UNIVERSIDADE FEDERAL DE SANTA MARIA
CENTRO DE CIÊNCIAS NATURAIS E EXATAS
PROGRAMA DE PÓS-GRADUAÇÃO EM
BIODIVERSIDADE ANIMAL

O QUE DETERMINA A VARIAÇÃO DO CRÂNIO EM MAMÍFEROS? AVALIANDO AS REGRAS DE RENSCH E DE BERGMANN EM PRIMATAS DA AMÉRICA DO SUL

DISSERTAÇÃO DE MESTRADO

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Santa Maria/RS, Brasil

2016

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Dissertação apresentada ao Programa de Pós-Graduação em Biodiversidade Animal, da Universidade Federal de Santa Maria, como requisito parcial para obtenção do grau de **Mestre em Ciências Biológicas – Área Biodiversidade Animal.**

Orientador: Prof. Dr. Nilton Carlos Cáceres

Santa Maria/RS, Brasil

2016

Ficha catalográfica elaborada através do Programa de Geração Automática
da Biblioteca Central da UFSM, com os dados fornecidos pelo(a) autor(a).

Sá Polidoro, George Lucas
O QUE DETERMINA A VARIAÇÃO DO CRÂNIO EM MAMÍFEROS? AVALIANDO AS REGRAS DE RENSCH E DE BERGMANN EM PRIMATAS DA AMÉRICA DO SUL / George Lucas Sá Polidoro.- 2016.
73 p.; 30 cm

Orientador: Nilton Carlos Cáceres
Dissertação (mestrado) - Universidade Federal de Santa Maria, Centro de Ciências Naturais e Exatas, Programa de Pós-Graduação em Biodiversidade Animal, RS, 2016

1. Primata 2. Bergmann 3. Rensch 4. Bugio 5. Macaco-prego I. Cáceres, Nilton Carlos II. Título.

Universidade Federal de Santa Maria
Centro de Ciências Naturais e Exatas
Programa de Pós-Graduação em Biodiversidade Animal

A Comissão Examinadora, abaixo assinada,
aprova a Dissertação de Mestrado

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elaborada por
George Lucas Sá Polidoro

como requisito parcial para obtenção do título de
Mestre em Biodiversidade Animal

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Santa Maria, 29 de agosto de 2016.

AGRADECIMENTOS

Agradeço ao Prof. Nilton Cáceres pela oportunidade e voto de confiança e a Msc. Jamile Bubadue pela irmandade, te amo.

RESUMO

Dissertação de Mestrado
Programa de Pós-Graduação em Biodiversidade Animal
Universidade Federal de Santa Maria

WHAT DRIVES SKULL VARIATIO IN MAMMALS? ASSESSING RENSCH’S AND BERGMANN’S RULES IN SOUTH-AMERICAN PRIMATES

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Data e Local da Defesa: Santa Maria, agosto de 2016

Nesse estudo nosso objetivo foi analisar se as regras de Rensch e Bergmann se aplicam aos primatas Sul Americanos dos gêneros *Sapajus* e *Alouatta*, onde os machos tendem a ser maiores que as fêmeas, e se as espécies tendem a ser maiores em altas latitudes. Observamos que *Alouatta* e *Sapajus* tendem a seguir a regra de Rensch e descobrimos um padrão inverso à regra de Bergmann para *Alouatta* (Tamanho maior em baixas latitudes), um padrão que depende tanto da filogenia, quanto da autocorrelação espacial. Em ambos sexos de ambos os gêneros, o tamanho é explicado pela complexidade da vegetação e do ambiente, portanto, a variação de tamanho não é só explicada pela taxonomia, mas também por adapatações relacionadas à pressão do ambiente.

Palavras-chave: Primata, Bergmann, Rensch, Bugio, Macaco-Prego

ABSTRACT

Master dissertation
Post-Graduation in Animal Biodiversity
Federal University of Santa Maria

WHAT DRIVES SKULL VARIATIO IN MAMMALS? ASSESSING RENSCH'S AND BERGMANN'S RULES IN SOUTH-AMERICAN PRIMATES

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In this study our aim was to analyze if Rensch' and Bergmann' rules apply to South-American primates of the genera *Sapajus* and *Alouatta*, where males tend to be larger than females and if species tend to be larger at higher latitudes. We found that *Alouatta* and *Sapajus* show similar Rensch's rule trend, and found a reverse Bergmann pattern for *Alouatta* (size larger at smaller latitudes), a pattern which is dependent of both phylogenetic and spatial autocorrelations. Both sexes of both genera, size is explained by vegetation complexity and enviroment, thus size variation is not only explained by taxonomy but also by adaptations related to the environment pressures.

Key-words: Primate, Bergmann, Rensch, Capuchin, Howler

SUMÁRIO

1- INTRODUÇÃO

Em 1849, Bergmann hipotetizou que animais endotérmicos tendem a aumentar o tamanho do corpo positivamente em relação a clina latitudinal (BERGMANN, 1849). Isso é, principalmente, devido à noção que animais com maior corpo em relação à superfície-volume corporal em áreas mais quentes podem dissipar calor mais rapidamente, enquanto que baixas relações de supefície-volume corporal reduzem a perda de calor em áreas mais frias (MEIRI et al., 2007). Em mamíferos, a regra de Bergmann pode não ser aplicada à todas as espécies no seu sentido geral. Por exemplo, em pequenos animais, existem vários casos onde se vê um padrão inverso de Bergmann (MAESTRI et al., 2016; MEDINA et al., 2007.; BELK e HOUSTON, 2002; ASHTON e FELDMAN, 2003). Nos Neotrópicos, Martínez et al. (2013) registrou um padrão interessante em *Cerdocyon thous*, onde essa espécie de canídeo segue Bergmann no sul do equador, porém ao norte, ocorre um padrão inverso. Esses exemplos sugerem que, para entender a relação entre o tamanho do corpo e o espaço geográfico, essa regra precisa ser testada em diferentes taxa, especialmente na América do Sul, onde estudos abordando esse assunto são escassos.

Enquanto a regra de Bergmann descreve o padrão relacionando a morfologia e o ambiente, a regra de Rensch prediz o aumento do dimorfismo sexual com o crescimento do tamanho do corpo (RENSCH 1950). Assim, é importante levar isso em conta, quando se tratar de espécies que possuem alto padrão de dimorfismo sexual (SHINE, 1989; ANDERSSON, 1994; FAIRBAIRN, 1997, 2007, 2013; WECKERLY 1998; BADYAEV, 2002). Uma vez que a regra de Bergmann prediz o efeito do tamanho do corpo e, a regra de Rensch prevê um efeito do tamanho do corpo nas taxas de dimorfismo sexual, é plausível esperar que essas regras se complementem quando lidamos com a variação dentro de um táxon com ampla distribuição e que possui dimorfismo sexual. A interação dessas duas regras pode ocorrer quando um padrão latitudinal no dimorfismo sexual é detectado. Assim, quando o macho é maior que a fêmea, por exemplo, é esperado que o declive da variação do tamanho do macho com a latitude, seja maior que o declive da fêmea e o oposto pode ser verdadeiro (BLANCKENHORN et al., 2006).

Em primatas, tanto a regra Bergmann quanto a de Rensch são frequentemente exploradas na literatura (GORDON, 2004; CLAUSS et al., 2013). Em relação à Bergmann, Harcourt & Schreier (2009) testaram o padrão latitudinal no tamanho do corpo nesses animais e encontraram um consistente modelo de Bergmann: a média do tamanho corporal aumenta com a latitude, e essa variação é altamente correlacionada com a filogenia, onde foi encontrado uma redução da riqueza de espécies menores em altas latitudes. Entretanto, sob a seleção sexual pela competição da escolha de machos e fêmeas, é esperado que o tamanho do corpo do macho seja o alvo primário dessa seleção (BLANCKENHORN, 2006; GORDON, 2004).

Em relação às espécies sul-americanas, as regras de Bergmann e de Rensch foram pouco exploradas. Martínez et al. (2013), Bidau e Martinez (2015) e Bubadué et al (2016) exploraram em espécies existentes para a família Canidae e ainda avaliaram a possível interação entre a regra de Bergmann com outras teorias importantes da macroecologia (regra de Rensch e deslocamento de caracteres). Consequentemente, primatas do gênero *Alouatta* e *Sapajus* são ótimos modelos para testar as regras de Bergmann e de Rensch e também suas interações, isto é, um padrão latitudinal potencialmente determinando a variação do tamanho do dimorfismo sexual. Esses dois clados amplamente distribuídos na América do Sul, são sexualmente dimórficos e possuem diferentes aspectos biológicos entre eles. De um lado, as espécies de *Alouatta* tem a dieta especializada em folhas (dieta principal), consumo de frutas, e podem pesar até 7- 8kg. Por outro lado, primatas do gênero *Sapajus* tendem a ter uma dieta mais generalista e são menores que as espécies de *Alouatta*, variando entre 2-3kg (ROSENBERGER, 1992; MELORO et al., 2014). As espécies do gênero *Sapajus*, tem a capacidade de dispersar longas distâncias em um dia, enquanto *Alouatta* tende a ter um padrão de atividade menor. Enquanto as duas espécies diferem e termos de ecologia alimentar e tamanho, não diferem na distribuição geográfica, já que os dois gêneros estão distribuídos amplamente na América do Sul (CORTES-ORTIZ et al., 2003; LYNCH-ALFARO et al., 2012a), mas a maioria das espécies se limita a um único bioma e demonstram pouca sobreposição geográfica (são parapátricas). Além disso, os dois grupos de primatas são sensíveis à variação da forma do crânio, como foi evidenciado através da morfometria geométrica (MELORO et al., 2014; CÁCERES et al., 2014).

Alouatta pertence à família Atelidae, e estudos recentes revelam que esse clado provavelmente se diversificou durante o Mioceno (6.8 ma), quando um bugio primitivo expandiu sua distribuição geográfica através da Cordilheira dos Andes. Enquanto, *Sapajus* foi recentemente dividido do gênero *Cebus* baseado em dados morfológicos e moleculares, e pertence à família Cebidae. *Sapajus* se diversificou de *Cebus* no fim do Mioceno (6.2 ma), e se manteve restrito à Mata Atlântica durante a maior parte da sua história filogenética, rapidamente se diversificando cerca de 2.7 ma, e somente se dispersando para o Cerrado e Amazônia no fim do Pleistoceno (400.00 anos atrás) (LYNCH-ALFARO et al., 2012; CÁCERES et al., 2014; MELORO et al., 2014).

2-OBJETIVOS

Nesse estudo, nosso objetivo foi analisar se as regras de Bergmann e Rensch se aplicam aos primatas do gênero *Sapajus e Alouatta* da América do Sul, e testar as seguintes hipóteses

2.1: OBJETIVOS ESPECÍFICOS

1 – *Alouatta* e *Sapajus* seguem a regra de Rensch, que afirma que o dimorfismo sexual aumenta com o tamanho do corpo (RENSCH, 1950). Nesses primatas, machos tendem a ser maiores que as fêmeas e competir entre eles (CÁCERES et al., 2014; MELORO et al., 2014). Assim, nós esperamos uma relação mais forte entre o dimorfismo sexual e o tamanho dos machos, do que o tamanho das fêmeas.

2 – *Alouatta* e *Sapajus* seguem a regra de Bergmann, que afirma que espécies são maiores em maiores latitudes (onde o clima tende a ser mais frio). Isso é relacionado à predição que afirma que animais homeotérmicos podem reter calor mais facilmente com a diminuição da superfície da área do corpo (BLACKBURN et al., 1999; ASHTON ET AL., 2000; RODRÍGUEZ et al., 2008). Contudo, nós estamos cientes que outras variáveis ambientais podem influenciar (ver MARTINEZ et al., 2013; MAESTRI et al. 2016), tais como vegetação e precipitação, e assim nós também testamos os impactos dessas outras variáveis ambientais.

3 – O dimorfismo sexual varia com a latitude e outras variáveis ambientais. Isso é baseado na predição acima: se as regras de Rensch e de Bergmann são verdadeiras para *Alouatta* e *Sapajus*, então o dimorfismo sexual também vai correlacionar com a latitude e outras variáveis ambientais, uma vez que depende do tamanho de machos e fêmeas, que esperamos que sigam um padrão geográfico (BLANCKENHORN et al., 2006). O Padrão vai ser consistente se não existir outra variável forte o suficiente para esconder esse padrão geográfico juntamente com os sexos.

3 - ARTIGO

What drives skull size variation in mammals? Assessing Rensch's and Bergmann's rules in South-American primates (*Alouatta* and *Sapajus*)

Aluno: George Lucas Sá Polidoro
Orientador: Nilton Cáceres

ABSTRACT

In this study our aim was to analyze if Rensch' and Bergmann' rules apply to South-American primates of the genera *Sapajus* and *Alouatta*, where males tend to be larger than females and if species tend to be larger at higher latitudes. We found that *Alouatta* and *Sapajus* show similar Rensch's rule trend, and found a reverse Bergmann pattern for *Alouatta* (size larger at smaller latitudes), a pattern which is dependent of both phylogenetic and spatial autocorrelations. Both sexes of both genera, size is explained by vegetation complexity and enviroment, thus size variation is not only explained by taxonomy but also by adaptations related to the environment pressures.

INTRODUCTION

In 1849, Bergmann hypothesized that endothermic animals tend to increase their body size positively in relation to the latitudinal cline (Bergmann, 1849). This is mainly due to the notion that animals with higher body surface-to-volume ratio in warm areas can dissipate heat more quickly, while a lower surface-to-volume ratio reduces heat loss in colder areas (Meiri, Yom-Tov, & Geffen. 2007). In mammals, Bergmann's rule may not be applicable for all species in its common sense. For instance, in small sized animals, there is several cases point out a reverse Bergmannian pattern (Maestri et al. 2016; Medina, A. I., Martí, D. A. & Bidau, C. J 2007.; Belk & Houston, 2002; Ashton & Feldman, 2003). In the Neotropics, Martínez et al. (2013) recorded an interesting pattern in *Cerdocyon thous* where this canid species follows Bergmann south of the equator, but a converse Bergmann pattern occurs above it. These examples suggest that, in order to understand the relationship between body size and the geographical space, this rule needs to be tested for different taxa, especially in South America, where the studies approaching this subject are scarce.

While Bergmann's rule describes a pattern relating morphology and the environment, Rensch's rule predicts the increase of sexual dimorphism with the enlargement of body size (Rensch, 1950). Thus, it is important to take this into account when dealing with species possessing high sexual dimorphism patterns (Shine, 1989; Andersson, 1994; Fairbairn, 1997, 2007, 2013; Weckerly, 1998; Badyaev, 2002; Fairbairn, Blanckenhorn & Szekely, 2007). Since Bergmann's rule predicts the effect of the environment on body size and Rensch's rule foresees an effect of body size in sexual dimorphism rates, it is plausible to expect that these rules complement themselves when dealing with the variation of size within a taxon widely distributed and which possesses sexual dimorphism. The interaction between these two rules can occur when a latitudinal pattern in sexual dimorphism is detectable. Thus, when the male is larger than the female, for example, it is expected that the slope of male size variation with latitude gets larger than the female slope and the opposite can also be true (Blanckenhorn et al. 2006).

In primates, both Bergmann's and Rensch's rules have already been explored frequently in the literature (Gordon 2004; Clauss et al 2013). Regarding Bergamnn's, Harcourt & Schreier (2009) broadly tested the latitudinal pattern in body size in these animals and found a consistent Bergmann model: the mean corporal size of primates enhances with latitude, and this variation is highly correlated with phylogeny, where they found a decrease of smaller species richness at higher latitudes. Meanwhile, under sexual selection by male competition or female mate choice, male body size is expected to be the primary target of selection (Blanckenhorn 2006; Gordon 2004).

Concerning South American species, both Rensch and Bergmann's rules have been poorly explored. Martínez et al. (2013), Bidau & Martinez (2015) and Bubadué et al (2016) explore this in extant species for the Canidae family and even evaluate the possible interaction between Bergmann's rule with other important theories of macroecology (Rensch's rule and character displacement). Hence, primates from the genera *Alouatta* and *Sapajus* are good models to test Bergmann's and Rensch's rules and also their interactions, that is, a latitudinal pattern potentially driving the sexual size dimorphism variation. Both these clades are broadly distributed in South America, they are sexually dimorphic and posses different biological aspects among themselves. On one hand, *Alouatta* species have a highly specialized diet for leafs (the main diet) and fruits consumption, and weighing up to 7-8kg. On the other hand, primates of the genus *Sapajus* tend to have a more generalist diet and are way smaller than *Alouatta* species, ranging between 2-3kg (Rosenberger 1992; Meloro et al. 2014). Also *Sapajus* are capable to disperse at larger distances within a day, while *Alouatta* tends to have a lower pattern of activity. Insofar both genera differs in terms of feeding ecology and size, but they do not differ in their geographical distribution, as both genera covers most of South America (Cortes-Ortiz et al. 2003; Lynch-Alfaro et al. 2012a), but most species are limited to a single biome and show little geographic overlap (are parapatric). Besides, both primate groups are sensible to the environmental variation in your skull form, as was evidenced through geometric morphometric procedures (Meloro et al. 2014; Cáceres et al. 2014).

Alouatta belongs to Atelidae family, and recent studies revealed that this clade probably diversified during the Miocen (6.8 mya), when a primal howler monkey expanded its geographical range through the Andes Cordillera. Meanwhile, *Sapajus* has been more recently split from *Cebus* based on both morphological and molecular data, and belongs to the Cebidae family. *Sapajus* diversified from *Cebus* in the late Miocen (6.2 mya), and remained restricted to the Atlantic forest during most of its phylogenetic history, rapidly diversifying about 2.7 mya, and only dispersed to Cerrado and Amazonia in the late Pleistocene (400,000 years ago) (Meloro et al. 2014; Cáceres et al. 2014; Lynch-Alfaro et al. 2012).

In this study our aim was to analyze if Rensch' and Bergmann' rules apply to South-American primates of the genera *Sapajus* and *Alouatta*, and to test the following hypothesis:

1 – *Alouatta* and *Sapajus* follow Rensch's rule, which states that sexual dimorphism increases with body size (Rensch 1950). In these primates, males tend to be larger than females and compete among each other (Cáceres et al. 2014; Meloro et al. 2014). Thus, we expect a stronger relationship between sexual dimorphism and the size of males rather than the size of females.

2 – *Alouatta* and *Sapajus* follow Bergmann's rule, which states species are larger at higher latitudes (where the weather tends to be colder). This is related to the prediction that states that homoeothermic animals, when larger, can retain heat more easily with the decrease of the surface area of the body (Blackburn et al. 1999; Ashton et al. 2000; Rodríguez et al. 2008). However, we are aware that other environmental variables can influence this (see Martinez et al. 2013; Maestri et al. 2016), such as vegetation and precipitation, and so we also tested for the impact of other environmental variables (see material and methods: enviromental variables).

3 – Sexual size dimorphism (SSD) varies with the latitude and other environmental variables. This is based on the predictions above: if Rensch's and Bergmann's rule are true to *Alouatta* and *Sapajus*, then sexual dimorphism will also correlate with latitude and the environmental variables, since it depends of male and female size, which we expect to follow a geographical

pattern (Blanckenhorn et al. 2006). The pattern will be consistent if there is no other variable strong enough to hidden this geographical pattern along sexes.

MATERIALS AND METHODS

GEOMETRIC MORPHOMETRICS

We collected data for 157 and 231 skulls of *Sapajus* and *Alouatta* respectively, belonging to six different species from each gener, housed in the main Brazilian museums:Museu Nacional (MNRJ), Museu Paraense Emílio Goeldi (MPEG), Museu de Zoologia da Universidade de São Paulo (MZUSP), Museu de História Natural Capão da Imbuia (MHNCI), Coleção Científica de Mastozoologia da UFPR (DZUP), Museu de ciências naturais da Fundação Zoobotânica do Rio Grande do Sul (MCN/FZB) . In ArcGis ver. 10, we subdivided our dataset into random grids of 200 km² and used the average of males and females to create a new dataset, which we used to perform the statistical tests (Fig. 1; Table 1; see also Appendix S1).

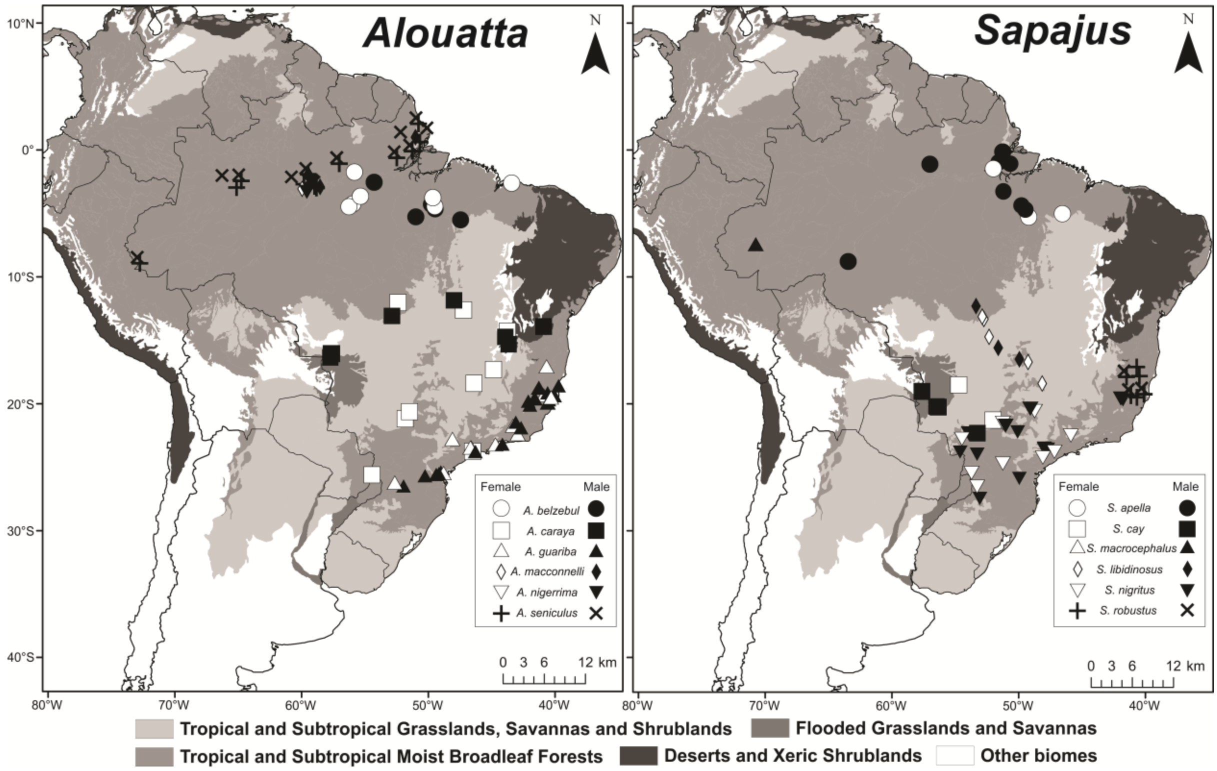

Figure 1. Maps of South America showing the geographic distribution of *Alouatta* and *Sapajus* specimens. Sampling localities of different species and sexes are shown by different symbols.

Table 1. Skull sample size for the twelve species and two genera of South-American primates included in this study.

Species	**#Grids**	**#Specimens**	**#Females**	**#Males**
Alouatta	34	231	115	116
Alouatta belzebul (Linnaeus, 1766)	7	65	36	29
Alouatta caraya (Humboldt, 1812)	10	46	26	20
Alouatta guariba (Humboldt, 1812)	8	47	19	28
Alouatta macconelli Elliot, 1910	2	11	5	6
Alouatta nigerrima Lönnberg, 1941	1	10	5	5
Alouatta seniculus (Linnaeus, 1766)	6	52	30	22
Sapajus	17	157	71	86
Sapajus apella (Linnaeus, 1758)	4	53	20	33
Sapajus macrocephalus (Spix, 1823)	1	10	5	5
Sapajus nigritus (Goldfuss, 1809)	6	46	21	25
Sapajus cay (Illiger, 1815)	3	12	6	6
Sapajus libidinosus (Spix, 1823)	2	16	7	9
Sapajus robustus (Kuhl, 1820)	1	20	10	10

Skull photographs were taken at a fixed distance (1 m) using a Manfrotto tripod to ensure parallelism between the plane of the digital camera and the axis of maximum skull length in ventral view. Digital photographs were landmarked by a single investigator (N.C.), thereby preventing inter-observer error, using the software tpsDig2 2.16 (Rohlf, 2015). When taking photos, we positioned a scale bar adjacent to the specimen in order to transform digital pixels into linear measurements, allowing us to compute skull size directly from the configuration of landmarks. Twenty-three homologous landmarks were identified and digitized in order to extract skull size information, in the form of the natural logarithm of centroid size (Fig. 2). Geometric morphometric analysis was applied to extract the size (as centroid size, the square root of the sum of squared distances between each landmark and the configuration centroid) from shape data from two dimensional raw coordinates (x, y) by using generalized Procustes analyses (Gpa, Rohlf & Slice, 1990).

