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Distribution of *Oecomys catherinae* Thomas, 1909 (Rodentia: Cricetidae) in northeastern Brazil with karyotypical and morphometrical notes

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ASFORA P.H., PALMA A.R.T., ASTÚA D. & GEISE L. **Distribution of *Oecomys catherinae* Thomas, 1909 (Rodentia: Cricetidae) in northeastern Brazil with karyotypical and morphometrical notes.** *Biota Neotrop.* 11(2): <http://www.biotaneotropica.org.br/v11n2/en/abstract?inventory+bn00811022011>

Abstract: The genus *Oecomys* Thomas, 1906 is currently composed of 16 species with unclear taxonomy and poorly known geographic limits. *O. catherinae* Thomas, 1909 is known to occur within the Brazilian Atlantic Forest from the states of Santa Catarina to Pernambuco (where the northernmost previously known specimen of *Oecomys* in the Atlantic forest was recorded), and along riverine forest into the Cerrado. To gain a greater understanding of its geographical and ecological distribution (mainly in Northeastern Brazil) and of its taxonomic characterization, we provide a short review of karyotypical and morphometrical data from specimens collected within the distribution range of the species. Specimens presented $2n = 60$ and AN varying between 62 and 64. A table with external and cranial measurements of the analyzed specimens is provided. In this paper we also report the presence of *O. catherinae* in the semi-deciduous forests of the state of Paraíba, representing the northernmost records of the species in the Atlantic forest and thereby extending its known geographical limits.

Keywords: small mammals, new register, Sigmodontinae, cytogenetic, morphometrics.

ASFORA P.H., PALMA A.R.T., ASTÚA D. & GEISE L. **Distribuição de *Oecomys catherinae* Thomas, 1909 (Rodentia: Cricetidae) no nordeste do Brasil com notas morfométricas e cariotípicas.** *Biota Neotrop.* 11(2): <http://www.biotaneotropica.org.br/v11n2/pt/abstract?inventory+bn00811022011>

Resumo: *Oecomys* Thomas, 1906 é um gênero atualmente composto por 16 espécies reconhecidas que apresentam taxonomia e distribuições geográficas ainda incertas. *O. catherinae* Thomas, 1906 é a espécie que ocorre ao longo da Floresta Atlântica brasileira dos estados de Santa Catarina a Pernambuco, onde se encontra o registro prévio mais ao norte para *Oecomys* na Floresta Atlântica, e ao longo de florestas de galeria no Cerrado. Pretendendo esclarecer aspectos relacionados à distribuição geográfica e ecológica de *O. catherinae*, com ênfase na região nordeste do Brasil, e auxiliar na sua caracterização taxonômica, fornecemos um breve resumo de dados morfométricos e cariotípicos de indivíduos coletados em diversos trabalhos ao longo da área de ocorrência da espécie. Os espécimens apresentaram $2n = 60$ e NA variando entre 62 e 64. Uma tabela de medidas corporais externas e cranianas dos indivíduos analisados é fornecida. Também registramos pela primeira vez a presença de *O. catherinae* nas florestas semi-decíduais do estado da Paraíba, sendo atualmente os registros mais ao norte da espécie na Floresta Atlântica, estendendo os limites geográficos conhecidos para a espécie.

Palavras-chave: pequenos mamíferos, novo registro, Sigmodontinae, citogenética, morfometria.

Introduction

The genus *Oecomys* Thomas, 1906 is currently composed of 16 species that present an unclear taxonomy and geographic distribution (Musser & Carleton 2005), 12 of which occur in Brazil: *O. auyentepui* Tate, 1939, *O. bicolor* (Tomes, 1860), *O. catherinae* Thomas, 1909, *O. cleberi* Locks, 1981, *O. concolor* (Wagner, 1845), *O. marmorata* (Thomas, 1906), *O. paricola* (Thomas, 1904), *O. rex* Thomas, 1910, *O. roberti* (Thomas, 1904), *O. rutilus* Anthony, 1921, *O. superans* Thomas, 1911 and *O. trinitatis* (J. A. Allen and Chapman, 1893) (see Bonvicino et al. 2008).

Hershkovitz (1960) considered all known *Oecomys* taxa as junior synonymous of two species, *O. concolor* (the large-bodied species) or *O. bicolor* (the small-bodied species). Some papers then refer to *Oecomys* specimens recorded in the Brazilian Atlantic Forest and Cerrado as *O. concolor* or *O.* group *concolor* (Andrades-Miranda et al. 2001, Andrade & Bonvicino 2003). Langguth et al. (2005) state that the specimens of *Oecomys* from the state of Pernambuco differ from *O. concolor* and refer to *O. bahiensis* (Hershkovitz, 1960) and could be co-specific with the animals sharing the same karyotype recorded further south in the Atlantic Forest, a diploid number (2n) of 60 and an autosomal number (AN) of 62, still called *O. concolor* in Langguth et al. (2005). Musser & Carleton (2005) treat *O. bahiensis* as a junior synonym of *O. catherinae*. So, for the purpose of this paper we considered the specimens of *O. bahiensis* and the specimens of *Oecomys* group *concolor* having a diploid number (2n) of 60 and an autosomal number (AN) of 62 as a synonym of *O. catherinae*.

