

NOTA PALEONTOLOGICA

Parrots (Aves, Psittaciformes) in the Pleistocene of Uruguay



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Introduction

Cyanoliseus Bonaparte, 1854 (Psittaciformes, Psittacidae, Arini) is the most frequent parrot in the Pleistocene record of Argentina. It comprises three species: the extinct *C. ensenadensis* (Cattoi, 1957) Tonni, 1972 and *C. patagonopsis* Acosta Hospitaleche and Tambussi, 2006, and the extant *C. patagonus* (Vieillot, 1817). A complete list of the Pleistocene Psittacidae known at the present is given by Acosta Hospitaleche and Tambussi (2006) and Tambussi *et al.* (2007). Nowadays, the burrowing parakeet *Cyanoliseus patagonus* (Psittacidae, Arini) is found in Argentina and the center of Chile, occasionally reaching Uruguay in winter (Collar, 1997; Bucher and Rodriguez, 1986) (figure 1). This paper reports the presence of *Cyanoliseus* in the Pleistocene of Uruguay, the first fossil parrot recorded in this country; comments about the environmental are also reported.

Materials and methods

The material under study was compared with all living species inhabitant Uruguay and representatives of all genera of parrots living in Argentina (Appendix 1). Osteological terminology from Baumel and Witmer (1993) was used for the descriptions and their English equivalents through the discussion. Measurements are in millimeters with 0.1 mm accuracy.

The specimens studied are housed at the Museo Nacional de Historia Natural y Antropología, Montevideo, Uruguay (MNHN); Paleontología Vertebrados of the Facultad de Ciencias,

Universidad de la República, Uruguay (FC-DPV); Museo de La Plata, La Plata, Argentina (MLP); Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina (MACN).

Systematic paleontology

Order PSITTACIFORMES Wagler, 1830
Family PSITTACIDAE Illiger, 1811
Tribe ARINI Smith, 1975

Genus *Cyanoliseus* Bonaparte, 1854

Type species. *Cyanoliseus patagonus* (Vieillot, 1817).

Remarks. The presence of the following associated characters is suitable to identify both humeri as *Cyanoliseus*: (1) deep and wide *incisura capitis*, (2) presence of a small tubercle in the center of the distal edge of the humerus head, (3) well developed crista deltopectoralis and (4) a deep *incisura intercondylaris*.

Comparative description. The distal extension of the crista deltopectoralis is larger than that of the crista bicipitalis, while in *Brotogeris*, *Pionus*, *Pyrrhura*, *Forpus* and *Pionopsitta*, both cristae are similar in their extension. As with other species of *Cyanoliseus*, the small tubercle in the center of the internal distal edge of the humerus head is present. The *sulcus ligamentorum transversus* is deeper and wider than in *Amazona*, *Ara*, *Nandayus*, *Aratinga*, *Myiopsitta*, *Brotogeris*, *Pionus*, *Pyrrhura*, *Pionopsitta*, *Anodorhynchus* and *Forpus*. The *fossa musculus brachialis* is deeper than in *Ara*, *Aratinga*, *Amazona*, *Pionus*, *Pionopsitta*, *Pyrrhura*, *Myiopsitta*, *Forpus*, *Anodorhynchus* and *Brotogeris*. The *condylus dorsalis* is elongated, while in *Amazona*, *Ara*, *Aratinga*, *Myiopsitta*, *Brotogeris*, *Pionus*, *Pyrrhura*, *Pionopsitta*, *Anodorhynchus* and *Forpus*, it is rounded. The *condylus ventralis* is oval and asymmetric, whereas in *Amazona*, *Ara*, *Brotogeris*, *Pionus*, *Pyrrhura*, *Pionopsitta*, and *Forpus* is symmetric.

