

# Cytogenetic analysis of the Marsh Deer, *Blastocerus dichotomus* (Mammalia, Cervidae)

José Maurício Barbanti Duarte and Miriam Luz Giannoni

## ABSTRACT

The chromosomal constitution of the Marsh Deer (*Blastocerus dichotomus*) was studied in 18 males and 18 females, mainly from the Tiete river basin in São Paulo State, Brazil. The species diploid number was determined to be 66 chromosomes and the fundamental number (FN), 74. The X and the Y were the largest and the smallest chromosome, respectively. Large amounts of the constitutive heterochromatin marked by the C band were located in the centromeric region of all the acrocentric chromosomes. The first chromosome pair was not marked and the second and third pairs showed weak centromeric markings. The X chromosome showed two strong telomeric markings while the Y was C band negative. Chromosomes four and five were the NOR carriers. Polymorphism for this band was observed in pair four. The results of this study are in agreement with other reports in the literature, in spite of the different origin of the animals.

## INTRODUCTION

The Marsh Deer is the only representative of the genus *Blastocerus* and the largest neotropical Deer. It weights up to 150 Kg (Walker, 1975), and reaches 210 cm in length and 125 cm in height (Ribeiro, 1919). It lives in swamps, marshes or flooded fields (Ribeiro, 1919; Miller, 1930; Junqueira, 1940) of Central South America, the interior of Bahia, the States of Goiás and Mato Grosso in Brazil and the extreme east of Bolivia and the Chaco in Paraguay, to Argentina and Rio Grande do Sul State in Brazil (Cabrera, 1960).

The actual size of this deer population is not known. It figures on the Brazilian list of animals threatened with extinction (Bernardes *et al.*, 1990). Among the Cervidae, it is considered the most threatened in spite of the fairly large number of animals living in the "Pantanal" swamp in Mato Grosso,

because of the destruction of its habitat. The greatest limiting factors for this species appear to be cattle diseases, the use of marshes for agriculture and the building of hydroelectric plants.

The Marsh Deer was studied cytogenetically by Neitzel (1987) who described the karyotype as having  $2n=66$  and  $FN=74$ . A metaphase with C bands was also shown with mention of additional heterochromatin on chromosome X. The author worked with a population in German Zoos, probably from Paraguay.

A larger number of animals was analyzed in this study and the data compared with the few existing reports in the literature.

## MATERIAL AND METHODS

Thirty-six animals were used for the present work, 18 females and 18 males (Figure 1). Thirty-five animals were captured in the wild, in a fauna rescue operation at the "Três Irmãos" hydroelectric plant (Charity *et al.*, 1991) in the Tietê river basin in

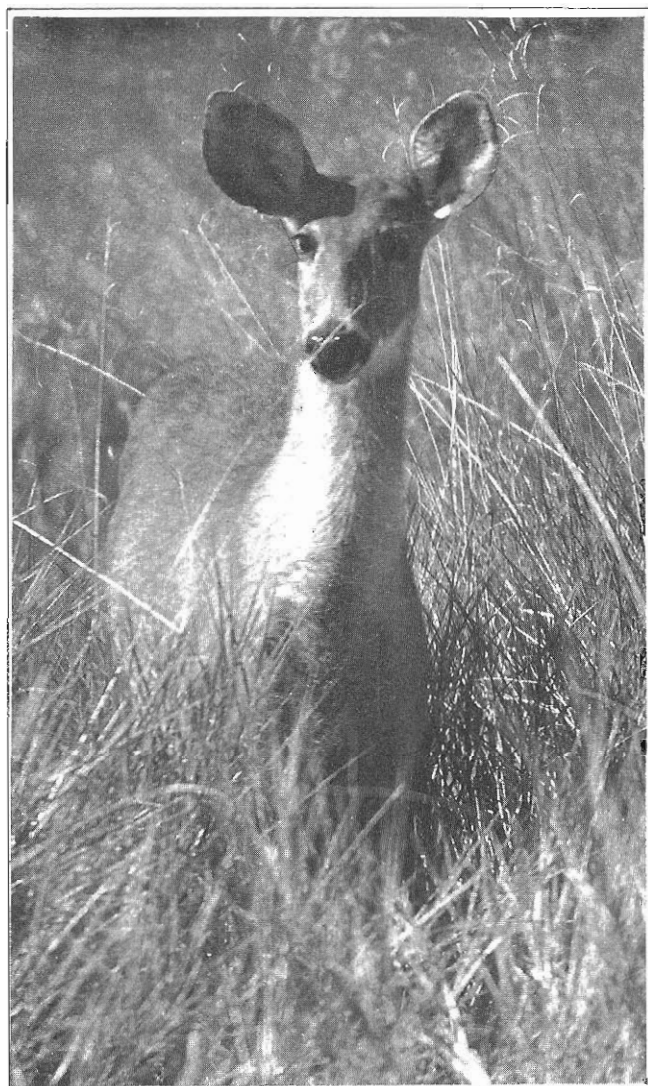
northwest of São Paulo State, Brazil. Another animal, of unknown origin, was obtained from the Brasília Zoo, Brasília, DF, Brazil.

