PUCPR

KARYOLOGIC SURVEY OF NOT FLYING SMALL MAMMALS FROM TOCANTINS, BRAZIL

Levantamento cariológico de pequenos mamíferos não voadores do Tocantins, Brasil

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Abstract

The not flying small mammals are known by the abundance, diversity and the big taxonomic complexity. They have much importance in the dynamic of the ecosystems, interfering in three important components: soil, vegetation and predators. Many studies of survey have been using the cytotaxonomy as an important tool of identification for these species. The aim of the current study is to show the karyologic survey of not flying small mammal sampled in 2001, mainly, in Ipueiras city, Tocantins, and data of two marsupials from others two cities (Lajeado and Pequizeiro, Tocantins). We did the cytotaxonomy analyses of 17 small rodents, distributed in nine species and two marsupials of different species. Cytotaxonomy, distribution and habitat considerations also are showed and discussed, principally, for Tocantins. The majority of the species already is known by the literature, however they are being quote by the first time for the Ipueiras city. The specie *Thrichomys apereoides inermis* (2n = 26) had been found only in Bahia State until the fulfillment of this work.

Keywords: Survey. Cytotaxonomy. Small mammals. Karyotype. Tocantins.

Resumo

Os pequenos mamíferos são conhecidos pela abundância, diversidade e pela ampla complexidade taxonômica. Possuem grande importância na dinâmica dos ecossistemas, pois interferem em três importantes componentes: solo, vegetação e predadores. Muitos estudos de levantamento têm utilizado a citotaxonomia como uma importante ferramenta de identificação dessas espécies.

O objetivo deste trabalho é apresentar o levantamento cariológico de pequenos mamíferos não voadores obtidos de uma coleta realizada em 2001, principalmente, no município de Ipueiras, Tocantins, e dados de dois marsupiais de outros municípios (Lajeado e Pequizeiro, Tocantins). Foram analisados citotaxonomicamente 17 roedores de pequeno porte, distribuídos em nove espécies e dois marsupiais, pertencentes a duas espécies. Considerações sobre citotaxonômia, distribuição e habitats também são apresentadas e discutidas, principalmente, em relação ao estado do Tocantins. A maioria das espécies já é conhecida pela literatura, contudo, estas são citadas pela primeira vez para o município de Ipueiras. A espécie Thrichomys apereoides inermis *(2n = 26) só havia sido encontrada na Bahia até o término deste trabalho.*

***Palavras-chave**: Levantamento. Citotaxonomia. Pequenos mamíferos. Cariótipo. Tocantins.*

INTRODUCTION

According Gastal (1), the small mammals can change de floristic composition due their activities and habits; they act as energy and biomass store, mediating the producers-decomposers cycle; act, probably, as regulators of invertebrate populations, specially of insects and can, even, act as pollinate agents. The small mammals are important in the ecosystems dynamics, interfering at least three components: soil, vegetation and the predators.

The rodents stand out for the abundance, diversity and by the big taxonomy complexity (2). Among the marsupials, the family Didelphidae is the unique found in South America and has species with difficult identification (2, 3).

Survey studies have utilized the cytogenetic (cytotaxonomy) as a basic toll for the species identification in completeness analyze of the systematic knowledge, morphologic and geographic distribution. This boarding has been contributed so much to elucidate taxonomic problems, including in the identifications of new species (4-8) and others, as list Silva (9).

This work shows the karyologic study of not flying small mammal sampled in the survey fulfilled in 2001, in Ipueiras city mainly, and data of two marsupials from others two cities (Lajeado and Pequizeiro).

The rodents were gotten in consequence of one practice class relative from the discipline *Coleta e Preservação Animal,* offered for the curse of Biologics Science (Unitins, actual UFT, Porto Nacional). Being of the interest the development of studies about diversity, cytotaxonomy and conservation of terrestrial small mammals in FCA/ Unesp, our objective is to show the results of the cytotaxonomy analyze realized for the small rodents and marsupials from the Tocantins State, Brazil, moreover commentaries about the distribution and vegetation type from the collect area.

MATERIALS AND METHODS

In Ipueiras city (coordinates 11°20"S, 48°46"W, approximately) were collected 17 small rodents and two marsupials in Lajeado city (9º55´S, 48º17´W) and Pequizeiro (8º39´S, 49º01´W).

