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ARTIGOS

Additional data for the virtual bank of cytogenetics of Brazilian mammals: karyotypes of medium and large mammals

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Abstract: Cytogenetic studies are important for species characterization and differentiation; furthermore, due to the highly variable and complex characteristics, karyotypes can assist in research that seeks to detect changes in genome organization, reveal phylogenetic history, and distinguish cryptic species. From the articles published in the literature, the karyotype information of terrestrial mammals of medium and large sizes was collected, with the intention of gathering them in a virtual database. For the searches, tools such as PubMed (National Center for Biotechnology Information) and Google Scholar were used; the words "karyotype", "diploid number" and "2n" were combined with the names of each species from the following orders of terrestrial mammals of Brazil: Cetartiodactyla, Carnivora, Cingulata, Lagomorpha, Perissodactyla, Pilosa and Primates. Here, we present information for 115 species with data referring to diploid number, the number of autosomes, the morphology of the sex chromosomes and, if present, karyotypic variation. From this information, Portable Document Format extension (.pdf) files were made for each species, which contained, as well as the aforementioned karyotype information, the name, author and year of publication of each species, diagrams from the original karyotypes and a link to download the original article. All documents and information are available at http://citogenetica.ufes.br, which already includes the cytogenetic data of Brazilian small mammals in its database.

Key-Words: Chromosome morphology; Database; Diploid number; Karyotype variation.

Resumo: Dados adicionais para o banco virtual de citogenética de mamíferos brasileiros: cariótipos de mamíferos de médio e grande portes. Estudos citogenéticos são importantes para a caracterização e diferenciação de espécies; além disso, devido às características altamente variáveis e complexas, os cariótipos podem auxiliar em pesquisas que buscam detectar mudanças na organização do genoma, revelar história filogenética e distinguir espécies crípticas. A partir dos artigos publicados na literatura, coletou-se a informação cariotípica de mamíferos terrestres de médio e grande porte, com o intuito de reuni-los em um banco de dados virtual. Para as buscas, foram utilizadas ferramentas como PubMed (Centro Nacional de Informações em Biotecnologia) e Google Scholar; palavras-chaves como "cariótipo", "número diplóide" e "2n" foram combinadas com os nomes de cada espécie das seguintes ordens de mamíferos terrestres do Brasil: Cetartiodactyla, Carnivora, Cingulata, Lagomorpha, Perissodactyla, Pilosa e Primatas. Aqui, apresentamos informações para 115 espécies com dados referentes ao número diplóide, o número de braços autossômicos, a forma dos cromossomos sexuais e, se presente, a variação cariotípica. A partir dessas informações, foram confeccionados arquivos de extensão *Portable Document Format* (.pdf) para cada espécie, os quais continham, além do cariótipo, o nome, autor e ano de publicação de cada espécie, figuras vetorizadas dos cariótipos originais e um link para baixar o artigo original. Todos os documentos e informações estão disponíveis em http://citogenetica.ufes.br, que já inclui os dados citogenéticos de pequenos mamíferos brasileiros em sua base de dados.

Palavras-Chave: Banco de dados; Morfologia dos cromossomos; Número diploide; Variação cariotípica.

INTRODUCTION

The Mammalia class is divided into 12 orders, of which seven are accounted for in Brazilian terrestrial mammals of medium and large sizes: Cetartiodactyla, with two families, six genera and 10 species; Carnivora, with seven families, 23 genera and 33 species; Cingulata, with one family, five genera and 11 species; Lagomorpha, with one family, one genus and one species; Perissodactyla, with one family, one genus and one species; Pilosa, with four families, five genera and eight species; and Primates, with five families, 19 genera and 118 species (Paglia *et al.,* 2012). Most of these orders differ in relation to the number of species found in each of the

Brazilian biomes (Paglia *et al.,* 2012); they are species that play an important role in the dynamics of ecosystems, such as top predators of the food chain (Sazima *et al.,* 1982) and seed dispersers (Jordano *et al.,* 2006).

