

## COMMENT ON «EL REGISTRO MAS ANTIGUO DE *HIPPIDION* OWEN, 1869 (MAMMALIA, PERISSODACTYLA) EN AMERICA DEL SUR» BY J. PRADO, M. T. ALBERDI AND M. REGUERO

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### Introduction

The Pampean area of Argentina (mainly in the Bonaerian region) includes the most complete biostratigraphic representation of the continental latest Miocene to Recent times in South America (Pascual *et al.*, 1965; Marshall *et al.*, 1983, 1984; Cione and Tonni, 1995a, b, c, 1996). It has been demonstrated that first occurrences of several mammal taxa of Holarctic origin in the late Cenozoic beds of the Pampean area are relevant for establishing the local biostratigraphic scheme and understanding those migration events that resulted in a remarkable modification of the indigenous fauna. One of these taxa is the family Equidae. The first appearance of horses in South America is recorded from sediments of a new local late Pliocene stage, the Marplatan, which replaces the former «Uquian Land-mammal age» of Pascual *et al.* (1965) according to Cione and Tonni (1995a; fig. 1).

In a recent publication, Prado *et al.* (1998: 90) stated that the oldest record of the family Equidae (and «indudablemente» of the genus *Hippidion*) in South America comes from the stratotype of the «Uquian», near the Uquía village (23° 18'S, 65° 21'W; Quebrada de Humahuaca, provincia de Jujuy, Argentina). In the same paper (p. 85), these authors suggest that «no se debe descartar la validez» of the «Uquian Land-mammal age».

We briefly comment herein the equid record from Uquía and the validity of the Marplatan as an age older than the Ensenadan and younger than the Chapadmalalan.

### Discussion

1. «Uquian Land mammal age» vs Marplatan Stage/Age.

Prado *et al.* (1998: 90) stated that «...respecto a la «Edad-mamífero» Uquiense, consideramos que no es aconsejable descartar su validez. La localidad de Esquina Blanca tiene varias ventajas sobre los afloramientos de la costa Bonaerense, ya que es una secuencia con una singular potencia, donde los niveles portadores de mamíferos están asociados a tobas volcánicas y donde existen valiosos datos paleomagnéticos. Si bien los registros nuevos con precisión estratigráfica son aún escasos, los nuevos trabajos de campo son prometedores».

We have extensively discussed the history, conceptual development, correlation, and faunal record of the «Piso Uquiense» and equivalent units elsewhere (Cione and Tonni, 1995a, b). We suggested that the Uquía Formation is not valid as a stratotype of a chronostratigraphic (or even biochronologic) unit and proposed a new local chronostratigraphic (and geochronologic) unit, the Marplatan, with type sections in the Bonaerian sea coast cliffs. We also took the «Uquian» case as a base for discussing the «Land-mammal age» concept and their use in South America. Besides, the Código Argentino de Estratigrafía (1992) recommend not using the term «Edad mamífero» («Land mammal age»). Some of Ameghino's views about the late Cenozoic standard scale were reassessed and the timing of the late Cenozoic American interchange of mammals was revised then (Cione and Tonni, 1995a, b).

Besides, we considered necessary to establish an accurate vertebrate biostratigraphic framework in a suitable area to obtain an empiric base for correlation to other regions, paleobiologic studies (paleobiogeography, community evolution, macroevolution) and environmental reconstruction. For this, we proposed a succession of biostratigraphic units in the fossiliferous late Cenozoic strata of the Pampean area: *Trigodon gaudryi*, *Neocavia depressidens*, *Paraglyptodon chapadmalensis*, *Platygonus scagliai*, *Akodon (Akodon) lorenzini*, *Paractenomys chapadmalensis*, *Toly-*

