles, and "pillars" observed in derived lineages. The expression of these accessory structures could represent vestigial elements formed following a general tooth development program, inhibited during most of the evolution of the group. As stated by others (Jernvall, 1995, 2000; Zanesco *et al.*, 2019), we suggest that the formation and disposition of these structures likely represent an example of the patterning cascade model of tooth morphogenesis (PCM), associated with the initiation and inhibition of primary and secondary enamel knots, the spacing of cusps, and the timing of crown growth (Skinner *et al.*, 2008; Ortiz *et al.*, 2018). The expression of these accessory cusps could bring mechanical support for the expansion of the lophs and lophids, increasing the occlusal surface area while assisting in greater mechanical improvement in the contact with antagonistic teeth. Although intriguing, the mechanisms that produce accessory dental elements in astrapotheres and other SANUs, together with their functionality, homologies, and even recurrence within populations, are far from being properly understood. At the current state of knowledge, we can only hypothesize on the correspondence of these structures with dental development models mostly studied on mice, seals, primates, and fossil hominids (Ortiz *et al.*, 2018; Chapple *et al.*, 2024). In Astrapotheria, these accessory structures should be presently interpreted as intraspecific phenotypic expressions within lineages, with significant variability across individual dental loci. They may reflect dental morphogenesis at the enamel-dentine junction following the PCM, as suggested for other groups of mammals (Skinner et al., 2008; Salazar-Ciudad and Jernvall, 2010; Zanesco *et al.*, 2019), facilitating modular responses for mechanical adaptation. Potential advantages of such responses might include enhanced occlusal surface area, improved masticatory efficiency, and increased dental resistance, as has been suggested for other structures like cingulids, and the Carabelli's trait of *Homo* upper molars (Anderson *et al.*, 2011; Fiorenza *et al.*, 2020). Alternatively, accessory cusp development could represent deviations from the PCM, including the involvement of crest patterning during cusp morphogenesis, independent ameloblast responses during enamel deposition, and/or genetic alterations or developmental disruptions (Riga *et al.*, 2014; Ortiz *et al.*, 2017; Chapple and Skinner, 2023). All these models need to be addressed and further investigated in astrapotheres and other SANUs. Finally, the potential homoplastic nature of accessory cusps must be considered when utilizing them in phylogenetic inferences and taxonomic characterizations (Ortiz *et al.*, 2017, 2018), and their inclusion in such analyses as independent characters should probably be reconsidered or directly avoided.

Wear facets and masticatory attributes of *Albertogaudrya unica*

The marked lateral development of the wear facets of the molar FMHN.PV.850, especially those located on the labial side of the paralophid, protoconid, and protolophid, represents something unusual in Astrapotheria, which demands the discussed comparison with the few known molars of *Albertogaudrya unica* and other astrapotheres.

The development of wear facets involves significant components derived from the morphology of the upper teeth during occlusion. This allows inferences about the upper dentition, based on the understanding that these facets constitute part of the same evolutionary module (Schultz *et al.*, 2018, 2020). In the Chilean specimen of *Albertogaudrya unica,* there are several wear facets, particularly well-developed on the labial side. The paralophid wear facet (pld-mb, Fig. 5A) is commonly associated with wear generated by the distal end of the metacone in the upper preceding tooth, plus the mesial side of the paracone of the upper occlusal tooth. In the case of the specimen AMNH 28639 of *Albertogaudrya unica* used for comparison (right P4-M1; see Simpson, 1967a), the ectoloph extends only a short distance from the metacone fold towards the distal side of the tooth but continues as a functional parastylar fold on the adjacent molar, and probably at least the mesial portion of their paracone. This functional zone in the upper teeth may account for the extensive development of the observed pld-mb facet (Fig. 5).

In FMHN.PV.850, the distolabial wear facet in the protoconid (pr-db, Fig. 4) is likely the result of the action of the protoloph and parastyle fold from the upper molar. Notably, pr-db is much smaller than the facet mentioned on the paralophid (pld-mb). The md-d wear and the pr-db, are probably the remnants of the protolophid wear facet on its distal side, formed during the initial stages of wear.