Figure 2. Disposition of 23 landmarks on a skull of *Alouatta caraya* specimen. Landmarks definitions: 1 = prosthion: antero-inferior point on projection of pre-maxilla between central incisors; 2 = posterior-most point of lateral incisor alveolus; 3 = anterior-most point of canine alveolus; 4 = mesial P1: most mesial point on P1 alveolus, projected onto alveolar margin; 5–9 = contact points between adjacent pre-molars/molars, projected labially onto alveolar margin; 10 = anterior-most point on curvature of the zygomatic process; 11 =middle point on curvature of the zygomatic process; 12 = posterior-most point on curvature of the zygomatic process; 13 = posterior extremity of occipital condyle along margin of foramen magnum; 14 = opisthion: posterior-most point of foramen magnum; 15 = basion: anterior-most point of foramen magnum;16 =most posterior tip of the palatine; 17 = posterior tip onto alveolar margin of M3;18–23 = contact points between adjacent pre-molars/molars, projected lingually onto alveolar margin. Scale bar is 5 cm.

ENVIRONMENTAL VARIABLES

For each specimen, we recorded the geographic coordinates of its collection locality and extracted six environmental variables for each site that are important predictors of skull-size variation in mammals (Martinez et al. 2013; Bubadué et al. 2016; Maestri et al. 2016). Four of these variables were taken with 2.5 arc-minutes resolution from the WorldClim raster database (Annual Mean Temperature, Temperature Seasonality, Annual Precipitation and Precipitation Seasonality; Hijmans et al. 2005), and the other two from the Atlas of the Biosphere [net primary productivity (=NPP) and evapotranspiration, https://nelson.wisc.edu/sage/data-and-models/atlas/maps.php], using DIVA-GIS 7.5 software (http://www.divagis.org/download).

STATISTICAL ANALYSES

In order to confirm sexual dimorphism in primates and to test for possible differences between species and genera in skull size (represented as the natural logarithm of the average centroid size in each geographical cell), we performed two-way ANOVA, also taking interaction between factors (species/genera and sex) into account. We then tested for the existence of Rensch's rule by regressing female and males size in the calculated SSD (=mean male size/ mean female size). To test for Bergmann's rule, we first regressed female and male skull size with latitude (Bergmann in its original form). We also tested for the impact of the environmental variables described above in these variables. The interaction against Rensch's and Bergmann's rule was tested by regressing SDD with latitude and the environmental variables.

When dealing with geographical variables, we may morphological data can be spatially autocorrelated (spatial autocorrelation; Diniz-Filho et al. 2003). Thus, we tested on SSD, female and male size the effect of spatial autocorrelation using Moran's Index test in Sam v.4.0 (Rangel et al. 2010). To minimize the degree of spatial dependence in our data we used the Eigenvector-based Spatial Filtering (Griffith, 2013). This method uses a distance or connectivity matrix to perform a Principal Coordinate Analysis (PCORD) and detects the orthogonal vectors explaining the structure of the spatial dependence of a variable (the spatial filters in Griffith, 2013). These filters, generated using the software SAM (Rangel et al. 2010), were then selected using the forward.sel function in R package packfor (Dray et al. 2007). This procedure was repeated for each primate genus and for three response variables (SSD, female and male size). We repeated the regressions mentioned above, using the filtered response variables through partial regression, when spatial autocorrelation was detected.

Because we are using different species within each genus, we tested again for the impact of latitude and environmental variables in SSD and male and female skull size using Partial Least Squares. Due to species shared ancestry, we firstly build a molecular phylogeny for each genus with our selected taxa using reference trees from the literature (*Alouatta*: Cortes-Ortiz et al. 2003; *Sapajus*: Lynch-Alfaro et al. 2012). Using the package phylotools (Zhang et al. 2012), we tested for phylogenetic signal in our response variables for each genus. In the *Alouatta* case, we excluded the species *Alouatta nigerrima* from the phylogenetic analyses due to its unstable positioning in the phylogenies available in the literature. In the case of detected phylogenetic signal, using the package ape in R (Paradis, Claude & Strimmer 2004), we performed Generalized Least Squares models using the phylogenies as a covariate to assess if our results remain when taking the phylogenetic history of species into account (cf. Meloro et al. 2014a, b).

RESULTS

In the two-way ANOVA model using sex and genera as factors, we found size as significantly different for both genera (Genera: F = 604.291, Df = 1, P < 0.001) and sex (Sex: F = 212.906, Df = 1, P < 0.001), with interaction between them (F = 8.802; Df = 1, P = 0.004). This was also true for the model using sex and species as factors as well (Species: F = 112.119, Df = 11, P < 0.001; Sex: F = 399.589, Df = 1, P < 0.001; Interaction between factors: F = 1.959, Df = 11, P = 0.045). Basically, males are larger than females, as *Alouatta* are larger than *Sapajus* (Fig. 3).

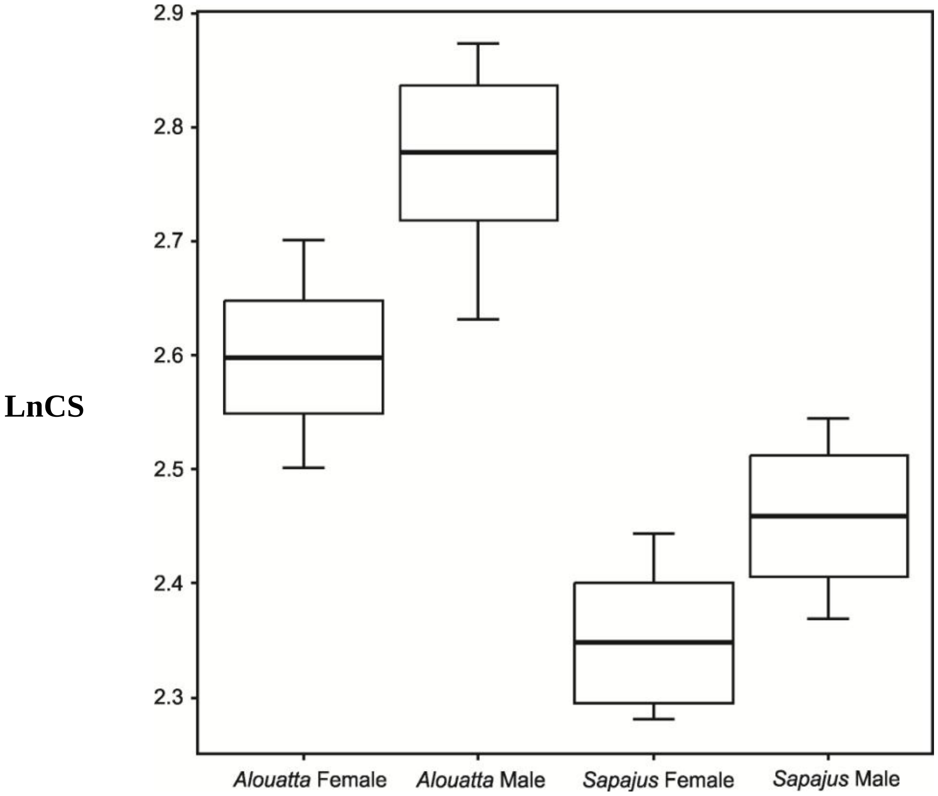

Figure 3. Box plot with standardized deviation of natural log transformed centroid size (LnCS) across sexes and genera. Black string: median, white box: first interquartile, bar: second interquartile.

SEXUAL SIZE DIMORPHISM

Linear regression models revealed only a significant relation between SSD and *Alouatta* male skull size, but not with females. Also, we found no significant relation between the environmental variables (except for a marginal one with seasonal temperature, P = 0.058), or even latitude, with SSD. In *Sapajus*, we only found a marginal relation between SSD and female body size (P = 0.058) and no significant relation between SSD, latitude and the environmental variables (see full results at Table 2).

Table 2. Results of linear regression between *Alouatta* and *Sapajus* sexual size dimorphism (SSD) and predictor variables. Significance is highlighted in bold. *marginal relation

	R^2	**Adjusted R^2**	**F**	**P**
Alouatta				
SSD~LnCS Male	0.31	0.29	14.41	**0.0006**
SSD~LnCS Female	0.03413	0.003951	1.131	0.2955
SSD~Latitude	0.07038	0.04133	2.423	0.1294
SSD~NPP	0.004972	-0.02612	0.1599	0.6919
SSD~Evapotranspiration	0.01929	-0.01136	0.6293	0.4335
SSD~Annual Mean Temperature	0.003926	-0.0272	0.1261	0.7248
SSD~Temperature Seasonality	0.1078	0.07991	3.866	0.0580*
SSD~Annual Precipitation	0.09875	0.07058	3.506	0.0703
SSD~Precipitation Seasonality	0.01766	-0.01304	0.5754	0.4537
Sapajus				
SSD~LnCS Male	0.1812	0.1228	3.099	0.1002
SSD~LnCS Female	0.2328	0.178	4.249	0.0584*
SSD~Latitude	0.007629	-0.06325	0.1076	0.7477
SSD~NPP	0.0284	-0.041	0.4092	0.5327
SSD~Evapotranspiration	0.09218	0.02733	1.421	0.2530
SSD~Annual Mean Temperature	0.03806	-0.03065	0.5539	0.4690
SSD~Temperature Seasonality	0.0001288	-0.07129	0.001803	0.9667
SSD~Annual Precipitation	0.001078	-0.07027	0.01511	0.9039
SSD~Precipitation Seasonality	0.04203	-0.0264	0.6142	0.4463

In both genera, SSD tends to increase with male skull size and the opposite is true for females (Fig. 4A and B). We found no pattern of variation between *Sapajus* SDD and temperature seasonality (Fig. 4D), but a pattern is visible for *Alouatta,* were SSD decreases at more seasonal environments (Fig. 4C).

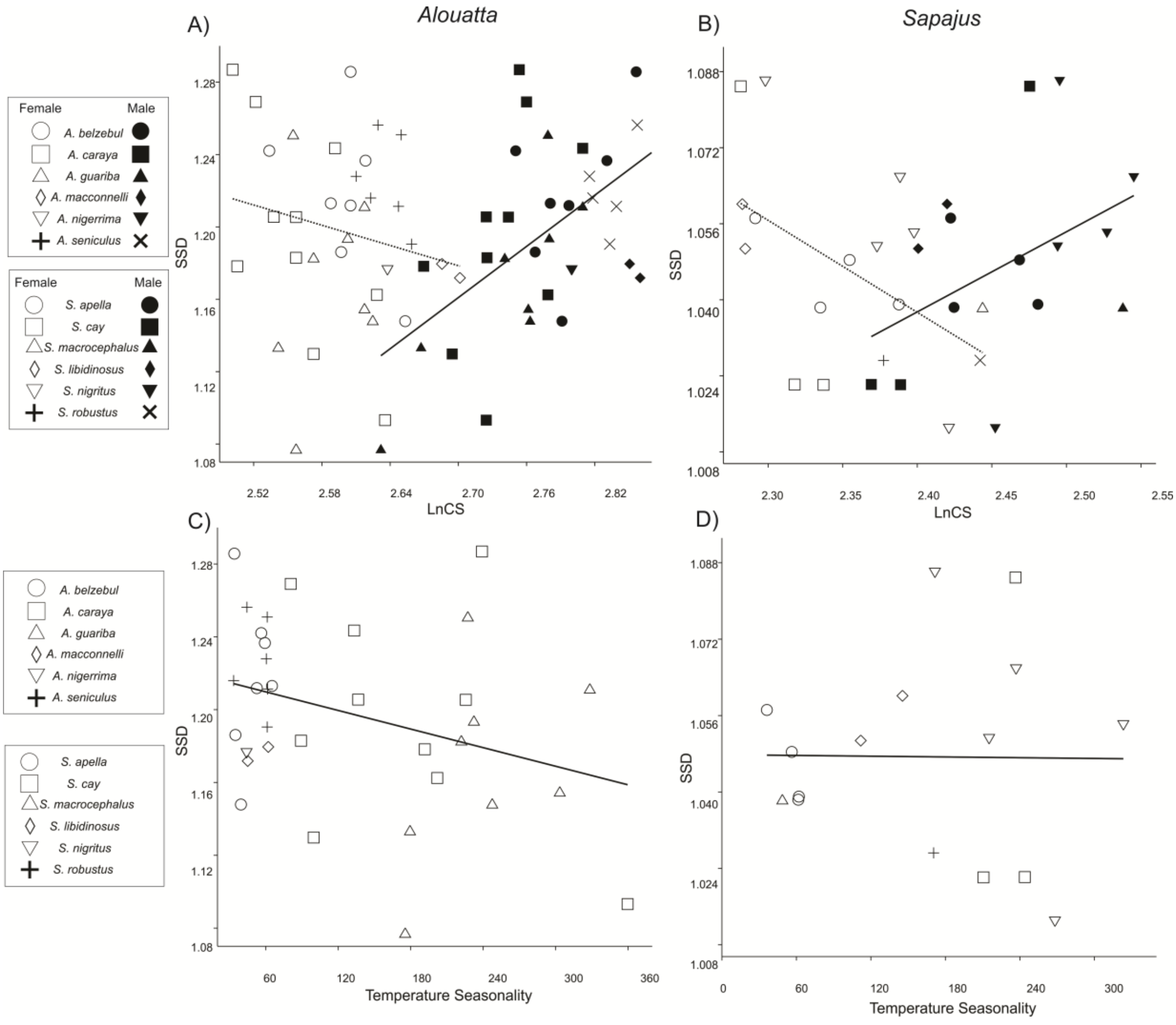

Figure 4. Regression plots of sexual size dimorphism and A) size (LnCS) of *Alouatta*; B) size (LnCS) of *Sapajus*; C) Temperature Seasonality in *Alouatta*; D) Temperature Seasonality in *Sapajus*. Species are labelled by different symbols.

Skull size

In males, linear regression models revealed a significant and negative relation between latitude and skull size of *Aloutta* (Fig. 5A), but not of *Sapajus* (Fig. 5B). Also, we found significant relation between the male skull size of *Alouatta* and the environmental variables evapotranspiration (positive, Fig. 6A), temperature seasonality (negative, Fig 7A) and annual precipitation (negative, Fig 8A). In *Sapajus*, we found significant relation between male skull size and net primary production (positive, Fig. 6D) and precipitation seasonality (negative, Fig 7D), besides a marginal relation with annual temperature (P = 0.061) (see full male skull size results at Table 3).

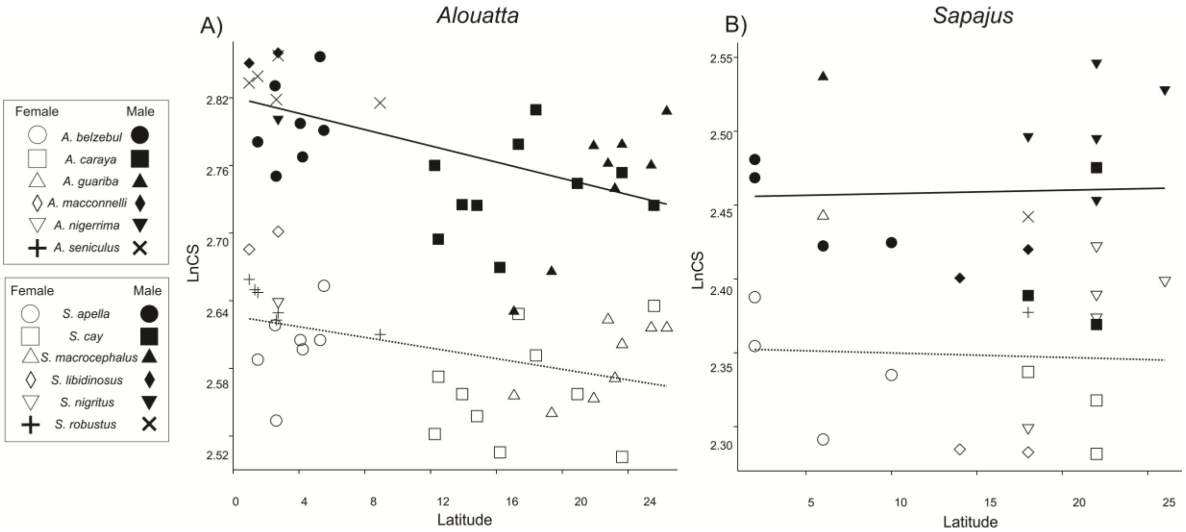

Figure 5. Regression plots of size and latitude from A) *Alouatta* and B) *Sapajus*. Species and sexes are labelled by different symbols.

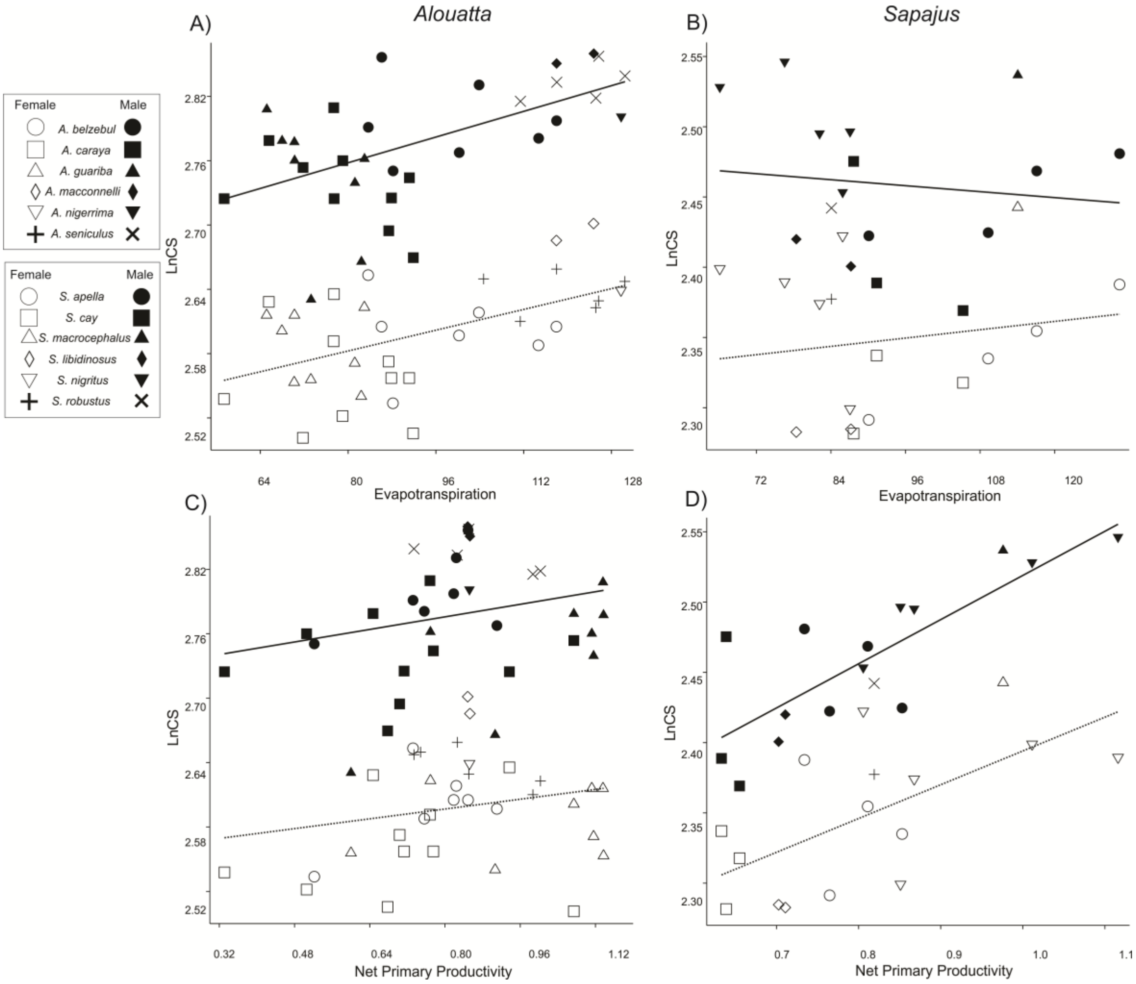

Figure 6. Regression plots of size (LnCS) and the vegetation related variables. Evapotranspiration: A) *Alouatta*; B) *Sapajus*; Net Primary Productivity (NPP): C) *Alouatta*; D) *Sapajus*. Species and sexes are labelled by different symbols.

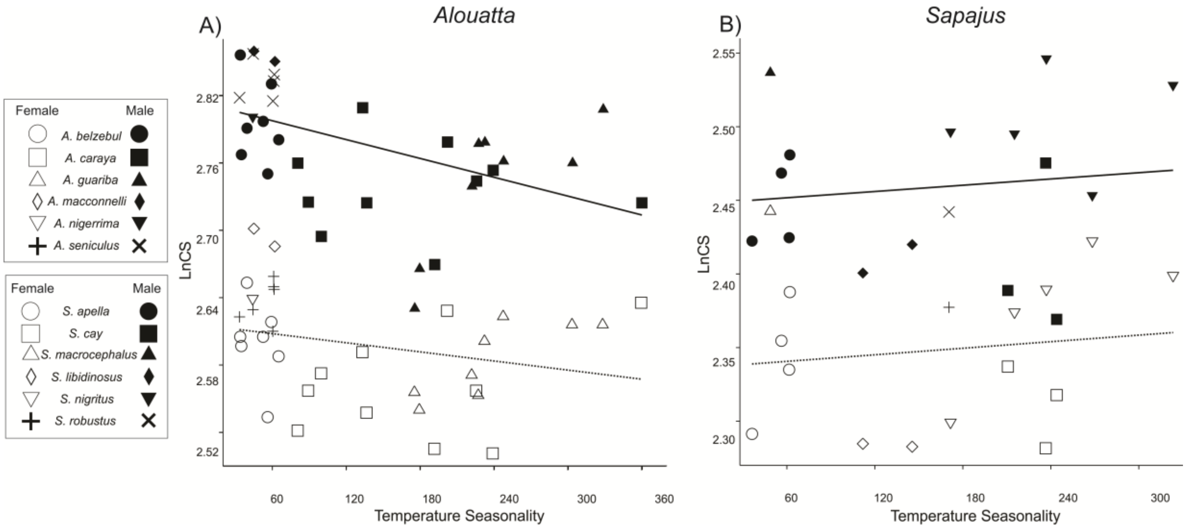

Figure 7. Regression plots of size (LnCS) and Temperature Seasonality: A) *Alouatta*; B) *Sapajus*;

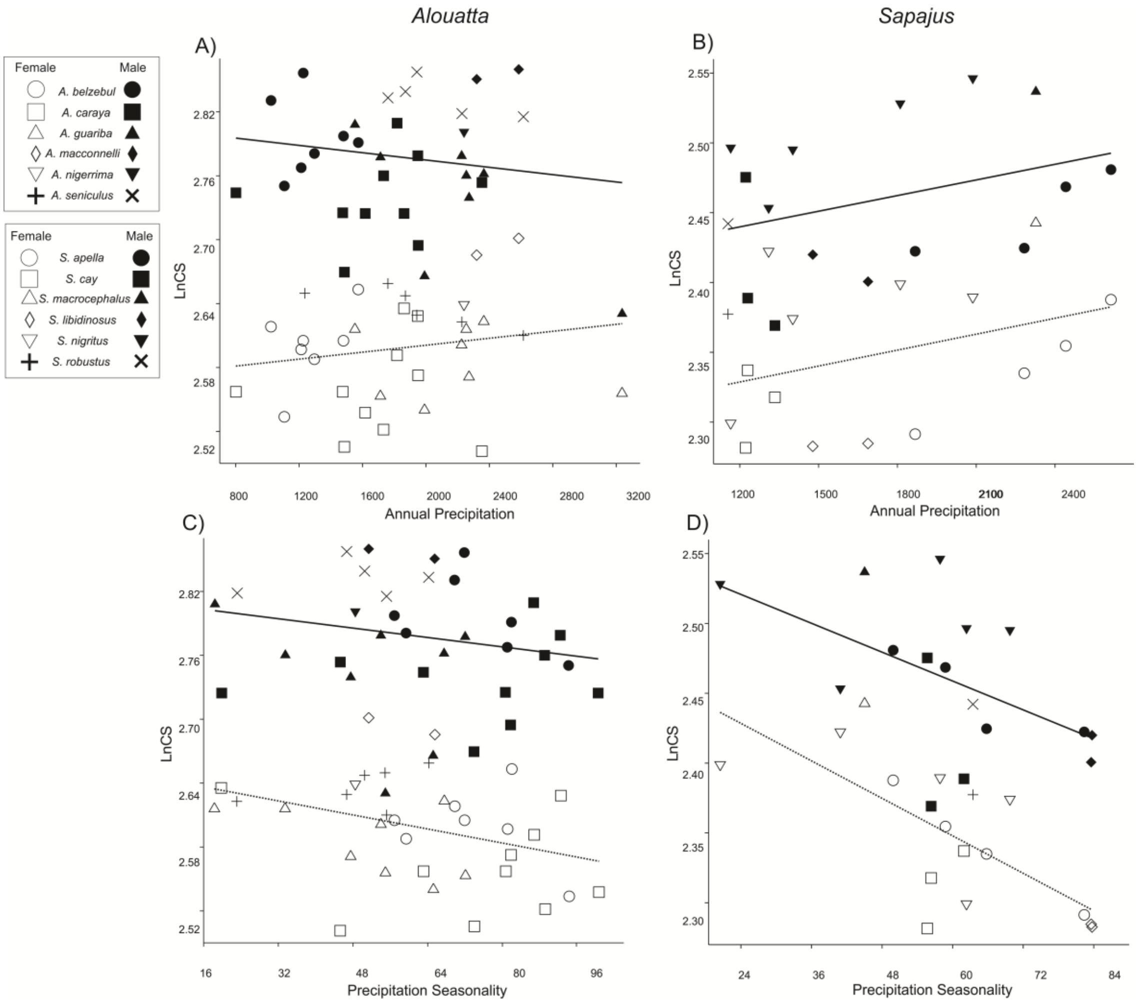

Figure 8. Regression plots of size (LnCS) and the precipitation variables. Annual Precipitation: A) *Alouatta*; B) *Sapajus;* Precipitation Seasonality: C) *Alouatta*; D) *Sapajus.* Species and sexes are labelled by different symbols.