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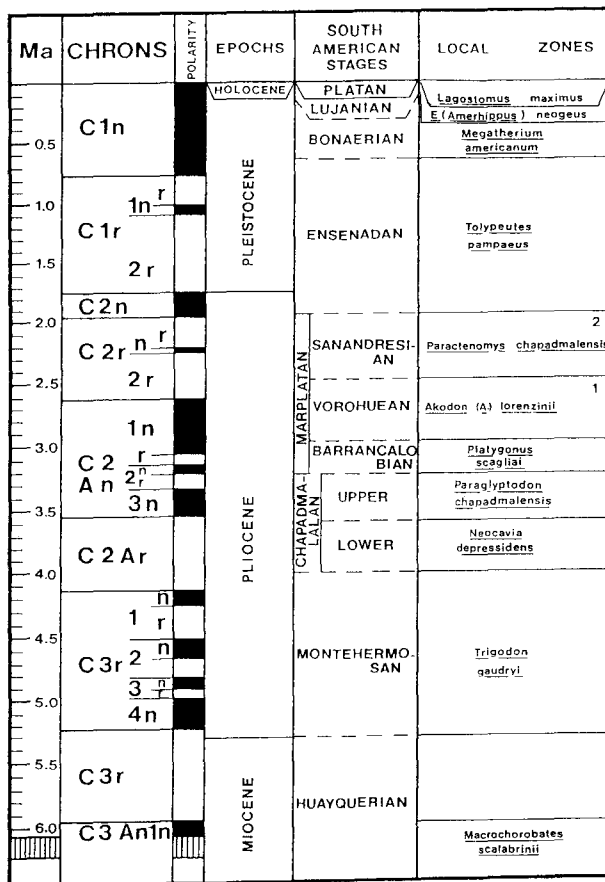


Fig. 1.—Pliocene to Holocene chronology of southern South America in comparison with the magnetostratigraphic scale (Cande and Kent, 1992) and the Global Stratigraphic Chart. Pampean mammal biostratigraphy is included (Cione and Tonni, 1995a, b, 1996, 1999; Tonni *et al.*, 1999). Paleomagnetic chrons are according to Berggren *et al.* (1995). Broken lines in the stages column indicate our uncertainty about the exact location of boundaries. Numbers in the biozones column indicate: 1, specimen MMP381, assigned to *Hippidion devillei* by Alberdi and Prado (1995). 2, specimens MLP95-IX-1-3 and MLP 95-IX-1-4 (housed in the Museo de La Plata), and MNCN 5363, MNCN 5365 and MNCN 5369 (housed in the Museo Argentino de Ciencias Naturales «Bernardino Rivadavia») from Uquía Formation which were assigned to *Hippidion devillei* by Prado *et al.* (1998).

*peutes pampaeus*, *Megatherium americanum*, *Equus (Amerhippus) neogeus*, and *Lagostomus maximus* biozones (Cione and Tonni, 1995a, b, 1996, 1999; Tonni *et al.*, 1998; Cione *et al.*, 1999). These biozones are the basis for defining the Montehermosan, lower Chapadmalalan, upper Chapadmalalan, lower Marplatan, middle Marplatan, upper Marplatan, Ensenadan, Bonaerian, Lujanian, and Platan stages in the Pampean area. Besides, those biozones are being tested with additional fossil evidence and calibrated with isotopic and magnetostratigraphic methods (Tonni *et al.*, 1999a, b).

Concerning to the «Uquian», we found that the sections of the Quebrada de Humahuaca were not adequate as type sections of a stage-age younger than Chapadmalalan and older than Ensenadan because:

1) The Uquía Formation has no stratigraphic relationships with other significantly fossiliferous units and is tectonically disturbed (see description in Prado *et al.*, 1998). There is no recognized sequence of fossiliferous units in the area representing the late Cenozoic such as can be found in different sections in the Pampean area. For the moment, in the late Cenozoic units of the Quebrada de Humahuaca, only can be distinguished the Maimará Formation, with the isolated record of a procionid that could be Huayquerian in age, and the Uquía Formation, type of the «Uquian» (Cione and Tonni, 1995a, b).

