

## A NEW KARYOTYPE OF *Cebus apella* (CEBIDAE, PLATYRRHINI) FROM ARGENTINA

Marta Mudry<sup>1</sup>, Irma Slavutsky<sup>1</sup>, Gabriel Zunino<sup>2</sup>, Alejandra Delprat<sup>1</sup> and  
Alejandro Brown<sup>3</sup>

### ABSTRACT

Blood samples of three wild specimens of *Cebus apella* ( $2n = 54$ ) from NE Argentina that were identified as *C. apella vellerosus* were analyzed. The G banding pattern was similar to *C. apella paraguayanus* except for pair 11. C banded karyotypes showed the loss of the large heterochromatic block of pair 11, characteristic of other subspecies of *C. apella*. Pairs 3, 5, 12, 13 and 19 conserved the variably sized intercalary bands which occur in other *C. apella*. Chromosomes 17 and 20 showed inconsistent heterochromatic blocks. Ag-NOR bands were studied in one individual and three positive NORs corresponding to the secondary constrictions of pairs 22 and 23 were observed. The finding of a new karyotype associated with a particular phenotype and geographic range confirms that *C. apella* is not karyologically uniform and shows variations at the subspecies level.

### INTRODUCTION

Two subspecies of Black capped capuchins, *Cebus apella*, have been described for Argentina (Cabrera, 1957). *C. apella paraguayanus* inhabits Montane Forest in the NW (Salta and Jujuy provinces) between 300 and 1700 m, and *C. apella vellerosus* in the Paranaense Forest of the NE (Misiones province) between 200 and 400 m (Crespo, 1950, 1974, 1982; Kinzey, 1979; Brown, 1984). Northwestern populations are phenotypically similar to the ones living in southern Bolivia and eastern

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<sup>1</sup> Sección Citogenética, Instituto de Investigaciones Hematológicas "M.R. Castex", Academia Nacional de Medicina, Pacheco de Melo 3081, 1425 Buenos Aires, Argentina. Send correspondence to M.M.

<sup>2</sup> Centro Argentino de Primates (CAPRIM), Corrientes, Argentina.

<sup>3</sup> Escuela Superior de Bosques, Universidad Nacional de la Plata - UNLP, Argentina.

Paraguay (Mantecón *et al.*, 1984) and are considered to be the same subspecies (Cabrera, 1957). On the other hand, northeastern populations, from Misiones, are phenotypically different from the northwestern sub-species (Mantecón *et al.*, 1984; Brown, in press).

Despite studies describing intra- and interindividual heteromorphisms unrelated to phenotypic or geographic features in *C. apella* specimens from three regions of Brazil (Freitas and Seuánez, 1982; Torres, 1988), other studies have found important chromosomal differences associated with a subspecific level as in the case of *C. apella xanthosternos* (Seuánez *et al.*, 1986). Based on captive individuals from NW Argentina and Buenos Aires Zoo, the karyotype of Argentinian *C. apella* was formerly regarded to be uniform (Mudry de Pargament *et al.*, 1984, 1987). C and G banding patterns of these individuals matched the ones described for *C. apella paraguayanus* (Seuánez *et al.*, 1983; Mantecón *et al.*, 1984; Matayoshi *et al.*, 1986). A recent analysis of one specimen from Misiones (Mudry, 1990) revealed important differences between subspecies.

In this paper we describe cytogenetically three additional specimens of *C. apella* from different locations of Misiones, whose karyotypes coincide with the above mentioned individual from this province. We suggest that this peculiar karyotype is widely distributed in the NE population, having evolved independently from the ones in Paraguay or NW Argentina. It would be related to specimens from SW Brazil.

## MATERIAL AND METHODS

We analyzed the peripheral blood lymphocytes of three adult male specimens of *C. apella* from Comandante Andresito and Iguazú National Park, in Misiones Province (Figure 1). The two specimens from the first locality were local people's pets captured near the town, and the one from Iguazú was darted (Pneudart rifle, 50 mg/ml Ketamine HCl) and released. Each specimen was described phenotypically considering pelage color and distribution.