It is well known that cytogenetic data are important tools for taxonomic and systematic studies, therefore aiding in the diagnosis of morphologically similar species, since karyotypes may be species-specific (Azevedo *et al.,* 2012; Bonvicino & Weksler, 1998; Wurster & Benirschke 1968). Additionally, they contribute to the elucidation of evolutionary and phylogenetic ambiguities (Robinson & Yang, 2012), increasing knowledge of species relationships (Romanenko *et al.,* 2007; Voss & Jansa, 2009) and revealing changes in genome organization at intra- and interspecific levels (Marshall *et al.,* 2008; Sagrillo *et al.,* 2005).

Given the importance of cytogenetic studies and the high diversity of Brazilian mammals, the gathering of karyotype information into one virtual guide, to be frequently updated, will contribute as a consistent tool to assist researchers who could be interested in systematic studies of the evolution and taxonomy of this group. Thus, this study intended to gather the cytogenetic data available in the literature for terrestrial mammals of Brazil, in order to complement an existing virtual library (http://citogenetica.ufes.br), where karyotype data for about 180 species of small non-flying mammals in Brazil (Paresque *et al.,* 2018) are already available.

MATERIALS AND METHODS

To gather the karyotypes for each species, a survey of the scientific papers available in the literature was carried out. To do so, the search tools PubMed of the National Center for Biotechnology Information (NCBI) and Google Scholar were employed, using the keywords "karyotype", "diploid number" and "2n", combined with the names of the mammalian species of interest.

Once the cytogenetic data were obtained, a general spreadsheet was created in Excel® containing information such as: scientific and popular name of each species, 2n (diploid number), FN (fundamental number), sex chromosome morphology and references. From this information, files with a Portable Document File (.pdf) extension were made, which were then made available for consultation in the UFES website (http://citogenetica.ufes.br). On this site, the data were organized according to the current taxonomic classification for the group. Each of these files contain the name, author and year of publication of each species, their karyotypic data, vectorized images of the original karyotypes, references and a download link to the original paper (Figure 1).

RESULTS

The cytogenetic data of 115 species of terrestrial mammals in Brazil were collected, corresponding to the 63.2% of all species (Table 1). Among the orders that present the known karyotypes of all the species are: Cetartiodactyla, Lagomorpha, Perissodactyla and Pilosa. Despite being the most diverse orders, Carnivora and Primates have scarce data, with only 39.4% and 61.8% of species, respectively, having known acknowledged karyotype information.

In Cetartiodactyla, the diploid number varied from 2n = 26 and FN = 46 in *Tayassu pecari* to 2n = 70 and FN = 70 in *Mazama gouazoubira. Mazama americana* was the species that presented the highest intraspecific karyotypic variation, ranging from 2n = 42 to 2n = 53, due to the occurrence of chromosomal rearrangements occurring in common ancestors (Almeida *et al.,* 2001). The high diversity of chromosome sets and variations in sex chromosomes, without a predominant morphology or size for X and Y, contributes to the identification of the species of this group, allowing for species-specific karyotypes.

For the order Carnivora, the karyotypes of 13 species were compiled. The diploid number ranged from 2n = 38 in species of the families Felidae, Mustelidae and Procyonidae up to 2n = 76 in *Atelocynus microtis* and *Chrysocyon brachyurus* (Family Canidae); the variation in autosome number ranged from FN = 68 for members of the families Mustelidae and Procyonidae to FN = 106 in *Cerdocyon thous.* It is worth mentioning that, in this case, the level of variation does not necessarily represent a high diversity of 2n, because the diploid number within each family repeats, leading to low interspecific variation. Thus, the differentiation of the chromosomal complements is subject to the combination of the form and size of the autosomal and sex pairs of each species.

In Cingulata, information was recorded for nine species (81.8% of the total species present in Brazil), which showed a diploid number variation from 2n = 38 in *Tolypeutes matacusa* to 2n = 64 in *Dasypus* species. The autosomal number ranged from FN = 68 in *Dasypus septemcinctus* to FN = 98 in *Euphractus sexcinctus.* With regard to the morphology of sex chromosomes, the majority of the members of this group presented a submetacentric X and small acrocentric Y.