Table 3. Results of linear regression between *Alouatta* and *Sapajus* male size (LnCS) and predictor variables. Significance is highlighted in bold. *marginal relation

	R^2	**Adjusted R^2**	**F**	**P**
Alouatta				
LnCS~Latitude	0.312	0.291	14.520	<< **0.001**
LnCS ~NPP	0.055	0.025	1.860	0.182
LNCS~Evapotranspiration	0.301	0.279	13.790	**0.001**
LNCS~ Annual Mean Temperature	0.058	0.029	1.971	0.170
LNCS~ Temperature Seasonality	0.209	0.185	8.486	**0.007**
LNCS~ Annual Precipitation	0.384	0.365	19.96	<< **0.001**
LNCS~ Precipitation Seasonality	0.037	0.007	1.240	0.274
Sapajus				
LNCS~Latitude	0.001	-0.070	0.016	0.902
LNCS~NPP	0.657	0.632	26.810	<< **0.001**
LNCS~Evapotranspiration	0.013	-0.057	0.184	0.674
LNCS~Annual Mean Temperature	0.228	0.173	4.134	0.062*
LNCS~Temperature Seasonality	0.015	-0.056	0.208	0.655
LNCS~Annual Precipitation	0.124	0.061	1.975	0.182
LNCS~Precipitation Seasonality	0.283	0.232	5.539	**0.034**

In females, no significant relationship between size and latitude was found, for both genera. However, we did found significance for *Alouatta* skull size and latitude (positive, 5A), evapotranspiration (positive, 6A), annual precipitation (positive, 8A). In *Sapajus*, results show a significant impact of net primary production (positive, 6D) and precipitation seasonality (negative, 8D) in females skull size (see full female skull size results at Table 4).

Table 4. Results of linear regression between *Alouatta* and *Sapajus* female size (LnCS) and the predictor variables. Significance is highlighted in bold.

	R^2	**Adjusted R^2**	**F**	**P**
Alouatta				
LnCS~Latitude	0.190	0.165	7.504	**0.009**
LnCS ~NPP	0.047	0.018	1.596	0.216
LNCS~Evapotranspiration	0.279	0.257	12.440	**0.001**
LNCS~Annual Mean Temperature	0.053	0.023	1.775	0.192
LNCS~Temperature Seasonality	0.069	0.039	2.371	0.133
LNCS~Annual Precipitation	0.218	0.194	8.941	**0.005**
LNCS~Precipitation Seasonality	0.119	0.092	4.342	**0.045**
Sapajus				
LNCS~Latitude	0.002	-0.069	0.028	0.869
LNCS~NPP	0.394	0.351	9.134	**0.009**
LNCS~Evapotranspiration	0.025	-0.043	0.373	0.551

LNCS~Annual Mean Temperature	0.081	0.016	1.247	0.283
LNCS~Temperature Seasonality	0.016	-0.053	0.234	0.636
LNCS~Annual Precipitation	0.131	0.069	2.123	0.167
LNCS~Precipitation Seasonality	0.491	0.454	13.51	**0.002**

SPATIAL AUTOCORRELATION

We found significant spatial autocorrelation for males and females of *Alouatta* and for males of *Sapajus* (Appendix 2). Adding the selected spatial filters into the linear regression models, we found, in both males and females of *Alouatta*, significant relationship between size (LnCS) and latitude, net primary productivity, evapotranspiration, temperature seasonality, annual precipitation and precipitation seasonality. In males of *Sapajus*, only net primary productivity and precipitation seasonality are regressing significantly with their size (see full results at Table 5).

Table 5. Results of linear regression between males and females of *Alouatta* and males of *Sapajus* size (LnCS) and the predictor variables, adding the selected spatial filters into the model. Significance is highlighted in bold.

	R^2	**Adjusted R^2**	**F**	**P**
Alouatta				
LnCS Male~Latitude	0.5728	0.530	13.410	<< **0.001**
LnCS Male~NPP	0.2319	0.155	3.019	**0.045**
LnCS Male~Evapotranspiration	0.3812	0.319	6.160	**0.002**
LnCS Male~Annual Mean Temperature	0.2046	0.125	2.573	0.073
LnCS Male~Temperature Seasonality	0.5722	0.529	13.37	<< **0.001**
LnCS Male~Annual Precipitation	0.4098	0.350	6.943	**0.001**
LnCS Male~Precipitation Seasonality	0.246	0.170	3.262	**0.035**
LnCS Female~Latitude	0.4423	0.386	7.930	< **0.001**
LnCS Female~NPP	0.2469	0.171	3.279	**0.034**
LnCS Female~Evapotranspiration	0.3762	0.313	6.031	**0.002**
LnCS Female~Annual Mean Temperature	0.1913	0.110	2.365	0.091
LnCS Female~Temperature Seasonality	0.3165	0.248	4.630	**0.009**
LnCS Female~Annual Precipitation	0.3287	0.261	4.895	**0.007**
LnCS Female~Precipitation Seasonality	0.2937	0.223	4.158	**0.014**
Sapajus				
LnCS Male~Latitude	0.2405	0.051	1.266	0.330
LnCS Male~NPP	0.6598	0.575	7.758	**0.004**
LnCS Male~Evapotranspiration	0.2956	0.120	1.678	0.224
LnCS Male~Annual Mean Temperature	0.407	0.259	2.745	0.089

LnCS Male~Temperature Seasonality	0.1902	-0.012	0.939	0.452
LnCS Male~Annual Precipitation	0.1488	-0.064	0.699	0.570
LnCS Male~Precipitation Seasonality	0.3272	0.159	1.945	0.176

PHYLOGENETIC SIGNAL

Only the skull sizes of males and females of *Alouatta* had significant phylogenetic signal (Table 6). The Phylogenetic Generalized Least Squares (PGLS) showed that, adding phylogeny into the model, the skull size of males and females impact in the sexual size dimorphism (SSD, males' coefficient = -0.488; females' coefficient = Coef: 0.631). Moreover, male size is significantly related to net primary productivity (coefficient = 0.103) and annual mean temperature (Coef: -0.009), while the results from females are extremely dependent of philogney, showing no significant results (see full PGLS results at Table 7).

Table 6. Phylogenetic Generalized Least Squares (PGLS) results and males and females skull sizes (LnCS) of *Alouatta* and *Sapajus.* Significance is highlighted in bold.

	K-statistic	**P**
Alouatta		
SSD	0.552	0.207
LnCS Male	0.942	**0.001**
LnCS Female	0.840	**0.001**
Sapajus		
SSD	0.191	0.168
LnCS Male	0.205	0.095
LnCS Female	0.155	0.231

Table 7. Phylogenetic Generalized Least Squares (PGLS), controlling the evolutionary history of *Alouatta* in the size of males and females. Significance is highlighted in bold.

	AIC	**BIC**	**logLik**	**T**	**P**
SSD~LnCS Female	-98.264	-93.775	52.132	-2.381	**0.024**
SSD~LnCS Male	-105.954	-101.465	55.977	3.910	**< 0.001**
LnCS Male~Latitude	-98.880	-94.391	52.440	-0.174	0.863
LnCS Male~NPP	-103.998	-99.509	54.999	2.288	**0.029**
LnCS Male~Evapotranspiration	-98.926	-94.436	52.463	-0.270	0.789
LnCS Male~Annual Mean Temperature	-105.914	-101.425	55.957	-2.721	**0.011**
LnCS Male~Temperature Seasonality	-99.016	-94.527	52.508	0.399	0.693
LnCS Male~Annual Precipitation	-101.991	-97.501	53.995	1.760	0.088
LnCS Male~Precipitation Seasonality	-99.376	-94.887	52.688	-0.707	0.485
LnCS Female~Latitude	-107.096	-102.607	56.548	-0.349	0.729
LnCS Female~NPP	-108.704	-104.214	57.352	1.294	0.205
LnCS Female~Evapotranspiration	-107.038	-102.548	56.519	0.259	0.798
LnCS Female~Annual Mean Temperature	-108.463	-103.974	57.232	-1.199	0.240

LnCS Female~Temperature Seasonality	-109.241	-104.751	57.620	1.487	0.147
LnCS Female~Annual Precipitation	-107.328	-102.838	56.664	0.584	0.563
LnCS Female~Precipitation Seasonality	-109.608	-105.118	57.804	-1.607	0.118

Discussion

Our results revealed a positive relation for males size of *Alouatta* and sexual size dimorphism (Rensch`s rule), but not for *Sapajus*. Indeed, Ravosa and Ross (1994) identified this when they assessed sexual dimorphism trends in skull dimensions of *Alouatta* and related this to the prolonged growth of males in this genus. Additionally, we found that sexual size dimorphism, still in *Alouatta*, tends to be larger at stable environments as, for instance, in Amazonia, and it is majorly influenced by the increase of the male. Moreover, when phylogeny is added to the equation, Rensch also turns to be true due to the decrease of female body size. This is a logical pattern, since the ratio between the skull size of males and females is indeed what defines SSD. Although not significant, the regression plots between SSD and the skull size of both male and females of *Sapajus* suggest a similar tendency to what was observed in *Alouatta*: males are larger, whereas females are smaller, when related to SSD, corroborating with what can be expected by Rensch’s rule (Rensch 1950). However, SSD is higher in *Alouatta* and this can be interpreted by the ecological and evolutionary differences between these two genera.

Alouatta are peculiar for being prominently folivorous primates, and because they are considerably larger than *Sapajus* — well known for their omnivorous diet, either preferring fruits or insects and the extensive use of tools (Cáceres et al. 2014, Canale et al. 2009, Fragaszy, Visalberghi, Fedigan L. 2004) consistently related most to savanna-like biomes — in order to minimize energy expenditure and, therefore, facilitate the digestion of leaves (Meloro et al. 2014a; Cáceres et al. 2014). These two genera also differ in their locomotion abilities: *Alouatta* are quadruped and cover smaller distances on a daily basis them other primate clades (Strier 1992; Meloro et al. 2014a). For instance, *A. seniculus* (an Amazonian species) has a daily range of about 706 meters (Strier 1992). Meanwhile, Ludwig 2005 stated that *S. nigritus* has a mean daily range of 1083m, and, although this cited daily range is smaller than what is usually found for other species of this genus, it still covers a much larger area per day than what is commonly recorded for *Alouatta* species (Strier 1992; Meloro et al. 2014; Lugwig 2005; Rimoli et al. 2008).

In terms of evolutionary history, *Alouatta* and *Sapajus* are very different. The *Alouatta* clade had split into two major clades at the end of the Miocene, the cis-andean (South America) and the trans-andean (Central America), when a primeval monkey expanded its geographical range over the Andean cordillera (Cortés-Ortiz et al. 2003; Gregory-Wodzicki 2000). The cis-andean linage has first invaded the Amazonian basin and now is widespread in South America (Bonvincino et al. 2001; Cortés-Ortiz et al. 2009) Within this linage, two subclades had separated from each other: one including *A. belzebul* and *A. guariba*, and the other including *A. caraya* and *A. seniculus*. Whereas most of the cis-andean *Alouatta* occur in the Amazon, *A. guariba* is found on Atlantic forest (Cortés-Ortiz et al. 2009; Rosenberger et al. 2009). Meanwhile, the diversification in *Sapajus* was associated with the northward expansion of the species-group range (the opposite to *Alouatta*), starting with the primitive *Sapajus nigritus* (Goldfuss, 1809) in the subtropical regions of the Atlantic forest and culminating with *S. apella* in the Amazon forest(Cáceres et al. 2014).

Since both genera have had the ability to evolve successfully throughout diverse habitats during the extensive climatic change in Pleistocene (Meloro et al. 2014a,b; Cáceres et al. 2014), we could have expected that they would be susceptible to a latitudinal trend of skull size variation. However, a previous study already has not supported this: Cáceres et al. 2014 found no correlation between latitude and skull size of South-American capuchin monkeys, when they compared the skull variation of *Cebus* and *Sapajus*. Our results support this, since we also did not find a significant correlation pattern between *Sapajus* skull size and latitude. Moreover, Bergmann’s rule, on its original form, stated that the animal size tends to be larger at higher latitudes, in module, that is, disregarding the negative signal of latitude South of the equator. For *Alouatta*, we found the opposite to that. That is, increased skull size at lower latitudes.

Moving beyond that, evapotranspiration, which is the amount of water removed from a gridcell through the processes of evaporation and plants transpiration (Willmott and Matsuura 2001, Foley et al. 1996, Kucharik et al. 2000), and the skull size of *Alouatta* are positively related, as our results have shown for both sexes, and we found the opposite trend related to temperature seasonality (in males) and precipitation seasonality (in females). Indeed, *Alouatta* species are larger at the Amazon basin, where latitudinal values are the nearest to zero (close to the equator). There, we have larger values of evapotranspiration, related to the increased vegetation density. Also, the Amazon possess a more stable environment, so the temperature and precipitation seasonality tend to be smaller than what is found in the south of geographical distribution of *Alouatta*, where specimens have smaller skull sizes.

As mentioned earlier, in *Sapajus*, we found no evident trend between skull size and latitude. However, for both sexes, there is a strong and positive relationship between net primary productivity and skull size. Net primary productivity measures the energy a plant accumulates during a time period, thus, this variable can be interpreted as a proxy of vegetation complexity (Foley et al. 1996, Kucharik et al. 2000). As in *Alouatta*, we can conclude *Sapajus* size increases at more forested environments, such as the Amazon and Atlantic Forests, but the variation is only dependent of vegetation density, not applying for a latitudinal trend, since we have species with similarly larger size at the two major forests of South America, regardless of latitude: *S. macrocephalus* at the Amazon forest and *S. nigritus* at the Atlantic Forest (Cáceres et al. 2014; Meloro et al. 2014a,b). Interestingly, this contradicts Cáceres et al. (2014) when they hypothesized that the skull size variation of capuchin monkeys should be considered unrelated to ecological differentiation and more related to taxonomical differentiation. We do not support this in the actual case, especially because we did not find a phylogenetic signal in males and females skull size, which means that taxonomy is not the only factor explaining size variation in these primates.

In terms of spatial autocorrelation (Diniz-Filho et al. 2003), we found a higher geographical space dependency between the samples of *Alouatta* (which was found in both male and females skull size) than in *Sapajus* (where spatial dependency was only significant in the male samples). This is not surprising to us since *Alouatta* daily range is much smaller than *Sapajus* (Ludwig, 2005; Strier, 1992) , which can possibly result in smaller gene flow between the samples of the first, increasing the dependency between samples of *Alouatta* that are closer to one another. Thus, when we added the geographical space into the equation, the environment patterns related to the skull size of *Alouatta* are much stronger, gaining significance or increasing explicability in the environmental variables here analyzed (see Tables 3, 4 and 5). The pattern we encountered for *Sapajus*, adding space, is stronger than without, but only for males and only for NPP (without spatial filter: Adj $R^2 = 0.351$; with spatial filter: Adj $R^2 = 0.574$).

Besides spatial autocorrelation, we can also expect phylogenetic autocorrelation as a bias in our conclusions, since the phylogenetic autocorrelation express past time in which taxa became independent for a given phenotypic trait or for the evolution of average phenotypes across different traits (Diniz-Filho 2006). Thus, when we added the phylogenetic history into our models, we found that the trends between *Alouatta* and *Sapajus* are even more similar than what we initially thought. We only found significant phylogenetic signal in the skull size of males and females of *Alouatta*. This indicates a stronger dependency of the evolutionary history of *Alouatta* than in *Sapajus*, related to the ecogeographical patterns. Indeed, in Amazonia, we see a clear substitution of *Alouatta* species, separated by geographical barriers, such as rivers (Wallace 1852; Meloro et al. 2014)**.** When phylogeny is corrected, we lost the significant relationship between the skull size of *Alouatta* and evapotranspiration and temperature/precipitation seasonally. However, we gained significance between skull size and NPP, which is also the main driver of skull size of males and females of *Sapajus*.

In summary, our results converge mostly between the two genera. *Alouatta* and *Sapajus* show similar Rensch's rule trends, where sexual size dimorphism variation is related with the increase of skull body size of males and decrease of females. We believe that, in this case, *Sapajus* was only not significant due to our relatively low number of samples. Thus, it may be valuable to do further analyses in this matter to confirm Rensch's rule for *Sapajus.* We found inverse Bergmann for *Alouatta* (size is larger at smaller latitudes), a pattern which is dependent of both phylogenetic and spatial autocorrelations. In both sexes of the two studied genera, size is especially explained by vegetation complexity and the environment seasonality (in some cases correlated to temperature or precipitation seasonality). This means howler and capuchin monkeys are indeed larger at more stable environments, regardless of the ecological differences among them (Meloro et al. 2014b). Thus, size variation in these animals is not only explained by taxonomy, as was previously thought (Cáceres et al. 2014), but also by adaptations related to the environmental pressures.

References

Andersson M. 1994. Sexual Selection. *Princeton University Press* .Princeton, NJ.

Ashton KG, Tracy MC Tracy, Queiroz A de. 2000. Is Bergmann's rule valid for mammals? *American Naturalist*. **156:** 390–415.

Ashton KG, Feldman CR. 2003. Bergmann's rule in non-avian reptiles: turtles follow it, lizards and snakes reverse it. *Evolution*. **57:** 1151–1163.

Badyaev AV, Hill GE, Whittingham LA. 2002. Population consequences of maternal effects: sex-bias in egg-laying order facilitates divergence in sexual dimorphism between bird populations. *Journal of Evolutionary Biology*. **15:** 997–1003.

Bergmann, C. 2007. Über die verhältnisse der wärmeokönomie der tiere zu ihrer grösse. *Göttinger Studien.* **3:** 595–708.

Belk MC, Houston D. 2002. Bergmann's Rule in Ectotherms: A Test Using Freshwater Fishes. *The american naturalist.* 160(6).

Bidau CJ, Martinez PA. 2016. Sexual size dimorphism and Rensch's rule in Canidae. *Biological Journal of the Linnean Society.* 1-15.

Blackburn TM, Gaston KJ, Loder N. 1999. Geographic gradients in body size: a clarification of Bergmann's rule. *Diversity and Distributions.* **5:** 165–174.

Blanckenhorn WU, Stillwell RC, Young KA, Fox CW, Ashton KG. 2006. When Rensch meets Bergmann: does sexual size dimorphism change systematically with latitude? *Evolution*. **60(10):**2004-11.

Bonvicino CR, Lemos B, Seuánez HN, 2001. Molecular phylogenetics of howler monkeys (Alouatta, Platyrrhini). *Chromosoma.* **110:** 241–246.

Bubadué J, Cáceres N, dos Santos Carvalho, R. 2016. Ecogeographical Variation in Skull Shape of South-American Canids: Abiotic or Biotic Processes? *Evol Biol* **43:** 145.

Cáceres N, Meloro C, Carotenuto F, Passaro F, Sponchiado J, Melo GL, Raia, P. 2014. Ecogeographical variation in skull shape of capuchin monkeys. *Journal of Biogeography*. **41:**501–512.

Canale GR, Guidorizzi CE, Kierulff MCM, Gatto C. 2009. First record of tool use by wild popula-tions of the yellow-breasted capuchin monkey (Cebus xanthosternos) and new records for thebearded capuchin (Cebus libidinosus). *Am J Primatol.* **71(5):**366–372.

Clauss M, Dittmann MT, Müller DWH, Meloro C, Codron D. 2013. Bergmann′s rule in mammals: a cross-species interspecific pattern. Oikos, 122: 1465–1472.

Cortés-Ortiz L, Bermingham E, Rico C, Rodríguez-Luna E, Sampaio I, Ruiz-García M (2003) Molecular systematics and biogeography of the Neotropical monkey genus, Alouatta . *Mol Phylogenet Evol* **26:** 64–81

Diniz-Filho JAF, Bini LM, Hawkins BA. 2003. Spatial autocorrelation and red herrings in geographical ecology. *Global Ecology and Biogeography*. **12(1):** 53-64.

Dray S, Legendre P, Blanchet G. 2007. Forward selection with permutation (Canoco p.46) (Version 0.0–7). http://r-forge.r-project.org/R/?group_id=195.

Fairbairn DJ 1997. Allometry for sexual size dimorphism: pattern and process in the coevolution of body size in males and females. *Annual review of ecology and systematics*. 659-687.

Fairbairn DJ. 2007. Introduction: the enigma of sexual size dimorphism. Sex, Size & Gender Roles: Evolutionary Studies of Sexual Size Dimorphism, 1-10.

Fairbairn DJ. 2013. Odd Couples. Extraordinary Differences Between the Sexes in the Animal Kingdom. *Princeton University Press.*

Fairbairn D, Blanckenhorn W, Szekely T. 2007. Sex, Size and gender Roles. Evolutionary Studies of Sexual Size Dimorphism. *Oxford University Press*.

Fragaszy D, Visalberghi E, Fedigan L. 2004. The complete capuchin. *Cambridge: Cambridge University Press.* 339 p.

Gregory-Wodzicki KM. 2000. Uplift history of the central and northern Andes: a review. *Geol. Soc. Amer. Bullet*. **112:** 1091–1105

Gordon AD. 2004. Evolution of body size and sexual size dimorphism in the order Primates: Rench's rule, quantitative genetics, and phylogenetic effects. *PhD dissertation*, University of Texas, Austin.

Harcourt AH, Schreier BM .2009. Diversity, Body Mass, and Latitudinal Gradients in Primates . *Internaional Journal of Primatology*. 30: 283.

Hijmans RJ, Cameron SE, Parra JL, Jones PG, Jarvis, A. 2005. Very high resolution interpolated climate surfaces for global land areas. *International Journal of Climatology*. **25:** 1965–1978.

Ludwig G, Aguiar LM, Rocha VJ. 2005. Uma avaliação da dieta. da área de vida e das estimativas populacionais de *Cebus nigritus* (Goldfuss, 1809) e um fragmento florestal no norte do estado do Paraná. *Neotropical Primates,* Belo Horizonte, v.13, n.3, p. 12-18

Lynch-Alfaro JW. 2012. How Different Are Robust and Gracile Capuchin Monkeys? An Argument for the Use of Sapajus and Cebus. *Am J Primatol*. **74(4):**273-86.

Martinez PA, Marti DA, Molina WF, Bidau CJ. 2013. Bergmann's rule across the equator: A case study in *Cerdocyon thous* (Canidae). *Journal of Animal Ecology*. **82:** 997–1008.