The *incisura intercondylaris* is wider than in

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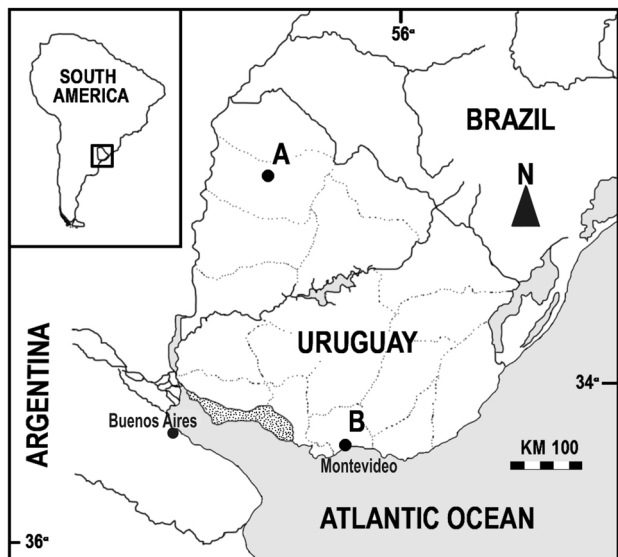


Figure 1. Location map showing the fossiliferous locality in Uruguay (A: *Cyanoliseus ensenadensis*; B: *C. patagonus*). Shaded area indicates the current area of occurrence of *Cyanoliseus patagonus* in Uruguay / mapa de Uruguay señalando la ubicación de las localidades donde fueron exhumados los fósiles (A: *Cyanoliseus ensenadensis*; B: *C. patagonus*). El área sombreada indica el sector actual de distribución de *Cyanoliseus patagonus*.

Amazona, Ara, Nandayus, Aratinga, Myiopsitta, Brotogeris, Pionus, Pyrrhura, Pionopsitta, Anodorhynchus and *Forpus*, and the *incisura capitis* is wider and deeper than in *Amazona, Ara, Nandayus, Aratinga, Brotogeris, Pionus, Pyrrhura, Pionopsitta, Anodorhynchus* and *Forpus*.

Cyanoliseus patagonus (Vieillot, 1817)

Figure 2

Material. Complete right humerus (MNHN 1716).

Geographic locality. Department of Canelones, Balneario San Luis (Interbalnearia Route, km 64.5), Uruguay; coastal cliffs near the Río de la Plata estuary (34° 47' S; 55° 37' W) (figure 1).

Stratigraphic provenance. Libertad Formation (Pleistocene).

The fossil comes from a stratigraphic level composed by quartz-feldspar sands (reworked loess) at 90 cm under a horizon of calcretes (paleosoil). In this place the sediments -referred to the Libertad Formation- are composed of loess, reworked loess, brownish siltstone, paleosols, and fluvial deposits (Loureiro *et al.*, 2002). Further details about the age of these sediments are not possible at this stage. However, on the basis of its stratigraphic relationships, some authors have considered to be lower to middle Pleistocene in age (Bossi and Navarro, 1991; Panario and Gutiérrez, 1999).

Comments. According to the compared material, the

humerus length of living *C. patagonus* ranges from 47 to 51 mm (n=8). The length of the humerus of the MNHN-1716 specimen is included into the confidence limits of the mean of *C. patagonus* which indicates a non significant statistical difference between the fossil remains and the available sample for this character. Its size is intermediate between *C. patagonopsis* and *C. ensenadensis*.

Some differences allow us to differentiate it from *C. patagonopsis*: the *tuberculum dorsale* is proportionally bigger, the *condylus dorsalis* is more rounded and its edges are less acute, the *condylus ventralis* is more asymmetric, the *tuberculum supracondylare ventrale* is less robust, and the *sulcus ligamentorum transversus* is not so expanded.

Cyanoliseus ensenadensis (Cattoi, 1957)

Figure 3

Material. Right humerus without distal portion (FC-DPV-1417).

Geographic locality. Sopas creek, Salto Department (31°15' S 57°00' W), Uruguay (figure 1).

Stratigraphic provenance. Brownish mudstones of the Sopas Formation (late Pleistocene). This unit is widespread in northern Uruguay and is in general characterized by massive brownish mudstones, sandstones and conglomerates formed mainly in a fluvial environment, but also including paleosols (Ubilla *et al.*, 2004).