2) In the Uquía Formation, there are not abundant micromammals or other mammals (Castellanos, 1950; D. Berman, M. Bond, M. Reguero, C. Quintana, personal commun; ALC, personal observation) and taxa identified need revision (Cione and Tonni, 1995a). The former faunal list of the «Uquian» was found highly inexact (e.g. the erroneous first appearance of five new families of North American origin: Ursidae, Felidae, Tapiridae, Gomphotheriidae, and Cervidae; see Tonni *et al.*, 1992; Cione and Tonni, 1995a, b). We considered that the «Uquian Stage» (or «Land-mammal age») has not been adequately defined (or characterized). We do not agree with the statement that the recent surveys gave promising results (Prado *et al.*, 1998: 90). Actually, both the old and new material are fragmentary and very few taxa were recorded (see the list of this field work in Esquina Blanca, Chucalezna and San Roque in Walther *et al.*, 1996, 1998 and Prado *et al.*, 1998).

We have proposed the new stage Marplatan because the rocks cropping out in the Bonaerian coastal cliffs are a better stratotype for a stage younger than Chapadmalalan and older than Ensenadan and the proposed stratotype is located more than 1800 km to the southeast of the type area of the «Uquian» (Cione and Tonni, 1995a, b). There is adequate thickness, the area is free of important structural complications and metamorphism, and several geologic and magnetostratigraphic studies have been carried out. Presently,  $Ar^{40}$ - $Ar^{39}$  laser fusion dating in the underlying uppermost beds of the Chapadmalalan was also done (Schultz *et al.*, 1998a, b; Zárate *et al.*, 1998). These dates support magnetostratigraphic studies in the Bonaerian coast (e.g. Orgeira, 1991) and contradict the interpretation by Prado and Alberdi (1994) and Ortiz Jaure-

guizar *et al.* (1995; see our fig. 2). However, the most important reason for using the coastal outcrops is the remarkable fossil content (with abundant micromammals) in very accessible sections.

Finally, while it is true that the Uquía Formation is thick and amenable to magnetostratigraphic studies and radiometric dating, it possibly spans a smaller part of the time that represents the post-Chapadmalalan and pre-Ensenadan sequence in the Pampean area. According to biostratigraphic evidence (*Paractenomys chapadmalensis*, *Glyptodon*), radiometric dates, and magnetostratigraphic analyses, Walther *et al.* (1996, 1998; see also Prado *et al.*, 1998) suggested that the middle and upper levels of the Uquía Formation at Esquina Blanca, should be correlated with the Sanandresian (Zone of *Paractenomys chapadmalensis*) and the lowermost levels (paleomagnetic site 4; from where no equid fossil was reported) could be perhaps older than Sanandresian. Additionally, Walther *et al.* (1996, 1998) correlated the section with the early Matuyama Chron (Chron C2 An to C2r; younger than 2.6 Ma; late Pliocene). These conclusions agree with the magnetostratigraphic studies (e.g. Orgeira, 1991 and papers cited therein) and radiometric dating in Buenos Aires area (Schultz *et al.*, 1996, 1998) (see also Tonni *et al.*, 1999b).

Prado *et al.* (1998) reinterpreted the profile at Esquina Blanca of Marshall *et al.* (1982). However, they wrongly located the dates in the section because they inverted them. The sample LGM 202 with a date of  $3.54 \pm 0.04$  million years, was actually obtained from the lowest dacite tuff (about 25 m), and the sample LGM 201, with dates of  $3.7 \pm 0.5$  and  $3.8 \pm 0.2$ , from the upper reworked vitric tuff (150 m; see Marshall *et al.*, 1982). The cause of the mistake probably lies on that the older dates come from samples stratigraphically higher than the younger ones. Besides, Marshall *et al.* (1982) considered as valid younger dates for the same levels, not considered by Prado *et al.* (1998) but discussed by Cione and Tonni (1995a, 1999).

## 2. Supposed first South American record of Equidae in the Uquía Formation.

Equid remains come from middle and upper levels of the Uquía Formation (Prado *et al.*, 1998) which seem to be correlated with the Sanandresian (Zone of *Paractenomys chapadmalensis*; Walther *et al.*, 1996, 1998; see also Prado *et al.*, 1998, p. 89). In the Pampean area, equids are first recorded in the Zone of *Akodon* (*Akodon*) *lorenzinii* (biostratigraphic basis of the Vorohuean substage; see Alberdi and Prado, 1993: 14; see also Reig, 1957; Cione and Tonni, 1995: 147, 149) which underlies the typical Zone of *Paractenomys chapadmalensis* (Sanandre-