Maestri R, Luza AL, de Barros LD, Hartz SM, Ferrari A, de Freitas TRO, Duarte LDS. 2016. Geographical variation of body size in sigmodontine rodents depends on both environment and phylogenetic composition of communities. *J. Biogeogr*. **43:** 1192–1202.

Medina AI, Martí DA, Bidau CJ. 2007. Subterranean rodents of the genus Ctenomys (Caviomorpha, Ctenomyidae) follow the converse to Bergmann's rule. *Journal of Biogeography*. **34:** 1439–1454.

Meiri S, Yom-Tov Y, Geffen E. 2007. What determines conformity to Bergmann's rule?. *Global Ecology and Biogeography*. **16:** 788–794.

Meloro C, Cáceres N, Carotenuto F, Passaro F, Sponchiado J, Melo GL, Raia P. 2014a. Ecogeographical variation in skull morphometry of howler monkeys (Primates: Atelidae). *Zoologischer Anzeiger - A Journal of Comparative Zoology*. **253:** 345–359.

Meloro C, Cáceres N, Carotenuto F, Sponchiado J, Melo GL, Passaro F .2014b. In and out the Amazonia: evolutionary ecomorphology in howler and capuchin monkeys. *Evolutionary Biology*. **41:**38–51.

Rangel TF, Diniz-Filho JAF, Bini LM. 2010. SAM: a comprehensive application for Spatial Analysis in Macroecology. *Ecography*. **33(1):** 46-50.

Rensch, B. 1950. Die Abhängigkeit der relativen Sexualdifferenz von der Körpergrösse. *Bonner Zoologische Beiträge.* **1:**58-69.

Rohlf FJ. 2015. The tps series of software. Hystrix, *The Italian Journal of Mammalogy*.

Rohlf FJ, Slice DE. 1990. Extensions of the Procrustes method for the optimal superimposition of landmarks. *Systematic Zoology*. **39:** 40–59.

Rodríguez MÁ, Olalla-Tárraga1 MA, Bradford AH. 2008. Bergmann's rule and the geography of mammal body size in the Western Hemisphere. *Global Ecology and Biogeography*. **17:** 274–283.

Rosenberger AL. 1992. Evolution of feeding niches in new world monkeys. *Am. J. Phys. Anthropol.* **88:** 525–562.

Shine R. 1989. Constraints, Allometry, and Adaptation: Food Habits and Reproductive Biology of Australian Brownsnakes (Pseudonaja: Elapidae). *Herpetologica*. **45(2):** 195-207.

Strier KB, 1992. Atelinae adaptations: behavioral strategies and ecological con-straints. *Am. J. Phys. Anthrop*. **88:** 515–524

Wallace AR. **1852.** On the monkeys of the Amazon. *Proceedings of the Zoological Society of London.* **20:**107-110.

Weckerly FW. 1998. Sexual-size dimorphism: influence of mass and mating systems in the most dimorphic mammals. *Journal of Mammalogy*. **79:** 33–52.

Appendix

cell	sp	Numero tombo	lat	long	lat_central	long_central	lncs	bio1	bio2	bio3	bio4	bio5	bio	bio7	bio8	bio9	bio10	bio11	bio12	bio13	bio14	bio15	bio16	bio17	bio18	bio19	evapotrans	npp
2	Alouatta_guariba	314	-26.4833	-51.9833	-26.3500	-52.3250	2.809403	15.96667	12.65	58.83721	322.4856	26.2	4.7	21.5	14.53333	18.15	19.8	12.05	1939	212	104	20.43987	562	443	476	458	65.0745	1.146
2	Alouatta_guariba	316	-26.2167	-52.6667	-26.3500	-52.3250	2.617396	17.01667	13.95	60.38961	334.211	28.2	5.1	23.1	20.96667	14.5	20.96667	12.91667	1958	195	119	16.1725	557	432	557	466	65.2522	1.126
media								16.49167	13.3	59.61341	328.3483	27.2	4.9	22.3	17.75	16.325	20.38333	12.48333	1948.5	203.5	111.5	18.30618	559.5	437.5	516.5	462	65.16335	1.136
3	Alouatta_caraya	322	-25.6167	-54.4667	-25.5750	-54.5250	2.809403	21.06667	13.05	55.76923	359.6547	32.2	8.8	23.4	23.15	17.9	25.36667	16.56667	1733	203	90	19.77447	521	337	477	372	77.4387	0.937
3	Alouatta_caraya	323	-25.6167	-54.4667	-25.5750	-54.5250	2.653242	21.06667	13.05	55.76923	359.6547	32.2	8.8	23.4	23.15	17.9	25.36667	16.56667	1733	203	90	19.77447	521	337	477	372	77.4387	0.937
3	Alouatta_caraya	324	-25.6167	-54.4667	-25.5750	-54.5250	2.631889	21.06667	13.05	55.76923	359.6547	32.2	8.8	23.4	23.15	17.9	25.36667	16.56667	1733	203	90	19.77447	521	337	477	372	77.4387	0.937
3	Alouatta_caraya	325	-25.6167	-54.4667	-25.5750	-54.5250	2.617396	21.06667	13.05	55.76923	359.6547	32.2	8.8	23.4	23.15	17.9	25.36667	16.56667	1733	203	90	19.77447	521	337	477	372	77.4387	0.937
3	Alouatta_caraya	326	-25.6167	-54.4667	-25.5750	-54.5250	2.587764	21.06667	13.05	55.76923	359.6547	32.2	8.8	23.4	23.15	17.9	25.36667	16.56667	1733	203	90	19.77447	521	337	477	372	77.4387	0.937
media								21.06667	13.05	55.76923	359.6547	32.2	8.8	23.4	23.15	17.9	25.36667	16.56667	1733	203	90	19.77447	521	337	477	372	77.4387	0.937
4	Alouatta_guariba	317	-25.3833	-49.0333	-25.4043	-49.7041	2.797281	16.5125	9.708333	55.47619	281.6358	25	7.5	17.5	19.75	13.16667	19.75	12.9	1728	227	87	31.80139	611	280	611	303	65.3252	1.126
4	Alouatta_guariba	318	-25.5833	-49.4	-25.4043	-49.7041	2.785011	16.92917	10.575	57.16216	288.4241	25.9	7.4	18.5	20.23333	14.56667	20.23333	13.23333	1298	182	65	29.41496	432	251	432	277	66.3792	1.126

4	Alouatta_guariba	319	-25.4667	-48.8167	-25.4043	-49.7041	2.617396	21.25833	8.283333	46.27561	349.1602	30.1	12.2	17.9	25.23333	17	25.35	17	2006	286	72	46.00269	830	257	786	257	85.4122	1.085
4	Alouatta_guariba	321	-25.5167	-49.1833	-25.4043	-49.7041	2.646175	17.04167	10.06667	56.55431	277.0858	25.7	7.9	17.8	20.13333	13.86667	20.13333	13.45	1275	177	71	31.61295	456	227	456	236	66.3792	1.126
4	Alouatta_guariba	337	-25.6833	-50.2833	-25.4043	-49.7041	2.809403	17.17917	11.90833	57.80744	321.0031	27	6.4	20.6	20.95	13.23333	20.95	13.23333	1454	185	73	28.37396	496	280	496	280	67.6673	1.098
media								17.78417	10.10833	54.65514	303.4618	26.74	8.28	18.46	21.26	14.36667	21.28333	13.96333	1552.2	211.4	73.6	33.44119	565	259	556.2	270.6	70.23262	1.1122
6	Alouatta_caraya	277	-23.7833	-46.5167	-23.6315	-46.5064	2.844909	17.23333	9.216667	57.24638	239.0448	24.7	8.6	16.1	20	14.28333	20.18333	14.28333	2227	291	78	45.25595	850	248	839	248	71.7688	1.074
6	Alouatta_caraya	278	-23.7833	-46.5167	-23.6315	-46.5064	2.815409	17.23333	9.216667	57.24638	239.0448	24.7	8.6	16.1	20	14.28333	20.18333	14.28333	2227	291	78	45.25595	850	248	839	248	71.7688	1.074
6	Alouatta_caraya	279	-23.7833	-46.5167	-23.6315	-46.5064	2.74084	17.23333	9.216667	57.24638	239.0448	24.7	8.6	16.1	20	14.28333	20.18333	14.28333	2227	291	78	45.25595	850	248	839	248	71.7688	1.074
6	Alouatta_caraya	280	-23.7833	-46.5167	-23.6315	-46.5064	2.653242	17.23333	9.216667	57.24638	239.0448	24.7	8.6	16.1	20	14.28333	20.18333	14.28333	2227	291	78	45.25595	850	248	839	248	71.7688	1.074
6	Alouatta_caraya	281	-23.7833	-46.5167	-23.6315	-46.5064	2.701361	17.23333	9.216667	57.24638	239.0448	24.7	8.6	16.1	20	14.28333	20.18333	14.28333	2227	291	78	45.25595	850	248	839	248	71.7688	1.074
6	Alouatta_caraya	282	-23.7833	-46.5167	-23.6315	-46.5064	2.501436	17.23333	9.216667	57.24638	239.0448	24.7	8.6	16.1	20	14.28333	20.18333	14.28333	2227	291	78	45.25595	850	248	839	248	71.7688	1.074
6	Alouatta_guariba	297	-23.45	-46.6167	-23.6315	-46.5064	2.753661	18.075	10.06667	61.0101	225.5045	25.9	9.4	16.5	20.65	15.26667	20.78333	15.26667	1405	238	34	63.12353	659	123	615	123	69.581	1.074
6	Alouatta_guariba	298	-23.45	-46.6167	-23.6315	-46.5064	2.60269	18.075	10.06667	61.0101	225.5045	25.9	9.4	16.5	20.65	15.26667	20.78333	15.26667	1405	238	34	63.12353	659	123	615	123	69.581	1.074

6	Alouatta_guariba	299	-23.45	-46.6167	-23.6315	-46.5064	2.791165	18.075	10.06667	61.0101	225.5045	25.9	9.4	16.5	20.65	15.26667	20.78333	15.26667	1405	238	34	63.12353	659	123	615	123	69.581	1.074
6	Alouatta_guariba	300	-23.45	-46.6167	-23.6315	-46.5064	2.624669	18.075	10.06667	61.0101	225.5045	25.9	9.4	16.5	20.65	15.26667	20.78333	15.26667	1405	238	34	63.12353	659	123	615	123	69.581	1.074
6	Alouatta_guariba	301	-23.45	-46.6833	-23.6315	-46.5064	2.580217	17.5375	10.19167	60.66468	227.6473	25.4	8.6	16.8	20.13333	14.68333	20.25	14.68333	1410	237	35	62.97297	660	123	611	123	69.581	1.074
6	Alouatta_guariba	302	-23.7667	-46.3	-23.6315	-46.5064	2.721295	16.62083	9.041667	56.86583	243.0625	24	8.1	15.9	19.46667	13.63333	19.65	13.63333	2837	350	117	38.77888	1025	369	1002	369	65.2278	1.074
6	Alouatta_guariba	303	-23.7667	-46.3	-23.6315	-46.5064	2.85647	16.62083	9.041667	56.86583	243.0625	24	8.1	15.9	19.46667	13.63333	19.65	13.63333	2837	350	117	38.77888	1025	369	1002	369	65.2278	1.074
6	Alouatta_guariba	304	-23.7667	-46.3	-23.6315	-46.5064	2.772589	16.62083	9.041667	56.86583	243.0625	24	8.1	15.9	19.46667	13.63333	19.65	13.63333	2837	350	117	38.77888	1025	369	1002	369	65.2278	1.074
media								17.36429	9.491667	58.48435	235.223	24.94286	8.721429	16.22143	20.08095	14.45357	20.24524	14.45357	2064.5	284.6429	70.71429	50.23853	819.3571	229.2857	793.6429	229.2857	69.5858	1.074
7	Alouatta_guariba	203	-23.2167	-44.7167	-23.2000	-44.4500	2.572612	22.85833	9.633333	58.38384	224.9529	30.7	14.2	16.5	25.45	20.08333	25.66667	20.08333	2237	292	90	43.38957	852	274	842	274	87.5917	1.116
7	Alouatta_guariba	208	-23.1833	-44.1833	-23.2000	-44.4500	2.74084	22.75	9.633333	59.1002	218.8815	30.7	14.4	16.3	25.3	20.13333	25.55	20.13333	1504	225	47	51.60534	625	152	580	152	74.85585	1.116
media								22.80417	9.633333	58.74202	221.9172	30.7	14.3	16.4	25.375	20.10833	25.60833	20.10833	1870.5	258.5	68.5	47.49746	738.5	213	711	213	81.22377	1.116
8	Alouatta_guariba	293	-22.7833	-48.1167	-22.7833	-48.1167	2.747271	20.875	11.8	63.1016	247.5287	29.2	10.5	18.7	23.51667	17.6	23.51667	17.6	1236	225	28	67.55014	599	100	599	100	82.9713	0.769
8	Alouatta_guariba	294	-22.7833	-48.1167	-22.7833	-48.1167	2.646175	20.875	11.8	63.1016	247.5287	29.2	10.5	18.7	23.51667	17.6	23.51667	17.6	1236	225	28	67.55014	599	100	599	100	82.9713	0.769

8	Alouatta_guariba	295	-22.7833	-48.1167	-22.7833	-48.1167	2.778819	20.875	11.8	63.1016	247.5287	29.2	10.5	18.7	23.51667	17.6	23.51667	17.6	1236	225	28	67.55014	599	100	599	100	82.9713	0.769
8	Alouatta_guariba	296	-22.7833	-48.1167	-22.7833	-48.1167	2.60269	20.875	11.8	63.1016	247.5287	29.2	10.5	18.7	23.51667	17.6	23.51667	17.6	1236	225	28	67.55014	599	100	599	100	82.9713	0.769
media								20.875	11.8	63.1016	247.5287	29.2	10.5	18.7	23.51667	17.6	23.51667	17.6	1236	225	28	67.55014	599	100	599	100	82.9713	0.769
9	Alouatta_caraya	266	-22.75	-53.5167	-23.0246	-53.5222	2.501436	23.0125	12.59167	64.9055	242.3945	32.1	12.7	19.4	24.71667	21.18333	25.51667	19.71667	1358	198	32	43.03311	508	177	471	217	96.6645	0.814
9	Alouatta_caraya	332	-22.7667	-53.2667	-23.0246	-53.5222	2.821379	22.71667	12.86667	64.65662	256.5801	31.8	11.9	19.9	24.46667	20.68333	25.38333	19.21667	1280	178	33	42.12274	469	161	445	216	92.0405	0.814
9	Alouatta_caraya	333	-22.7667	-53.2667	-23.0246	-53.5222	2.867899	22.71667	12.86667	64.65662	256.5801	31.8	11.9	19.9	24.46667	20.68333	25.38333	19.21667	1280	178	33	42.12274	469	161	445	216	92.0405	0.814
9	Alouatta_caraya	334	-22.7667	-53.2667	-23.0246	-53.5222	2.778819	22.71667	12.86667	64.65662	256.5801	31.8	11.9	19.9	24.46667	20.68333	25.38333	19.21667	1280	178	33	42.12274	469	161	445	216	92.0405	0.814
9	Alouatta_caraya	336	-22.7667	-53.2667	-23.0246	-53.5222	2.867899	22.71667	12.86667	64.65662	256.5801	31.8	11.9	19.9	24.46667	20.68333	25.38333	19.21667	1280	178	33	42.12274	469	161	445	216	92.0405	0.814
media								22.77583	12.81167	64.70639	253.743	31.86	12.06	19.8	24.51667	20.78333	25.41	19.31667	1295.6	182	32.8	42.30481	476.8	164.2	450.2	216.2	92.9653	0.814
10	Alouatta_guariba	188	-21.75	-43.3333	-21.9122	-43.0180	2.564949	19.53333	9.866667	60.5317	202.0613	27.6	11.3	16.3	21.66667	17.08333	21.83333	17.01667	1536	292	19	78.57399	774	65	693	82	73.0017	1.144
10	Alouatta_guariba	197	-22.4	-42.9667	-21.9122	-43.0180	2.541602	18.30833	9.966667	57.94574	231.4562	26.5	9.3	17.2	21.03333	15.48333	21.23333	15.48333	1712	303	39	65.4487	794	133	703	133	64.0985	1.185
10	Alouatta_guariba	198	-22.4	-42.9667	-21.9122	-43.0180	2.778819	18.30833	9.966667	57.94574	231.4562	26.5	9.3	17.2	21.03333	15.48333	21.23333	15.48333	1712	303	39	65.4487	794	133	703	133	64.0985	1.185

10	Alouatta_guariba	199	-22.4	-42.9667	-21.9122	-43.0180	2.557227	18.30833	9.966667	57.94574	231.4562	26.5	9.3	17.2	21.03333	15.48333	21.23333	15.48333	1712	303	39	65.4487	794	133	703	133	64.0985	1.185
10	Alouatta_guariba	201	-21.4667	-43.1167	-21.9122	-43.0180	2.76001	22.025	12.11667	63.10764	232.3839	30.8	11.6	19.2	24.03333	19.13333	24.61667	19	1439	279	18	80.65232	739	59	624	76	76.0895	1.144
10	Alouatta_guariba	202	-21.8833	-42.7	-21.9122	-43.0180	2.797281	22.62083	12.075	62.24227	235.0576	31.8	12.4	19.4	25.21667	19.6	25.41667	19.6	1329	266	18	76.93908	664	64	553	64	79.7352	0.98
media								19.85069	10.65972	59.95314	227.3119	28.28333	10.53333	17.75	22.33611	17.04444	22.59444	17.01111	1573.333	291	28.66667	72.08525	759.8333	97.83333	663.1667	103.5	70.18699	1.137167
16	Alouatta_guariba	177	-19.9167	-40.5833	-19.3541	-40.9180	2.541602	20	10.03333	64.31624	171.0529	27.7	12.1	15.6	21.43333	18.03333	22.1	17.88333	1322	207	41	53.68979	590	149	417	158	83.9215	0.851
16	Alouatta_guariba	178	-19.9167	-40.5833	-19.3541	-40.9180	2.557227	20	10.03333	64.31624	171.0529	27.7	12.1	15.6	21.43333	18.03333	22.1	17.88333	1322	207	41	53.68979	590	149	417	158	83.9215	0.851
16	Alouatta_guariba	179	-19.3333	-40.9	-19.3541	-40.9180	2.533697	22.89583	11.20833	66.71627	169.7118	31	14.2	16.8	24.28333	20.9	24.93333	20.73333	1216	208	26	67.94351	601	92	424	103	87.7537	0.851
16	Alouatta_guariba	180	-19.3833	-40.05	-19.3541	-40.9180	2.674149	24.27083	9.091667	61.84807	177.7314	31.5	16.8	14.7	25.78333	22.16667	26.43333	22.08333	1203	188	36	53.92093	534	140	360	145	91.8065	0.851
16	Alouatta_guariba	182	-19.1333	-40.6167	-19.3541	-40.9180	2.753661	23.83333	10.53333	68.39827	158.6639	31.4	16	15.4	25.06667	21.83333	25.85	21.83333	1168	192	28	63.68557	558	103	389	103	87.7537	0.851
16	Alouatta_guariba	183	-18.5833	-39.7333	-19.3541	-40.9180	2.533697	24.0625	8.141667	62.15013	162.4405	30.6	17.5	13.1	24.6	22	26.11667	22	1329	184	59	39.33375	501	203	357	203	92.08325	1.049
16	Alouatta_guariba	184	-19.6833	-40.5	-19.3541	-40.9180	2.70805	23.4	10.03333	65.15152	173.2444	31	15.6	15.4	24.8	21.26667	25.58333	21.26667	1204	201	33	59.53025	562	123	380	123	91.8022	0.851
16	Alouatta_guariba	185	-19.9167	-40.5833	-19.3541	-40.9180	2.674149	20	10.03333	64.31624	171.0529	27.7	12.1	15.6	21.43333	18.03333	22.1	17.88333	1322	207	41	53.68979	590	149	417	158	83.9215	0.851

16	Alouatta_guariba	186	-18.75	-41.3	-19.3541	-40.9180	2.476538	23.59583	11.49167	66.42582	167.2839	32.1	14.8	17.3	25.05	21.68333	25.51667	21.4	1138	203	22	73.9626	587	69	412	80	78.8352	1.004
16	Alouatta_guariba	187	-18.75	-41.3	-19.3541	-40.9180	2.70805	23.59583	11.49167	66.42582	167.2839	32.1	14.8	17.3	25.05	21.68333	25.51667	21.4	1138	203	22	73.9626	587	69	412	80	78.8352	1.004
16	Alouatta_guariba	190	-19.6	-41.6333	-19.3541	-40.9180	2.509599	23.3125	12.275	65.99462	195.182	31.8	13.2	18.6	24.96667	20.95	25.45	20.68333	1180	215	18	76.75144	622	61	451	77	72.8763	0.899
16	Alouatta_guariba	191	-20.1167	-42	-19.3541	-40.9180	2.70805	20.35417	12.45833	65.57018	203.2068	29	10	19	22.06667	17.96667	22.46667	17.61667	1222	228	17	76.62073	640	64	484	77	74.3492	1.046
16	Alouatta_guariba	193	-19.6	-41.6333	-19.3541	-40.9180	2.639057	23.3125	12.275	65.99462	195.182	31.8	13.2	18.6	24.96667	20.95	25.45	20.68333	1180	215	18	76.75144	622	61	451	77	72.8763	0.899
16	Alouatta_guariba	194	-19.6	-41.6333	-19.3541	-40.9180	2.827314	23.3125	12.275	65.99462	195.182	31.8	13.2	18.6	24.96667	20.95	25.45	20.68333	1180	215	18	76.75144	622	61	451	77	72.8763	0.899
16	Alouatta_guariba	195	-19.6	-41.6333	-19.3541	-40.9180	2.631889	23.3125	12.275	65.99462	195.182	31.8	13.2	18.6	24.96667	20.95	25.45	20.68333	1180	215	18	76.75144	622	61	451	77	72.8763	0.899
16	Alouatta_guariba	200	-19.7833	-42.1333	-19.3541	-40.9180	2.533697	21.25417	12.075	65.27027	207.3475	29.4	10.9	18.5	22.96667	18.68333	23.43333	18.43333	1184	230	15	80.0067	637	57	478	68	73.1755	0.96
16	Alouatta_guariba	291	-19.5167	-40.3333	-19.3541	-40.9180	2.525729	24.475	9.6	64	174.3755	31.9	16.9	15	25.85	22.53333	26.68333	22.28333	1175	192	32	58.41757	542	125	364	126	91.8022	0.851
16	Alouatta_guariba	292	-19.5167	-40.3333	-19.3541	-40.9180	2.541602	24.475	9.6	64	174.3755	31.9	16.9	15	25.85	22.53333	26.68333	22.28333	1175	192	32	58.41757	542	125	364	126	91.8022	0.851
media								22.74792	10.82917	65.1602	179.4196	30.67778	14.08333	16.59444	24.1963	20.61944	24.85093	20.4287	1213.222	205.6667	28.72222	65.21538	586.0556	103.3889	415.5	112	82.40381	0.906556
17	Alouatta_caraya	151	-18.4	-46.4167	-18.4000	-46.4167	2.785011	21.89583	11.34167	71.7827	133.2199	29.1	13.3	15.8	22.68333	20.58333	23.13333	19.95	1480	301	7	86.81036	785	29	637	45	77.3683	0.768