For the animal captures were used traps of the type *life trap.* After the capture, the animals were identified in the field according theirs external morphology, noting the vegetation type around of the collect point (Table 1) and one field number was given for each animal, as follows: *Bolomys lasiurus* (FSL 156, 170, 172, 173 - male and 165 - female); *Calomys* sp. (FSL 157 and 160 - male); *Nectomys* sp. (FSL 155 - female); *Oligoryzomys* sp. (FSL 158 - male and 166 - female); *Oryzomys* sp. (FSL 168, male); *Rhipidomys macrurus* (FSL 162 - male); *Proechimys roberti* (FSL 159 - female); *Thrichomys apereoides* (FSL 161, 163 and 167 - male); *Rattus rattus* (FSL 164, 169 - male) and the marsupials, *Micoureus demerarae* (LJ 17 - male) e *Philander opossum* (PQ 2 - female). Still in the field, with an improvised laboratory, the extraction of the cell material was done according Baker et al. (10). The clamp was changed three times and the cell material was stored in freezer. The taxidermized animals, skins and cranium were stored in the "Museu de Zoologia da Fundação Universidade do Tocantins (Unitins)", in Porto Nacional, TO. The material relative the marsupials were stored in *Museu Nacional da UFRJ,* Rio de Janeiro, RJ.

Flakes with cell material of each animal were done and blushed with Giemsa for analyze in optic microscopic. The flakes with metaphases were priorized for the count of the diploid number (2n) and definement of the autossomic arms (NA). According the quality of the flakes, these were classified as: "Good" (metaphases with none or rare superposition and easy identification of the chromosome form); "Reasonable" (metaphases with superpositions, but allowing the identification chromosome form) and "Bad" (with two situations: 1. Incomplete – variation for the diploid number and grouped chromosomes, but with identification form; 2. Separated chromosomes with arms very united, defaulting the form identification). The conclusive cytotaxonomy identification were obtained through the completeness analyze of all metaphases from each animal, principally for the "Reasonable" and "Bad" ones and consult of the specialist bibliographic, especially for the Tocantins State.

The identified species is showed in this work respecting the most recently taxonomy denominations (4, 11), fallowing the oldest name, between parentheses, and flakes for each specie.

RESULTS AND DISCUSSION

A total of 30 flakes was prepared and blushed, being 26 from rodents and four from the marsupials. The identified species were: *Necromys lasiurus* (*Bolomys lasiurus*), nine flakes; *Calomys tener*, two; *Nectomys rattus*, two; *Oligoryzomys microtis* (*O. flavescens*), three; *Hilaeamys megacephalus* (*Oryzomys megacephalus*), one; *Rhipidomys macrurus*, one; *Proechimys roberti*, one; *Thrichomys a. inermis* (*T. apereoides*), six and *Rattus rattus*, one. Marsupiais: *Philander opossum*, one flake, and *Marmosa murina*, three.

The Table 2 brings the studied specie names and identified, cell sample quality and obtained cytogenetic data (2n, NA, autossomic and sexual types). The majority of the analyzed species already is known by the literature for the Tocantins State, but not for the studied city and others States, even São Paulo (Table 2).

The quality flakes of *Necromys lasiurus* allowed easily verified 2n = 34 and NA = 34. The autossomic pairs 1 until 15 are acrocentric, varying since big until gradual little and the pair 16 shows chromosomes very little meta or submetacentric. The X is middle acrocentric and the Y one little acrocentric

TABLE 1 - Preliminary identification of the species and vegetation type of collection point

Species	Males	females	Point of colection
Rodents			
B. lasiurus	3	1	Near Swamp
Calomys sp.	2	0	Ciliar Forest
Nectomys sp.	0	1	Near Swamp
Oryzomys sp.	1	0	Ciliar Forest
Oligoryzomys sp.	1	1	Near Swamp, Field - Cerrado
R. macrurus	1	0	Field - Ciliar Forest
P. roberti	0	1	Near Swamp
T. apereoides	3	0	Ciliar Forest
R. rattus	2	0	Rural Home
Marsupials			
Micoureus sp.	1	0	Ciliar Forest
P. opossum	0	1	Ciliar Forest

Note: "-" = transition area.

(Table 2). These data are concordant with Lima (6) and Lima; Kasahara (7) when compared with data from other regions of Brazil, specially, from Tocantins that quote the occurrence in São Sebastião city (extreme north), Pequizeiros (northwest), Lajeado (central north), Porto Nacional (central) and Formoso do Araguaia (southwest).

The second sample pertains to *Calomys tener*, despite the bad quality of the metaphases, is possible to show up variation of 2n since 56 until 66 chromosomes, the acrocentric form is predominant and one big submetacentric is present (Table 2). These data are more similar to *C. tener* (2n = 66 and NA = 66) with occurrence in São Sebastião and Pequizeiro city, Tocantins (6, 7). The karyotype is described as 31 pairs of acrocentric chromosomes, one little metacentric pair, the X is big submetacentric and Y is little acrocentric.