Cytogenetic analyses performed on several species of *Oecomys* suggest that this genus presents a karyotypical diversification with a diploid number ranging from 58 to 86, yet some species within this genus present the same diploid number, being differentiated by their autosomal number (see Langguth et al. 2005), (Table 1, for a comprehensive review). Thus, karyotypes can be helpful in revealing the genetic diversity in the genus (Langguth et al. 2005).

According to Musser & Carleton (2005), *O. catherinae* occurs in the Brazilian Atlantic Forest, from the states of Santa Catarina to Bahia and along riverine forest into the Cerrado and Caatinga regions, with poorly documented limits. Bonvicino et al. (2008) state that *O. catherinae* occurs from the states of Santa Catarina to Paraíba, citing Costa et al. (2004) – a paper not listed in their references section. In fact, Bonvicino et al. (2008) were referring to Costa et al. (2008), which states that *O. catherinae* occurs from the states of Santa Catarina to Bahia, and there are no records of the species in Paraíba (C.R. Bonvicino, personal communication). No other reference to the occurrence of *O. catherinae* in Paraíba state was found in the literature or in the collections of the Museu Nacional, Universidade Federal do Rio de Janeiro (MN), Museu de Zoologia da USP (MZUSP), Universidade Federal de Pernambuco (UFPE) or the Universidade Federal da Paraíba (UFPB) nor in any collection integrating the Species Link (<http://www.splink.org.br>) or MaNIS network (<http://manisnet.org>).

Therefore, the northernmost previously known recorded specimen of *Oecomys* in the Atlantic Forest was collected at Camaragibe, 6 km NE of São Lourenço da Mata (08° 00' 00" S 35° 03' 00" O), in a remnant of the Atlantic Forest of Pernambuco (Oliveira & Langguth 2004, Langguth et al. 2005).

We report here the presence of *Oecomys catherinae* (Figure 1) in two different localities in the state of Paraíba, Brazil, extending its known distribution in the northeastern Atlantic Forest further north and adding new ecological data about the species. We also present a short review of distributional, morphometrical, and

karyological data, and give details on chromosomal variation in the autosomal number from individuals collected across the species distribution range.

Material and Methods

Trapping was carried out at two localities in the state of Paraíba. The first locality is Reserva Biológica Guaribas (06° 44' 59" S, 41° 07' 11" W), within the municipalities of Mamanguape and Rio Tinto. This reserve encompasses three non-contiguous areas: SEMA I (3016 ha), SEMA II (673 ha) and SEMA III (338 ha). The average annual rainfall is 1386 mm/year, with a dry season lasting from September to February (CPTEC/INPE 2009) and average annual temperature 25.5 °C (Hijmans et al. 2005). The vegetation of Reserva Biológica Guaribas is a mosaic of semi-deciduous forests located in valleys, and savannas with sandy soils on the tops of hills ("tabuleiros" vegetation) (Instituto..., 1993, Rodrigues and Silva et al. 2000). The second locality is Usina São João (07° 06' 56" S, 35° 04' 47" W), in the municipality of Cruz do Espírito Santo, with almost 700 ha of forest fragments. The average annual rainfall is 1294 mm/year (Instituto..., 2009) and average annual temperature is 25.0 °C (Hijmans et al. 2005). The vegetation at Usina São João is also a mosaic of savanna and semi-deciduous forest (Instituto..., 1993), similar to Reserva Biológica Guaribas. Both sites are included in the Pernambuco Interior Forests ecoregion of the Brazilian Atlantic Forest (Olson et al. 2001).

Three trapping trips in Reserva Biológica Guaribas were carried out, in March 2008, September 2008 and May 2009, lasting 11, 8 and 5 consecutive nights, respectively, totaling 2,978 trap-nights. Two semi-deciduous forest sites and one savanna (Tabuleiro) site were sampled on each field trip. Two trapping trips were carried out in Usina São João, in January and October 2009, lasting 5 consecutive nights each, totaling 1,757 trap-nights. In this locality, one trap line was set in a semi-deciduous forest area (Figure 2), one in the Tabuleiro Forest (low forest on sandy soil), and a third at a Tabuleiro dense savanna site.

Live-traps (Sherman® of three different sizes: height: 10/7.5/10 cm, width: 8/9/11 cm, depth: 30.5/23/38 cm and Tomahawk® height: 15 cm, width: 14 cm, depth: 41 cm) were



Figure 1. Individual of *Oecomys catherinae* (UFPE1890) trapped in Guaribas Biological Reserve. Juvenile male. Photo by Paulo Asfora.

Figura 1. Indivíduo de *Oecomys catherinae* (UFPE1890) capturado na Reserva Biológica Guaribas. Macho jovem. Foto: Paulo Asfora.

distributed in points along linear transects formed by 30 trap stations, each 10 m apart from the next. At each station two traps were set; one on the ground and another fixed on tree branches about 2 m above the ground. Traps were baited with a mix of pineapple, banana, sardines, peanut butter and corn flower and were rebaited every other day.

All trapped animals were sexed, measured, weighed, and karyotyped in the field. Specimens were identified to species level by comparison of morphological characters (skin and skull) with descriptions in the literature (Langguth et al. 2005, Bonvicino et al. 2008) and karyological analysis (Andrade & Bonvicino 2003, Langguth et al. 2005). Voucher specimens from the state of Paraíba were collected under IBAMA/ICMBio licenses #11633-2 and # 14734-1, and are currently housed at the Coleção de Mamíferos da Universidade Federal de Pernambuco.