Cultures of peripheral blood lymphocytes were made at 37°C for 72 hs in F-10 medium supplemented with Phytohemagglutinin and 15% Fetal Calf Serum. Cells were exposed to Colchicine (Demecolcin, Ciba) (0.12 mg/ml medium) for 1.5 hs before harvesting. Chromosomes analysis was performed by standard techniques, taking into account chromosome size and morphology. Chromosome formula and modal number (2n) were established by scoring at least 30 well spread metaphases. G- (Seabright, 1971), C- (Summer, 1972) and Ag-NOR banding (Goodpasture and Bloom, 1975) techniques were carried out, and the observed karyotypes were compared to *C. apella paraguayanus* (Mudry *et al.*, 1984).

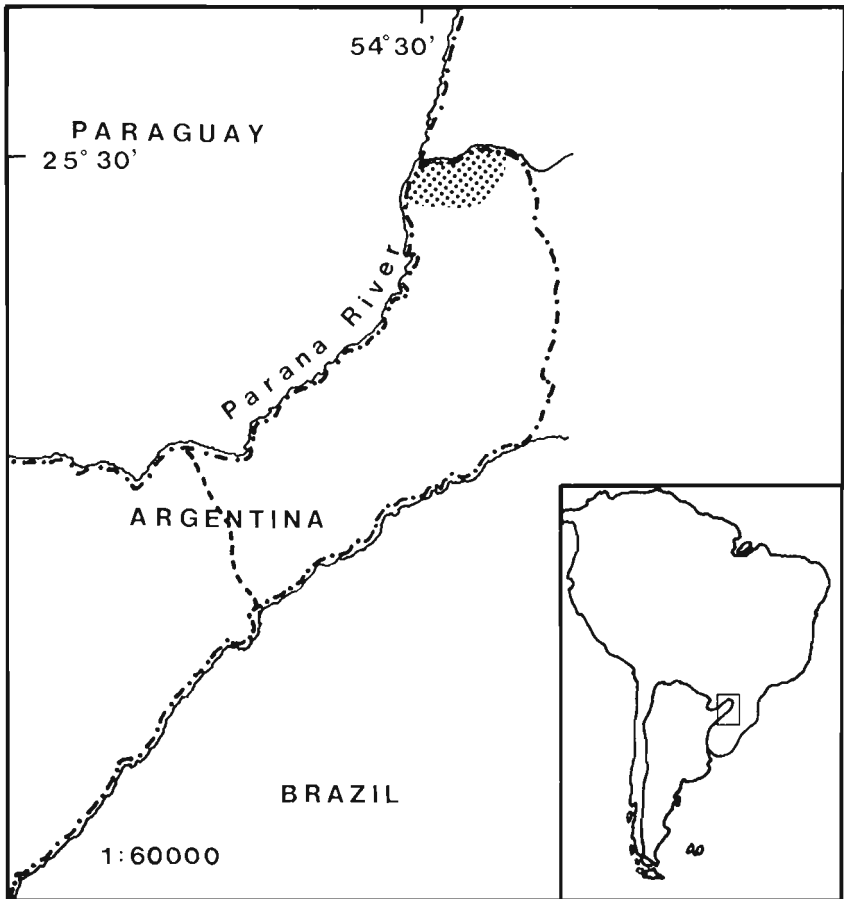


Figure 1 - Map showing the origin of sampled *Cebus apella* in Misiones province, Argentina.

## RESULTS AND DISCUSSION

The three individuals as well as the other previously captured specimens from Misiones, showed a uniform pattern of color. The body was dark brown, turning black towards the limbs and tail, and the head had two black tufts in the center and white hairs over the ears and around the face.