Distal to the hypoflexid of FMHN.PV.850, there are two main facets associated with the hypoconid: the hd-mb and hd-db. In more bunoid dentition, these correspond to the facets described by Shultz *et al*. (2018) in the upper teeth, located in the distal edge of the paracone (PA-d) and the mesial zone of the metacone (ME-m). The well-developed ectoloph in *Albertogaudrya,* where the recognition of these cusps is limited to the labial enamel folds of the paracone and metacone, suggests that the wear facets hd-mb and hd-db are linked to the more occlusal edge of enamel. In the case of the paracone fold in the M1 of the specimen AMNH 28639, the development is much more pronounced than in the metacone fold, which may indicate the greater depth and extent of hd-mb compared to hd-db in the specimen under study. This wear is similar to what is observed in the lower molars of *Maddenia lapidaria*, where wear facets labial to the protoconid were described (Kramarz and Bond, 2009), and likely corresponds to those here described as pr-bd and pld-mb. Other basal taxa, like *Trigonostylops*, or more derived as *Astrapothericulus,* also exhibit a similar development of wear facets on the labial side. In the latter case, a similar development of the labial cingulid is also present. These facets are particularly evident in the m1 of *T. gegenbauri* (MLP-PV 121736) and in the m2 of *A. iheringi* (MACN-A 52-410), where the pr-db, as well as part of what would correspond to pld-mb, are also present, although not as deep as those described for FMHN.PV.850. They also show wear facets in the labial side of the hypolophid; however, in contrast to their extension in the *Albertogaudrya* specimen described here*,* on these taxa, they are restricted to the more mesial part. In *T. gegenbauri,* the only evident facet is the hd-mb likely due to the proportionally less mesiodistal extension of the talonid. In *A.*

iheringi, where the hypolophid is proportionally longer, the exclusive presence of this facet could be related to slight differences in occlusion during the masticatory process.

In lateral view, the labial cingulid of *T. gegenbauri* and *A. iheringi* is concave in the talonid, ascending both on the distal side and towards the hypoflexid. The somewhat straighter labial cingulid in the talonid of the specimen of *Albertogaudrya* FMHN.PV.850 (Fig. 4B) appears to be an artifact since the distal portion of the tooth is missing. The mesial portion of the labial cingulid in *Albertogaudrya* differs from the aforementioned taxa, as it ascends directly from the inflection at the hypoflexid and is mesially obliterated by the pld–mb facet. These labial wear facets do not seem to be present in *Astrapotherium*, in which the labial cingulid is also reduced or even absent in many cases.

These differences in the development of wear facets not only reflect variations in occlusal relationships with the upper antagonistic teeth but may also be influenced by the development of higher crowns and increased hypsodonty. These features are particularly evident in *Albertogaudrya, Maddenia*, and *Astrapothericulus*.

***Albertogaudrya unica* as a biochronological element during the middle to early late Eocene in Patagonia**

Astrapotheres were common in Patagonia during the Paleogene (Simpson, 1967a; Cladera *et al.*, 2004; Kramarz *et al.*, 2019a, 2022), also present during the early Eocene in the Antarctic Peninsula (Bond *et al.*, 2011; Gelfo, 2024). This frequency makes the group useful for biochronological, biostratigraphic, and biogeographic regional correlation, especially considering the numerous specimens collected from localities or exposures with controlled stratigraphic position and associated isotopic ages (Madden *et al.*, 2010; Dunn *et al.*, 2013; Kramarz *et al.*, 2022).