17	Alouatta_caraya	152	-18.4	-46.4167	-18.4000	-46.4167	2.844909	21.89583	11.34167	71.7827	133.2199	29.1	13.3	15.8	22.68333	20.58333	23.13333	19.95	1480	301	7	86.81036	785	29	637	45	77.3683	0.768
17	Alouatta_caraya	153	-18.4	-46.4167	-18.4000	-46.4167	2.797281	21.89583	11.34167	71.7827	133.2199	29.1	13.3	15.8	22.68333	20.58333	23.13333	19.95	1480	301	7	86.81036	785	29	637	45	77.3683	0.768
17	Alouatta_caraya	154	-18.4	-46.4167	-18.4000	-46.4167	2.631889	21.89583	11.34167	71.7827	133.2199	29.1	13.3	15.8	22.68333	20.58333	23.13333	19.95	1480	301	7	86.81036	785	29	637	45	77.3683	0.768
17	Alouatta_caraya	155	-18.4	-46.4167	-18.4000	-46.4167	2.549445	21.89583	11.34167	71.7827	133.2199	29.1	13.3	15.8	22.68333	20.58333	23.13333	19.95	1480	301	7	86.81036	785	29	637	45	77.3683	0.768
media								21.89583	11.34167	71.7827	133.2199	29.1	13.3	15.8	22.68333	20.58333	23.13333	19.95	1480	301	7	86.81036	785	29	637	45	77.3683	0.768
18	Alouatta_caraya	271	-17.3333	-44.8833	-17.3333	-44.8833	2.778819	23.55417	13.69167	66.4644	202.0178	32.1	11.5	20.6	24.96667	20.7	25.21667	20.7	1107	229	3	92.51998	630	13	482	13	65.5637	0.647
18	Alouatta_caraya	272	-17.3333	-44.8833	-17.3333	-44.8833	2.701361	23.55417	13.69167	66.4644	202.0178	32.1	11.5	20.6	24.96667	20.7	25.21667	20.7	1107	229	3	92.51998	630	13	482	13	65.5637	0.647
18	Alouatta_caraya	273	-17.3333	-44.8833	-17.3333	-44.8833	2.549445	23.55417	13.69167	66.4644	202.0178	32.1	11.5	20.6	24.96667	20.7	25.21667	20.7	1107	229	3	92.51998	630	13	482	13	65.5637	0.647
media								23.55417	13.69167	66.4644	202.0178	32.1	11.5	20.6	24.96667	20.7	25.21667	20.7	1107	229	3	92.51998	630	13	482	13	65.5637	0.647
19	Alouatta_guariba	289	-17.0667	-40.7	-17.0667	-40.7000	2.631889	24.05	10.83333	67.70833	175.4345	31.6	15.6	16	24.85	21.55	25.96667	21.55	1023	177	32	54.93792	448	117	290	117	73.2273	0.6
19	Alouatta_guariba	290	-17.0667	-40.7	-17.0667	-40.7000	2.557227	24.05	10.83333	67.70833	175.4345	31.6	15.6	16	24.85	21.55	25.96667	21.55	1023	177	32	54.93792	448	117	290	117	73.2273	0.6
media								24.05	10.83333	67.70833	175.4345	31.6	15.6	16	24.85	21.55	25.96667	21.55	1023	177	32	54.93792	448	117	290	117	73.2273	0.6
21	Alouatta_	168	-16.	-57.	-16.2	-57.7	2.5336	26.254	12.475	65.657	193.24	34.8	15.8	19	27.433	24.266	27.833	23.433	1283	234	16	72.444	625	61	290	98	91.8688	0.678

	caraya		3667	7667	108	136	97	17		89	34				33	67	33	33				75						
21	Alouatta_caraya	169	-16.0667	-57.65	-16.2108	-57.7136	2.493205	26.27917	12.59167	65.5816	190.1251	34.8	15.6	19.2	27.35	24.46667	27.86667	23.51667	1298	241	16	74.25962	637	58	293	91	91.8688	0.678
21	Alouatta_caraya	170	-16.0667	-57.65	-16.2108	-57.7136	2.660226	26.27917	12.59167	65.5816	190.1251	34.8	15.6	19.2	27.35	24.46667	27.86667	23.51667	1298	241	16	74.25962	637	58	293	91	91.8688	0.678
21	Alouatta_caraya	171	-16.0667	-57.6833	-16.2108	-57.7136	2.517696	26.35833	12.63333	65.12027	192.3519	35	15.6	19.4	27.41667	24.55	27.96667	23.58333	1302	243	16	74.49698	641	58	293	91	91.8688	0.678
21	Alouatta_caraya	175	-16.0667	-57.6833	-16.2108	-57.7136	2.797281	26.35833	12.63333	65.12027	192.3519	35	15.6	19.4	27.41667	24.55	27.96667	23.58333	1302	243	16	74.49698	641	58	293	91	91.8688	0.678
media								26.30583	12.585	65.41233	191.6394	34.88	15.64	19.24	27.39333	24.46	27.9	23.52667	1296.6	240.4	16	73.99159	636.2	58.6	292.4	92.4	91.8688	0.678
25	Alouatta_caraya	147	-14.3	-43.7667	-14.8162	-43.7810	2.557227	24.98333	12.68333	71.65725	132.7563	33.2	15.5	17.7	25.71667	23.13333	26.18333	23.13333	781	180	1	100.7256	466	3	205	3	55.466	0.398
25	Alouatta_caraya	148	-14.3	-43.7667	-14.8162	-43.7810	2.517696	24.98333	12.68333	71.65725	132.7563	33.2	15.5	17.7	25.71667	23.13333	26.18333	23.13333	781	180	1	100.7256	466	3	205	3	55.466	0.398
25	Alouatta_caraya	159	-15.3333	-43.6833	-14.8162	-43.7810	2.701361	24.48333	12.11667	70.03854	141.892	32.3	15	17.3	25.23333	22.45	25.63333	22.45	838	200	0	99.11436	488	3	247	3	59.7608	0.13
25	Alouatta_caraya	162	-14.75	-43.9333	-14.8162	-43.7810	2.747271	24.49583	12.89167	69.68468	138.7191	33.1	14.6	18.5	25.25	22.56667	25.76667	22.56667	807	192	0	102.1401	492	3	241	7	58.8868	0.398
media								24.73646	12.59375	70.75943	136.5309	32.95	15.15	17.8	25.47917	22.82083	25.94167	22.82083	801.75	188	0.5	100.6764	478	3	224.5	4	57.3949	0.331
27	Alouatta_caraya	141	-13.9167	-40.9167	-13.9167	-40.9167	2.714695	24.04167	10.05	71.2766	140.7421	30.5	16.4	14.1	25.1	22	25.41667	22	586	127	3	86.90561	316	19	227	19	45.3453	0.813
27	Alouatta_caray	142	-13.916	-40.916	-13.9167	-40.9167	2.917771	24.04167	10.05	71.2766	140.7421	30.5	16.4	14.1	25.1	22	25.41667	22	586	127	3	86.90561	316	19	227	19	45.3453	0.813

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27	Alouatta_caraya	143	-13.9167	-40.9167	-13.9167	-40.9167	2.833213	24.04167	10.05	71.2766	140.7421	30.5	16.4	14.1	25.1	22	25.41667	22	586	127	3	86.90561	316	19	227	19	45.3453	0.813
27	Alouatta_caraya	144	-13.9167	-40.9167	-13.9167	-40.9167	2.557227	24.04167	10.05	71.2766	140.7421	30.5	16.4	14.1	25.1	22	25.41667	22	586	127	3	86.90561	316	19	227	19	45.3453	0.813
27	Alouatta_caraya	145	-13.9167	-40.9167	-13.9167	-40.9167	2.617396	24.04167	10.05	71.2766	140.7421	30.5	16.4	14.1	25.1	22	25.41667	22	586	127	3	86.90561	316	19	227	19	45.3453	0.813
27	Alouatta_caraya	146	-13.9167	-40.9167	-13.9167	-40.9167	2.484907	24.04167	10.05	71.2766	140.7421	30.5	16.4	14.1	25.1	22	25.41667	22	586	127	3	86.90561	316	19	227	19	45.3453	0.813
media								24.04167	10.05	71.2766	140.7421	30.5	16.4	14.1	25.1	22	25.41667	22	586	127	3	86.90561	316	19	227	19	45.3453	0.813
28	Alouatta_caraya	174	-12.0333	-52.4167	-12.4690	-52.6260	2.572612	25.625	13.83333	69.86532	89.15003	34.9	15.1	19.8	26.01667	24.38333	26.35	24.31667	1818	307	3	80.72578	887	17	458	44	87.8888	0.713
28	Alouatta_caraya	260	-13.1	-52.8833	-12.4690	-52.6260	2.694627	25.08333	14.11667	70.58333	110.1514	34.1	14.1	20	25.61667	23.56667	25.95	23.43333	1703	292	1	82.96503	857	15	412	37	86.8897	0.694
media								25.35417	13.975	70.22433	99.65072	34.5	14.6	19.9	25.81667	23.975	26.15	23.875	1760.5	299.5	2	81.84541	872	16	435	40.5	87.38925	0.7035
31	Alouatta_caraya	172	-11.9833	-54.3167	-11.9833	-54.3167	2.60269	24.94583	14.725	68.80841	86.00894	35.1	13.7	21.4	25.06667	23.96667	25.73333	23.7	2053	340	2	81.62871	996	16	531	48	97.0542	0.787
31	Alouatta_caraya	173	-11.9833	-54.3167	-11.9833	-54.3167	2.747271	24.94583	14.725	68.80841	86.00894	35.1	13.7	21.4	25.06667	23.96667	25.73333	23.7	2053	340	2	81.62871	996	16	531	48	97.0542	0.787
media								24.94583	14.725	68.80841	86.00894	35.1	13.7	21.4	25.06667	23.96667	25.73333	23.7	2053	340	2	81.62871	996	16	531	48	97.0542	0.787
32	Alouatta_caraya	163	-12.6333	-47.2333	-12.2500	-47.6083	2.509599	25.95	11.95	69.47674	82.07535	34.3	17.1	17.2	25.91667	25.45	27	24.88333	1451	268	2	90.09295	767	11	160	26	78.1065	0.481

32	Alouatta_caraya	164	-12.6333	-47.2333	-12.2500	-47.6083	2.533697	25.95	11.95	69.47674	82.07535	34.3	17.1	17.2	25.91667	25.45	27	24.88333	1451	268	2	90.09295	767	11	160	26	78.1065	0.481
32	Alouatta_caraya	267	-11.8667	-47.9833	-12.2500	-47.6083	2.76001	25.975	12.48333	68.21494	77.7379	34.9	16.6	18.3	25.93333	25.6	26.96667	24.96667	1555	287	2	87.31733	788	13	178	29	80.8165	0.555
media								25.95833	12.12778	69.05614	80.62954	34.5	16.93333	17.56667	25.92222	25.5	26.98889	24.91111	1485.667	274.3333	2	89.16774	774	11.66667	166	27	79.00983	0.505667
36	Alouatta_seniculus	244	-9.2	-63.1667	-9.2000	-63.1667	2.85647	25.86667	10.58333	71.02908	59.67081	33.1	18.2	14.9	25.68333	25.38333	26.6	25.11667	2292	382	14	68.90881	1063	77	496	170	108.82	0.818
36	Alouatta_seniculus	245	-9.2	-63.1667	-9.2000	-63.1667	2.844909	25.86667	10.58333	71.02908	59.67081	33.1	18.2	14.9	25.68333	25.38333	26.6	25.11667	2292	382	14	68.90881	1063	77	496	170	108.82	0.818
								25.86667	10.58333	71.02908	59.67081	33.1	18.2	14.9	25.68333	25.38333	26.6	25.11667	2292	382	14	68.90881	1063	77	496	170	108.82	0.818
37	Alouatta_seniculus	88	-8.93333	-72.7833	-8.9333	-72.7833	2.815409	25.90417	10.70833	77.03837	60.43247	32.4	18.5	13.9	26.1	25.08333	26.48333	25.05	1617	236	32	55.19036	644	126	504	175	111.391	0.987
37	Alouatta_seniculus	91	-8.93333	-72.7833	-8.9333	-72.7833	2.61007	25.90417	10.70833	77.03837	60.43247	32.4	18.5	13.9	26.1	25.08333	26.48333	25.05	1617	236	32	55.19036	644	126	504	175	111.391	0.987
media								25.90417	10.70833	77.03837	60.43247	32.4	18.5	13.9	26.1	25.08333	26.48333	25.05	1617	236	32	55.19036	644	126	504	175	111.391	0.987
39	Alouatta_belzebul	117	-5.51667	-47.4667	-5.5167	-47.4667	2.653242	26.425	11.93333	73.21063	39.39889	34.3	18	16.3	26.25	26.08333	26.95	25.98333	1475	275	8	82.02874	766	37	239	86	83.6655	0.732
39	Alouatta_belzebul	118	-5.51667	-47.4667	-5.5167	-47.4667	2.791165	26.425	11.93333	73.21063	39.39889	34.3	18	16.3	26.25	26.08333	26.95	25.98333	1475	275	8	82.02874	766	37	239	86	83.6655	0.732
media								26.425	11.93333	73.21063	39.39889	34.3	18	16.3	26.25	26.08333	26.95	25.98333	1475	275	8	82.02874	766	37	239	86	83.6655	0.732
41	Alouatta_belze	113	-5.2833	-51	-5.2833	-51.0000	2.533697	25.51667	10.8	84.375	33.93398	32	19.2	12.8	25.11667	25.56667	25.98333	25.11667	1862	314	17	71.90206	890	93	185	890	86.1122	0.849

	bul		3																									
41	Alouatta_belzebul	114	-5.28333	-51	-5.2833	-51.0000	2.639057	25.51667	10.8	84.375	33.93398	32	19.2	12.8	25.11667	25.56667	25.98333	25.11667	1862	314	17	71.90206	890	93	185	890	86.1122	0.849
41	Alouatta_belzebul	115	-5.28333	-51	-5.2833	-51.0000	2.639057	25.51667	10.8	84.375	33.93398	32	19.2	12.8	25.11667	25.56667	25.98333	25.11667	1862	314	17	71.90206	890	93	185	890	86.1122	0.849
41	Alouatta_belzebul	116	-5.28333	-51	-5.2833	-51.0000	2.85647	25.51667	10.8	84.375	33.93398	32	19.2	12.8	25.11667	25.56667	25.98333	25.11667	1862	314	17	71.90206	890	93	185	890	86.1122	0.849
media								25.51667	10.8	84.375	33.93398	32	19.2	12.8	25.11667	25.56667	25.98333	25.11667	1862	314	17	71.90206	890	93	185	890	86.1122	0.849
43	Alouatta_belzebul	133	-3.96667	-45.65	-4.0000	-45.4833	2.944439	27.24583	10.075	81.91057	52.59011	33.7	21.4	12.3	26.96667	27.8	28	26.73333	1677	333	21	85.05176	912	78	114	285	92.9428	0.653
43	Alouatta_belzebul	134	-3.96667	-45.65	-4.0000	-45.4833	2.912351	27.24583	10.075	81.91057	52.59011	33.7	21.4	12.3	26.96667	27.8	28	26.73333	1677	333	21	85.05176	912	78	114	285	92.9428	0.653
43	Alouatta_belzebul	250	-4.03333	-45.3167	-4.0000	-45.4833	2.753661	27.3625	10.09167	80.73333	56.25126	33.9	21.4	12.5	27.06667	27.6	28.15	26.81667	1618	342	16	90.41011	914	60	105	508	84.9037	0.595
43	Alouatta_belzebul	251	-4.03333	-45.3167	-4.0000	-45.4833	2.509599	27.3625	10.09167	80.73333	56.25126	33.9	21.4	12.5	27.06667	27.6	28.15	26.81667	1618	342	16	90.41011	914	60	105	508	84.9037	0.595
media								27.30417	10.08333	81.32195	54.42069	33.8	21.4	12.4	27.01667	27.7	28.075	26.775	1647.5	337.5	18.5	87.73093	913	69	109.5	396.5	88.92325	0.624
44	Alouatta_belzebul	25	-4.65	-49.4833	-4.2244	-49.6237	2.674149	27.05417	10.175	86.22881	31.6557	33.1	21.3	11.8	26.83333	27.41667	27.45	26.65	2180	409	23	82.10288	1138	87	144	1117	91.1325	0.887
44	Alouatta_belzebul	26	-4.31667	-49.7833	-4.2244	-49.6237	2.844909	27.1	10.31667	87.42938	34.96752	33.2	21.4	11.8	26.81667	27.45	27.55	26.63333	2306	427	26	80.77667	1206	94	138	1164	97.0508	0.887
44	Alouatta_belze	27	-3.7666	-49.666	-4.2244	-49.6237	2.74084	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924

	bul		7	7																								
44	Alouatta_belzebul	29	-4.65	-49.4833	-4.2244	-49.6237	2.895912	27.05417	10.175	86.22881	31.6557	33.1	21.3	11.8	26.83333	27.41667	27.45	26.65	2180	409	23	82.10288	1138	87	144	1117	91.1325	0.887
44	Alouatta_belzebul	73	-3.76667	-49.66667	-4.2244	-49.6237	2.85647	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	93	-4.46667	-49.51667	-4.2244	-49.6237	2.557227	27.13333	10.23333	86.72316	31.57483	33.2	21.4	11.8	26.91667	27.48333	27.55	26.73333	2238	420	23	82.19	1175	87	139	1145	97.0508	0.887
44	Alouatta_belzebul	94	-4.46667	-49.51667	-4.2244	-49.6237	2.721295	27.13333	10.23333	86.72316	31.57483	33.2	21.4	11.8	26.91667	27.48333	27.55	26.73333	2238	420	23	82.19	1175	87	139	1145	97.0508	0.887
44	Alouatta_belzebul	95	-4.46667	-49.51667	-4.2244	-49.6237	2.587764	27.13333	10.23333	86.72316	31.57483	33.2	21.4	11.8	26.91667	27.48333	27.55	26.73333	2238	420	23	82.19	1175	87	139	1145	97.0508	0.887
44	Alouatta_belzebul	96	-4.46667	-49.51667	-4.2244	-49.6237	2.60269	27.13333	10.23333	86.72316	31.57483	33.2	21.4	11.8	26.91667	27.48333	27.55	26.73333	2238	420	23	82.19	1175	87	139	1145	97.0508	0.887
44	Alouatta_belzebul	97	-3.76667	-49.66667	-4.2244	-49.6237	2.549445	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	98	-3.76667	-49.66667	-4.2244	-49.6237	2.797281	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	99	-3.76667	-49.66667	-4.2244	-49.6237	2.701361	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	100	-3.76667	-49.66667	-4.2244	-49.6237	2.747271	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	101	-3.76667	-49.66667	-4.2244	-49.6237	2.639057	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924

44	Alouatta_belzebul	102	-3.76667	-49.6667	-4.2244	-49.6237	2.580217	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	103	-3.76667	-49.6667	-4.2244	-49.6237	2.753661	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	104	-3.76667	-49.6667	-4.2244	-49.6237	2.580217	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	106	-3.76667	-49.6667	-4.2244	-49.6237	2.572612	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
44	Alouatta_belzebul	107	-3.76667	-49.6667	-4.2244	-49.6237	2.60269	27.11667	10.43333	86.94444	36.45254	33.3	21.3	12	26.88333	27.53333	27.58333	26.66667	2424	450	28	80.6399	1273	95	135	1219	103.076	0.924
media								27.11272	10.35789	86.84805	34.84257	33.25263	21.32632	11.92632	26.88158	27.50614	27.56053	26.67719	2352.947	438.1579	26.31579	81.12743	1234.632	92.42105	136.9474	1189.789	100.2332	0.910368
45	Alouatta_belzebul	2	-4.26667	-55.9833	-4.0814	-55.8306	2.653242	27.34583	9.691667	80.76389	50.24749	33.6	21.6	12	26.98333	27.78333	28.03333	26.76667	2137	324	60	54.87468	916	207	242	888	116.322	0.821
45	Alouatta_belzebul	4	-4.26667	-55.9833	-4.0814	-55.8306	2.564949	27.34583	9.691667	80.76389	50.24749	33.6	21.6	12	26.98333	27.78333	28.03333	26.76667	2137	324	60	54.87468	916	207	242	888	116.322	0.821
45	Alouatta_belzebul	24	-4.48333	-56.2833	-4.0814	-55.8306	2.839078	27.2625	9.708333	79.5765	50.77244	33.6	21.4	12.2	26.85	27.63333	27.93333	26.66667	2113	302	69	49.69715	859	232	277	844	119.673	0.815
45	Alouatta_belzebul	28	-4.48333	-56.2833	-4.0814	-55.8306	2.815409	27.2625	9.708333	79.5765	50.77244	33.6	21.4	12.2	26.85	27.63333	27.93333	26.66667	2113	302	69	49.69715	859	232	277	844	119.673	0.815
45	Alouatta_belzebul	66	-4.48333	-56.2833	-4.0814	-55.8306	2.564949	27.2625	9.708333	79.5765	50.77244	33.6	21.4	12.2	26.85	27.63333	27.93333	26.66667	2113	302	69	49.69715	859	232	277	844	119.673	0.815
45	Alouatta_belzebul	68	-4.48333	-56.2833	-4.0814	-55.8306	2.617396	27.2625	9.708333	79.5765	50.77244	33.6	21.4	12.2	26.85	27.63333	27.93333	26.66667	2113	302	69	49.69715	859	232	277	844	119.673	0.815

45	Alouatta_belzebul	120	-3.65	-55.3833	-4.0814	-55.8306	2.734368	26.69583	9.658333	79.82094	54.50014	33	20.9	12.1	26.16667	26.93333	27.48333	26.16667	1781	286	53	62.32525	835	177	230	835	117.399	0.82
45	Alouatta_belzebul	122	-3.65	-55.3833	-4.0814	-55.8306	2.60269	26.69583	9.658333	79.82094	54.50014	33	20.9	12.1	26.16667	26.93333	27.48333	26.16667	1781	286	53	62.32525	835	177	230	835	117.399	0.82
45	Alouatta_belzebul	123	-3.65	-55.3833	-4.0814	-55.8306	2.61007	26.69583	9.658333	79.82094	54.50014	33	20.9	12.1	26.16667	26.93333	27.48333	26.16667	1781	286	53	62.32525	835	177	230	835	117.399	0.82
45	Alouatta_belzebul	124	-3.65	-55.3833	-4.0814	-55.8306	2.60269	26.69583	9.658333	79.82094	54.50014	33	20.9	12.1	26.16667	26.93333	27.48333	26.16667	1781	286	53	62.32525	835	177	230	835	117.399	0.82
45	Alouatta_belzebul	125	-3.65	-55.3833	-4.0814	-55.8306	2.617396	26.69583	9.658333	79.82094	54.50014	33	20.9	12.1	26.16667	26.93333	27.48333	26.16667	1781	286	53	62.32525	835	177	230	835	117.399	0.82
45	Alouatta_belzebul	127	-3.65	-55.3833	-4.0814	-55.8306	2.61007	26.69583	9.658333	79.82094	54.50014	33	20.9	12.1	26.16667	26.93333	27.48333	26.16667	1781	286	53	62.32525	835	177	230	835	117.399	0.82
media								26.99306	9.80556	79.89662	52.5488	33.3	21.18333	12.11667	26.53056	27.30833	27.725	26.43333	1951	297.6667	59.5	56.87412	856.5	200.3333	247.6667	846.8333	117.9775	0.8185
47	Alouatta_belzebul	246	-2.61667	-43.45	-2.6167	-43.4500	2.76001	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
47	Alouatta_belzebul	247	-2.61667	-43.45	-2.6167	-43.4500	2.681022	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
47	Alouatta_belzebul	248	-2.61667	-43.45	-2.6167	-43.4500	2.785011	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
47	Alouatta_belzebul	249	-2.61667	-43.45	-2.6167	-43.4500	2.572612	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
47	Alouatta_belzebul	252	-2.61667	-43.45	-2.6167	-43.4500	2.772589	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522

47	Alouatta_belzebul	253	-2.61667	-43.45	-2.6167	-43.4500	2.476538	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
47	Alouatta_belzebul	254	-2.61667	-43.45	-2.6167	-43.4500	2.501436	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
47	Alouatta_belzebul	255	-2.61667	-43.45	-2.6167	-43.4500	2.580217	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
media								27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
48	Alouatta_belzebul	7	-2.55	-54.3	-2.5500	-54.3000	2.785011	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	9	-2.55	-54.3	-2.5500	-54.3000	2.60269	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	10	-2.55	-54.3	-2.5500	-54.3000	2.809403	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	11	-2.55	-54.3	-2.5500	-54.3000	2.833213	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	12	-2.55	-54.3	-2.5500	-54.3000	2.944439	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	13	-2.55	-54.3	-2.5500	-54.3000	2.791165	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	14	-2.55	-54.3	-2.5500	-54.3000	2.587764	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	15	-2.55	-54.3	-2.5500	-54.3000	2.624669	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824