The specimens had a modal number of  $2n = 54$  and a chromosome formula with 10 non-acrocentric and 16 acrocentric chromosome pairs, a submetacentric X and a small acrocentric Y chromosome (Figure 2). These specimens showed eight small and eight large acrocentric chromosomes, in disagreement with previous

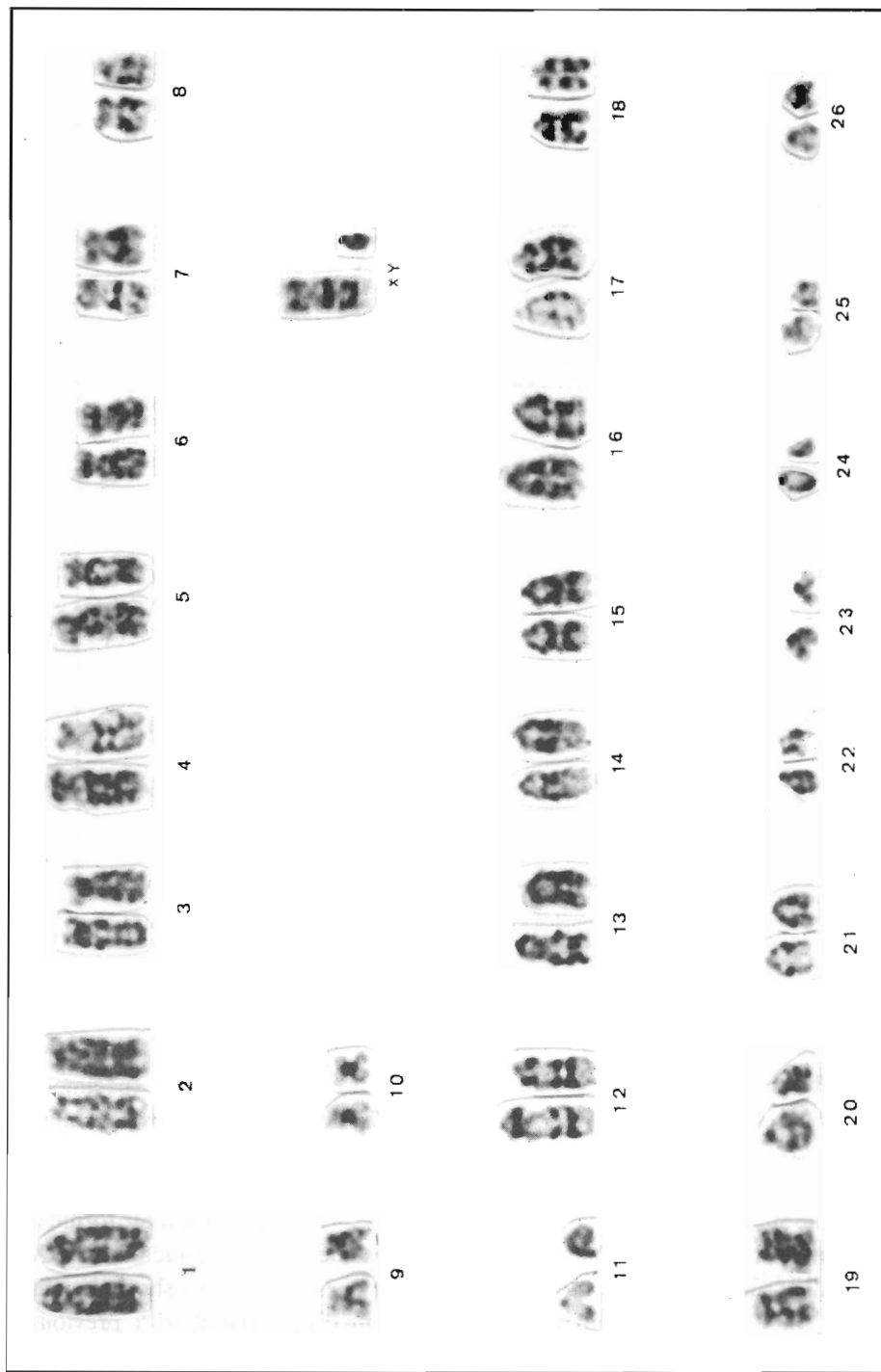


Figure 2 - G-banded karyotype of *Cebus apella vellerosus*.