The lymphocyte culture technique (Moorhead *et al.*, 1960) was used to obtain the metaphases. The technique of Sumner (1972) was used for the C bands while that of Howell and Black (1980) was used for the NOR banding and that of Seabright (1971) for G banding. All the techniques were slightly adapted to the material studied.

Chromosome biometry was used to obtain the arms ratio (AR) and the chromosome classification according to Guerra (1986).

## RESULTS

All analyzed animals showed 66 chromosomes, with FN=74 (Figure 2). The first two pairs were metacentric with AR=1.36 and 1.14 and the third pair

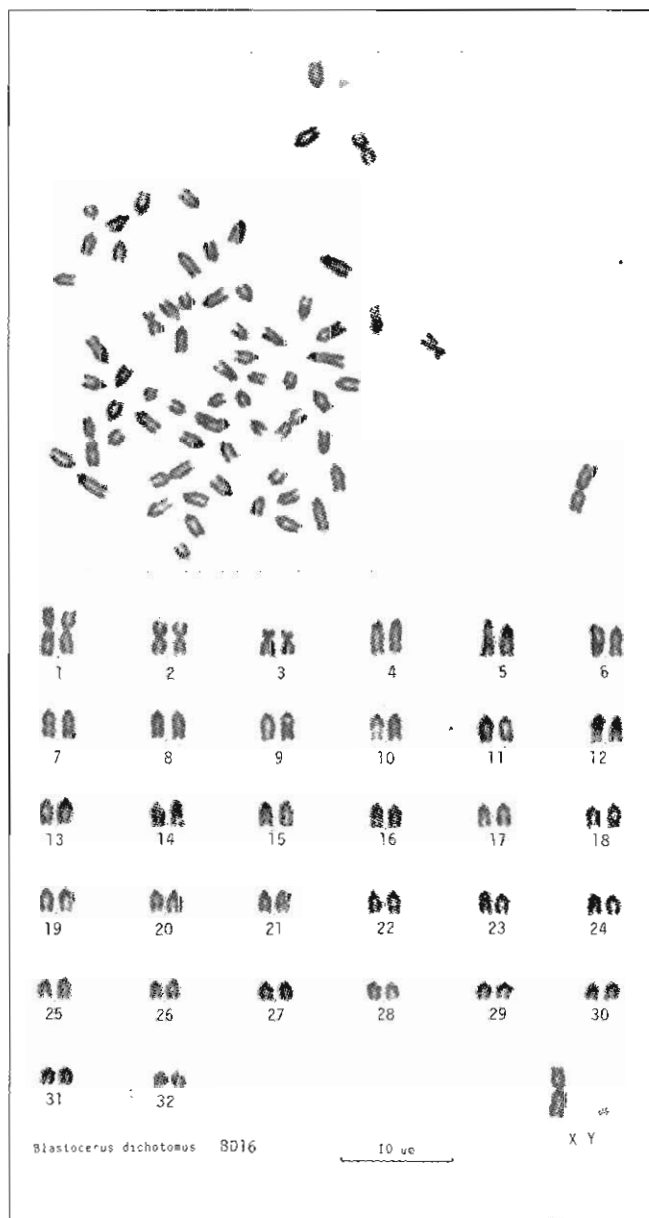


**Figure 1** - Female Marsh Deer in characteristic habitat (Pantanal, Miranda-MS).

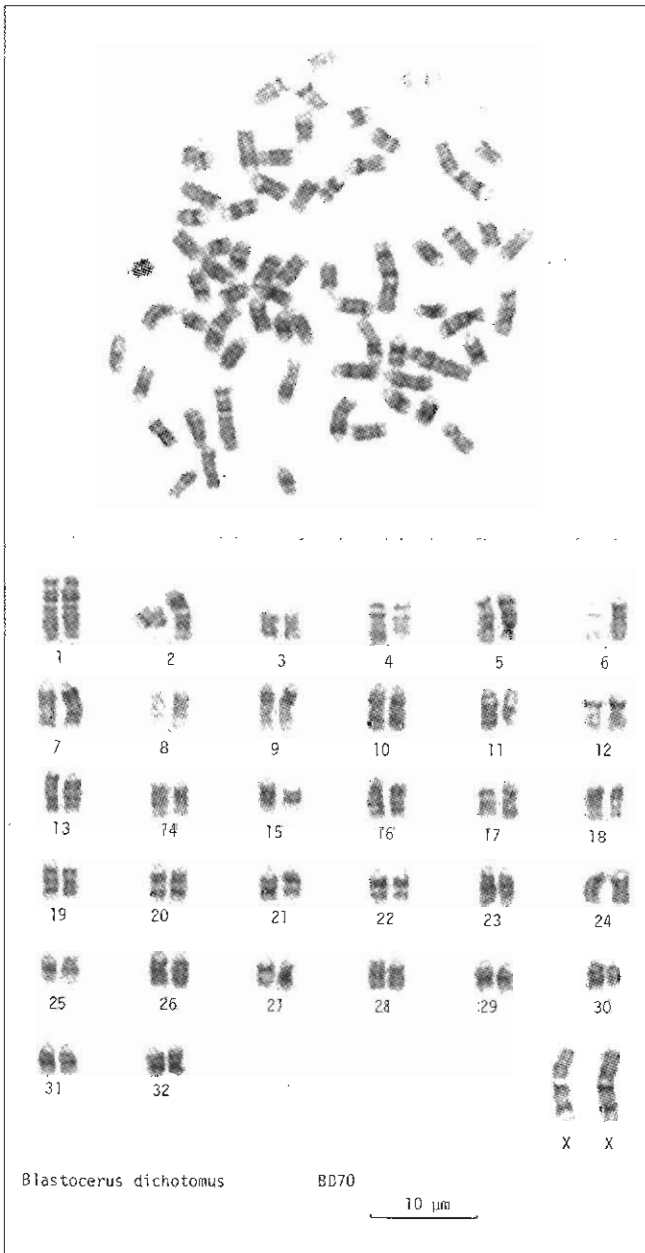