The Pilosa order presented a variation from 2n = 49 in *Choloepus hoffmanni* to 2n = 65 in *Choloepus didactylus,* whereas the variation in the autosomal number ranged from FN = 56 in *Bradypus tridactylus* to FN = 108 in members of the Myrmecophagidae family. As for the sex chromosomes, the meta/submetacentric form predominated for the X, with the acrocentric form of the Y in Myrmecophagidae and metacentric form in Bradypodidae.

Finally, for Primates, information was collected for 73 species, with distinct patterns of karyotype variations observed depending on the family. The Aotidae family presented a diploid number ranging from 2n = 46 in *Aotus vociferans* to 2n = 54 in *Aotus nancymaae* and *A. trivirgatus,* with an X chromosome that showed a large submetacentric form for most species, and a Y that was variable. In Atelidae, variation ranged from 2n = 32 in *Ateles paniscus* to 2n = 62 in members of the genera *Brachyteles* and *Lagothrix;* the X chromosome was

ARTIGOS

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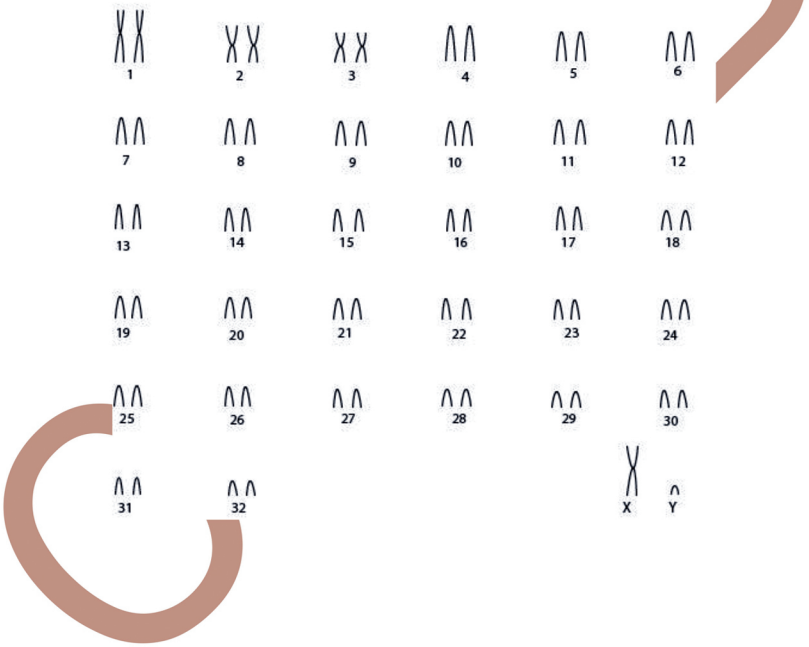
Blastocerus dichotomus (Illiger, 1815)

Cariótipo de Duarte & Giannoni (1995)

2n	NF	Cromossomo X	Cromossomo Y	Localidade
66	74	Metacêntrico grande	Submetacêntrico pequeno	São Paulo (Brasil)

Coloração Comum



Referência

Barbanti Duarte, J. M.; Giannoni, M. L.. Cytogenetic analysis of the Marsh Deer, Blastocerus dichotomus (Mammalia, Cervidae). Revista Brasileira de Genetica, v. 18, n. 2, p. 245-248, 1995.

Link

http://hdl.handle.net/11449/64568

Figure 1: Model of the file prepared for each mammalian species of medium and large sizes whose karyotype is known in the literature. The files have a .pdf extension (Portable Document Format) and are available for consultation in the database at http://citogenetica.ufes.br. Each file presents: name, author and year of publication of each species, diploid number, autosomal number, form and size of the sex chromosomes, vectorized images of the original karyotypes, bibliographical reference and the hyperlink to consult the original article on the corresponding cytogenetic data.

Table 1: Compilation of cytogenetic data of medium and large Brazilian mammals, with the respective popular name in Brazil, diploid number (2n), fundamental number (FN), morphology of the X and Y chromosomes and references. ND = not described.