Chromosomes in metaphases from our collected individuals were obtained with *in vitro* culture (culture of bone marrow grown in Dulbecco's MEM with 10% fetal bovine serum and colchicine). Conventional coloration with Giemsa 5% was used to count diploid (2n) and autosomal numbers (AN, excluding sexual chromosomes) and to observe variation in chromosome morphology. This analysis was carried out using an optic photomicroscope (Hund Wetzlar – H500 LL HP100). We also summarize karyotypic data of *O. catherinae* recorded across the species distribution found in the literature and from our unpublished data to present a review of the actual karyotypic data of the species.

For morphometric analysis we examined specimens of *O. catherinae* currently housed in MN, UFPE and UFPB as well as individuals collected by us in many localities (Appendix I) during this and previous trips. Following Geise et al. (2008), 20 cranial measurements were obtained with a digital caliper: condylo-incisive length (CIL), breadth of occipital condyles (BOC), length of diastema (LD), length of palatal bridge (LPB), length (LIF) and breadth (BIF) of incisive foramina, length of the maxillary molar row (LM), breadth of M1 (BM1), breadth between the first molars, including both teeth (M1M1), bullar length (BL), height of skull (HS), length of the rostrum (LR), rostrum width (RW), least interorbital length (LIB), internal orbital length (IOL), zygomatic breadth (ZB), breadth of the braincase (BB), breadth of the zygomatic plate (BZP), mandible height (MH) and length (ML). Additionally, head-and-body length (HBL), tail length (TL), Hindfoot length (HF), Ear length (E) and body weight (W) were also analyzed. We performed descriptive statistic analyses of the external and cranial measurements of these specimens including a *t*-test to detect sexual dimorphism. Age classes were determined according to molar teeth wear (Cerqueira et al. 1989); only adult specimens were included in statistical analyses.

Results and Discussion

We collected 46 individuals of six marsupial species – *Caluromys philander* Linnaeus, 1758 (n = 2), *Didelphis albiventris* Lund, 1840 (n = 5), *Marmosa murina* Linnaeus, 1758 (n = 9), *Micoureus demerarae* Thomas, 1905 (n = 10), *Monodelphis domestica* Wagner, 1842 (N = 2) and four rodent species – *Akodon cursor* Winge, 1887 (n = 12), *Necomys lasiurus* Lund, 1840 (n = 1), *Oecomys catherinae* (n = 4) and *Oligoryzomys* sp. (n = 1).

Two specimens of *O. catherinae* were trapped in SEMA III, in Reserva Biológica Guaribas, a forest fragment that includes well-preserved late secondary semi-deciduous forest in a natural regeneration process of nearly 60 years (unpublished data). The first specimen was a young male (age class 2) trapped in March

2008 (museum number UFPE1890) and the second specimen was an adult male (museum number UFPE 1889, age class 3) trapped in September 2008. Another two specimens were trapped in October 2009 in Mata do Açude (semi-deciduous forest trap-line), in Usina São João (Figure 2); a male (museum number UFPE1896) and a female (museum number UFPE1897), both adults (age class 4). All were trapped in Sherman® traps set on tree branches at about 2 m off the ground.

These records show the occurrence of *O. catherinae* in the Atlantic Forest of the state of Paraíba, Brazil, representing the northernmost occurrence of the species and extending its distribution one degree of latitude and 122 km north of the previously known northernmost locality (Langguth et al. 2005). These records also represent an extension of the known ecological limits in northeastern Brazil beyond the coastal rainforests of the state of Pernambuco, in the Pernambuco Coastal Forests ecoregion, into the semi-deciduous forests of the state of Paraíba, part of the Pernambuco Interior Forests ecoregion (Olson et al. 2001) (see Table 1). These new records also place the distributional limits of *O. catherinae* very close to the northernmost limit of the Brazilian Atlantic Forest, just 110 km further north near the city of Natal (Instituto..., 1993). The records at Guaribas also lie very close (9 km) to the border between the Atlantic Forest and the semi-arid Caatinga shrublands (Instituto..., 1993) (Figure 3).

With these new records we suggest that the distribution limits of *O. catherinae* north from São Francisco river actually reach still further northward and further inland than previously recorded and may closely follow the limits of the Atlantic Forest. No *O. catherinae* specimens were recorded in the few studies including the “brejos úmidos” (Oliveira & Langguth, 2004; Souza et al. 2004), which are forest enclaves on mesic ridges amidst semi-arid Caatinga.

In the Brazilian Atlantic Forest we found individuals identified as *O. catherinae* occurring from Joinville, in the state of Santa Catarina, the type locality (Cherem et al. 2004, Carleton et al. 2009), to the state of Espírito Santo (Pinto et al. 2009a, b). However, although Musser & Carleton (2005) and Costa et al. (2008) state that *O. catherinae* occurs from the states of Santa Catarina to Bahia, the only register of



Figure 2. Photo of Mata do Açude in Usina São João representing the vegetation types where *Oecomys catherinae* was collected during field work. Photo by Alexandre Palma.

Figura 2. Foto da Mata do Açude, na Usina São João, representando o tipo de vegetação onde obtivemos capturas de *Oecomys catherinae*. Foto: Alexandre Palma.