Comments. *C. ensenadensis* is the smallest species of

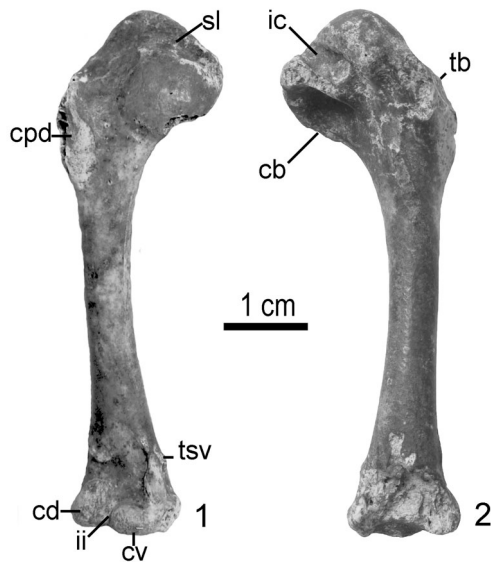


Figure 2. Humerus of *Cyanoliseus patagonus* MNHN 1716. 1, cranial view; 2, caudal view / *húmero de Cyanoliseus patagonus* MNHN 1716. 1, vista cranial; 2, vista caudal. **cb**, *crista bicipitale*; **cd**, *condylus dorsalis*; **cdp**, *crista deltopectoralis*; **cv**, *condylus ventralis*; **ic**, *incisura capitis*; **sl**, *sulcus ligamentorus transversus*; **tb**, *tuberculum dorsale*; **tsv**, *tuberculum supracondylare ventrale*.

the genus *Cyanoliseus*. The studied humerus is smaller than *C. patagonus*. The holotype, until now the only known specimen, measures 44.7 mm length. Although the *sulcus ligamentorum transversus* is small in this genus, it is even less expanded in *C. patagonopsis* and *C. patagonus*.

Discussion and conclusions

The Pampean Region of *Cyanoliseus* indicates that the three species lived during the Pleistocene, but only the two smallest species have been found in Uruguay: *C. ensenadensis* and *C. patagonus*.

Coincidentally, all fossil species of *Cyanoliseus* are diagnosed using humeri, which are useful bones in the identification of these taxa. The humeral characters are: 1- a distal extension of the deltopectoral crest bigger than the bicipital crest, 2- a small tubercle in the center of the internal distal edge of the humerus head, 3- a deep and wide transverse ligamentary groove, 4- a deep brachial fossa, 5- an oval and asymmetric ventral condyle, 6- an enlarged dorsal condyle with its proximal end more acute, 7- a wide and deep capital groove, and 8- a broad dorsal tubercle.

The MNHN 1716 is morphologically indistinguishable from that of modern species. *Cyanoliseus patagonus* is a winter migrant whose presence in Uruguay was confirmed at the end of the 70's (Cuello, 1985; Azpiroz, 2001), and is recorded today in southwest of Uruguay, but only sporadically (Claramunt and Cuello, 2004) (figure 1).

The associated paleofauna with *Cyanoliseus patagonus* recovered from Libertad Formation at San Luis locality includes passerine birds, colubrids, and anurans (Rinderknecht, 1998, Claramunt and Rinderknecht, 2005), a woodpecker of the genus *Colaptes* Vigors, 1826 Rinderknecht and Claramunt, 2000), rodents of the genera *Akodon* Meyen, 1833 and *Galea* Meyen, 1831, and an assemblage of typical Pleistocene mammals (Ubilla and Rinderknecht, 2001). The co-occurrence of the likely grazer *Glyptodon* Owen, 1839, the grass mouse *Akodon*, the cui *Galea* and this parrot supports, the idea of the presence of open or semiopen environments, considering the environmental adaptations inferred or known for these taxa (Rood, 1972; Walker, 1975; Scillato-Yané *et al.*, 1995; Fariña and Vizcaíno, 2001). Living burrowing parrots almost always nest in holes (Masello and Quillfeldt, 2002), in the banks of rivers and other steep. An analysis related to environmental variables that could constrain the distribution of living representatives of *C. patagonus*, indicates subhumid to semiarid climates associated with 600-800 mm of annual precipitation (Tambussi *et al.*, 2007).

The other fossil parrot described here belongs to



Figure 3. Humerus of *Cyanoliseus ensenadensis* FC-DPV-1417. 1, cranial view; 2, caudal view / *húmero de Cyanoliseus ensenadensis* FC-DPV-1417. 1, vista cranial; 2, vista caudal.

C. ensenadensis, characterized by its size and the transversal ligament groove which is less expanded than that of *C. patagonopsis*. *Cyanoliseus ensenadensis* is the smallest species of the genus, being a third smaller than the living species *C. patagonus* and two thirds smaller than the extinct *C. patagonopsis* (Acosta Hospitaleche and Tambussi, 2006).