Order	Species	Popular name in Brazil	2n	FN	X	Y	References
Cetartiodactyla	*Blastocerus dichotomus*	Cervo do Pantanal	66	74	Large metacentric	Small submetacentric	Duarte & Giannoni, 1995
Cetartiodactyla	*Mazama americana*	Veado mateiro	42 to 53	48 to 56	Submetacentric	Metacentric	Cursino *et al.,* 2014
Cetartiodactyla	*Mazama bororo*	Veado bororó de São Paulo	32 to 34	46	Medium submetacentric	Small acrocentric	Duarte & Jorge, 2003
Cetartiodactyla	*Mazama gouazoubira*	Veado catingueiro	70	70	Large Acrocentric	Small acrocentric	Neitzel, 1979
Cetartiodactyla	*Mazama nana*	Veado bororó do sul	36 to 40	56 to 60	Medium metacentric	Small metacentric	Abril & Duarte, 2008
Cetartiodactyla	*Mazama nemorivaga*	Veado da Amazônia	68-69	70	Medium submetacentric	Small metacentric	Fiorillo *et al.,* 2013
Cetartiodactyla	*Odocoileus virginianus*	Veado da cara branca	70	74	Large submetacentric	Small metacentric	Wurster & Benirschke, 1967
Cetartiodactyla	*Ozotoceros bezoarticus*	Veado campeiro	68	74	Large metacentric	Small metacentric	Duarte & Giannoni, 1995
Cetartiodactyla	*Pecari tajacu*	Cateto or caititu	30	46	Medium Acrocentric	Small acrocentric	Lima *et al.,* 2004
Cetartiodactyla	*Tayassu pecari*	Queixada or porco do mato	26	46	Medium Acrocentric	Small acrocentric	Andrea *et al.,* 2001; Adega *et al.,* 2007
Carnivora	*Atelocynus microtis*	Cachorro do mato de orelha curta	74 and 76	76	Submetacentric	Submetacentric	Wurster & Benirschke, 1968
Carnivora	*Cerdocyon thous*	Cachorro do mato	74	106	Large submetacentric	Small acrocentric	Hatanaka *et al.,* 1998
Carnivora	*Chrysocyon brachyurus*	Lobo guará	76	78	Large submetacentric	Medium acrocentric	Pieńkowska-Schelling *et al.,* 2008
Carnivora	*Eira barbara*	Irara	38	68	Medium submetacentric	ND	Wurster & Benirschke, 1968
Carnivora	*Galictis cuja*	Furão	38	68	Metacentric	Small acrocentric	Barbosa, 2013
Carnivora	*Leopardus geoffroyi*	Gato do mato grande	38	72	Medium metacentric	Small submetacentric	Wurster & Benirschke, 1968
Carnivora	*Lycalopex gymnocercus*	Raposa do campo	74	76	Submetacentric	Acrocentric	Brum-Zorrilla & Langguth, 1980
Carnivora	*Lycalopex vetulus*	Raposinha	74	76	Metacentric	Metacentric	Wurster & Benirschke, 1968