was submetacentric (AR=1.56). The other autosomes were acrocentric. The X chromosome was the largest chromosome and metacentric, with AR=1.16 and the Y the smallest chromosome and submetacentric. The reduced size of the Y chromosome did not allow biometric analysis.

There was great difficulty in finding a pattern for the G bands, because of the morphology and the number of chromosomes (Figure 3).

C banding marked all the acrocentric chromosomes, in large centromeric blocks. Chromosome one was not marked and chromosomes two and three weakly marked. The X chromosome had two telomeric markings and the Y chromosome was C band negative (Figure 4).



**Figure 2** - Karyotype of a male Marsh Deer.



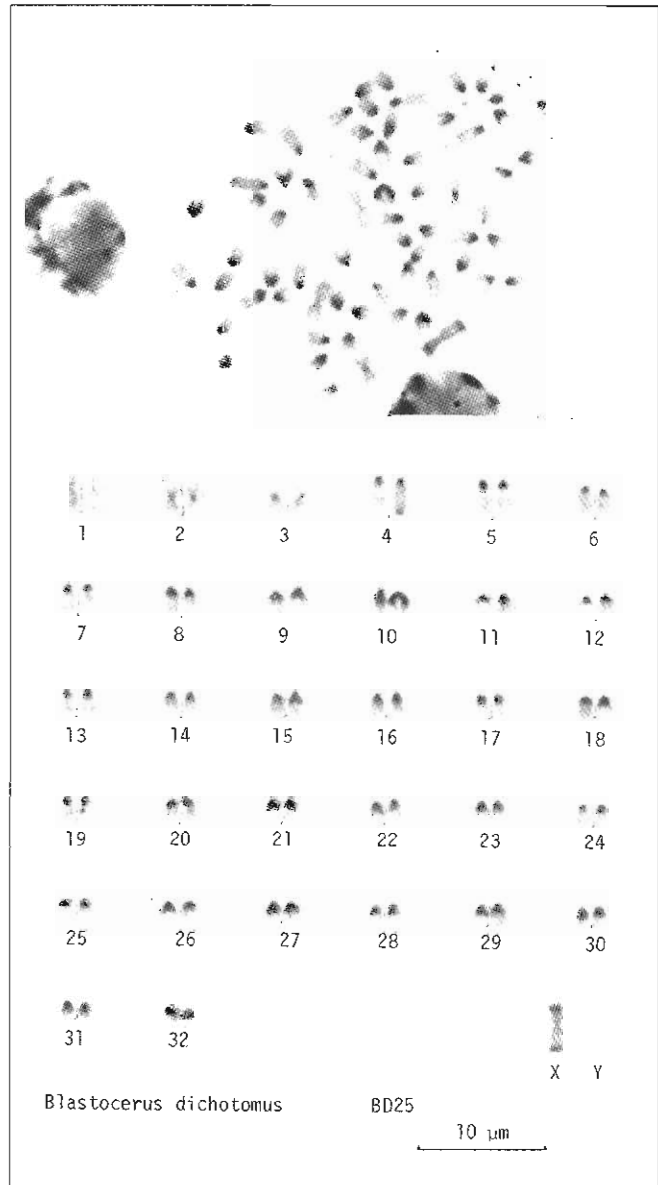
**Figure 3** - Karyotype of a female Marsh Deer with G bands.