reports for *C. apella*, in which it was possible to observe seven small and nine large acrocentric (Torres de Caballero *et al.*, 1976; Garcia *et al.*, 1976, 1983; Freitas and Seuáñez, 1982; Mantecón *et al.*, 1984; Matayoshi *et al.*, 1986). G and C banded karyotypes showed the loss of the large heterochromatic block of pair 11 present in other subspecies of *C. apella*, such that chromosome 12 became the largest acrocentric of the karyotype. The heterochromatic block of chromosome 11 is located in the distal region of the long arm in most subspecies of *C. apella* (Garcia *et al.*, 1976; Clemente *et al.*, 1987; Matayoshi *et al.*, 1987), being intercalary in *C. apella xanthosternos* (Seuáñez *et al.*, 1986). We do not have a clear explanation for the loss of the heterochromatic block of chromosome 11, more cytogenetic studies of phenotypically similar individuals from Brazil being necessary for a better understanding of the evolutionary changes involved.

C band analysis showed seven chromosome pairs with heterochromatic blocks of variable sizes: 3, 5, 12, 13, 17, 19 and 20 (Figure 3). Five of these pairs (3, 5, 12, 13 and 19) and chromosome 11 were also observed in Argentinian and Paraguayan *C. apella paraguayanus* (Mudry *et al.*, 1984), as well as in other subspecies (Seuáñez *et al.*, 1983, 1986; Matayoshi *et al.*, 1986). Chromosomes 17 and 20 showed inconsistent heterochromatic blocks (62% of cells).

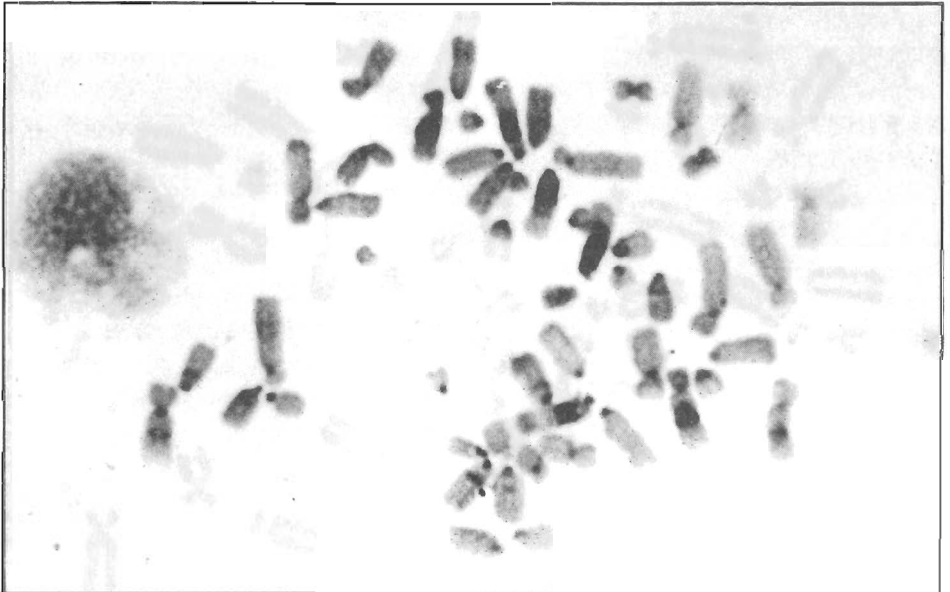


Figure 3 - C-banded metaphase showing the absence of the large distal heterochromatic block of chromosome 11.