Table 1. Characteristics of sites of occurrence of *Oecomys catherinae* at northern Atlantic Forest. 1 = Altitude database ETOPO2 from NOAA & NGDC (National... 2001); 2 = IBGE (Instituto... 1993); 3 = Hijmans et al. (2005); 4 = Langguth et al. (2005); 5 = Asfora & Pontes (2009).

Tabela 1. Características dos locais de ocorrência de *Oecomys catherinae* na porção norte da Floresta Atlântica. 1 = Banco de dados de altitude ETOPO2 do NOAA & NGDC (National... 2001); 2 = IBGE (Instituto... 1993); 3 = Hijmans et al. (2005); 4 = Langguth et al. (2005); 5 = Asfora & Pontes (2009).

Locality, municipality	Altitude ¹ (m)	Vegetation ²	Mean annual temperature ³ (°C)	Rainfall ³ (mm/year)	Forest fragment size (ha)
REBIO Saltinho, Rio Formoso – PE ⁴	26	Dense rain forest	23.8	1930	564
CIMNC, Paudalho – PE	118	Open rain forest	24.4	1388	800
Usina São José, Igarassú– PE	48	Open rain forest	24.8	1613	323
Rancho Mineiro, São Lourenço da Mata – PE ⁴	47	Open rain forest	24.9	1473	Unknown
RPPN Frei Caneca, Jaqueira – PE ⁵	640	Open rain forest with semi-deciduous forest	21.0	1113	500
Usina São João, Cruz do Espírito Santo – PB	54	Semi-deciduous forest in a savanna/forest mosaic	25.0	1294	700
REBIO Guaribas, Mamanguape – PB	20	Semi-deciduous forest in a savanna/forest mosaic	25.5	1337	338
Usina Serra Grande, Ibataguara – AL ⁵	390	Open rain forest with semi-deciduous forest	23.0	1225	3000