The Nucleolus Organizer Regions (NOR) were localized in the telomere of chromosomes four and five (Figure 5). Polymorphism for this band was observed in chromosome pair four and absent in one of the chromosomes for some of the animals analyzed.

## DISCUSSION

The majority of animals analyzed in this study came from an isolated population restricted to the marshlands of the Tietê river for decades.

The cytogenetic data obtained in our study coincided in part with those of Neitzel (1987). However, in the C band pattern, the author showed a marking in

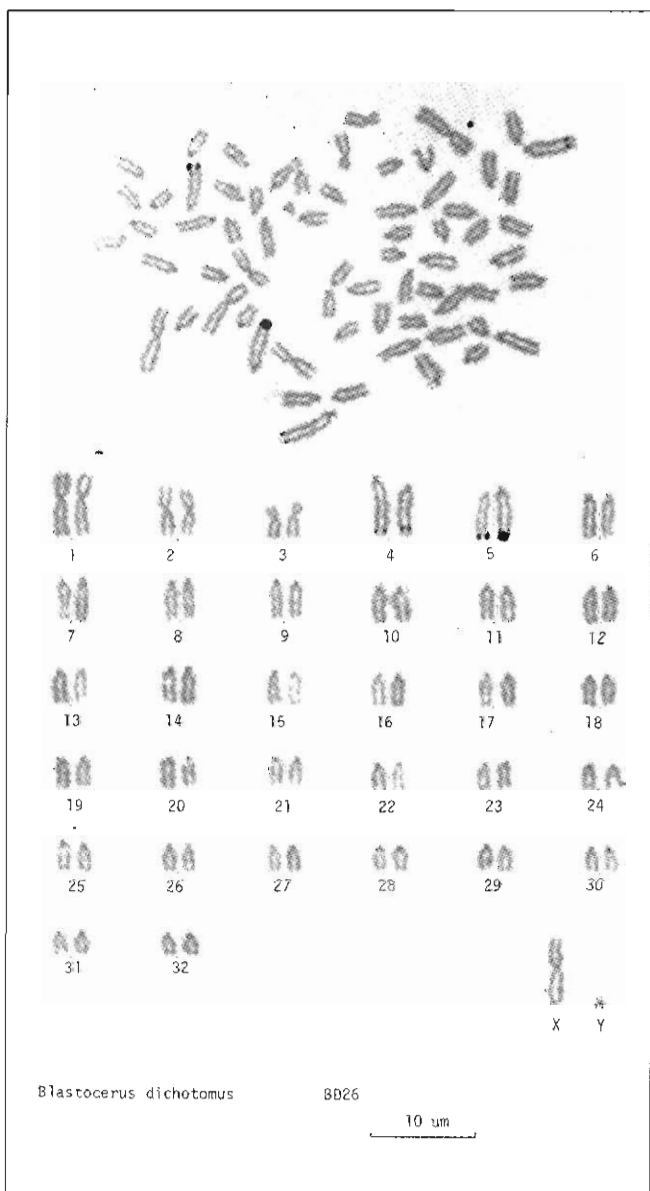


**Figure 4** - Karyotype of a male Marsh Deer with C bands.

the Y chromosome which was absent in all the animals analyzed in our study.

The large heterochromatic blocks identified by C banding could, according to Rubini and Fontana (1988), lead to great chromosome fragility. However, in spite of the large number of animals analyzed, no polymorphism was found, except for the NOR band. This could stem from the fact that the animals belonged to a single population isolated for decades and, therefore, genetically similar. On the other hand, polymorphism of the NOR bands could characterize a certain genetic variability.