The *N. rattus* metaphases have 2n = 52 and NA = 52, the specie already was described by Lima (6), Lima and Kasahara (7) for the cities São Sebastião, Couto Magalhães (northwestern), Lajeado and Porto Nacional, Tocantins State. The autossomic pairs 1 until 10 are acrocentric, assorting big until middle; the pair 11 until 24 are little acrocentric with size gradual variation and the pair 25 is little submetacentric. In the sexual pair, the X is big submetacentric and the Y little acrocentric (Table 2.)

The *Oryzomys* sp. flakes revealed to belong to the specie *Hilaeamys megacephalus* (*O. megacephalus*), 2n = 54 and NA = 62, this specie already was described in Tocantins for the Lajeado and Porto Nacional cities (6, 7). The karyotype has the pair 1 and 3 as big subtelocentrics, the pair 1 is the biggest of them. The pairs 2 and 4 until 21 are acrocentrics, varying since big until little. The sexual pair has a big acrocentric X and a middle submetacentric (Table 2).

Analyzing the *Oligoryzomys* sp. samples, that have reasonable quality metaphases, was possible to obtain consented data with *Oligoryzomys microtis* (*O. flavescens*), despite the quality. However, wasn't possible to define the diploid number with precision, but 73% of the analyzed metaphases display 2n varying always 62 chromosomes. The majority are acrocentric and four are little metacentric or submetacentric (Table 2). In the literature, is found two karyotypes for the gender *Oligoryzomys* in Tocantins, they are: 2n = 64 and NA = 66 for *O. flavescens* (6, 7) and 2n = 70 and NA = 76 for *Oligoryzomys* sp.n. (6, 8). *Oligoryzomys microtis* (*O. flavescens*) own only two pairs little metacentric and the other specie has four pairs of meta and submetacentric. The last specie occurs in São Sebastião and Couto Magalhães, near Pequizeiro (northeast).

For *R. macrurus* metaphases were found the same karyotype described by Lima (6) and Lima & Kasahara (7) for Lajeado city, with 2n=44 and NA=48. The karyotype shows the pairs 1 until 18 as acrocentrics. The 19 until 21 are meta or submetacentric and the sexual pair has a big submetacentric X and a small metacentric Y.

The *P. roberti* metaphases shows 2n=30 and NA=54. The result is equal found by Lima (6) and Lima & Kasahara (7) for Tocantins State, in São Sebastião, Lajeado and Porto Nacional. The 1 until 4 autossomic pairs are big submetacentric with size gradate change; the pairs 5 until 12 are metacentric or submetacentric, varying small up to middle. The pair 9 has a secondary constriction at the long arms; the 13 pair is a small subtelocentric and the 14 pair is a very small acrocentric. The X is a middle metacentric (Table 2).

Thrichomys sp. showed 2n=26 and NA = 48. This karyotype was described by Leal-Mesquita et al. (12) to São Paulo State. The pair 1 is a big metacentric and the pair 2 is a metacentric with secondary constriction at the short arm. The pair 3 is metacentric and the pairs 4 until 12 are meta or submetacentric, with size gradual change. The sexual pair is a big subtelocentric X and a small metacentric Y. This karyotype was discussed by Lima (6) and Lima & Kasahara (13) as being *T.a. inermis* and, later was recognized as *T. inermis* (14). Our results disagree only for the sexual pair. The chromosome Y of our sample is a small subtelocentric or submetacentric and not a metacentric (Figure 1 and Table 2). Carvalho and Fagundes (15) and Silva et al. (16), mention 2n=26 occurring in Jalapão-TO and Ipueiras-TO, respectively and recently for Rio do Sono (17). However, the Y variation is cited here by the first time and none variation for X was found as in Rio do Sono.

The specie *R. rattus*, domestic mouse, has easy morphological identification and his karyotype is well-know and studied, including is found in Tocantins with large distribution (6, 7). The pairs 1 until 9 are subtelocentric. The pair 1 is big and the 9 is midlle. The pairs 2,3,5,6,8,10 and 13 are small up to big acrocentrics. The pair 14 until 20 are metacentric or submetacentric, similar the 4 until 11 pairs (result of the fusion of the pairs 4/7 and 11/12, 2n=42,

respectively). The sexual pair has an acrocentric X and a middle acrocentric Y (Tabela 2).