Fauna associated with the humerus FC-DPV-1417 attributed to *C. ensenadensis* includes a variety of fossil vertebrates such as glyptodonts, horses like *Equus neogeus* and *Hippidion principale*, *Machrauchenia patachonica*, *Toxodon platensis*, deer like *Ozotoceros*, mostly related to open or semiopen environments (Ubilla, 2004; Ubilla *et al.*, 2004) with a TL/OSL age of 43.5 +/- 3.6 ka BP (Ubilla, 2004). Earthworm aestivation chambers described from this layer indicates a seasonal climate (Verde *et al.*, 2007). In the Sopas Formation birds were found from different outcrops: aff. *Rhea* sp. Brisson, 1760, *Chloephaga picta* (Gmelin, 1789) and *Cariama cristata* (Linnaeus, 1766) (Ubilla *et al.*, 2004; Tambussi *et al.*, 2005). Open to semiopen environment under seasonal climatic conditions are suggested by paleoicnological evidence (Verde *et al.*, 2007) and the record of seriemas and magellan geese. According to mammalian biostratigraphic information, the faunal assemblage is correlated to the Lujanian Age/Stage of the Buenos Aires province, and ¹⁴C ages are >43 ky BP (Ubilla *et al.*, 2004), which is older than the fauna of the Guerrero Member of the Lujan Formation (between 21ka and 10 ka BP, Cione and Tonni, 1999; Tonni *et al.*, 2003) of the Pampean Region.

In Argentina, *Cyanoliseus ensenadensis* has been recorded at Olivos (Ensenadan Formation) instead assignable to the Ensenadan stage (early to middle Pleistocene). Biostratigraphically, they are defined by

the presence of fossil mammals such as *Mesotherium cristatum* Serrés, 1867, *Arctotherium angustidens* Gervais and Ameghino, 1880, *Theriodictis platensis* Mercerat, 1891, *Glyptodon munizi* Ameghino, 1881, *Neosclerocalyptus pseudornatus* (Ameghino, 1889) Paula Couto, 1957 and *Eutatus seguini* Gervais, 1867. Taking into account biostratigraphic and absolute ages available (Ubilla, 2004), the record of *C. ense-nadensis* in Uruguay belongs to later sediments than those of Argentina.

Until now, the fossil record of *Cyanoliseus* was limited to the Pleistocene of Argentina. Consequently, the material reported here not only expands the geographic range of *Cyanoliseus* during the Pleistocene, but is also the first time that any fossil Psittacidae has been reported from Uruguay. Therefore, the record of these parrots increases our knowledge of the Uruguayan Pleistocene avifauna, where Psittaciformes have never previously been found.

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Appendix I. List of extant species and materials used for comparisons. Fossil specimens are indicated with # / lista de especies y materiales utilizados para las comparaciones. Los especímenes fósiles están indicados con #.

Amazona aestiva (Linnaeus, 1758) MLP 621, MACN 27741, 17308; *Ara chloropterus* Gray, 1859 MACN 53522, 20986; *Ara militaris* (Linnaeus, 1766) MLP 408; *Aratinga acuticaudata* (Vieillot, 1818) MLP 68; *Aratinga aurea* (Gmelin, 1788) MLP 342, MACN 54878; *Aratinga leucophthalma* (Statius Muller, 1776) MLP 407, MACN 20404; *Anodorhynchus hyacinthinus* (Latham, 1790) MACN 23591, 23590, *Brotogeris versicolus* MLP 348, MACN 18238; *Cyanoliseus patagonus* (Vieillot, 1817) MLP 65, MLP 260 a-g (n=8) and #MLP 81-VII-20-21, *C. ensenadensis* #MACN 17716, *C. patagonopsis* #MLP 81-VII-20-20, *Forpus passerinus* (Linnaeus, 1758) MACN 54856, *Myiopsitta monachus* Boddaert, 1783 MLP 66, 262, *Nandayus nenday* (Vieillot, 1823) MLP 257, 405, 406, *Pionopsitta pileata* (Scopoli, 1769) MLP 67, *Pionus maximiliani* (Kuhl, 1820) MLP 343, MACN 17309, *Pyrrhura frontalis* (Vieillot, 1818) MLP 351, MACN 17307.