Three of the small acrocentrics, corresponding to pairs 22 and 23 showed a secondary constriction (Figure 4). Ag-NOR banding of one individual revealed three positive NOR chromosomes which correspond to those with a secondary constriction (Figure 5). Similar Ag-NOR bands have been observed in *C. apella* by other authors (García *et al.*, 1983; Freitas and Seuáñez, 1982; Seuáñez *et al.*, 1986). There are normally four nucleolar organizer regions in these species and a small deletion of the secondary constriction region of one of the acrocentric chromosome could have occurred. A similar finding was observed by Freitas and Seuáñez (1982) in *C. apella*. This suggests variability in the expression of NORs for different subspecies of *Cebus*.

In previous reports we described the karyotypic constancy of captive individuals from Argentina and Paraguay (Mudry *et al.*, 1984, 1985, 1987). However, a

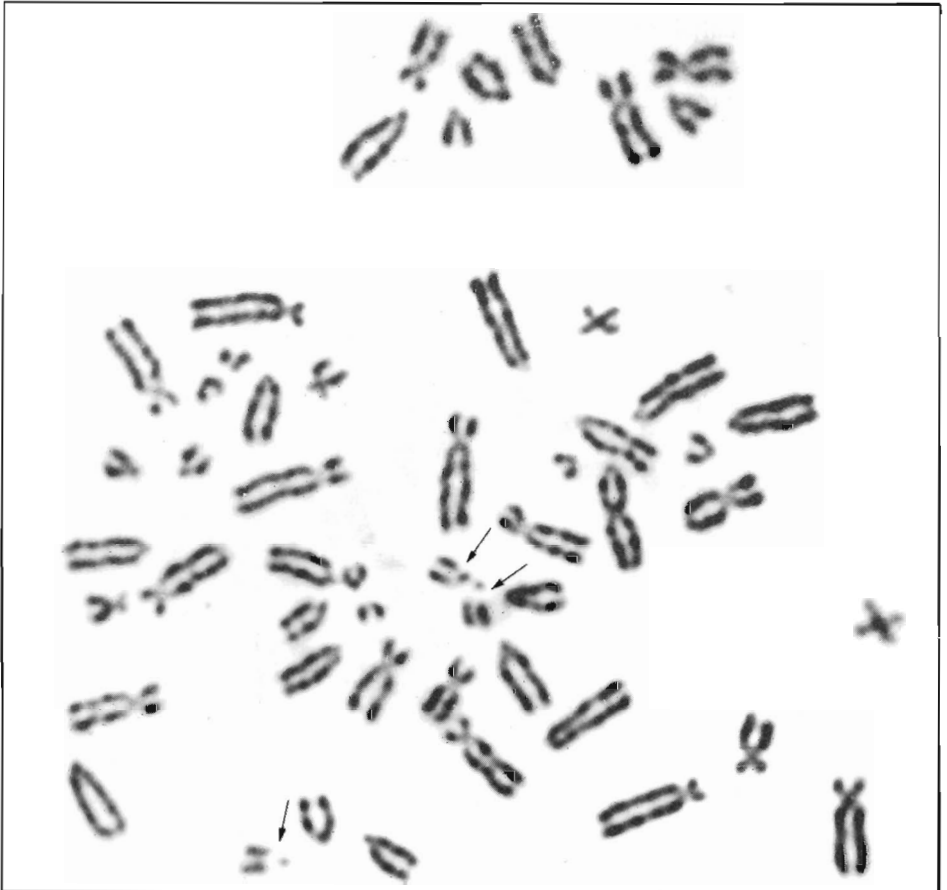


Figure 4 - Standard metaphase showing the secondary constrictions of chromosomes 22 and 23.