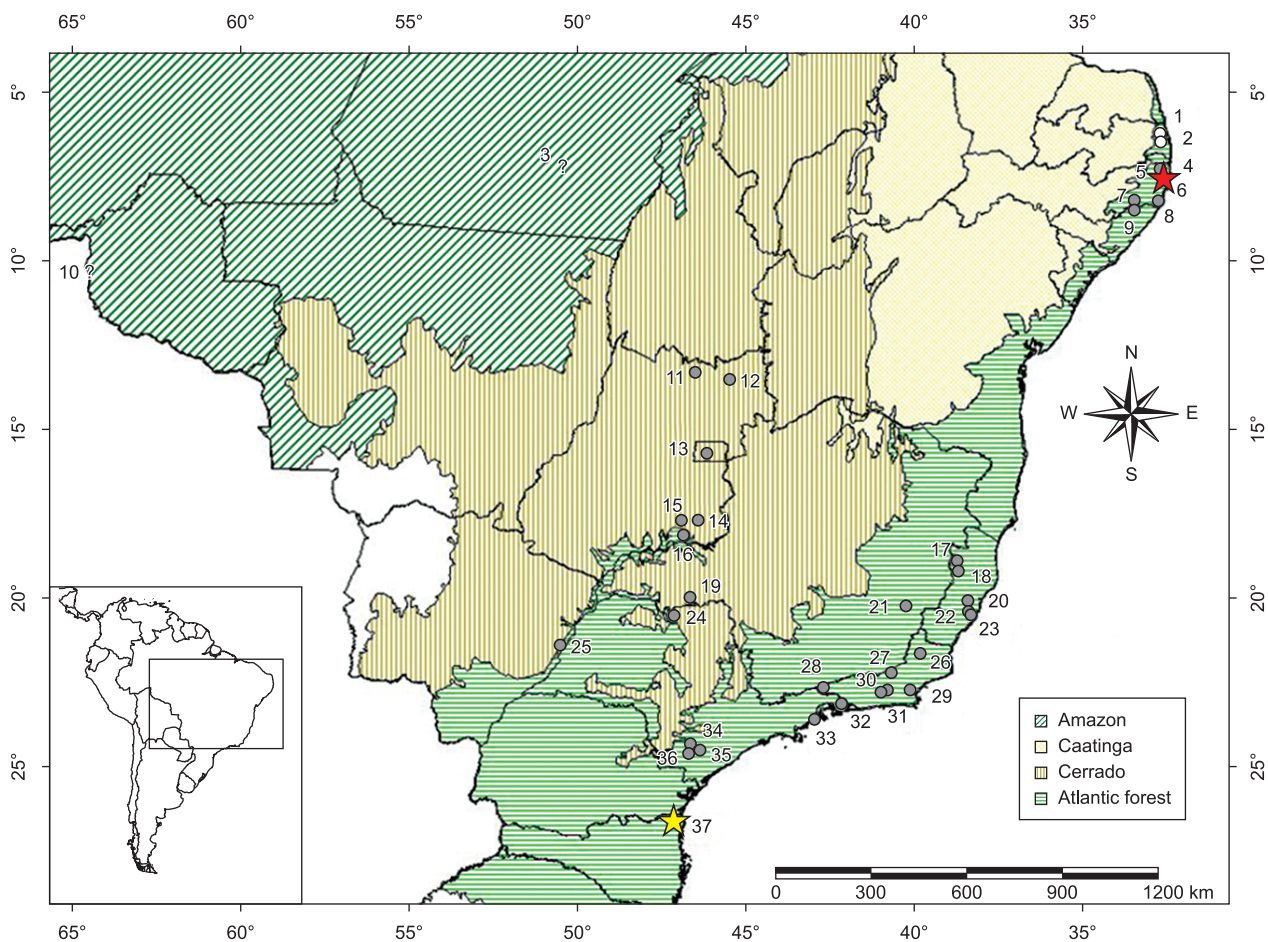


Figure 3. Distribution map of *Oecomys catherinae* showing the previous records (gray circles) and our new record sites (Reserva Biológica Guaribas, 1, and Usina São João, 2, white circles). Type locality of *O. catherinae* (yellow star) and *O. bahiensis* (red star) are pointed on the map. ? represents possible occurrence based in published data, for more information see the text. Data from the examined Museums and from Percequillo et al. (2011), Carleton et al. (2009), Cáceres et al. (2008), Pinheiro & Geise (2008), Lambert et al. (2006), Langguth et al. (2005), Cherem et al. (2004), Andrade & Bonvicino (2003), Pinto et al. (2009a,b), Andrades-Miranda et al. (2001), Asfora & Pontes (2009), Vieira & Palma (2005) and this paper. Localities numbers follow Appendix I.

Figura 3. Mapa de distribuição de *Oecomys catherinae* mostrando os registros anteriores conhecidos (círculos pretos) e as localidades dos novos registros (Reserva Biológica Guaribas, 1, e Usina São João, 2, círculos brancos). As localidades tipo de *O. catherinae* (estrela amarela) e *O. bahiensis* (estrela vermelha) estão indicados no mapa. ? indicam possíveis ocorrências baseadas na literatura, consultar o texto para mais informações. Dados obtidos nas coleções visitadas e em Percequillo et al. (2011), Carleton et al. (2009), Cáceres et al. (2008), Pinheiro & Geise (2008), Lambert et al. (2006), Langguth et al. (2005), Cherem et al. (2004), Andrade & Bonvicino (2003), Pinto et al. (2009a,b), Andrades-Miranda et al. (2001), Asfora & Pontes (2009), Vieira & Palma (2005) e neste trabalho. Números das localidades seguem a tabela no Apêndice I.

Oecomys collected in the state of Bahia was an individual identified as *Oecomys* sp. from Una (Pardini 2004). In the states of Pernambuco and Alagoas we found records of individuals identified as *O. bahiensis* (Langguth et al. 2005, Asfora & Pontes 2009), synonymized as *O. catherinae* (Musser & Carleton 2005). This apparently disjunct distribution in the Atlantic Forest could be an artifact of insufficient sampling effort in the northeastern region of Brazil, or alternately might suggest that *O. bahiensis* could be a valid species differing from *O. catherinae*.

We found several putative records of *O. catherinae* (or *O. concolor* presenting $2n = 60$ and $AN = 62$) in the gallery forests in Cerrado biome from the states of Goiás and Minas Gerais and Distrito Federal (Andrades-Miranda 2001, Andrade & Bonvicino 2003, Langguth et al. 2005, Vieira & Palma 2005 and references therein). However we did not examine these specimens and this classification is based only at the karyotypes or the identifications published. No record of *Oecomys* of any species was found for the Caatinga biome (Freitas et al. 2005, Oliveira et al. 2003).

There is a published record of *O. catherinae* from Pinkaití Research Station, Ourilândia do Norte, in the southeast of the state of Pará, in a region of the Amazon forest consisting of approximately 70% forest and 30% Cerrado (Lambert et al. 2006). However these identifications were just hypotheses made by Robert Voss (R. Voss, personal communication). Another possible record of *O. catherinae* in the Amazon biome is from Andrades-Miranda et al. (2001), who found *O. concolor* presenting $2n = 60$, $AN = 62$, in Guajará-Mirim, in the state of Rondônia. If confirmed these records show another disjunct population of *O. catherinae* in the north of Brazil and extend the species occurrence to the southern limits of the Amazon forest. Another hypothesis states that more than one species may share the same chromosomal complement, which would make necessary a detailed revision, since we have not observed all specimens or the type of *O. catherinae*.

External and cranial measurements of the individuals from the state of Paraíba and of all examined specimens are shown in Table 2 and 3. No sexual dimorphism was found in cranial measurements

Table 2. External measures (in mm) and weight (in g) of the collected specimens of *Oecomys catherinae* in Paraíba State. AC = age class; HBL = Head and Body length; TL = Tail Length; HF = Hindfoot; E = Ear; W = weight. 1 = Means of all examined individuals from Atlantic Forest localities; 2 = data from Bonvicino et al. (2008). UFPE = Universidade Federal de Pernambuco.

Tabela 2. Medidas externas (em mm) e massa corporal (em g) dos espécimens de *Oecomys catherinae* coletados no estado da Paraíba. Sex = sexo; AC = classe etária; HBL = comprimento da cabeça e corpo; TL = comprimento da cauda; HF = pé; E = Orelha; W = peso. 1 = Médias de todos os indivíduos analisados coletados na Floresta Atlântica; 2 = dados retirados de Bonvicino et al. (2008). UFPE = Universidade Federal de Pernambuco.