Carnivora	*Nasua nasua*	Quati	38	68	Medium submetacentric	Small acrocentric	Wurster & Benirschke, 1968
Carnivora	*Panthera onca*	Onça pintada	38	72	Medium submetacentric	Small submetacentric	Ledesma *et al.,* 2004
Carnivora	*Pteronura brasiliensis*	Ariranha	38	64	Submetacentric	Submetacentric	Franco-de-Sá *et al.,* 2007
Carnivora	*Puma yagouaroundi*	Gato mourisco	38	76	Medium submetacentric	ND	Wurster & Benirschke, 1968
Carnivora	*Speothos venaticus*	Cachorro vinagre	74	ND	Large submetacentric	Small acrocentric	Carvalho *et al.,* 2010
Cingulata	*Cabassous tatouay*	Tatu de rabo mole grande	50	68	Small metacentric	Acrocentric	Barroso & Seuánez, 1991
Cingulata	*Cabassous unicinctus*	Tatu de rabo mole	46	ND	Medium submetacentric	Small acrocentric	Jacintho *et al.,* 2009
Cingulata	*Dasypus hybridus*	Tatu mulita	64	76 and 81	Large submetacentric	Small crocentric	Lizarralde *et al.,* 2005; Saez *et al.,* 1964
Cingulata	*Dasypus kappleri*	Tatu de quinze quilos	64	ND	ND	ND	Redi *et al.,* 2005
Cingulata	*Dasypus novemcinctus*	Tatu galinha	64-65	78	Large metacentric	Small acrocentric	Beath *et al.,* 1962; Bernirschke *et al.,* 1969
Cingulata	*Dasypus septemcinctus*	Tatuí	64	76	Submetacentric	Acrocentric	Barroso & Seuánez, 1991
Cingulata	*Euphractus sexcinctus*	Tatu peba	58	98	Submetacentric or Acrocentric	Acrocentric	Jorge *et al.,* 1978; Barroso & Seuánez, 1991
Cingulata	*Priodontes maximus*	Tatu canastra	50	76	Submetacentric	Metacentric	Bernirschke & Wurster, 1969
Cingulata	*Tolypeutes matacus*	Tatu bola	38	ND	Metacentric	Acrocentric	Jorge *et al.,* 1978
Lagomorpha	*Sylvilagus brasiliensis*	Tapeti	40	68	Large submetacentric	Small submetacentric	Langguth & Sousa, 2008
Perissodactyla	*Tapirus terrestris*	Anta	80	80	Large submetacentric	Small acrocentric	Houck *et al.,* 2000
Pilosa	*Bradypus torquatus*	Preguiça de coleira	50	64	Submetacentric	Metacentric	Azevedo *et al.,* 2012
Pilosa	*Bradypus tridactylus*	Preguiça de três dedos	52	56	Metacentric	Metacentric	Dobigny *et al.,* 2005
Pilosa	*Bradypus variegatus*	Bicho preguiça	54	ND	ND	ND	Azevedo *et al.,* 2012
Pilosa	*Choloepus didactylus*	Preguiça real	65	ND	ND	ND	Dobigny *et al.,* 2005