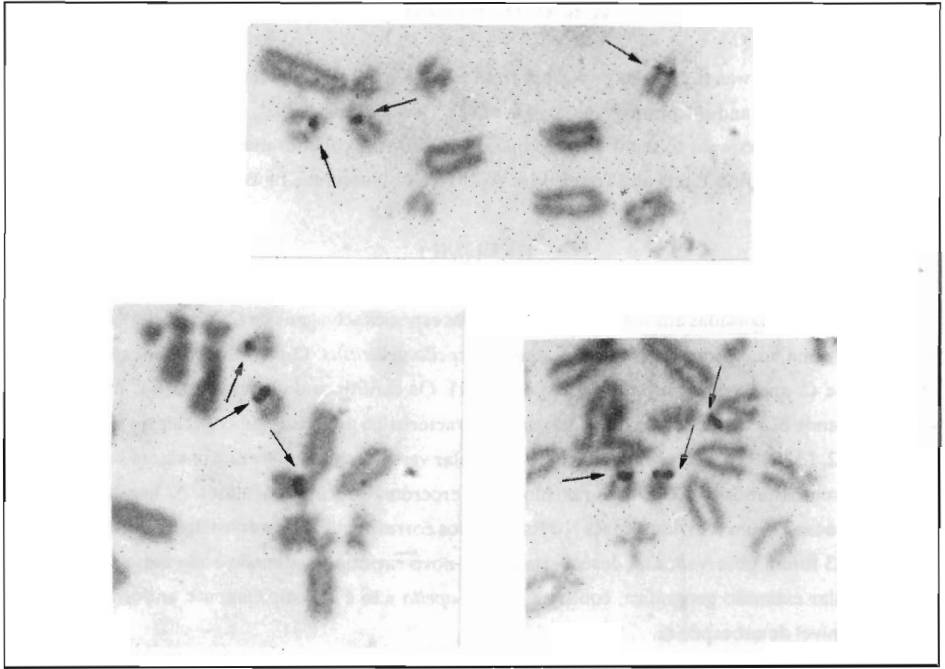


Figure 5 - Partial metaphases showing the three NOR positive chromosomes 22 and 23.

specimen from NE Argentina (Iguazú National Park) (Mudry, 1990) and the specimens we now describe exhibited not only phenotypic differences but also different banding patterns when compared with previous *C. apella* descriptions.

The presence of *C. apella vellerosus* in NE Argentina has been mentioned by several authors (Cabrera, 1939, 1957; Crespo, 1974; Massoia *et al.*, 1987), but this subspecies was not recognized in neighboring countries. In Paraguay, separated from Misiones by the Paraná River, *C. apella paraguayanus* is found (Cabrera, 1939, 1957) and in Brazil (North and East from Misiones), and without any apparent barrier, only *C. apella nigrinus* is recognized (Kinzey, 1979). The phenotypic and karyotypic characteristics of the specimens described in this paper clearly distinguish them from *C. apella paraguayanus*, but they are phenotypically similar to *C. apella nigrinus*. This similitude and the absence of geographic barriers suggests that *C. apella vellerosus* is a synonym of *C. apella nigrinus* but a karyological study of Brazilian specimens is needed to confirm this hypothesis. The finding of a new karyotype associated with a particular phenotype and particular geographic range confirms that *C. apella* is not karyologically uniform but shows variations at the subspecies level.

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## RESUMO

Foram analisadas amostras de sangue de três espécies selvagens de *Cebus apella* ( $2n = 54$ ) do NE da Argentina, que foram identificados como *C. apella vellerosus*. O padrão de bandeamento G foi similar ao de *C. apella paraguayanus* exceto no par 11. Os cariótipos de bandeamento C mostraram a perda do grande bloco heterocromático do par 11, característico de outras subespécies de *C. apella*. Os pares 3, 5, 12, 13, e 19 conservaram o tamanho intercalar variável das bandas que ocorrem em outros *C. apella*. Os cromossomos 17 e 20 mostraram blocos heterocromáticos inconsistentes. As bandas Ag-NOR foram estudadas em um indivíduo e três NORs positivos correspondendo às constrictões secundárias dos pares 22 e 23 foram observados. A descoberta de um novo cariótipo associado a um certo fenótipo e a uma particular extensão geográfica, confirma que *C. apella* não é cariotipicamente uniforme e mostra variações a nível de subespécies.

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