Albertogaudrya unica constitutes a conspicuous late Casamayoran (Barrancan subage) through Mustersan species of extra-Andean Patagonia, mostly known from remains collected in the Chubut Province, Argentina. Although somewhat ambiguous, the majority of these specimens come from middle Eocene deposits of the Sarmiento Formation, with older records linked to the Gran Barranca Member at Gran Barranca (i.e., Barranca south of Lake Colhué Huapi, Simpson, 1967b), type locality of the Barrancan subage of the Casamayoran SALMA (Cifelli, 1985; Madden *et al.*, 2010). Dunn *et al.* (2013) provided a U-Pb (CA-ID-TIMS) single zircon age for a tuff from this member of 39.861 ± 0.037 Ma (by CA-ID-TIMS), while Ré *et al.* (2010) integrated ^{40}Ar/^{39}Ar dating and magnetochronology, suggesting a depositional age (corrected after Ogg, 2020) between Chron 19r (41.180–42.196 Ma) and Chron C18n.1n (38.398–39.582 Ma). Both studies then constrained the Barrancan subage of the Casamayoran SALMA in Gran Barranca to the lapse between 42.2-38.4 Ma. It has been discussed that *Albertogaudrya unica* also occurs in Mustersan age fossil assemblages (Simpson, 1967a, b; Folino *et al.*, 2024), which at Gran Barranca are represented by the Rosado and the Lower Puesto Almendra members of the Sarmiento Formation. Dunn *et al.* (2013) conservatively constrained the age of the Mustersan SALMA at Gran Barranca between 38.2–38.0 Ma, while paleomagnetic data (Ré *et al.*, 2010) suggested an age (corrected after Ogg, 2020) between Chron C18n.1n and the top of Chron C17n.1n, namely 38.398–37.385 Ma. As such, the biochron of *A. unica* would expand between 42.2 and 37.4 Ma, middle to early late Eocene, late Lutetian to early Priabonian ages.

Bostelmann *et al.* (2021) were the first to record the occurrence of *Albertogaudrya unica* in Chilean rocks, based on isolated dental elements collected from volcaniclastic deposits informally named "Estancia La Frontera beds" at the Alto Río Simpson, in the Aysén Region, Patagonia. The detailed lithological, stratigraphic, and paleontological analysis of these rocks favors a direct correlation with the Gran Barranca Member of the Sarmiento Formation, in Argentina (Bostelmann *et al.*, 2024). A middle Eocene age for similar exposures was presented by Gianni *et al.* (2017), who obtained a U-Pb (LA-ICP-MS) zircon age of 39.9 ± 0.6 Ma from a tuff sample collected in outcrops near El Pedregoso, in the Meseta del Chalía (Argentina), 20 km north of the Alto Río Simpson fossiliferous outcrops at Estancia La Frontera (Bostelmann *et al.*, 2021, 2024).

The discovery of *Albertogaudrya unica* in Magallanes extends the known geographic distribution of this species by 400 kilometers to the south, from central Patagonia to the southern extreme of the continent, at around latitude 51°S. The new record provides a biochronological datum for the fossiliferous beds of the Upper Member of the Río Turbio Formation in Sierra Baguales, which presently lacks direct isotopic dating, but features an important and consistent marine fossil record. The geological and biochronological context previously summarized, supports a middle Eocene age for *A. unica* in Sierra Baguales, consistent with the suggested Bartonian to early Priabonian age of the Upper Member of the Río Turbio Formation based on its diverse chondrichthyo-fauna (Otero *et al.*, 2013; Garrido *et al.*, 2024), and known sedimentological, stratigraphic, and isotopic information recorded in Chile and nearby Argentina (Casadío *et al.*, 2009; Fosdick *et al.*, 2020; George *et al.*, 2020; Alarcón *et al.*, 2022, 2023; Morales *et al.*, 2022, 2023). George *et al.* (2020) obtained a U-Pb detrital zircon age with an MDA of 40.47 ± 0.26 Ma for the top of the Lower Member of the Río Turbio Formation near El Encierro creek, 30 m stratigraphically below the lowest Loma Tiburón fossiliferous levels. The available evidence therefore suggests that a 40-37 Ma, Bartonian to Priabonian age, could be confidently assigned for the exposures at Loma Tiburón Locality 2. However, the lack of more complete and diverse mammal remains currently hinders a precise assignment of this Paleogene local fauna to either the Barrancan subage or the Mustersan SALMA.