Museum number	Sex	AC	HBL (n)	TL (n)	HF (n)	E (n)	W (n)
UFPE1890	m	2	109.00	136.00	28.50	18.50	32.00
UFPE1889	m	3	138.00	147.00	27.00	19.00	67.00
UFPE1896	m	4	140.00	156.00	29.00	20.00	71.00
UFPE1897	f	4	145.00	125.00	27.00	18.00	68.00
<i>O. catherinae</i> ¹	-	-	136.76 (25)	157.28 (25)	28.60 (25)	18.76 (25)	74.45 (24)
<i>O. catherinae</i> ²	-	-	132-150	166.00	30.00	20.00	70.00

Table 3. Descriptive statistics (16 males and 11 females) of *Oecomys catherinae* specimens examined and results from *t*-test to detect sexual dimorphism. Refer to text for measurement acronyms.

Tabela 3. Estatísticas descritivas dos espécimens de *Oecomys catherinae* examinados (16 machos e 11 fêmeas) e resultados dos testes-*t* para detectar dimorfismo sexual. Consultar o texto para o significado dos acrônimos.

Measurement	n	Mean (\pm Std.Dev.)	Range	<i>t</i> -test (p)
CIL	27	30.72 (\pm 1.64)	26.07-35.41	0.379
BOC	27	7.06 (\pm 0.38)	6.4-8.46	0.239
LD	27	8.66 (\pm 0.56)	7.06-10.16	0.258
LPB	27	6.96 (\pm 0.47)	6.08-8.46	0.845
LIF	27	5.84 (\pm 0.38)	5.16-6.86	0.269
BIF	27	2.41 (\pm 0.16)	2.16-2.81	0.275
LM	27	5.17 (\pm 0.38)	4.73-6.92	0.329
BM1	27	1.44 (\pm 0.11)	1.29-1.87	0.447
M1M1	27	6.19 (\pm 0.37)	5.56-7.73	0.556
BL	26	3.67 (\pm 0.38)	2.83-4.74	0.771
HS	27	9.7 (\pm 0.49)	8.97-11.36	0.180
LR	26	11.93 (\pm 0.79)	10.16-13.82	0.753
RW	27	6.35 (\pm 0.47)	5.48-7.54	0.275
LIB	27	6.03 (\pm 0.37)	5.22-6.8	0.295
IOL	27	11.77 (\pm 0.49)	10.16-12.81	0.256
ZB	27	17.52 (\pm 1.04)	14.3-20.07	0.234
BB	27	13.95 (\pm 0.63)	13-16.01	0.661
BZP	27	3.96 (\pm 0.27)	3.27-4.33	0.677
MH	25	8.84 (\pm 0.58)	7.79-10.39	0.695
ML	27	16.94 (\pm 0.91)	14.68-19.53	0.639

(Table 2) and the only external measurement differing between the sexes was “Ear Length” with a $p = 0.024$. Based on their work with *O. sydandersoni* in Bolivia, Carleton et al. (2009) state that none of the 18 craniodental variables demonstrated significant secondary sexual dimorphism.

The karyotype of the specimens from the state of Paraíba showed a $2n = 60$ and an $AN = 62$ (Figure 4b), matching the already described karyotype for the species (Langguth et al. 2005). Nine

karyotyped individuals, from a total of 14, recorded in Cachoeiras de Macacu, Guapimirim and Sumidouro in the Atlantic Forest of Rio de Janeiro state, presented a polymorphism in the autosomal number, with $AN = 64$ (Table 4). These individuals presented the autosomal complement composed by one pair of large subtelocentric chromosomes, two pairs of small metacentric chromosomes and 26 pairs of large to small acrocentric chromosomes (Figure 4a). The difference between this latter karyotype and the $2n = 60$, $AN = 62$,

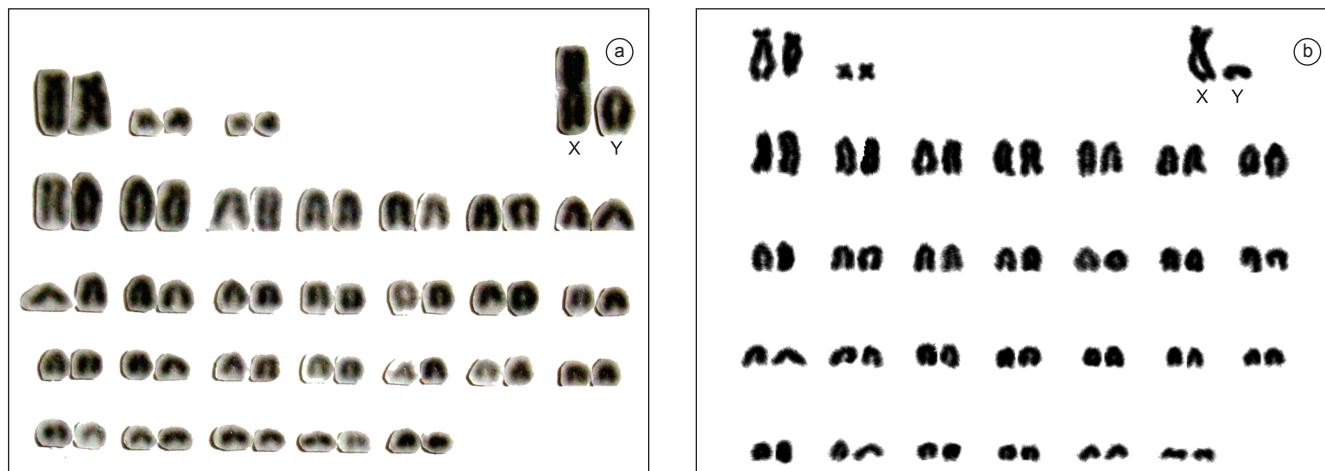


Figure 4. (a) Karyotype of *Oecomys catherinae* (SU86) collected in Sumidouro, Rio de Janeiro State, $2n = 60$, $AN = 64$ and (b) karyotype of *Oecomys catherinae* (UFPE1889) collected in Mamanguape, Paraíba State, $2n = 60$, $AN = 62$ with conventional staining.