48	Alouatta_belzebul	16	-2.55	-54.3	-2.5500	-54.3000	2.60269	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	17	-2.55	-54.3	-2.5500	-54.3000	2.639057	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	18	-2.55	-54.3	-2.5500	-54.3000	2.631889	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	19	-2.55	-54.3	-2.5500	-54.3000	2.646175	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	20	-2.55	-54.3	-2.5500	-54.3000	2.778819	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	21	-2.55	-54.3	-2.5500	-54.3000	2.61007	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
48	Alouatta_belzebul	22	-2.55	-54.3	-2.5500	-54.3000	2.862201	25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
media								25.42083	8.891667	79.38988	59.21679	31.3	20.1	11.2	25	26.03333	26.26667	24.9	1991	353	41	69.80705	971	140	151	521	103.852	0.824
49	Alouatta_seniculus	5	-2.45	-64.7833	-2.6304	-65.3805	2.517696	26.59167	9.166667	87.30159	32.25138	32	21.5	10.5	26.35	26.7	26.98333	26.16667	3411	384	205	22.17101	1117	627	713	888	126.043	1.002
49	Alouatta_seniculus	108	-2.96667	-65.15	-2.6304	-65.3805	2.747271	26.62917	9.091667	87.41987	30.7821	32	21.6	10.4	26.46667	26.7	27.01667	26.21667	3031	341	158	24.91766	998	512	642	733	124.073	1.002
49	Alouatta_seniculus	109	-2.45	-64.7833	-2.6304	-65.3805	2.639057	26.59167	9.166667	87.30159	32.25138	32	21.5	10.5	26.35	26.7	26.98333	26.16667	3411	384	205	22.17101	1117	627	713	888	126.043	1.002
49	Alouatta_seniculus	110	-2.45	-64.7833	-2.6304	-65.3805	2.873565	26.59167	9.166667	87.30159	32.25138	32	21.5	10.5	26.35	26.7	26.98333	26.16667	3411	384	205	22.17101	1117	627	713	888	126.043	1.002

49	Alouatta_seniculus	111	-2.45	-64.7833	-2.6304	-65.3805	2.572612	26.59167	9.166667	87.30159	32.25138	32	21.5	10.5	26.35	26.7	26.98333	26.16667	3411	384	205	22.17101	1117	627	713	888	126.043	1.002
49	Alouatta_seniculus	209	-2.5	-66.0833	-2.6304	-65.3805	2.76001	25.7125	9.475	86.13636	40.51515	31.3	20.3	11	25.5	25.71667	26.25	25.2	2746	319	151	25.0579	899	481	535	719	122.637	1.008
media								26.45139	9.205556	87.1271	33.3838	31.88333	21.31667	10.56667	26.22778	26.53611	26.86667	26.01389	3236.833	366	188.1667	23.10993	1060.833	583.5	671.5	834	125.147	1.003
50	Alouatta_seniculus	34	-3	-58.85	-2.7375	-59.4336	2.766319	26.77083	8.641667	81.52516	42.87711	32.4	21.8	10.6	26.36667	27.11667	27.38333	26.36667	2169	322	76	49.82947	876	255	262	876	127.699	0.852
50	Alouatta_seniculus	35	-3	-58.85	-2.7375	-59.4336	2.646175	26.77083	8.641667	81.52516	42.87711	32.4	21.8	10.6	26.36667	27.11667	27.38333	26.36667	2169	322	76	49.82947	876	255	262	876	127.699	0.852
50	Alouatta_seniculus	36	-3	-58.85	-2.7375	-59.4336	2.901422	26.77083	8.641667	81.52516	42.87711	32.4	21.8	10.6	26.36667	27.11667	27.38333	26.36667	2169	322	76	49.82947	876	255	262	876	127.699	0.852
50	Alouatta_seniculus	38	-2.93333	-59.25	-2.7375	-59.4336	2.879198	26.9625	8.541667	82.13141	47.6314	32.6	22.2	10.4	26.65	27.41667	27.65	26.5	2304	306	91	41.49705	850	295	325	836	123.999	0.862
50	Alouatta_seniculus	40	-2.88333	-58.98333	-2.7375	-59.4336	2.681022	26.95417	8.591667	81.8254	44.69382	32.6	22.1	10.5	26.6	27.33333	27.6	26.55	2226	316	84	45.19396	853	272	293	848	125.527	0.824
50	Alouatta_seniculus	44	-3	-58.85	-2.7375	-59.4336	2.646175	26.77083	8.641667	81.52516	42.87711	32.4	21.8	10.6	26.36667	27.11667	27.38333	26.36667	2169	322	76	49.82947	876	255	262	876	127.699	0.852
50	Alouatta_seniculus	45	-3	-58.85	-2.7375	-59.4336	2.653242	26.77083	8.641667	81.52516	42.87711	32.4	21.8	10.6	26.36667	27.11667	27.38333	26.36667	2169	322	76	49.82947	876	255	262	876	127.699	0.852
50	Alouatta_seniculus	46	-2.88333	-58.98333	-2.7375	-59.4336	2.646175	26.95417	8.591667	81.8254	44.69382	32.6	22.1	10.5	26.6	27.33333	27.6	26.55	2226	316	84	45.19396	853	272	293	848	125.527	0.824
50	Alouatta_seniculus	47	-2.88333	-59	-2.7375	-59.4336	2.564949	27.00417	8.575	82.45192	44.38767	32.6	22.2	10.4	26.65	27.4	27.63333	26.56667	2237	314	86	44.39857	851	276	299	844	125.527	0.824

50	Alouatta_seniculus	49	-2.71667	-59.8333	-2.7375	-59.4336	2.557227	27.0625	8.475	82.28155	46.56984	32.6	22.3	10.3	26.68333	27.6	27.73333	26.63333	2259	282	99	35.98352	791	312	374	758	121.141	0.862
50	Alouatta_seniculus	50	-3	-58.85	-2.7375	-59.4336	2.595255	26.77083	8.641667	81.52516	42.87711	32.4	21.8	10.6	26.36667	27.11667	27.38333	26.36667	2169	322	76	49.82947	876	255	262	876	127.699	0.852
50	Alouatta_seniculus	52	-2.6	-60.6167	-2.7375	-59.4336	2.895912	27.25833	8.55	83.82353	41.66061	32.7	22.5	10.2	26.95	27.73333	27.85	26.88333	2579	337	87	43.90562	969	304	361	748	125.846	0.874
50	Alouatta_seniculus	62	-1.91667	-59.5	-2.7375	-59.4336	2.624669	27.24583	8.675	82.61905	45.94752	32.9	22.4	10.5	26.91667	27.9	27.9	26.85	2442	393	85	49.10586	1011	322	322	853	123.839	0.877
50	Alouatta_seniculus	64	-1.91667	-59.5	-2.7375	-59.4336	2.867899	27.24583	8.675	82.61905	45.94752	32.9	22.4	10.5	26.91667	27.9	27.9	26.85	2442	393	85	49.10586	1011	322	322	853	123.839	0.877
50	Alouatta_seniculus	74	-2.88333	-58.9833	-2.7375	-59.4336	2.827314	26.95417	8.591667	81.8254	44.69382	32.6	22.1	10.5	26.6	27.33333	27.6	26.55	2226	316	84	45.19396	853	272	293	848	125.527	0.824
50	Alouatta_seniculus	76	-2.88333	-58.9833	-2.7375	-59.4336	2.639057	26.95417	8.591667	81.8254	44.69382	32.6	22.1	10.5	26.6	27.33333	27.6	26.55	2226	316	84	45.19396	853	272	293	848	125.527	0.824
50	Alouatta_seniculus	78	-1.91667	-59.5	-2.7375	-59.4336	2.66026	27.24583	8.675	82.61905	45.94752	32.9	22.4	10.5	26.91667	27.9	27.9	26.85	2442	393	85	49.10586	1011	322	322	853	123.839	0.877
media								26.96863	8.610784	82.05871	44.36059	32.58824	22.09412	10.49412	26.6049	27.4049	27.60392	26.56078	2271.941	330.2353	82.94118	46.63853	891.8824	280.6471	298.1765	846.6471	125.6666	0.850647
50	Alouatta_macconelli	213	-3.06667	-59.9833	-2.7375	-59.4336	2.70805	27.38333	8.333333	81.69935	48.2104	32.9	22.7	10.2	26.98333	27.98333	28.06667	26.9	2160	292	62	47.33943	830	223	275	814	123.523	0.888
50	Alouatta_macconelli	214	-2.91667	-58.55	-2.7375	-59.4336	2.867899	26.95833	8.683333	81.91824	43.7884	32.6	22	10.6	26.55	27.6	27.6	26.55	2184	338	73	53.49844	921	243	243	921	125.527	0.824
50	Alouatta_	216	-2.9	-58.	-2.73	-59.4	2.7972	26.958	8.6833	81.918	43.788	32.6	22	10.6	26.55	27.6	27.6	26.55	2184	338	73	53.498	921	243	243	921	125.527	0.824

	macconelli		1667	55	75	336	81	33	33	24	4											44						
50	Alouatta_macconelli	217	-2.91667	-58.55	-2.7375	-59.4336	2.833213	26.95833	8.683333	81.91824	43.7884	32.6	22	10.6	26.55	27.6	27.6	26.55	2184	338	73	53.49844	921	243	243	921	125.527	0.824
50	Alouatta_macconelli	218	-2.91667	-58.55	-2.7375	-59.4336	2.912351	26.95833	8.683333	81.91824	43.7884	32.6	22	10.6	26.55	27.6	27.6	26.55	2184	338	73	53.49844	921	243	243	921	125.527	0.824
50	Alouatta_macconelli	219	-1.91667	-59.5	-2.7375	-59.4336	2.694627	27.24583	8.675	82.61905	45.94752	32.9	22.4	10.5	26.91667	27.9	27.9	26.85	2442	393	85	49.10586	1011	322	322	853	123.839	0.877
50	Alouatta_macconelli	221	-1.91667	-59.5	-2.7375	-59.4336	2.884801	27.24583	8.675	82.61905	45.94752	32.9	22.4	10.5	26.91667	27.9	27.9	26.85	2442	393	85	49.10586	1011	322	322	853	123.839	0.877
media								27.10119	8.630952	82.0872	45.03701	32.72857	22.21429	10.51429	26.71667	27.74048	27.75238	26.68571	2254.286	347.1429	74.85714	51.36356	933.7143	262.7143	270.1429	886.2857	124.7584	0.848286
50	Alouatta_nigerrima	231	-3.3	-58.2667	-2.7375	-59.4336	2.587764	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	232	-3.3	-58.2667	-2.7375	-59.4336	2.639057	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	233	-3.3	-58.2667	-2.7375	-59.4336	2.667228	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	234	-3.3	-58.2667	-2.7375	-59.4336	2.624669	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	235	-3.3	-58.2667	-2.7375	-59.4336	2.667228	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852

50	Alouatta_nigerrima	236	-3.3	-58.2667	-2.7375	-59.4336	2.714695	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	237	-3.3	-58.2667	-2.7375	-59.4336	2.791165	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	238	-3.3	-58.2667	-2.7375	-59.4336	2.821379	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	239	-3.3	-58.2667	-2.7375	-59.4336	2.844909	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
50	Alouatta_nigerrima	240	-3.3	-58.2667	-2.7375	-59.4336	2.821379	26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
media								26.9625	8.758333	81.09568	44.0622	32.7	21.9	10.8	26.55	27.61667	27.61667	26.55	2225	317	79	48.48234	895	267	267	895	129.747	0.852
52	Alouatta_seniculus	33	-1.08333	-57.0333	-1.4962	-56.4899	2.839078	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	37	-1.08333	-57.0333	-1.4962	-56.4899	2.890372	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	41	-1.08333	-57.0333	-1.4962	-56.4899	2.833213	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	42	-1.08333	-57.0333	-1.4962	-56.4899	2.639057	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	43	-1.08333	-57.0333	-1.4962	-56.4899	2.564949	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	51	-1.08333	-57.0333	-1.4962	-56.4899	2.653242	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734

52	Alouatta_seniculus	55	-1.08333	-57.0333	-1.4962	-56.4899	2.681022	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	60	-1.08333	-57.0333	-1.4962	-56.4899	2.646175	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	70	-1.08333	-57.0333	-1.4962	-56.4899	2.694627	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	75	-1.08333	-57.0333	-1.4962	-56.4899	2.80336	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_seniculus	86	-1.08333	-57.0333	-1.4962	-56.4899	2.827314	27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
media								27.475	8.966667	80.78078	61.51496	33.8	22.7	11.1	26.96667	28.03333	28.33333	26.91667	2585	408	87	50.48836	1115	326	329	905	130.45	0.734
52	Alouatta_belzebul	54	-1.75	-55.85	-1.4962	-56.4899	2.572612	27.03333	9.233333	80.99415	65.13389	33.4	22	11.4	26.46667	27.95	27.95	26.43333	2365	380	67	59.3815	1044	218	218	959	114.705	0.756
52	Alouatta_belzebul	57	-1.75	-55.85	-1.4962	-56.4899	2.85647	27.03333	9.233333	80.99415	65.13389	33.4	22	11.4	26.46667	27.95	27.95	26.43333	2365	380	67	59.3815	1044	218	218	959	114.705	0.756
52	Alouatta_belzebul	69	-1.75	-55.85	-1.4962	-56.4899	2.76001	27.03333	9.233333	80.99415	65.13389	33.4	22	11.4	26.46667	27.95	27.95	26.43333	2365	380	67	59.3815	1044	218	218	959	114.705	0.756
52	Alouatta_belzebul	71	-1.75	-55.85	-1.4962	-56.4899	2.721295	27.03333	9.233333	80.99415	65.13389	33.4	22	11.4	26.46667	27.95	27.95	26.43333	2365	380	67	59.3815	1044	218	218	959	114.705	0.756
52	Alouatta_belzebul	72	-1.75	-55.85	-1.4962	-56.4899	2.60269	27.03333	9.233333	80.99415	65.13389	33.4	22	11.4	26.46667	27.95	27.95	26.43333	2365	380	67	59.3815	1044	218	218	959	114.705	0.756
								27.03333	9.233333	80.99415	65.13389	33.4	22	11.4	26.46667	27.95	27.95	26.43333	2365	380	67	59.3815	1044	218	218	959	114.705	0.756

53	Alouatta_seniculus	39	-0.63333	-52.5	-1.3176	-52.8516	2.667228	26.9125	8.791667	82.16511	61.16762	33	22.3	10.7	26.48333	27.65	27.73333	26.21667	2320	332	51	54.85346	970	185	207	800	104.715	0.748
53	Alouatta_seniculus	58	-0.63333	-52.5	-1.3176	-52.8516	2.873565	26.9125	8.791667	82.16511	61.16762	33	22.3	10.7	26.48333	27.65	27.73333	26.21667	2320	332	51	54.85346	970	185	207	800	104.715	0.748
53	Alouatta_seniculus	61	-0.63333	-52.5	-1.3176	-52.8516	2.631889	26.9125	8.791667	82.16511	61.16762	33	22.3	10.7	26.48333	27.65	27.73333	26.21667	2320	332	51	54.85346	970	185	207	800	104.715	0.748
media								26.9125	8.791667	82.16511	61.16762	33	22.3	10.7	26.48333	27.65	27.73333	26.21667	2320	332	51	54.85346	970	185	207	800	104.715	0.748
56	Alouatta_seniculus	56	0.6	-50.6833	0.9769	-50.9550	2.66026	26.96667	7.65	79.6875	62.60748	32.6	23	9.6	26.31667	27.75	27.75	26.2	2165	378	18	71.74057	1005	80	103	894	114.614	0.845
56	Alouatta_seniculus	79	-0.1	-51.2833	0.9769	-50.9550	2.734368	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
56	Alouatta_seniculus	80	0.933333	-52	0.9769	-50.9550	2.844909	26.04583	8.508333	78.78086	61.88179	32.3	21.5	10.8	25.66667	26.78333	26.86667	25.31667	2463	343	72	46.03145	972	250	329	853	116.225	0.853
56	Alouatta_seniculus	81	-0.1	-51.2833	0.9769	-50.9550	2.928524	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
56	Alouatta_seniculus	82	-0.1	-51.2833	0.9769	-50.9550	2.66026	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
56	Alouatta_seniculus	83	-0.1	-51.2833	0.9769	-50.9550	2.890372	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
56	Alouatta_seniculus	84	-0.1	-51.2833	0.9769	-50.9550	2.791165	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
56	Alouatta_seniculus	85	2.05	-50.7833	0.9769	-50.9550	2.785011	26.55833	8.3	75.45455	59.57552	32.9	21.9	11	25.95	27.31667	27.31667	25.83333	3349	516	30	70.7717	1432	136	136	1412	121.041	0.865

56	Alouatta_seniculus	87	2.05	-50.7833	0.9769	-50.9550	2.61007	26.55833	8.3	75.45455	59.57552	32.9	21.9	11	25.95	27.31667	27.31667	25.83333	3349	516	30	70.7717	1432	136	136	1412	121.041	0.865
56	Alouatta_seniculus	89	1.25	-49.9167	0.9769	-50.9550	2.747271	26.80417	7.608333	77.63605	63.62026	32.6	22.8	9.8	26.36667	27.63333	27.63333	26.05	2921	458	11	76.04516	1343	68	68	1291	114.1695	0.859
56	Alouatta_seniculus	92	-0.1	-51.2833	0.9769	-50.9550	2.624669	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
								26.81894	8.019697	78.25235	61.1344	32.73636	22.48182	10.25455	26.27727	27.56364	27.61667	26.09394	2614.636	401.7273	32.09091	64.25334	1124	139.4545	163.4545	1063.091	118.0142	0.826091
56	Alouatta_macconelli	225	1	-51.0333	0.9769	-50.9550	2.70805	26.725	7.95	78.71287	62.03005	32.6	22.5	10.1	26.1	27.48333	27.51667	25.96667	2240	343	24	65.53627	969	97	133	902	117.978	0.853
56	Alouatta_macconelli	226	1	-51.0333	0.9769	-50.9550	2.674149	26.725	7.95	78.71287	62.03005	32.6	22.5	10.1	26.1	27.48333	27.51667	25.96667	2240	343	24	65.53627	969	97	133	902	117.978	0.853
56	Alouatta_macconelli	227	1	-51.0333	0.9769	-50.9550	2.674149	26.725	7.95	78.71287	62.03005	32.6	22.5	10.1	26.1	27.48333	27.51667	25.96667	2240	343	24	65.53627	969	97	133	902	117.978	0.853
56	Alouatta_macconelli	230	1	-51.0333	0.9769	-50.9550	2.850707	26.725	7.95	78.71287	62.03005	32.6	22.5	10.1	26.1	27.48333	27.51667	25.96667	2240	343	24	65.53627	969	97	133	902	117.978	0.853
media								26.725	7.95	78.71287	62.03005	32.6	22.5	10.1	26.1	27.48333	27.51667	25.96667	2240	343	24	65.53627	969	97	133	902	117.978	0.853

cell	sp	Numero tombo	lat	long	lat_central	long_central	lncs	bio1	bio2	bio3	bio4	bio5	bio6	bio7	bio8	bio9	bio10	bio11	bio12	bio13	bio14	bio15	bio16	bio17	bio18	bio19	evapotrans	npp
cell 0	Sapajus_apella	MG 21502	-1.0	-57.	-2	-56	2.5055	27.270	9.0083	81.156	61.991	33.6	22.5	11.1	26.766	27.833	28.133	26.7	2613	408	89	49.891	1124	336	340	906	130.45	0.734

			8	03			55	83	33	16	87				67	33	33					91						
cell 0	Sapajus_ apella	MG 21494	-1.08	-57.03	-2	-56	2.521036	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 21503	-1.08	-57.03	-2	-56	2.418361	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 21508	-1.08	-57.03	-2	-56	2.368512	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 13225	-1.08	-57.03	-2	-56	2.459523	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 21506	-1.08	-57.03	-2	-56	2.394372	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 21497	-1.08	-57.03	-2	-56	2.493685	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 21505	-1.08	-57.03	-2	-56	2.407721	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 21491	-1.08	-57.03	-2	-56	2.349349	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 0	Sapajus_ apella	MG 21499	-1.08	-57.03	-2	-56	2.424499	27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
media								27.27083	9.008333	81.15616	61.99187	33.6	22.5	11.1	26.76667	27.83333	28.13333	26.7	2613	408	89	49.89191	1124	336	340	906	130.45	0.734
cell 1	Sapajus_ apella	MG 01167	-0.10	-51.28	-2	-52	2.502325	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
cell 1	Sapajus_ apella	MG 01030	-0.10	-51.28	-2	-52	2.330733	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
cell 1	Sapajus_ apella	MG 01290	-0.10	-51.28	-2	-52	2.437413	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
cell 1	Sapajus_ apella	MG 01936	-0.93	-51.58	-2	-52	2.367411	27.00833	8.983333	83.17901	51.60309	33	22.2	10.8	26.68333	27.61667	27.68333	26.4	2516	341	60	47.35724	971	261	286	864	118.401	0.8
cell 1	Sapajus_ apella	MG 02287	-3.22	-51.22	-2	-52	2.443804	26.46667	9.216667	79.45402	47.54583	32.4	20.8	11.6	26.26667	26.96667	27.15	26.03333	2266	393	33	72.65867	1013	120	165	940	108.316	0.859

cell 1	Sapajus_apella	MG 01291	-0.10	-51.28	-2	-52	2.340993	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
cell 1	Sapajus_apella	MG 01289	-0.10	-51.28	-2	-52	2.522007	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
cell 1	Sapajus_apella	MG 01220	-1.03	-50.68	-2	-52	2.490059	26.87083	9.208333	85.26235	45.04837	32.8	22	10.8	26.5	27.4	27.43333	26.31667	2725	367	96	41.70781	1022	347	385	1010	121.771	0.869
cell 1	Sapajus_apella	MG 01241	-0.10	-51.28	-2	-52	2.485531	27.0125	7.975	78.9604	60.86964	32.8	22.7	10.1	26.46667	27.73333	27.81667	26.3	2419	368	32	61.90436	1030	144	171	972	118.511	0.8
cell 1	Sapajus_apella	MG 02395	-1.43	-52.02	-2	-52	2.309243	27.12083	9.225	83.86364	53.27708	33.2	22.2	11	26.76667	27.76667	27.81667	26.5	2389	355	53	54.58309	1014	220	246	807	111.565	0.783
media								26.95417	8.448333	80.55214	56.26922	32.82	22.34	10.48	26.50167	27.615	27.69833	26.305	2441	366.4	43.4	58.7733	1020	181.2	210.8	945.3	117.1119	0.8111
cell 2	Sapajus_apella	MG 00010	-2.62	-43.45	-2	-44	2.523602	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
cell 2	Sapajus_apella	MG 00019	-2.62	-43.45	-2	-44	2.31487	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
cell 2	Sapajus_apella	MG 00016	-2.62	-43.45	-2	-44	2.130006	27.18333	8.466667	81.41026	56.21927	32.7	22.3	10.4	26.65	27.96667	27.96667	26.65	1713	357	7	94.31047	972	26	26	972	88.1835	0.522
cell 2	Sapajus_apella	MG 21977	-2.55	-43.35	-2	-44	2.383799	27.2125	8.491667	81.65064	56.57356	32.7	22.3	10.4	26.66667	27.98333	27.98333	26.66667	1697	357	6	95.35155	969	23	23	969	88.1835	0.522
media								27.19063	8.472917	81.47035	56.30784	32.7	22.3	10.4	26.65417	27.97083	27.97083	26.65417	1709	357	6.75	94.57074	971.25	25.25	25.25	971.25	88.1835	0.522
cell 3	Sapajus_macrocephalus	MZ 05315	-7.38	-70.78	-6	-72	2.591823	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_macrocephalus	MZ 05316	-7.38	-70.78	-6	-72	2.519614	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_macrocephalus	MZ 05317	-7.38	-70.78	-6	-72	2.443591	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_macrocephalus	MZ 05318	-7.38	-70.78	-6	-72	2.4157	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_macroce	MZ 05319	-7.3	-70.	-6	-72	2.4559	25.566	10.55	81.782	48.679	31.6	18.7	12.9	25.766	24.983	26.066	24.833	2327	289	59	45.031	845	226	581	305	114.06	0.976