Establishment of the Patagonian biogeographic provincialism

The taxonomic affinities of the Alto Río Simpson fossil mammals at Estancia La Frontera in Aysén (Bostelmann *et al.*, 2021) demonstrate that typical Casamayoran age faunas were present westward, reaching the foothills of the Andes, well beyond their known core localities in the central Patagonian plateau and the Atlantic coast (Cifelli, 1985; Pascual *et al.*, 2002; Carlini *et al.*, 2022). This taxonomic similarity provides evidence of a well-established regional biogeographic provincialism across Patagonian faunas, which by the middle Eocene extended at least from latitudes 41° (Vera *et al.*, 2020) to 46°S (Bostelmann *et al.*, 2021). The present record of *Albertogaudrya* in Magallanes (Fig. 6), adds a new element for the southward extension of this biogeographic pattern, up to 51°S, reaching the northwestern limits of the Paleogene epicontinental marine embayment, which by that time covered most of eastern Magallanes and Tierra del Fuego (Malumián and Náñez, 2011; Morales *et al.*, 2023). The southern extension of this faunal provincialism has also been recently sustained with the preliminary recognition of a notoungulate with affinities to *Puelia sigma* in estuarine facies of the Loreto Formation at Río de las Minas, near the city of Punta Arenas, 53°S (Kaempfe *et al.*, 2024). *Puelia sigma* is another Barrancan?-Mustersan species, previously recorded at different localities of northern Chubut and Río Negro provinces in central Patagonia, Argentina (Simpson, 1967a; Martínez, 2018; Kramarz *et al.*, 2022). Although scant, these new Magellanic records suggest that by middle Eocene times, a regional mammal component was present along the southern cone of South America, constituting assemblages characterized by low local endemism and high ecological disparity (Simpson, 1967a; Kramarz *et al*., 2022; Bostelmann *et al.*, 2021, 2022; Bostelmann, 2024).

The origin of this biogeographic pattern can be traced back to the early Eocene or even the Paleocene, at least in the extra-Andean territory and the Atlantic coastal exposures of Chubut. There, Peligran, "Sapoan" and Itaboraian/Riochican faunas, provide an early indication of the composite nature of the mammal assemblages, mostly formed by well-diversified typical "South American groups", like marsupials, notoungulates, litopterns, astrapotheres, and dasypodids, among others (Simpson, 1935; Tejedor *et al.*, 2009; Goin *et al.*, 2016, 2022), and relic elements of the latest Late Cretaceous-Neogene non-tribosphenic mammals (monotremes, meridiolestidans, and gondwanatheres). Unfortunately, the absence of Paleocene or early Eocene fossil mammals south of 44° S makes the generalization of this hypothesis highly speculative. Most of the typical "South American" therian lineages likely originated and flourished in the middle and low latitudes of the Neotropical Region during the latest Cretaceous-Paleocene, derived from earlier Laurasian (North American) stocks. These lineages subsequently dispersed towards the Austral region, following hyperthermal conditions associated with the climatic optima of the early and late Paleocene, and early Eocene (Pascual *et al.*, 1996; Bowen *et al.*, 2015; Carneiro and Oliveira, 2022; The Cenozoic CO_2 Proxy Integration Project [CenCO$_2$PIP] Consortium, 2023). After their establishment and diversification, they built the homogeneous and cohesive character of the middle to late Eocene Patagonian faunas (Woodbourne *et al.*, 2014; Goin *et al.*, 2016; Goin, 2022).

The auspicious future identification and prospection of new Paleocene and early Eocene fossiliferous deposits in the Chilean Patagonia (Fosdick *et al.*, 2020; Garrido *et al.*, 2022, 2024), will enable us to test the real timing and extent of the proposed regional provincialism pattern. This will help to develop a robust model of the processes and ways in which this biogeographic homogenization was achieved. A pattern that, despite multiple instances of species turnover, displacement, and replacement associated with global climatic shifts during the late Eocene to early Oligocene, late Oligocene, and Early Miocene (Goin et al., 2010, 2012; Buffan *et al.*, 2025), was preserved with notable coherence across Patagonia, at least until the onset of the Neogene (Flynn *et al.*, 2002; Vizcaíno *et al.*, 2022; McGrath *et al.*, 2020, 2023; Bostelmann, 2024).