Order	Species	Popular name in Brazil	2n	FN	X	Y	References
Pilosa	*Choloepus hoffmanni*	Preguiça real	49	61	Metacentric	ND	Corin-Frederic, 1969
Pilosa	*Cyclopes didactylus*	Tamanduá	64	100	Submetacentric	ND	Jorge *et al.,* 1985; Jorge, 2000
Pilosa	*Myrmecophaga tridactyla*	Tamanduá bandeira	60	108	Large metacentric	Small acrocentric	Pereira Júnior *et al.,* 2004
Pilosa	*Tamandua tetradactyla*	Tamanduá mirim	54	108	Large metacentric	Small acrocentric	Dobigny *et al.,* 2005
Primate	*Alouatta belzebul*	Guariba-de-mãos-ruivas	49-50	70	Submetacentric	ND	Armada *et al.,* 1987; Lima & Seuánez, 1989
Primate	*Alouatta caraya*	Bugio	52	70	Submetacentric	Acrocentric	Egozcue & De Egozcue, 1966
Primate	*Alouatta guariba*	Bugio ruivo	45-46, 49-50, 52	64, 66, 72	Submetacentric	Small acrocentric	Oliveira *et al.,* 1998; Oliveira *et al.,* 2000
Primate	*Alouatta macconnelli*	Bugio	47 to 49	ND	ND	ND	Lima & Seuánez, 1991
Primate	*Alouatta nigerrima*	Bugio	50	66	Submetacentric	ND	Armada *et al.,* 1987
Primate	*Alouatta seniculus*	Bugio	43 to 45	50, 52, 54	Small acrocentric	Small submetacentric	Yunis *et al.,* 1976
Primate	*Alouatta ululata*	Guariba de mãos ruivas	49	70	Submetacentric	ND	Viana *et al.,* 2015
Primate	*Aotus azarae*	Macaco da noite	49-50	69-70	Metacentric	ND	Mudry de Pargament *et al.,* 1984
Primate	*Aotus infulatus*	Macaco da noite	49-50	ND	ND	ND	Pieczarka & Nagamachi, 1988
Primate	*Aotus nancymaae*	Macaco da noite	54	72	Large submetacentric	Small acrocentric	Pieczarka *et al.,* 1992
Primate	*Aotus nigriceps*	Macaco da noite	51-52	65-66	Submetacentric	Submetacentric	Ma *et al.,* 1980
Primate	*Aotus trivirgatus*	Macaco da noite	50 and 54	72 and 74	Submetacentric	Small metacentric	Egozcue *et al.,* 1969; Menezes *et al.,* 2010
Primate	*Aotus vociferans*	Macaco da noite	46 to 48	70	Large submetacentric	Small acrocentric	Pieczarka *et al.,* 1992; Ma *et al.,* 1976; Descailleaux *et al.,* 1990
Primate	*Ateles belzebuth*	Macaco aranha	34	62	Medium submetacentric	Acrocentric	Medeiros *et al.,* 1997
Primate	*Ateles chamek*	Macaco aranha da cara preta	34	62	Medium submetacentric	Small acrocentric	Medeiros *et al.,* 1997
Primate	*Ateles marginatus*	Macaco aranha	34	62	Medium submetacentric	Subtelocentric	Medeiros *et al.,* 1997
Primate	*Ateles paniscus*	Macaco aranha	32	58	Metacentric	Acrocentric	Pieczarka *et al.,* 1989
Primate	*Brachyteles arachnoides*	Muriqui do sul	62	78	Submetacentric	ND	Koiffman & Saldanha, 1978
Primate	*Cacajao calvus*	Uacari-branco	46	ND	Submetacentric	Acrocentric	Bernirschke *et al.,* 1976
Primate	*Cacajao melanocephalus*	Uacari-branco	45	65	Submetacentric	Acrocentric	Koiffmann & Saldanha, 1981
Primate	*Callicebus coimbrai*	Guigó	44	ND	ND	ND	Rodrigues *et al.,* 2004
Primate	*Callicebus cupreus*	Zogue-zogue	46	66	Submetacentric	Small acrocentric	Dumas *et al.,* 2005
Primate	*Callicebus donacophilus*	Zogue-zogue	50	70	Submetacentric	Submetacentric	Minezawa & Borda, 1984; de Boer, 1974; Barros *et al.,* 2003
Primate	*Callicebus hoffmannsi*	Zogue-zogue	50	68	Submetacentric	Acrocentric	Rodrigues *et al.,* 2001
Primate	*Callicebus lugens*	Zogue-zogue	16	22	ND	ND	Bonvicino *et al.,* 2000, Stanyon *et al.,* 2003
Primate	*Callicebus moloch*	Arabasu	46, 48 e 50	64, 66 e 72	Submetacentric	Small acrocentric	Dumas *et al.,* 2005
Primate	*Callicebus pallescens*	Guigó	50	66	Submetacentric	Metacentric	Dumas *et al.,* 2005
Primate	*Callicebus personatus*	Guigó	44	62	Submetacentric	ND	Rodrigues *et al.,* 2004
Primate	*Callicebus personatus nigrifrons*	Guigó	42	68	Submetacentric	Metacentric	Nagamachi *et al.,* 2003
Primate	*Callicebus torquatus*	Zogue-zogue	20 and 22	26 and 28	Submetacentric	ND	Egozcue *et al.,* 1969; Benirschke & Bogart, 1976; Barros *et al.,* 2000
Primate	*Callimico goeldii*	Sagui de Goeldi	47-48	ND	Submetacentric	Small acrocentric	Dutrillaux *et al.,* 1988
Primate	*Callithrix aurita*	Sagui da serra escuro	46	74	Submetacentric	Acrocentric	Nagamachi *et al.,* 1997
Primate	*Callithrix flaviceps*	Sagui da serra	46	ND	ND	ND	Armada *et al.,* 1982
Primate	*Callithrix geoffroyi*	Sagui de cara branca	46	74	Medium submetacentric	Metacentric	Nagamachi *et al.,* 1997