Figura 4. (a) Cariótipo de *Oecomys catherinae* (SU86) coletado em Sumidouro, Rio de Janeiro, $2n = 60$, $AN = 64$ (a) e (b) cariótipo de *Oecomys catherinae* (UFPE1889) coletado em Mamanguape, Paraíba, $2n = 60$, $AN = 62$ (b), observados em coloração convencional.

Table 4. Recorded karyotypes of *Oecomys catherinae* in literature. Brazilian states: GO = Goiás, PB = Paraíba, PE = Pernambuco, RJ = Rio de Janeiro, SP = São Paulo. $2n$ = diploid number, AN = autossomal number. 1 = this study, 2 = Andrade and Bonvicino (2003), 3 = Andrades-Miranda et al. (2001), 4 = Langguth et al. (2005); 5 = Pinheiro & Geise (2008). See appendix for more details about the localities.

Tabela 4. Cariótipos registrados para *Oecomys catherinae*. Estados brasileiros: GO = Goiás, PB = Paraíba, PE = Pernambuco, RJ = Rio de Janeiro, SP = São Paulo. $2n$ = número diplóide; AN = número autossômico. 1 = este estudo; 2 = Andrade e Bonvicino (2003); 3 = Andrades-Miranda et al. (2001); 4 = Langguth et al. (2005); 5 = Pinheiro & Geise (2008). Ver apêndice para maiores detalhes sobre as localidades.

City	UF	$2n$	AN	Source
Caldas Novas	GO	60	62	3
Minaçu	GO	60	62	3
Teresina de Goiás	GO	60	62	2
Mamanguape	PB	60	62	1
Cruz do Espírito Santo	PB	60	62	1
Igarassú	PE	60	62	1
Jaqueira	PE	60	62	1
Paudalho	PE	60	62	1
Rio Formoso	PE	60	62	4
São Lourenço da Mata	PE	60	62	4
Cachoeiras de Macacu	RJ	60	62/64	1
Cambuci	RJ	60	62	1
Casimiro de Abreu	RJ	60	62	1
Guapimirim	RJ	60	62	2
Guapimirim	RJ	60	64	1
Sumidouro	RJ	60	62	2
Sumidouro	RJ	60	64	1
Capão Bonito	SP	60	62	2
Ubatuba	SP	60	62/64	5

is the presence of a third small metacentric pair (Figure 4a). Pinheiro & Geise (2008) also reported the karyotype $2n = 60$ and $AN = 64$ from Picinguaba, Ubatuba, in the state of São Paulo. We re-analyzed these karyotypes from Pinheiro & Geise (2008) and confirmed that they showed the same polymorphism as the individuals from the state of Rio de Janeiro.

These data suggest that this polymorphism could be shared by the populations occurring from Cachoeiras de Macacu and Sumidouro, in the state of Rio de Janeiro, to Ubatuba, in the state of São Paulo, inherited from a common ancestor. And it probably could also occur in individuals of *O. catherinae* collected in the intermediary area of Itatiaia and Mangaratiba, in the state of Rio de Janeiro, (Figure 4a).

Our work confirms the lack of information about the taxonomic status and geographic distribution of the *Oecomys catherinae*. We found many uncertain records based mainly in old data of *O. concolor*, *O. aff. concolor* or *O. group concolor*. It shows an urgent need for a taxonomic revision to confirm the identity of these individuals. We showed three apparently disjunctive populations of *O. catherinae* in: a) the Northern, b) Northeastern and c) Central and Southeastern regions of Brazil, and a chromosomal polymorphism shared by the meta-populations spread among the states of Rio de Janeiro and São Paulo. These data could be a sampling artifact, or *O. catherinae* as currently recognized could be composed by more than one species.

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Appendix I e II

Appendix I. Localities used to compose the map of occurrence of *Oecomys catherinae* in Brazil: 1 = Carleton et al. (2009), 2 = Cáceres et al. (2008), 3 = Pinheiro & Geise (2008), 4 = Lambert et al. (2006), 5 = Langguth et al. (2005), 6 = Andrade & Bonvicino (2003), 7 = Pinto et al. (2009a), 8 = Pinto et al. (2009b), 9 = Andrades-Miranda et al. (2001), 10 = Asfora & Pontes (2009), 11 = Vieira & Palma (2005), 12 = Percequillo et al. (2011), TS = this paper. MN = Museu Nacional, Universidade Federal do Rio de Janeiro.