Conclusion

We document the first Paleogene mammal from the Magallanes Region, Chile, a relevant area for understanding early biogeographic patterns in Patagonia, intercontinental connections between South America and Antarctica, and the evolution and development of southern mammal faunas in a broad temporal context. This new record represents the first mention of a continental Paleogene mammal south of 46° S, and also the first occurrence of a fully terrestrial vertebrate in the extensive marginal marine deposits of the middle Eocene Magallanes Basin. The fossil is composed of a medium-sized, isolated left m1 or m2, assigned to the primitive astrapothere *Albertogaudrya unica*, representing the second mention of this species in Chile, and extending its known geographic distribution more than 400 kilometers towards the south.

The described tooth is similar to other lower molars of *Albertogaudrya unica*, although some notable differences are evident. These include an extended paralophid that contacts the lingual wall, and the development of unusual wear facets: namely, an extended and lateralized paralophid mesiobuccal wear facet (pld-mb), and a notch-like protoconid distobuccal wear facet (pr-db). While this seems to differ from the common pattern observed in known lower molars of *Albertogaudrya unica*, we interpreted it as part of an intraspecific variability, reflecting a particular occlusal contact between the trigonid and the opposing upper molar. Accessory dental structures present in the upper and lower teeth of astrapotherids, such as isolated cusps and bunoid structures, are analyzed in the light of morpho-developmental teeth models, questioning their utility as valuable and independent phylogenetic or taxonomic characters.

The presence of *A. unica* in northern Magallanes allows us to infer an age between 40-37 Ma for the fossiliferous levels of the Upper Member of the Río Turbio Formation present at Loma Tiburón Locality 2, in Sierra Baguales. This age is concordant with published geochronological information of the unit in Chile and nearby Argentina, and the rich and highly informative fossil chondrichthyan assemblage. From a biochronological and biogeographic perspective, *Albertogaudrya unica* can be considered a characteristic species of the Barrancan subage and Mustersan SALMA of Patagonia (late Lutetian to early Priabonian age), supporting the hypothesis of the establishment of a biogeographic provincialism in Patagonia, as early as the beginning of the middle Eocene.

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Appendix

List of analyzed specimens

Antarctodon sobrali: MLP-PV 08-XI-30-1 (holotype); IAA Pv 826.

Trigonostylops wortmani: AMNH 28700; MACN-A 10627; MACN-A 10653; MACN-A 12505; MACN-PV CH 1211; MPEF PV 5482.

Trygonostylops gegenbauri: MLP-PV 12-1736 (type).

Trygonostylops sp.: MLP-PV 56-XII-18-43-54; MLP-PV 59-II-24-216-219; MLP-PV 59-II-24-286-287; MLP-PV 59-II-24-409; MLP-PV 59-II-24-518-520; MLP-PV 59-II-24-701; MLP-PV 59-II-24-482-484; MLP-PV 66-V-5-96; MLP-PV 69-III-27-9; MLP-PV 69-III-26-1.

Tetragonostylops apthomasi: DGM 355-M; AMNH 49831, 49832, 49836, 49854, 49838, 49839, 49861, 49862, 49863; MLP-PV 69-I-9-8.

Tetragonostylops cf. *T. apthomasi*: MPEF PV 5479.

Albertogaudrya unica: MACN-A 10635, 12000, 12001, 12002, 12004 (type of *Albertogaudrya separata*), 12005 (type of *Scabellia cyclogona*), 12007 (type of *Albertogaudrya oxygona*), 12008, 12014 (type of *Albertogaudrya regia*); AMNH 28639, 28640, 28641, 28947; MHN Tournouër collection N°10; MURAY.PV.004.

Albertogaudrya? *carahuasensis*: CNS-PV 10000 (1, 2) (holotype).

Scaglia cf. *S. kraglievichorum*: MPEF PV 5478.

Astraponotus spp.: MACN-A 10971, MLP-PV 12-1471, 12-2217, 67-II-27-28, 67-II-27-379, 67-II-27-167, 83-III-3-1, 82-V-7-2, 69-III-24-295; MPEF PV 1084, 1279, 1296.

Maddenia lapidaria: MPEF PV 6113, 7696a, 7709, 7732, 7738, 7848.

Isolophodon aplanatus: MLP-PV 12-2139, MPEF PV 7475.

cf. *Isolophodon cingulosus*: MLP-PV 61-VIII-3-387.