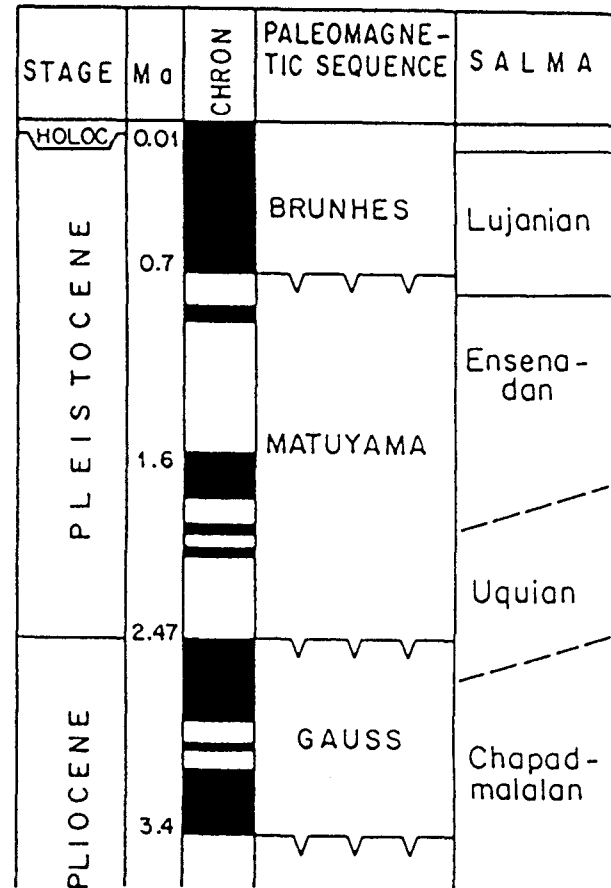


Fig. 2.—Pliocene to Holocene chronology of southern South America by Prado and Alberdi (1994). Note the treatment of «Land mammal ages», with diachronic boundaries. The «stage» label actually correspond to epoch. The lower boundary of «Uquian» (= Marplatan) is remarkably young in comparison with the new  $Ar^{40}-Ar^{39}$  laser fusion dating of the uppermost beds of Chapadmalalan (3.3 Ma according Schultz *et al.*, 1998a, b). This new dating is close to the age determinations using magnetostratigraphy in the area and the Quebrada de Humahuaca (see Orgeira, 1991; Walther *et al.*, 1996, 1998). In the Pampean area, the upper beds of the Vorohuean and Sanandresian present reversed polarity, which suggests that they range to the Chron C2r (younger than 2.6 Ma; see Cione and Tonni, 1999). Boundaries between chrons correspond to papers previous to that of Cande and Kent (1992).

sian substage). The record consist in a skull formerly referred to *Onohippidium* by Reig (1957) which comes from Vorohuean beds at the locality Baliza Chica, near Miramar, partido de General Alvarado and is housed in the Museo Municipal de Ciencias Naturales de Mar del Plata (collection number: MMP 381). Remarkably, this stratigraphic provenance was accepted by Alberdi and Prado (1992: 270; 1993: 13) and the material was formerly identified as *Hippidion principale* (Lund, 1845) (which is a species found in the Bonaerian-Lujanian) by them. Later, Alberdi and Prado (1995:

297) assigned the Baliza Chica material to *Hippidion devillei*. Accordingly, Alberdi and Prado (1996: 664), in a range chart, do not include the species *Hippidion principale* in the «Uquian». Presently, there is debate concerning equid systematics in South America. If the view of MacFadden (1997) is accepted, *Onohippidium* would be the oldest equid genus in South America but if the view of Alberdi and Prado (1998) is accepted, *Hippidion* would be the oldest equid genus in the continent.

In sum, there is no published evidence sustaining that equid remains from the Quebrada de Humahuaca are older than those from the Vorohuean beds at Baliza Chica in the Atlantic coast (this latter a record not considered by Prado *et al.*, 1998). On the contrary, there is biostratigraphic evidence (for the moment restricted to two taxa) that supports that Uquía remains are younger.

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