Number	City	State	Latitude	Longitude	Source
1	Mamanguape	PB	06° 48' 02" S	35° 05' 47" W	TS
2	Cruz do Espírito Santo	PB	07° 06' 55" S	35° 04' 47" W	TS
3	Ourlândia do Norte	PA	07° 46' 14" S	51° 57' 43" W	4
4	Igarassú	PE	07° 50' 27" S	35° 00' 06" W	TS
5	Paudalho	PE	07° 50' 38" S	35° 06' 07" W	TS
6	São Lourenço da Mata	PE	08° 00' 12" S	35° 01' 17" W	5
7	Jaqueira	PE	08° 42' 59" S	35° 50' 37" W	10
8	Rio Formoso	PE	08° 43' 47" S	35° 10' 34" W	5
9	Ibateguara	AL	08° 59' 42" S	35° 50' 27" W	10
10	Guajará-Mirim	RO	10° 47' 27" S	65° 19' 55" W	9
11	Mináçu	GO	13° 33' 49" S	48° 13' 19" W	9
12	Teresina de Goiás	GO	13° 46' 35" S	47° 15' 53" W	6
13	Brasília	DF	15° 49' 36" S	47° 55' 18" W	11
14	Ipameri	GO	17° 43' 29" S	48° 09' 35" W	9
15	Caldas Novas	GO	17° 44' 42" S	48° 37' 30" W	9
16	Corumbáiba	GO	18° 08' 35" S	48° 33' 32" W	9
17	Águia Branca	ES	18° 53' 23" S	40° 49' 36" W	7
18	Pancas	ES	19° 12' 16" S	40° 47' 43" W	7
19	Conceição das Alagoas	MG	19° 54' 50" S	48° 23' 11" W	MN
20	Santa Teresa	ES	19° 57' 10" S	40° 31' 30" W	7
21	Pirapitinga	MG	20° 07' 60" S	42° 17' 60" W	TS
22	Cariacica	ES	20° 16' 52" S	40° 31' 19" W	7
23	Viana	ES	20° 23' 20" S	40° 27' 41" W	8
24	Barra Grande	SP	20° 25' 00" S	48° 50' 00" W	5
25	Brasilândia	MS	21° 15' 00" S	52° 02' 00" W	2
26	Cambuci	RJ	21° 29' 35" S	41° 52' 20" W	TS
27	Sumidouro	RJ	22° 02' 42" S	42° 40' 24" W	TS
28	Itatiaia	RJ	22° 26' 14" S	44° 36' 00" W	TS
29	Casimiro de Abreu	RJ	22° 29' 05" S	42° 12' 04" W	TS
30	Cachoeiras de Macacu	RJ	22° 32' 35" S	42° 48' 19" W	TS
31	Guapimirim	RJ	22° 33' 48" S	42° 57' 53" W	TS
32	Mangaratiba	RJ	22° 55' 12.1" S	44° 06' 32" W	TS
33	Ubatuba	SP	23° 20' 45" S	44° 51' 00" W	3
34	Capão Bonito	SP	24° 00' 14" S	48° 20' 21" W	6
35	Sete Barras	SP	24° 14' 04" S	48° 05' 11" W	6
36	Parque Estadual Intervales, Ribeirão Grande	SP	24° 20' S	48° 25' W	12
37	Joinville	SC	26° 18' 16" S	48° 50' 54" W	1

Appendix II. Specimens examined: The 52 specimens analyzed by us are deposited in collections from Museu Nacional, Universidade Federal do Rio de Janeiro (MN) and Universidade Federal de Pernambuco (UFPE). Individuals used in cranial analyses are marked with * and individuals karyotyped by us are marked with #. RB-M, FU, FS and SU = field number of Laboratório de Vertebrados, Universidade Federal do Rio de Janeiro; HGB CFVC = field number of Helena de Godoy Bergallo. ALAGOAS: **Ibateguara** Loc. 9 (UFPE1666*); MINAS GERAIS: **Conceição das Alagoas** Loc. 19 (MN68206*), **Pirapitinga** Loc. 21 (MN72737#, MN72738#); PARAÍBA: **Cruz do Espírito Santo** Loc. 2 (UFPE1896*#, UFPE1897*#), **Mamanguape** Loc. 1 (UFPE1889*#, UFPE1890#); PERNAMBUCO: **Igarassú** Loc. 4 (UFPE1892*#), **Jaqueira** Loc. 7 (UFPE1893*, UFPE1894*, UFPE1891*#), **Paudalho** Loc. 5 (UFPE1888*#), **Rio Formoso** Loc. 8 (UFPB4450); RIO DE JANEIRO: **Cachoeiras de Macacu** Loc. 30 (MN74364#, MN74370*#, MN74374*, MN74371*#, MN74372*#, MN74373), **Cambuci** Loc. 26 (RB-M-3-51#, RB-M-3-52#), **Casimiro de Abreu** Loc. 29 (FU16#, FU17#), **Guapimirim** Loc. 31 (FS04-77, MN74359*#, FS04-27, MN74360*#, MN74361, MN74362*, MN74365, MN74366*#, MN74367#, MN74363*, MN74368#, MN74369*#, FS13-96*), **Itatiaia** Loc. 28 (HGBCFVC 04), **Mangaratiba** Loc. 33 (RB-M-58), **Sumidouro** Loc. 27 (SU63#, SU86#); SÃO PAULO: **Ubatuba** Loc. 34 (MN74376*#, MN74380*, MN74375*, MN74377*#, MN74378#, MN74379#, MN74381*)