	phalus		8	78			11	67		95	53				67	33	67	33				88					2	
cell 3	Sapajus_ macrocephalus	MZ 05320	-7.38	-70.78	-6	-72	2.419486	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_ macrocephalus	MZ 05392	-7.38	-70.78	-6	-72	2.457779	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_ macrocephalus	MZ 05746	-7.38	-70.78	-6	-72	2.484097	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_ macrocephalus	MZ 05314	-7.38	-70.78	-6	-72	2.560956	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 3	Sapajus_ macrocephalus	MZ 05321	-7.38	-70.78	-6	-72	2.55899	25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
media								25.56667	10.55	81.78295	48.67953	31.6	18.7	12.9	25.76667	24.98333	26.06667	24.83333	2327	289	59	45.03188	845	226	581	305	114.062	0.976
cell 4	Sapajus_ apella	MG 12168	-5.23	-49.22	-6	-48	2.446568	27.05	9.816667	81.80556	33.09765	33.3	21.3	12	26.68333	27.35	27.45	26.66667	1909	359	16	81.60181	982	67	82	843	91.5418	0.73
cell 4	Sapajus_ apella	MG 12172	-5.23	-49.22	-6	-48	2.438522	27.05	9.816667	81.80556	33.09765	33.3	21.3	12	26.68333	27.35	27.45	26.66667	1909	359	16	81.60181	982	67	82	843	91.5418	0.73
cell 4	Sapajus_ apella	MG 12173	-5.23	-49.22	-6	-48	2.430592	27.05	9.816667	81.80556	33.09765	33.3	21.3	12	26.68333	27.35	27.45	26.66667	1909	359	16	81.60181	982	67	82	843	91.5418	0.73
cell 4	Sapajus_ apella	MG 12174	-5.23	-49.22	-6	-48	2.4593	27.05	9.816667	81.80556	33.09765	33.3	21.3	12	26.68333	27.35	27.45	26.66667	1909	359	16	81.60181	982	67	82	843	91.5418	0.73
cell 4	Sapajus_ apella	MG 12333	-4.32	-49.78	-6	-48	2.492406	27.1	10.31667	87.42938	34.96752	33.2	21.4	11.8	26.81667	27.45	27.55	26.63333	2306	427	26	80.77667	1206	94	138	1164	97.0508	0.887
cell 4	Sapajus_ apella	MG 23053	-4.98	-46.57	-6	-48	2.341873	25.84167	11.6	75.81699	49.25967	33.4	18.1	15.3	25.68333	25.95	26.5	25.26667	1232	249	11	85.39808	675	45	146	114	81.9625	0.668
cell 4	Sapajus_ apella	MG 23024	-4.98	-46.57	-6	-48	2.296556	25.84167	11.6	75.81699	49.25967	33.4	18.1	15.3	25.68333	25.95	26.5	25.26667	1232	249	11	85.39808	675	45	146	114	81.9625	0.668
cell 4	Sapajus_ apella	MG 12167	-4.65	-49.48	-6	-48	2.360683	27.05417	10.175	86.22881	31.6557	33.1	21.3	11.8	26.83333	27.41667	27.45	26.65	2180	409	23	82.10288	1138	87	144	1117	91.1325	0.887
cell 4	Sapajus_ apella	MG 12170	-5.23	-49.22	-6	-48	2.286117	27.05	9.816667	81.80556	33.09765	33.3	21.3	12	26.68333	27.35	27.45	26.66667	1909	359	16	81.60181	982	67	82	843	91.5418	0.73

cell 4	Sapajus_ apella	MG 12166	-4.65	-49.48	-6	-48	2.408851	27.05417	10.175	86.22881	31.6557	33.1	21.3	11.8	26.83333	27.41667	27.45	26.65	2180	409	23	82.10288	1138	87	144	1117	91.1325	0.887
media								26.81417	10.295	82.05488	36.22865	33.27	20.67	12.6	26.52667	27.09333	27.27	26.38	1867.5	353.8	17.4	82.37876	974.2	69.3	112.8	784.1	90.09498	0.7647
cell 5	Sapajus_ apella	MG 23023	-4.73	-45.90	-6	-44	2.470428	26.35	10.86667	79.31873	56.56854	33.2	19.5	13.7	26.06667	26.51667	27.13333	25.76667	1325	262	12	87.52077	742	44	121	155	80.7823	0.595
cell 5	Sapajus_ apella	MG 23022	-5.50	-45.23	-6	-44	2.302234	26.69167	10.93333	70.99567	82.37479	34.5	19.1	15.4	26.23333	26.66667	27.9	25.86667	1160	250	7	89.48597	637	35	67	254	70.8753	0.524
cell 5	Sapajus_ apella	MG 23021	-4.73	-45.90	-6	-44	2.316913	26.35	10.86667	79.31873	56.56854	33.2	19.5	13.7	26.06667	26.51667	27.13333	25.76667	1325	262	12	87.52077	742	44	121	155	80.7823	0.595
cell 5	Sapajus_ apella	MG 23054	-4.73	-45.90	-6	-44	2.248091	26.35	10.86667	79.31873	56.56854	33.2	19.5	13.7	26.06667	26.51667	27.13333	25.76667	1325	262	12	87.52077	742	44	121	155	80.7823	0.595
media								26.43542	10.88333	77.23797	63.0201	33.525	19.4	14.125	26.10833	26.55417	27.325	25.79167	1283.75	259	10.75	88.01207	715.75	41.75	107.5	179.75	78.30555	0.5725
cell 6	Sapajus_ apella	MG 21764	-8.75	-63.47	-10	-64	2.445925	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21765	-8.75	-63.47	-10	-64	2.395437	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21766	-8.75	-63.47	-10	-64	2.481165	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21928	-8.75	-63.47	-10	-64	2.414322	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21771	-8.75	-63.47	-10	-64	2.348471	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21759	-8.75	-63.47	-10	-64	2.313807	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21925	-8.75	-63.47	-10	-64	2.350235	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21772	-8.75	-63.47	-10	-64	2.528087	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_ apella	MG 21755	-8.7	-63.	-10	-64	2.3962	26.05	10.233	71.561	61.533	33	18.7	14.3	25.883	25.633	26.816	25.266	2283	361	23	65.765	1005	99	499	187	109.30	0.853

			5	47			12		33	77	44				33	33	67	67				54					1	
cell 6	Sapajus_apella	MG 21770	-8.75	-63.47	-10	-64	2.314054	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21756	-8.75	-63.47	-10	-64	2.378424	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21779	-8.75	-63.47	-10	-64	2.331683	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21774	-8.75	-63.47	-10	-64	2.250363	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21773	-8.75	-63.47	-10	-64	2.265623	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21769	-8.75	-63.47	-10	-64	2.366195	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21957	-8.75	-63.47	-10	-64	2.542595	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21757	-8.75	-63.47	-10	-64	2.416999	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21758	-8.75	-63.47	-10	-64	2.428363	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21761	-8.75	-63.47	-10	-64	2.430557	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21762	-8.75	-63.47	-10	-64	2.430719	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21763	-8.75	-63.47	-10	-64	2.291339	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21749	-8.75	-63.47	-10	-64	2.30775	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
cell 6	Sapajus_apella	MG 21750	-8.75	-63.47	-10	-64	2.531069	26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853
media								26.05	10.23333	71.56177	61.53344	33	18.7	14.3	25.88333	25.63333	26.81667	25.26667	2283	361	23	65.76554	1005	99	499	187	109.301	0.853

cell 7	Sapajus_libidinosus	MZ 02364	-15.55	-51.63	-14	-52	2.248054	25.85417	12.075	70.20349	112.5623	33.5	16.3	17.2	26.35	24.46667	26.88333	24.15	1522	287	5	86.21748	792	18	383	40	84.2563	0.707
cell 7	Sapajus_libidinosus	MZ 02365	-15.55	-51.63	-14	-52	2.346955	25.85417	12.075	70.20349	112.5623	33.5	16.3	17.2	26.35	24.46667	26.88333	24.15	1522	287	5	86.21748	792	18	383	40	84.2563	0.707
cell 7	Sapajus_libidinosus	MZ 06713	-14.68	-52.35	-14	-52	2.243646	25.08333	13.63333	70.63903	137.1518	33.5	14.2	19.3	25.78333	23.16667	26.23333	23.06667	1498	275	4	85.04285	744	15	392	41	85.6678	0.737
cell 7	Sapajus_libidinosus	MZ 06960	-13.10	-52.88	-14	-52	2.430182	25.08333	14.11667	70.58333	110.1514	34.1	14.1	20	25.61667	23.56667	25.95	23.43333	1703	292	1	82.96503	857	15	412	37	86.8897	0.694
cell 7	Sapajus_libidinosus	MZ 06961	-13.28	-52.75	-14	-52	2.397098	24.7625	14.00833	70.74916	111.9075	33.7	13.9	19.8	25.28333	23.21667	25.68333	23.1	1639	281	1	83.10595	821	13	400	36	86.8897	0.694
cell 7	Sapajus_libidinosus	MZ 06962	-13.10	-52.88	-14	-52	2.466207	25.08333	14.11667	70.58333	110.1514	34.1	14.1	20	25.61667	23.56667	25.95	23.43333	1703	292	1	82.96503	857	15	412	37	86.8897	0.694
cell 7	Sapajus_libidinosus	MZ 06963	-13.10	-52.88	-14	-52	2.293776	25.08333	14.11667	70.58333	110.1514	34.1	14.1	20	25.61667	23.56667	25.95	23.43333	1703	292	1	82.96503	857	15	412	37	86.8897	0.694
cell 7	Sapajus_libidinosus	MZ 06968	-13.28	-52.75	-14	-52	2.298018	24.7625	14.00833	70.74916	111.9075	33.7	13.9	19.8	25.28333	23.21667	25.68333	23.1	1639	281	1	83.10595	821	13	400	36	86.8897	0.694
cell 7	Sapajus_libidinosus	MZ 06969	-13.10	-52.88	-14	-52	2.38931	25.08333	14.11667	70.58333	110.1514	34.1	14.1	20	25.61667	23.56667	25.95	23.43333	1703	292	1	82.96503	857	15	412	37	86.8897	0.694
cell 7	Sapajus_libidinosus	MZ 06971	-13.10	-52.88	-14	-52	2.321466	25.08333	14.11667	70.58333	110.1514	34.1	14.1	20	25.61667	23.56667	25.95	23.43333	1703	292	1	82.96503	857	15	412	37	86.8897	0.694
cell 7	Sapajus_libidinosus	MZ 10716	-12.25	-53.38	-14	-52	2.374032	25.025	14.86667	67.26998	94.78444	35.5	13.4	22.1	25.31667	23.8	25.78333	23.61667	2218	383	6	81.21248	1085	31	550	46	97.258	0.728
cell 7	Sapajus_libidinosus	MZ 06964	-13.10	-52.88	-14	-52	2.302953	25.08333	14.11667	70.58333	110.1514	34.1	14.1	20	25.61667	23.56667	25.95	23.43333	1703	292	1	82.96503	857	15	412	37	86.8897	0.694
media								25.15347	13.78056	70.27619	111.8154	34	14.38333	19.61667	25.67222	23.64444	26.07083	23.48194	1688	295.5	2.333333	83.5577	849.75	16.5	415	38.41667	87.213	0.702583
cell 8	Sapajus_cay	MZ 03361	-19.00	-57.65	-18	-56	2.357633	25.75417	10.69167	65.99794	226.7804	33.5	17.3	16.2	27.76667	23	27.78333	22.56667	1066	175	25	59.3163	462	84	447	115	84.0645	0.513
cell 8	Sapajus_cay	MZ 03363	-19.00	-57.65	-18	-56	2.39002	25.75417	10.69167	65.99794	226.7804	33.5	17.3	16.2	27.76667	23	27.78333	22.56667	1066	175	25	59.3163	462	84	447	115	84.0645	0.513
cell 8	Sapajus_cay	MZ 03770	-18.	-54.	-18	-56	2.3010	25.570	12.308	66.173	186.50	33.8	15.2	18.6	26.833	23.866	27.35	22.933	1476	247	24	65.851	695	94	341	130	102.30	0.813

			48	75			66	83	33	84	44				33	67		33				38					2	
cell 8	Sapajus_cay	MZ 04317	-19.00	-57.65	-18	-56	2.41991	25.75417	10.69167	65.99794	226.7804	33.5	17.3	16.2	27.76667	23	27.78333	22.56667	1066	175	25	59.3163	462	84	447	115	84.0645	0.513
cell 8	Sapajus_cay	MZ 19697	-18.48	-54.75	-18	-56	2.320158	25.57083	12.30833	66.17384	186.5044	33.8	15.2	18.6	26.83333	23.86667	27.35	22.93333	1476	247	24	65.85138	695	94	341	130	102.302	0.813
media								25.68083	11.33833	66.0683	210.67	33.62	16.46	17.16	27.39333	23.34667	27.61	22.71333	1230	203.8	24.6	61.93033	555.2	88	404.6	121	91.3595	0.633
cell 9	Sapajus_libidinosus	MZ 01430	-18.37	-48.17	-18	-48	2.285111	23.75833	12.43333	69.07407	174.7834	31.1	13.1	18	25.08333	21.51667	25.1	21.11667	1364	279	7	89.48114	739	23	626	40	82.3557	0.602
cell 9	Sapajus_libidinosus	MZ 19618	-16.67	-49.27	-18	-48	2.2256	23.09583	11.29167	66.03314	159.0663	30.4	13.3	17.1	23.91667	22.05	24.4	20.81667	1435	247	6	79.62392	688	28	209	147	79.4238	0.747
cell 9	Sapajus_libidinosus	MZ 11095	-16.45	-49.97	-18	-48	2.337256	23.375	10.66667	67.94055	123.941	30.5	14.8	15.7	23.86667	22.95	24.56667	21.55	1556	286	5	82.85462	771	19	202	151	75.9598	0.747
cell 9	Sapajus_libidinosus	MZ 11096	-16.45	-49.97	-18	-48	2.41995	23.375	10.66667	67.94055	123.941	30.5	14.8	15.7	23.86667	22.95	24.56667	21.55	1556	286	5	82.85462	771	19	202	151	75.9598	0.747
media								23.40104	11.26458	67.74708	145.4329	30.625	14	16.625	24.18333	22.36667	24.65833	21.25833	1477.75	274.5	5.75	83.70358	742.25	22.25	309.75	122.25	78.42477	0.71075
cell 10	Sapajus_robustus	MZ 11141	-19.20	-40.10	-18	-40	2.389717	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851
cell 10	Sapajus_robustus	MZ 11145	-19.20	-40.10	-18	-40	2.379708	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851
cell 10	Sapajus_robustus	MZ 11147	-19.20	-40.10	-18	-40	2.411325	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851
cell 10	Sapajus_robustus	MZ 11149	-19.20	-40.10	-18	-40	2.387579	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851
cell 10	Sapajus_robustus	MZ 11151	-19.20	-40.10	-18	-40	2.504648	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851
cell 10	Sapajus_robustus	MZ 06201	-19.45	-40.67	-18	-40	2.37338	24.23333	10.7	66.45963	168.3116	32.1	16	16.1	25.56667	22.15	26.35	22.15	1175	201	26	66.10237	573	97	393	97	87.7537	0.851
cell 10	Sapajus_robustus	MZ 11163	-19.20	-40.10	-18	-40	2.407702	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851

cell 10	Sapajus_ robustus	MZ 11173	-19.20	-40.10	-18	-40	2.352214	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851
cell 10	Sapajus_ robustus	MZ 11166	-19.20	-40.10	-18	-40	2.456974	24.0625	9.391667	64.32648	167.7678	31.3	16.7	14.6	25.41667	22.13333	26.16667	21.96667	1202	184	37	53.24015	528	141	365	142	91.8065	0.851
cell 10	Sapajus_ robustus	MZ 05917	-19.32	-41.15	-18	-40	2.458759	24.1375	11.74167	66.3371	175.9794	32.6	14.9	17.7	25.6	22.15	26.13333	21.83333	1170	208	21	74.23686	604	69	425	84	79.4173	0.899
cell 10	Sapajus_ robustus	MZ 05918	-19.32	-41.15	-18	-40	2.337791	24.1375	11.74167	66.3371	175.9794	32.6	14.9	17.7	25.6	22.15	26.13333	21.83333	1170	208	21	74.23686	604	69	425	84	79.4173	0.899
cell 10	Sapajus_ robustus	MZ 07879	-17.07	-40.70	-18	-40	2.357614	24.05	10.83333	67.70833	175.4345	31.6	15.6	16	24.85	21.55	25.96667	21.55	1023	177	32	54.93792	448	117	290	117	73.2273	0.6
cell 10	Sapajus_ robustus	MZ 05915	-19.32	-41.15	-18	-40	2.416216	24.1375	11.74167	66.3371	175.9794	32.6	14.9	17.7	25.6	22.15	26.13333	21.83333	1170	208	21	74.23686	604	69	425	84	79.4173	0.899
cell 10	Sapajus_ robustus	MZ 05916	-19.32	-41.15	-18	-40	2.455471	24.1375	11.74167	66.3371	175.9794	32.6	14.9	17.7	25.6	22.15	26.13333	21.83333	1170	208	21	74.23686	604	69	425	84	79.4173	0.899
cell 10	Sapajus_ robustus	MZ 05919	-19.32	-41.15	-18	-40	2.379266	24.1375	11.74167	66.3371	175.9794	32.6	14.9	17.7	25.6	22.15	26.13333	21.83333	1170	208	21	74.23686	604	69	425	84	79.4173	0.899
cell 10	Sapajus_ robustus	MZ 05920	-19.32	-41.15	-18	-40	2.382817	24.1375	11.74167	66.3371	175.9794	32.6	14.9	17.7	25.6	22.15	26.13333	21.83333	1170	208	21	74.23686	604	69	425	84	79.4173	0.899
cell 10	Sapajus_ robustus	MZ 02716	-17.78	-40.48	-18	-40	2.444025	24.2375	10.15833	68.17673	159.8739	31.5	16.6	14.9	25.48333	22.05	26.13333	22.05	999	168	33	52.78363	424	121	297	121	81.1138	0.6
cell 10	Sapajus_ robustus	MZ 02717	-17.85	-41.50	-18	-40	2.455689	23.09583	11.825	66.43258	169.685	31.9	14.1	17.8	24.6	21.06667	24.96667	20.83333	1090	205	21	74.66466	561	69	381	79	76.1583	0.709
cell 10	Sapajus_ robustus	MZ 02718	-17.85	-41.50	-18	-40	2.534626	23.09583	11.825	66.43258	169.685	31.9	14.1	17.8	24.6	21.06667	24.96667	20.83333	1090	205	21	74.66466	561	69	381	79	76.1583	0.709
cell 10	Sapajus_ robustus	MZ 02719	-17.85	-41.50	-18	-40	2.345216	23.09583	11.825	66.43258	169.685	31.9	14.1	17.8	24.6	21.06667	24.96667	20.83333	1090	205	21	74.66466	561	69	381	79	76.1583	0.709
media								23.95667	10.6375	65.71385	170.5347	31.845	15.675	16.17	25.33167	21.94583	25.97417	21.74917	1155.15	194.05	28.8	63.45801	548.8	104.2	379.65	110.6	84.07628	0.819
cell 10	Sapajus_ nigritus	MZ 02213	-19.53	-40.62	-18	-40	2.298082	24.55833	10.38333	66.13588	169.3683	32.3	16.6	15.7	25.88333	22.43333	26.7	22.43333	1162	198	28	64.1891	560	104	379	104	83.9215	0.851
cell 10	Sapajus_ nigritus	MZ 02214	-19.	-40.	-18	-40	2.5171	24.558	10.383	66.135	169.36	32.3	16.6	15.7	25.883	22.433	26.7	22.433	1162	198	28	64.189	560	104	379	104	83.921	0.851

			53	62			82	33	33	88	83				33	33		33				1					5	
cell 10	Sapajus_ nigritus	MZ 02215	-19.63	-40.45	-18	-40	2.494056	24.325	9.783333	64.36404	174.9091	31.9	16.7	15.2	25.7	22.13333	26.55	22.13333	1170	196	32	59.60362	546	122	364	122	91.8022	0.851
cell 10	Sapajus_ nigritus	MZ 02216	-19.63	-40.45	-18	-40	2.484882	24.325	9.783333	64.36404	174.9091	31.9	16.7	15.2	25.7	22.13333	26.55	22.13333	1170	196	32	59.60362	546	122	364	122	91.8022	0.851
cell 10	Sapajus_ nigritus	MZ 02217	-19.53	-40.62	-18	-40	2.485605	24.55833	10.38333	66.13588	169.3683	32.3	16.6	15.7	25.88333	22.43333	26.7	22.43333	1162	198	28	64.1891	560	104	379	104	83.9215	0.851
media								24.465	10.14333	65.42714	171.5846	32.14	16.64	15.5	25.81	22.31333	26.64	22.31333	1165.2	197.2	29.6	62.35491	554.4	111.2	373	111.2	87.07378	0.851
cell 11	Sapajus_ cay	MZ 04299	-20.18	-56.50	-22	-56	2.321538	25.01667	11.53333	64.07407	244.9706	33.1	15.1	18	27.38333	21.68333	27.38333	21.68333	1318	219	27	56.72329	571	114	571	114	105.257	0.655
cell 11	Sapajus_ cay	MZ 05788	-20.18	-56.50	-22	-56	2.362583	25.01667	11.53333	64.07407	244.9706	33.1	15.1	18	27.38333	21.68333	27.38333	21.68333	1318	219	27	56.72329	571	114	571	114	105.257	0.655
cell 11	Sapajus_ cay	MZ 03774	-20.23	-56.37	-22	-56	2.317743	24.77083	11.70833	64.68692	242.9502	32.9	14.8	18.1	27.11667	21.46667	27.11667	21.46667	1349	223	28	55.97724	583	117	583	117	105.257	0.655
cell 11	Sapajus_ cay	MZ 03775	-20.23	-56.37	-22	-56	2.423317	24.77083	11.70833	64.68692	242.9502	32.9	14.8	18.1	27.11667	21.46667	27.11667	21.46667	1349	223	28	55.97724	583	117	583	117	105.257	0.655
								24.89375	11.62083	64.3805	243.9604	33	14.95	18.05	27.25	21.575	27.25	21.575	1333.5	221	27.5	56.35026	577	115.5	577	115.5	105.257	0.655
cell 12	Sapajus_ cay	MZ 28539	-21.25	-52.03	-22	-52	2.268886	23.25417	12.125	65.54054	241.1851	31	12.5	18.5	25.63333	20.15	25.63333	19.91667	1165	198	21	60.99268	525	85	525	127	87.5905	0.551
cell 12	Sapajus_ cay	MZ 28540	-21.25	-52.03	-22	-52	2.29427	23.25417	12.125	65.54054	241.1851	31	12.5	18.5	25.63333	20.15	25.63333	19.91667	1165	198	21	60.99268	525	85	525	127	87.5905	0.551
cell 12	Sapajus_ cay	DZU P/CC MZ 89	-22.28	-53.27	-22	-52	2.475347	22.91667	12.35	66.39785	227.0696	31.5	12.9	18.6	24.56667	20.31667	25.13333	19.78333	1337	184	27	45.0906	493	155	469	190	87.7812	0.814
media								23.14167	12.2	65.82631	236.48	31.16667	12.63333	18.53333	25.27778	20.20556	25.46667	19.87222	1222.333	193.3333	23	55.69199	514.3333	108.3333	506.3333	148	87.65407	0.638667
cell 12	Sapajus_ nigritus	MZ 06013	-22.28	-52.62	-22	-52	2.538904	23.02917	12.475	64.97396	251.59	31.5	12.3	19.2	25.58333	21.08333	25.58333	19.53333	1194	159	31	45.15095	456	140	456	179	86.5642	0.684
cell 12	Sapajus_ nigritus	MZ 06015	-22.	-52.	-22	-52	2.3568	23.029	12.475	64.973	251.59	31.5	12.3	19.2	25.583	21.083	25.583	19.533	1194	159	31	45.150	456	140	456	179	86.564	0.684