Animals from other regions, such as "Pantanal" of the Parana river basin, should be analyzed to confirm this data. This would certainly clarify aspects related to the chromosome stability in neotropical deer.



**Figure 5** - Karyotype of a male Marsh Deer with NOR bands in pairs four and five.

The genus *Blastocerus* was not accepted by Neitzel (1987) and the species was included in the *Odocoileus* genus. Although some cytogenetic data may confirm this opinion, the morphological differences between these two genera are indisputable and do not allow such a change.

## ACKNOWLEDGMENTS

The authors thank CESP and the Brasília Zoo for permission to collect material. Thanks are also due to Rose L. Gasparini and Patricia de Oliveira for the collection and sending of several of the analyzed samples, and to the technicians Paulo Antonio Tosta and João Airton Boer for help in the laboratory.

The study was partially funded by the FCAVJ/UNESP and by CESP. Publication supported by FAPESP.

## RESUMO

A constituição cromossômica do Cervo do Pantanal (*Blastocerus dichotomus*) foi estudada em 18 machos e 18 fêmeas originários, em sua maioria, da bacia do rio Tietê, Estado de São Paulo. O número diplóide da espécie foi de 66 cromossomos e número fundamental de braços de 74. O cromossomo X foi o maior do lote e Y o menor. A heterocromatina constitutiva, marcada pela banda C, foi localizada na região centromérica de todos cromossomos acrocêntricos, em grandes blocos. O primeiro par cromossômico não marcou e o segundo e terceiro apresentaram fracas marcações centroméricas. O cromossomo X evidenciou duas fortes marcações teloméricas e o Y foi banda C negativo. Os cromossomos 4 e 5 foram os portadores de NOR. Houve polimorfismo desta banda no par 4. Os dados do presente estudo coincidem com os existentes na bibliografia, apesar da origem diferente dos animais.

## REFERENCES

- Bernardes, A.T., Machado, A.B.M. and Rylands, A.B. (1990). *Fauna Brasileira Ameaçada de Extinção*. Fundação Biodiversitas, Belo Horizonte.
- Cabrera, A. (1960). Catalogo de los mamíferos de America del Sur. *Rev. Mus. Arg. Ciencias Nat. Bernardino Rivadavia* 4: 309-732.
- Charity, S., Buschinelli, M.C., Gasparini, R.L., Tomas, W., Nunes, A., Oliveira, P., Santiago, M.E. and Cury, M. (1991). Translocation of a total Marsh Deer population at Tiete river, São Paulo State, Brazil. In: *XXIV World Veterinary Congress*, Rio de Janeiro, pp. 194.
- Guerra, M.S. (1986). Reviewing the chromosome nomenclature of Levan *et al.* *Rev. Brasil. Genet.* 9: 741-743.
- Howell, W.M. and Black, D.A. (1980). Controlled silver staining of nucleolus organizer regions with a protective colloidal developer: a 1-step method. *Experientia* 36: 1014-1015.
- Junqueira, J.F.D. (1940). Veados do Brasil: o cervo. *Chacaras Quintais* 61(6).
- Miller, F.W. (1930). Notes on some mammals of southern Mato Grosso, Brazil. *J. Mamm.* 11: 10-22.
- Moorhead, R.S., Nowell, P.C., Nellman, W.J., Battips, D.M. and Hungerford, D.A. (1960). Chromosome preparations of leucocytes cultured from human peripheral blood. *Exp. Cell Res.* 20: 613-616.
- Neitzel, H. (1987). Chromosome evolution of cervidae: karyotypic and molecular aspects. In: *Cytogenetics, Basic and Applied Aspects* (Obe, G. and Basler, A., eds.). Springer Verlag, Berlin, pp. 90-112.
- Ribeiro, A.M. (1919). Veados do Brasil segundo as coleções Rondon e de vários museus nacionais e estrangeiros. *Rev. Mus. Paulista (São Paulo)* 11: 213-308.
- Rubini, M. and Fontana, F. (1988). Standard G-banded karyotype, constitutive heterochromatin and nucleolus organizer regions in the Roe Deer (*Capreolus capreolus*). *Genetica* 77: 143-148.
- Seabright, M. (1971). A rapid banding technique for human chromosomes. *Lancet* 11: 971-972.
- Sumner, A.T. (1972). A simple technique of demonstrating centromeric heterochromatin. *Exp. Cell Res.* 75: 304-306.
- Walker, E. (1975). *Mammals of the World*. John Hopkins University Press, Baltimore, pp. 1215.

(Received July 29, 1994)