Order	Species	Popular name in Brazil	2n	FN	X	Y	References
Primate	*Callithrix jacchus*	Sagui de tufos branco	46	74	Medium submetacentric	Acrocentric	Mudry *et al.,* 1990; Sherlock, 1996
Primate	*Callithrix kuhlii*	Sagui	46	74	Medium submetacentric	Metacentric	Nagamachi *et al.,* 1997
Primate	*Callithrix penicillata*	Sagui	46	74	Medium submetacentric	Metacentric or submetacentric	Nagamachi *et al.,* 1997
Primate	*Cebuella pygmaea*	Sagui-leãozinho	44	74	Submetacentric	Small acrocentric	Nagamachi *et al.,* 1992
Primate	*Cebus albifrons*	Caiarara	52 and 54	68	Submetacentric	Small acrocentric	Amaral *et al.,* 2008; Egozcue e Egozcue, 1967
Primate	*Cebus olivaceus*	Caiarara	52	70	Medium submetacentric	Small acrocentric	Amaral *et al.,* 2008
Primate	*Chiropotes israelita*	Cuxiú	54	74	Submetacentric	ND	Stanoyn *et al.,* 2004
Primate	*Chiropotes satanas chiropotes*	Cuxiú	54	74	Submetacentric	Acrocentric	Seuánez *et al.,* 1992
Primate	*Chiropotes satanas utahicki*	Cuxiú	54	74	Submetacentric	Acrocentric	Seuánez *et al.,* 1992
Primate	*Lagothrix lagothricha*	Macaco barrigudo	62	88	Medium submetacentric	Small acrocentric	Stanyon *et al.,* 2001; Clemente *et al.,* 1987
Primate	*Lagothrix lagothricha cana*	Macaco barrigudo	62	90	Medium submetacentric	Small acrocentric	Garcia *et al.,* 1980
Primate	*Lagothrix lagothricha poeppigii*	Macaco barrigudo prateado	62	90	ND	ND	Garcia *et al.,* 1980
Primate	*Leontopithecus caissara*	Mico-leão-de-cara-preta	46	74	Submetacentric	Acrocentric	Sbalqueiro *et al.,* 1992
Primate	*Leontopithecus chrysomelas*	Mico-leão-de-cara-dourada	46	74	Submetacentric	Subtelocentric	Nagamachi *et al.,* 1997
Primate	*Leontopithecus chrysopygus*	Mico-leão-preto	46	76	Submetacentric	Subtelocentric	Seuánez *et al.,* 1988
Primate	*Leontopithecus rosalia*	Mico-leão-dourado	46	74	Submetacentric	Subtelocentric	Nagamachi *et al.,* 1997
Primate	*Mico argentatus*	Sagui-branco	44	74	Submetacentric	Small metacentric	Egozcue *et al.,* 1968
Primate	*Mico chrysoleucos*	Sauim	44	74	Submetacentric	Small metacentric	Nagamachi *et al.,* 1996
Primate	*Mico emiliae*	Sauim	44	74	Submetacentric	Small metacentric	Barros *et al.,* 1990
Primate	*Mico humeralifer*	Sagui	44	74	Submetacentric	Small metacentric	Nagamachi *et al.,* 1996
Primate	*Mico mauesi*	Sagui-de-Maués	44	74	Large submetacentric	Small acrocentric	Nagamachi *et al.,* 1994
Primate	*Pithecia irrorata*	Parauacú	48	64	Medium submetacentric	ND	Finotelo *et al.,* 2010
Primate	*Pithecia pithecia*	Parauacú	48	64	Metacentric	Small acrocentric	Henderson *et al.,* 1977
Primate	*Saguinus bicolor*	Sauim-de-coleira	46	74	Submetacentric	Metacentric or acrocentric	Dantas & Barros, 1997
Primate	*Saguinus fuscicollis*	Sauim-de-cara-suja	46	74	Submetacentric	Small metacentric	Egozcue *et al.,* 1969
Primate	*Saguinus imperator*	Sauim-imperador	46	74	Submetacentric	Acrocentric	Dantas & Barros, 1997
Primate	*Saguinus labiatus*	Sauim-de-bigode	46	74	Submetacentric	Acrocentric	Marczynska *et al.,* 1983
Primate	*Saguinus martinsi*	Sauim	46	74	ND	ND	Dantas & Barros, 1997
Primate	*Saguinus midas*	Sagui-de-mão-dourada	46	74	Submetacentric	Acrocentric	Nagamachi & Pieczarka, 1988
Primate	*Saguinus mystax*	Sagui-de-boca-branca	46	74	Submetacentric	Metacentric	Dantas & Barros, 1997
Primate	*Saguinus niger*	Sagui-una	46	74	Submetacentric	ND	Nagamachi & Pieczarka, 1988
Primate	*Saguinus nigricollis*	Sagui, sauim	46	74	Submetacentric	Metacentric	Benirschke *et al.,* 1962
Primate	*Saguinus weddelli*	Sauim	46	74	Submetacentric	Acrocentric	Dantas & Barros, 1997
Primate	*Saimiri boliviensis*	Macaco-de-cheiro	44	72	Medium ubmetacentric	Small acrocentric	García *et al.,* 1995
Primate	*Saimiri macrodon*	Macaco-de-cheiro	44	74	Submetacentric	Acrocentric	Bender & Mettler, 1958
Primate	*Saimiri sciureus*	Macaco-de-cheiro	44	74	Submetacentric	Acrocentric	Mudry *et al.,* 1990
Primate	*Saimiri ustus*	Macaco-de-cheiro	44	74	ND	ND	Romagno, 2001
Primate	*Saimiri vanzolinii*	Macaco-de-cheiro	44	72	ND	ND	Yassuda & Chu, 1985
Primate	*Sapajus apella*	Macaco-prego	54	72	Submetacentric	Submetacentric	Freitas & Seuánez, 1981