Parastrapotherium holmbergi: MACN-A 52-503 (syntype of *P. trouessarti*), 52-506 (syntype of *P. trouessarti*).

Parastrapotherium martiale: MACN-A 52-604 (holotype).

Astrapothericulus iheringi: MACN-A 52-410, 52-411, 52-417, 52-419, 52-605.

Astrapotherium magnum: MACN-A 3207, 3209, 3210.

Astrapotherium burmeisteri: MLP-PV 12-94 (type), MACN-A 3274-3278 (type of *A. giganteum*).

Astrapotherium burmeisteri?: YPM PU 13168.

Uruguaytherium beaulieui: MNHN 213 (holotype).

Figures

Figure 1. Geographic context and study area. **A.** Map of South America demarking in inset B central and southern Patagonia. **B.** Detail of the localities (yellow circles) in which *Albertogaudrya unica* has been previously recorded in central Patagonia. The black square denotes Sierra Baguales that is detailed in inset C. Main cities are denoted by purple circles. **C.** Geographic map of Sierra Baguales, Magallanes, Chile, and detailed study area (red square) expanded in Figure 2. Key cities are shown as purple circles. The hillshade basemap was obtained from the free repository of ArcGIS Pro 3.1, built over the ALOS PALSAR shuttle mission, the GeoEYE Satellite constellation and the USGS database.

Figure 2. **A.** Panoramic view towards the northeast of Loma Tiburón Locality 2, with eroded outcrops of the Upper Member of the Río Turbio Formation. The white star marks the location where FMHN.PV.850 was collected. Photograph courtesy of José Luis Oyarzún Barría. **B.** Geologic map of the study area in Sierra Baguales with discussed locations, dates, and geographic references. The Purple bar denotes the Chorrillo Jabón stratigraphic section of Alarcón (2020). Yellow boxes depict sample locations of George *et al.* (2020) with published detrital zircon U-Pb ages in the area, expressed as weighted maximum depositional ages MDAs.

Figure 3. Stratigraphic section of the Upper Member of the Río Turbio Formation at Chorrillo Jabón locality. The section lies 2 kilometers to the northwest of Loma Tiburón Locality 2. Black silhouettes mark the approximate stratigraphic position of fossil vertebrates collected as surface materials. Colors in the stratigraphic logs represent the fresh-rock original tones. For interpretation

of the references to color in this figure legend, the reader is referred to the web version of this article.

Figure 4. *Albertogaudrya unica* Ameghino, 1901. FMHN.PV.850, incomplete left m1 or m2. **A.** Occlusal view. **B.** Labial view. **C.** Antero-lateral view. **D.** Lingual view. Abbreviations: **co**: cristid obliqua, **enf**: entoflexid, **ent**: entoconid, **hd**: hypoconid, **hd-mb**: hypoconid mesiobuccal wear facet, **hd-db**: hypoconid distobuccal wear facet, **hyf**: hypoflexid, **lac**: labial cingulid, **me**: metaconid, **md-d**: metaconid distal wear facet, **pld**: paralophid, **pld-cr**: paralophid lingual crest, **pld-mb**: paralophid mesiobuccal wear facet, **pr**: protoconid, **pr-db**: protoconid distobuccal wear facet, **prld**: protolophid. Scale bar: 10 mm.

Figure 5. Compared teeth of *Albertogaudrya unica* in occlusal view. **A.** FMHN.PV.850, left incomplete molar, Sierra Baguales, Magallanes. **B.** MACN-A 12001 (lectotype), inverted right m2. C. MACN-A 12001 (lectotype), inverted right p4. **D**. MACN-A 12001 (lectotype), lingual view of the right molar series, m1-m3. **E**. MACN-A 12001 (lectotype), inverted occlusal view of the right molar series, m1-m3. Anatomical abbreviations as in Fig. 4, and **cus**: cuspule, **wle**: wrinkled lingual enamel. Scale bars: 10 mm.

Figure 6. Idealized artistic reconstruction of *Albertogaudrya unica* at the Eocene coastal plain in Sierra Baguales, Última Esperanza Province, Magallanes, Chile. Illustration by Jorge Blanco.