The exemplar identified in the field as *Micoreus* sp. has 14 chromosomes and NA = 22, but the chromosomal forms are equal *Marmosa murina* from Porto Nacional, Tocantins, studied by Lima (18). The pairs 1, 2 and 3 are submetacentric. The pair 4 is metacentric, the pair 5 is subtelocentric and the pair 6 is acrocentric. The X is a small acrocentric and the Y is a acrocentric smaller than X (Tabela 2.) The species 2n=14 are morphologically very similar and until then were considered from *Marmosa* gender. After review (3), many species of *Marmosa* changed to the genders *Micoureus* (ex. *M. cinereus*, *M. elegans* and *M. incanus*), *Marmosops* (ex. *M. fuscatus*) and *Thylamus* (ex. *M. pussilla*).

In the material of *P. opsossum* was obtained 2n=22 and NA=20. All chromosomes are acrocentrics with small up to middle size. The sexual pair is the smallest (Table 1). The karyotype is very similar to others species of the genders *Didelphis* and *Chironectes,* both 2n=22 and NA = 20 (18, 19). However, *P. opsossum* has easy morphological identification, with grey uniform color (dorsal and laterally) with furs until 5-8cm on the tail and a cream speck above the eyes (2).

The studies about small mammals from Tocantins are very little and the registers of habits are scarce. However, the data showed in table 1 agree with the literature for some species (2, 20) and, particularly, informations of Lima (6) and Silva et al. (16) relating to Tocantins.

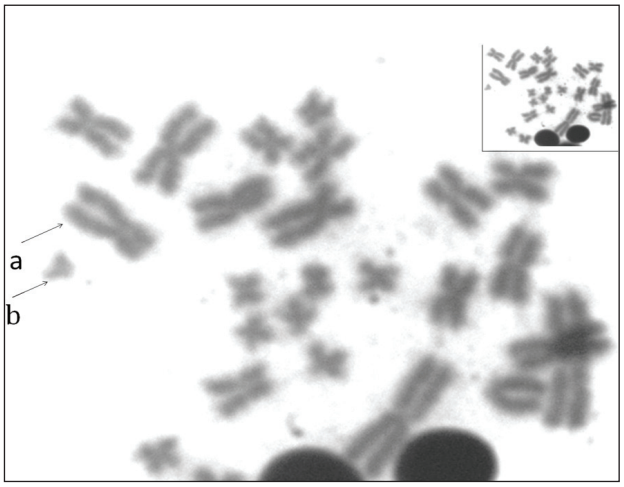

FIGURE 1 - Metaphase of T. inermis of our sample. The arrows stand out X (arrow a) and Y (arrow b) chromosomes

Source: Picture of author research result.

TABLE 2 - Cytogenetic data from rodents and marsupials

Specie	Flakes	2n	NA	Autossomics		Sexuals	
				1arm	2arms	X	Y
Rodents							
*B. lasiurus**	Good	34	34	30	2	A	a
*C. tener**	Bad	56-66	-	»	~	SM	-
*N. rattus**	Good	52	52	48	2	ST	a
O. megacephalus	Good	54	62	42	10	A	SM
*O. flavescens**	Bad	60-64	-	»	4	ST	-
*R. macrurus**	Good	44	48	36	6	SM	m
P. roberti	Good	30	54	2	26	M	-
T. a. inermis	Good	26	48	0	12	ST	a
*R. rattus**	Reasonable	38	58	14	22	A	M
Marsupials							
M. murina	Good	14	22	4	8	a	a
*P. opossum**	Good	22	20	20	0	a	a

Note: 2n = diploid number; NA = number of autossomic arms; 1 arm = acrocentric; 2 arms = double arms (metacentric, submetacentric or telocentric); » = the majority; A = acrocentric; M = metacentric; SM = big submetacentric; ST = big subtelocentric; __ = middle size; a = small acrocentric; ~ = uncertain form, but tendentious to be double arms, * = occurrence in São Paulo State.

CONCLUSION

The cytotaxonomy revealed to be an important tool for survey woks. Allied to systematic, morphologic analyze and knowledge of geographic distribution, it turns the identification more efficient and accurate.

Nine rodent species were identified (Ipueiras) and two of marsupials (Lajeado and Piquizeiros). The majority of the collected species and analyzed already is known by the literature and occur at others States. But, for the studied regions are being cited by the first time.

Seven of all species studied in this work are found at São Paulo State and the majority was captured near swamp and ciliar forest and *Thrichomys apereoides inermis* (2n=26), until little time, occurred only for Bahia State.

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