predominantly submetacentric, but variable in size, and the Y was as variable in form as in size. The Callitrichidae family presented low interspecific variation, from 2n = 44 in species of *Cebuella* and *Mico* to 2n = 48 in *Callimico goeldii;* for this group, an FN = 74 predominated, with the exception of *Leontopithecus chrysopygusm,* which presented an FN = 76. The same constancy was observed in the submetacentric form of the X chromosome, with having only the Y chromosome showed any variation. In Cebidae, the diploid number ranges from 2n = 44 in members of the genus *Saimiri* to 2n = 54 in *Sapajus paella;* the submetacentric forms for the X and acrocentric for the Y prevailed in the sex chromosomes. Representatives of Pitheciidae presented the greatest variation, ranging from 2n = 16 and FN = 22 in *Callicebus lugens* to 2n = 54 and FN = 74 in members of the genus *Chiropotes;* the X chromosome was shown to be submetacentric, except for in *Pithecia pithecia,* while different forms and sizes of the Y chromosome were observed. In general, there is a consensus among the authors about the importance of cytogenetic data as a tool that is capable of assisting in the diagnosis of primate species.

From this information, .pdf files were made for all species, which contained images of the karyotypes recorded in the literature (Figure 1); these files are available and can be consulted at http://citogenetica.ufes.br.

DISCUSSION

The database of Cytogenetics of Brazilian Mammals (CIMAB) and its electronic address are available for consultation. This compilation is the result of a constant effort and is an important step in facilitating access to the cytogenetic characteristics of mammalian species occurring in Brazil. Some taxonomic groups, such as Carnivora and Primates, still lack karyotype data for a number of species; these orders were the ones with the lowest number of species with known cytogenetic data, indicating that new efforts should be made, focusing on these groups. The combined analysis of diploid numbers, autosomal numbers, as well as size and shape of the sex chromosomes at different taxonomic levels revealed that cytogenetics can be considered an important tool for the recognition and diagnosis of species, since, for the most part, this combination leads to karyotypes that are considered species-specific. The work of implanting the site and the insertion of new data should not stop here; the team from the Research Center on Evolution and Anatomy is constantly gathering efforts to keep the information updated with the publication of new articles. In addition, all researchers and authors of articles on mammalian cytogenetics are invited to contribute with new information. In the future, we intend to add information to other groups of mammals that have not yet been contemplated, along with data on interdisciplinary techniques involving chromosomes; our intention is to build a solid database and reference for the study of mammalian cytogenetics.

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