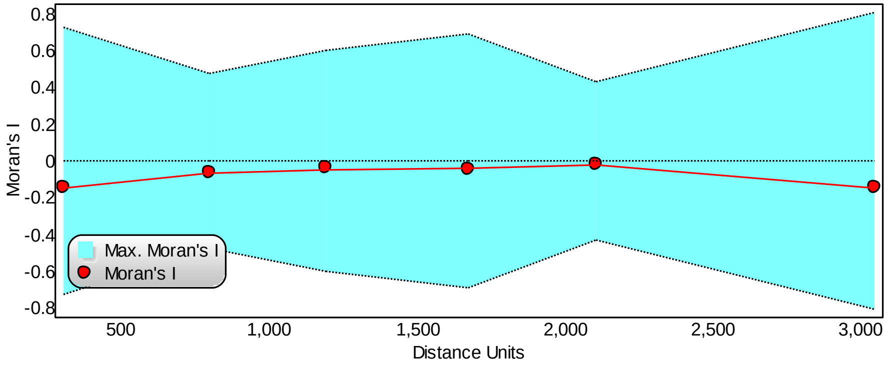
			28	62			84	17		96					33	33	33	33				95					2	
cell 12	Sapajus_ nigritus	MZ 06016	-22.28	-52.62	-22	-52	2.352396	23.02917	12.475	64.97396	251.59	31.5	12.3	19.2	25.58333	21.08333	25.58333	19.53333	1194	159	31	45.15095	456	140	456	179	86.5642	0.684
cell 12	Sapajus_ nigritus	MZ 06014	-22.28	-52.62	-22	-52	2.455605	23.02917	12.475	64.97396	251.59	31.5	12.3	19.2	25.58333	21.08333	25.58333	19.53333	1194	159	31	45.15095	456	140	456	179	86.5642	0.684
cell 12	Sapajus_ nigritus	MHN CI 035	-22.72	-53.17	-22	-52	2.392691	22.7125	12.85833	64.94108	256.3124	31.7	11.9	19.8	24.46667	20.7	25.38333	19.2	1265	174	32	42.49367	461	156	443	212	92.0405	0.814
cell 12	Sapajus_ nigritus	MHN CI 038	-22.72	-53.17	-22	-52	2.582792	22.7125	12.85833	64.94108	256.3124	31.7	11.9	19.8	24.46667	20.7	25.38333	19.2	1265	174	32	42.49367	461	156	443	212	92.0405	0.814
cell 12	Sapajus_ nigritus	MHN CI 1248	-23.75	-53.32	-22	-52	2.384254	20.82083	12.975	62.68116	289.7213	30.6	9.9	20.7	24.03333	18.31667	24.03333	17.01667	1499	168	65	25.37132	465	267	465	327	77.1992	0.675
cell 12	Sapajus_ nigritus	MHN CI 4177	-23.93	-51.97	-22	-52	2.445565	20.97917	12.25833	60.98673	302.7259	30.3	10.2	20.1	24.38333	18.31667	24.38333	17.06667	1491	203	66	38.57249	533	250	533	295	82.7092	1.106
cell 12	Sapajus_ nigritus	MHN CI 4366	-23.93	-51.97	-22	-52	2.436985	20.97917	12.25833	60.98673	302.7259	30.3	10.2	20.1	24.38333	18.31667	24.38333	17.06667	1491	203	66	38.57249	533	250	533	295	82.7092	1.106
media								22.25787	12.56759	63.82585	268.2398	31.17778	11.47778	19.7	24.8963	20.07593	25.1	18.63148	1309.667	173.1111	42.77778	40.90082	475.2222	182.1111	471.2222	228.5556	85.88393	0.805667
cell 13	Sapajus_ nigritus	MZ 05903	-21.67	-49.73	-22	-48	2.494409	21.52917	12.69167	64.7534	255.8449	30	10.4	19.6	24.25	18.28333	24.25	18.06667	1257	209	25	63.97817	589	107	589	141	88.6275	0.838
cell 13	Sapajus_ nigritus	MZ 06887	-22.18	-48.77	-22	-48	2.535538	21.2	12.38333	64.49653	248.0286	29.7	10.5	19.2	23.9	18.03333	23.9	17.96667	1194	218	22	70.27928	594	91	594	111	84.6383	0.769
cell 13	Sapajus_ nigritus	MZ 00794	-20.53	-47.42	-22	-48	2.340293	19.70417	8.875	64.31159	136.5227	26	12.2	13.8	20.63333	18.41667	20.83333	17.66667	1562	282	16	78.23076	780	54	416	85	76.6877	0.802
cell 13	Sapajus_ nigritus	MZ 01418	-23.78	-46.52	-22	-48	2.566741	17.23333	9.216667	57.24638	239.0448	24.7	8.6	16.1	20	14.28333	20.18333	14.28333	2227	291	78	45.25595	850	248	839	248	71.7688	1.074
cell 13	Sapajus_ nigritus	MZ 02850	-21.45	-49.93	-22	-48	2.370587	22.0125	12.725	64.92347	250.8361	30.4	10.8	19.6	24.61667	18.8	24.61667	18.58333	1214	217	19	68.52693	587	88	587	117	89.247	0.838
cell 13	Sapajus_ nigritus	MZ 00815	-20.53	-47.42	-22	-48	2.356127	19.70417	8.875	64.31159	136.5227	26	12.2	13.8	20.63333	18.41667	20.83333	17.66667	1562	282	16	78.23076	780	54	416	85	76.6877	0.802
cell 13	Sapajus_ nigritus	MZ 00828	-20.53	-47.42	-22	-48	2.558584	19.70417	8.875	64.31159	136.5227	26	12.2	13.8	20.63333	18.41667	20.83333	17.66667	1562	282	16	78.23076	780	54	416	85	76.6877	0.802

cell 13	Sapajus_nigritus	MZ 02350	-23.53	-46.63	-22	-48	2.421269	18.75833	9.85	60.80247	222.065	26.5	10.3	16.2	21.31667	16.03333	21.43333	16.03333	1359	223	35	60.27758	622	128	585	128	71.7688	1.074
cell 13	Sapajus_nigritus	MZ 02849	-21.45	-49.93	-22	-48	2.538129	22.0125	12.725	64.92347	250.8361	30.4	10.8	19.6	24.61667	18.8	24.61667	18.58333	1214	217	19	68.52693	587	88	587	117	89.247	0.838
cell 13	Sapajus_nigritus	MZ 03003	-20.33	-47.78	-22	-48	2.365816	22.40833	11.45	67.35294	174.6143	29.3	12.3	17	23.78333	20.01667	23.86667	19.83333	1490	300	9	84.21323	783	44	728	71	85.0247	0.802
cell 13	Sapajus_nigritus	MZ 02857	-21.45	-49.93	-22	-48	2.411317	22.0125	12.725	64.92347	250.8361	30.4	10.8	19.6	24.61667	18.8	24.61667	18.58333	1214	217	19	68.52693	587	88	587	117	89.247	0.838
cell 13	Sapajus_nigritus	MZ 05907	-21.67	-49.73	-22	-48	2.42558	21.52917	12.69167	64.7534	255.8449	30	10.4	19.6	24.25	18.28333	24.25	18.06667	1257	209	25	63.97817	589	107	589	141	88.6275	0.838
cell 13	Sapajus_nigritus	MZ 00832	-20.53	-47.42	-22	-48	2.301292	19.70417	8.875	64.31159	136.5227	26	12.2	13.8	20.63333	18.41667	20.83333	17.66667	1562	282	16	78.23076	780	54	416	85	76.6877	0.802
cell 13	Sapajus_nigritus	MZ 02851	-23.53	-46.40	-22	-48	2.537191	17.825	9.633333	59.1002	234.7678	25.4	9.1	16.3	20.55	14.88333	20.66667	14.88333	1426	233	35	61.60046	647	124	635	124	65.2278	1.074
cell 13	Sapajus_nigritus	MZ 02852	-21.45	-49.93	-22	-48	2.371075	22.0125	12.725	64.92347	250.8361	30.4	10.8	19.6	24.61667	18.8	24.61667	18.58333	1214	217	19	68.52693	587	88	587	117	89.247	0.838
cell 13	Sapajus_nigritus	MZ 03006	-20.33	-47.78	-22	-48	2.410152	22.40833	11.45	67.35294	174.6143	29.3	12.3	17	23.78333	20.01667	23.86667	19.83333	1490	300	9	84.21323	783	44	728	71	85.0247	0.802
cell 13	Sapajus_nigritus	MZ 03007	-20.33	-47.78	-22	-48	2.478138	22.40833	11.45	67.35294	174.6143	29.3	12.3	17	23.78333	20.01667	23.86667	19.83333	1490	300	9	84.21323	783	44	728	71	85.0247	0.802
cell 13	Sapajus_nigritus	MZ 00098	-23.45	-46.68	-22	-48	2.464976	17.5375	10.19167	60.66468	227.6473	25.4	8.6	16.8	20.13333	14.68333	20.25	14.68333	1410	237	35	62.97297	660	123	611	123	69.581	1.074
cell 13	Sapajus_nigritus	MZ 02859	-21.45	-49.93	-22	-48	2.398287	22.0125	12.725	64.92347	250.8361	30.4	10.8	19.6	24.61667	18.8	24.61667	18.58333	1214	217	19	68.52693	587	88	587	117	89.247	0.838
cell 13	Sapajus_nigritus	MZ 05905	-21.67	-49.73	-22	-48	2.340129	21.52917	12.69167	64.7534	255.8449	30	10.4	19.6	24.25	18.28333	24.25	18.06667	1257	209	25	63.97817	589	107	589	141	88.6275	0.838
cell 13	Sapajus_nigritus	MZ 06165	-21.67	-49.73	-22	-48	2.478867	21.52917	12.69167	64.7534	255.8449	30	10.4	19.6	24.25	18.28333	24.25	18.06667	1257	209	25	63.97817	589	107	589	141	88.6275	0.838
media								20.70357	11.21508	64.05935	215.1927	28.3619	10.87619	17.48571	22.85079	18.03651	22.92619	17.77143	1401.524	245.2857	23.38095	69.73792	673	91.90476	590.619	116	82.16927	0.867667
cell 14	Sapajus_nigritus	MZ 07055	-22.	-44.	-22	-44	2.5378	18.787	12.075	62.242	235.50	27.1	7.7	19.4	21.35	15.65	21.433	15.65	1579	280	23	75.514	792	81	735	81	59.513	1.137

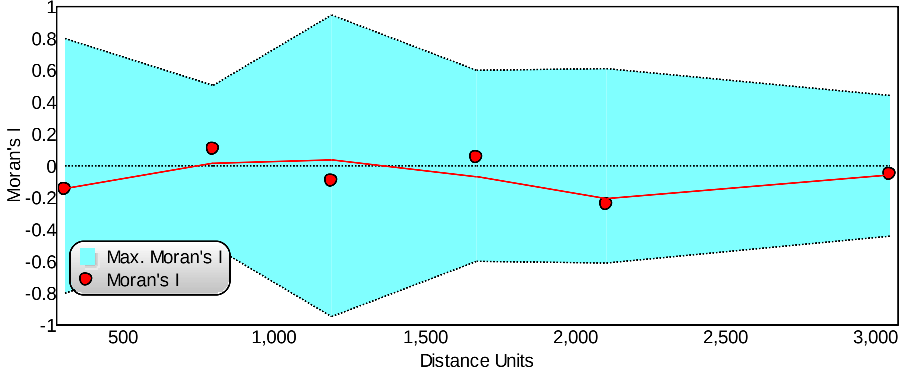
			45	58			76	5		27	84						33					01					3	
cell 14	Sapajus_nigritus	MZ 07056	-22.45	-44.58	-22	-44	2.35732	18.7875	12.075	62.24227	235.5084	27.1	7.7	19.4	21.35	15.65	21.43333	15.65	1579	280	23	75.51401	792	81	735	81	59.5133	1.137
cell 14	Sapajus_nigritus	MZ 09641	-23.73	-45.88	-22	-44	2.552415	22.69167	7.533333	52.31481	238.3068	29.3	14.9	14.4	25.65	19.75	25.65	19.75	2595	334	96	40.20058	955	318	955	318	93.583	1.095
cell 14	Sapajus_nigritus	MZ 09642	-23.73	-45.88	-22	-44	2.419475	22.69167	7.533333	52.31481	238.3068	29.3	14.9	14.4	25.65	19.75	25.65	19.75	2595	334	96	40.20058	955	318	955	318	93.583	1.095
media								20.73958	9.804167	57.27854	236.9076	28.2	11.3	16.9	23.5	17.7	23.54167	17.7	2087	307	59.5	57.85729	873.5	199.5	845	199.5	76.54815	1.116
cell 15	Sapajus_nigritus	MCN 3191	-27.42	-51.77	-26	-52	2.527128	18.37917	11.39167	55.56911	330.306	28.6	8.1	20.5	17.2	17.86667	22.25	14.31667	1698	202	114	19.4536	511	368	447	369	68.8322	1.111
cell 15	Sapajus_nigritus	MHN CI 168	-25.40	-52.40	-26	-52	2.330015	17.52917	12.29167	59.95935	317.1855	27.3	6.8	20.5	21.05	17.86667	21.05	13.5	1795	195	104	21.52616	515	382	515	415	64.4502	0.777
cell 15	Sapajus_nigritus	MHN CI 298	-26.48	-51.98	-26	-52	2.465548	15.96667	12.65	58.83721	322.4856	26.2	4.7	21.5	14.53333	18.15	19.8	12.05	1939	212	104	20.43987	562	443	476	458	65.0745	1.146
media								17.29167	12.11111	58.12189	323.3257	27.36667	6.533333	20.83333	17.59444	17.96111	21.03333	13.28889	1810.667	203	107.3333	20.47321	529.3333	397.6667	479.3333	414	66.11897	1.011333
cell 16	Sapajus_nigritus	MZ 19620	-24.18	-46.78	-26	-48	2.605539	22.92083	7.825	51.82119	250.5218	30.1	15	15.1	26.03333	19.86667	26.03333	19.86667	2140	291	83	43.36244	850	269	850	269	78.7235	1.1265
cell 16	Sapajus_nigritus	MZ 19622	-24.18	-46.78	-26	-48	2.354667	22.92083	7.825	51.82119	250.5218	30.1	15	15.1	26.03333	19.86667	26.03333	19.86667	2140	291	83	43.36244	850	269	850	269	78.7235	1.1265
cell 16	Sapajus_nigritus	MHN CI 196	-25.83	-48.65	-26	-48	2.531444	20.675	7.5	47.7707	294.0199	28.7	13	15.7	24.36667	17.13333	24.36667	17.13333	1977	284	84	43.30696	816	269	816	269	83.2278	1.085
cell 16	Sapajus_nigritus	MHN CI 314	-24.67	-49.95	-26	-48	2.416945	16.8625	11.64167	58.20833	274.0946	26.2	6.2	20	19.96667	13.93333	20.18333	13.33333	1531	196	77	26.83607	515	274	498	308	64.1833	1.089
media								20.84479	8.697917	52.40535	267.2895	28.775	12.3	16.475	24.1	17.7	24.15417	17.55	1947	265.5	81.75	39.21698	757.75	270.25	753.5	278.75	76.21452	1.10675

Appendix 2

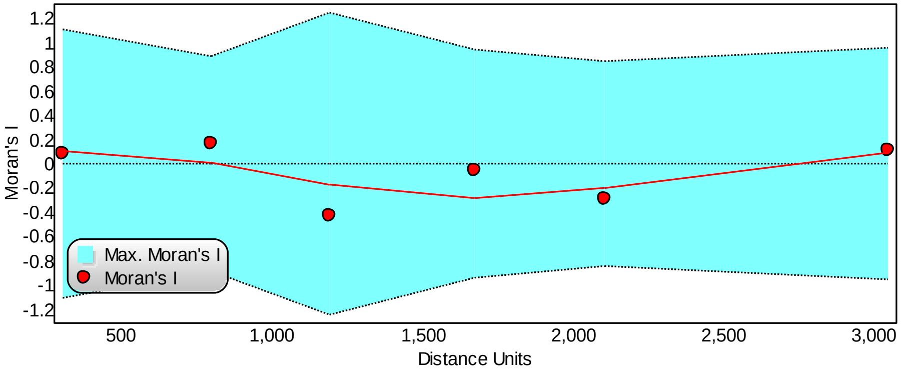
SSD								
D.Class	Count	DistCntr	Moran's I	Std Err	P	I (max)	I/I(max)	**SSD**
1	40	304.63	-0.147	0.162	0.622	0.727	-0.202	no variables sel
2	40	795.316	-0.064	0.121	0.981	0.474	-0.135	
3	38	1189.821	-0.04	0.171	0.876	0.601	-0.067	
4	36	1676.198	-0.046	0.055	0.713	0.685	-0.068	
5	36	2103.898	-0.017	0.038	0.185	0.426	-0.039	
6	36	3048.321	-0.147	0.192	0.675	0.806	-0.183	



LnCS_F								
D.Class	Count	DistCntr	Moran's I	Std Err	P	I (max)	I/I(max)	**LnCS_F**
1	40	304.63	-0.149	0.164	0.615	0.803	-0.186	no variable sel
2	40	795.316	0.106	0.117	0.14	0.508	0.209	
3	38	1189.821	-0.097	0.172	0.859	0.948	-0.103	
4	36	1676.198	0.055	0.078	0.118	0.604	0.091	
5	36	2103.898	-0.245	0.066	**0.007**	0.614	-0.399	
6	36	3048.321	-0.05	0.209	0.936	0.445	-0.112	



Lncs_M								
D.Class	Count	DistCntr	Moran's I	Std Err	P	I (max)	I/I(max)	**LnCS_M**
1	40	304.63	0.084	0.163	0.355	1.103	0.076	no variable sel
2	40	795.316	0.16	0.118	0.055	0.89	0.18	
3	38	1189.821	-0.433	0.172	**0.033**	1.244	-0.348	
4	36	1676.198	-0.06	0.072	0.932	0.939	-0.064	
5	36	2103.898	-0.286	0.059	**<.001**	0.843	-0.339	
6	36	3048.321	0.104	0.204	0.403	0.953	0.109	



4- CONCLUSÃO

Nossos resultados convergem entre os dois gêneros. *Alouatta* e *Sapajus* demonstram tendências similares para a regra de Rensch, onde a variação do tamanho do dimorfismo sexual é relacionado com o aumento do crânio de machos e a diminuição do crânio das fêmeas. Nós acreditamos que nesse caso, *Sapajus* só não foi significante devido ao nosso relativamente baixo número de amostras. Assim, é necessário que novas análises sejam feitas para confirmar a regra de Rensch para *Sapajus.* Nós encontramos um padrão inverso ao de Bergmann para *Alouatta* (tamanho maior em baixas latitudes), um padrão que é dependente da filogenia e da autocorrelação espacial. Nos dois sexos dos dois gêneros estudados, tamanho é especialmente explicado pela complexidade da vegetação e da sazonalidade do ambiente (em alguns casos correlacionado com a temperatura ou a sazonalidade da precipitação). Significando que bugios e macacos prego são realmente maiores em ambientes mais estáveis, independente das diferenças ecológicas entre eles (MELORO et al., 2014b). Portanto, a variação do tamanho nesses animais não é somente explicada pela taxonomia, como acreditavam previamente (CÁCERES et al., 2014), mas também pelas adaptações relacionadas às pressões do ambiente.

REFERÊNCIAS BIBLIOGRÁFICAS

ANDERSSON, M. Sexual Selection. **Princeton University Press**, 1994.

ASHTON, K. G.; TRACY, M. C.; QUEIROZ A. DE. Is Bergmann’s rule valid for mammals? **The American Naturalist**, v. 156, p. 390–415, 2000.

ASHTON, K. G.; FELDMAN, C. R. Bergmann’s rule in non-avian reptiles: turtles follow it, lizards and snakes reverse it. **Evolution,** v. 57, p. 1151–1163, 2003.

BADYAEV, A. V.; HILL, G. E.; WHITTINGHAM, L. A. Population consequences of maternal effects: sex-bias in egg-laying order facilitates divergence in sexual dimorphism between bird populations. **Journal of Evolutionary Biology,** v. 15, p. 997–1003, 2002.

BELK, M. C.; HOUSTON, D. Bergmann’s Rule in Ectotherms: A Test Using Freshwater Fishes. **The American Naturalist**, v. 160, n. 6, 2002.

BERGMANN, C. Über die verhältnisse der wärmeokönomie der tiere zu ihrer grösse. **Göttinger Studien**, v. 3, p. 595–708, 2007.

BIDAU, C. J.; MARTINEZ, P. A. Sexual size dimorphism and Rensch's rule in Canidae. **Biological Journal of the Linnean Society,** v.1, p.1-15, 2016.

BLANCKENHORN, W. U.; STILLWELL, R. C.; YOUNG, K. A.; FOX, C. W.; ASHTON, K. G. When Rensch meets Bergmann: does sexual size dimorphism change systematically with latitude? **Evolution,** v. 60, n.10, p.2004-11, 2006.

BUBADUÉ J, CÁCERES N, DOS SANTOS CARVALHO, R. Ecogeographical Variation in Skull Shape of South-American Canids: Abiotic or Biotic Processes? **Evolutionary Biology**, v. 43, p. 145, 2016.

CÁCERES, N.; MELORO, C.; CAROTENUTO, F.; PASSARO, F.; SPONCHIADO, J.; MELO, G. L.; RAIA, P. Ecogeographical variation in skull shape of capuchin monkeys. **Journal of Biogeography**, v. 41, p. 501–512, 2014.

CLAUSS, M.; DITTMANN, M.T.; MÜLLER, D. W. H.; MELORO, C.; CODRON, D. Bergmann′s rule in mammals: a cross-species interspecific pattern. **Oikos,** v. 122, p. 1465–1472, 2013.

CORTÉS-ORTIZ, L.; BERMINGHAM, E.; RICO, C.; RODRÍGUEZ-LUNA, E.; SAMPAIO, I.; RUIZ-GARCÍA, M. Molecular systematics and biogeography of the Neotropical monkey genus, *Alouatta* . **Molecular Phylogenetics Evolution**, v. 26, p. 64–81, 2003.

FAIRBAIRN, D. J. Allometry for sexual size dimorphism: pattern and process in the coevolution of body size in males and females. **Annual review of ecology and systematics** , p. 659-687, 1997.

FAIRBAIRN, D. J. Introduction: the enigma of sexual size dimorphism. Sex, Size & Gender Roles: **Evolutionary Studies of Sexual Size Dimorphism**, p. 1-10, 2007.

FAIRBAIRN, D.J. Odd Couples. Extraordinary Differences Between the Sexes in the Animal Kingdom. **Princeton University Press**, 2013.

FAIRBAIRN, D.; BLANCKENHORN, W.; SZEKELY, T. Sex, Size and gender Roles. **Evolutionary Studies of Sexual Size Dimorphism. Oxford University Press**, 2007.

GORDON, A. D. Evolution of body size and sexual size dimorphism in the order Primates: Rench's rule, quantitative genetics, and phylogenetic effects. **PhD dissertation**, University of Texas, Austin, 2004.

HARCOURT, A. H.; SCHREIER, B. M. Diversity, Body Mass, and Latitudinal Gradients in Primates . **International Journal of Primatology**, v. 30, n. 283, 2009.

LYNCH-ALFARO, J. W. How Different Are Robust and Gracile Capuchin Monkeys? An Argument for the Use of Sapajus and Cebus. **American Journal of Primatology**, v. 74, n. 4, p. 273-86, 2012.

MARTINEZ, P.A.; MARTI, D. A.; MOLINA, W. F.; BIDAU, C. J. Bergmann's rule across the equator: A case study in Cerdocyon thous (Canidae). **Journal of Animal Ecology**, v. 82, p. 997–1008, 2013.

MAESTRI, R.; LUZA, A. L.; DE BARROS, L. D.; HARTZ, S. M.; FERRARI, A.; DE FREITAS, T. R. O.; DUARTE, L. D. S. Geographical variation of body size in sigmodontine rodents depends on both environment and phylogenetic composition of communities. **Journal of Biogeography,** v. 43, p. 1192–1202, 2016.

MEDINA, A. I.; MARTÍ, D. A.; BIDAU, C. J. Subterranean rodents of the genus Ctenomys (Caviomorpha, Ctenomyidae) follow the converse to Bergmann's rule. **Journal of Biogeography,** v. 34, p. 1439–1454, 2007.

MEIRI, S.; YOM-TOV, Y.; GEFFEN, E. What determines conformity to Bergmann's rule?. **Global Ecology and Biogeography**, v. 16, p. 788–794, 2007.

MELORO, C.; CÁCERES, N.; CAROTENUTO, F.; SPONCHIADO, J.; MELO, G. L.; PASSARO, F. In and out the Amazonia: evolutionary ecomorphology in howler and capuchin monkeys. **Evolutionary Biology,** v. 41, p. 38–51, 2014.

RENSCH, B. Die Abhängigkeit der relativen Sexualdifferenz von der Körpergrösse. **Bonner Zoologische Beiträge**, v. 1, p. 58-69, 1950.

RODRÍGUEZ, M. Á.; OLALLA-TÁRRAGA, M. A.; BRADFORD, A. H. Bergmann’s rule and the geography of mammal body size in the Western Hemisphere. **Global Ecology and Biogeography**, v. 17, p. 274–283, 2008.

ROSENBERGER, A. L. Evolution of feeding niches in new world monkeys. **American Journal of Physical Anthropology,** v. 88, p. 525–562, 1992.

SHINE, R. Constraints, Allometry, and Adaptation: Food Habits and Reproductive Biology of Australian Brownsnakes (Pseudonaja: Elapidae). **Herpetologica,** v. 45, n. 2, p. 195-207, 1989.

WECKERLY, F. W. Sexual-size dimorphism: influence of mass and mating systems in the most dimorphic mammals. **Journal of Mammalogy**, v. 79, p. 33–52, 1998.