**Supplementary data**

**Title**: The fate of endemic birds of eastern Brazilian mountaintops due to climate change

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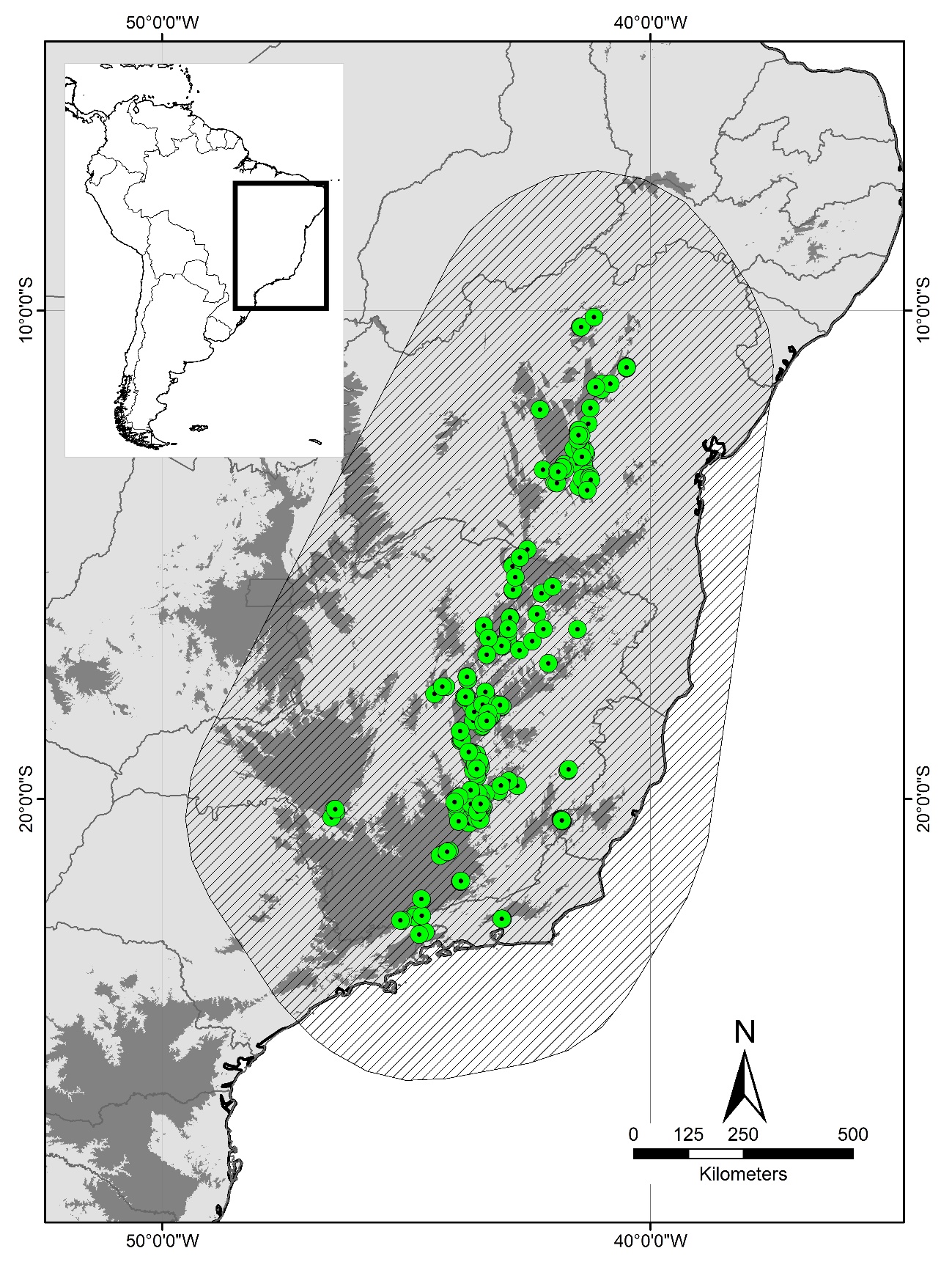
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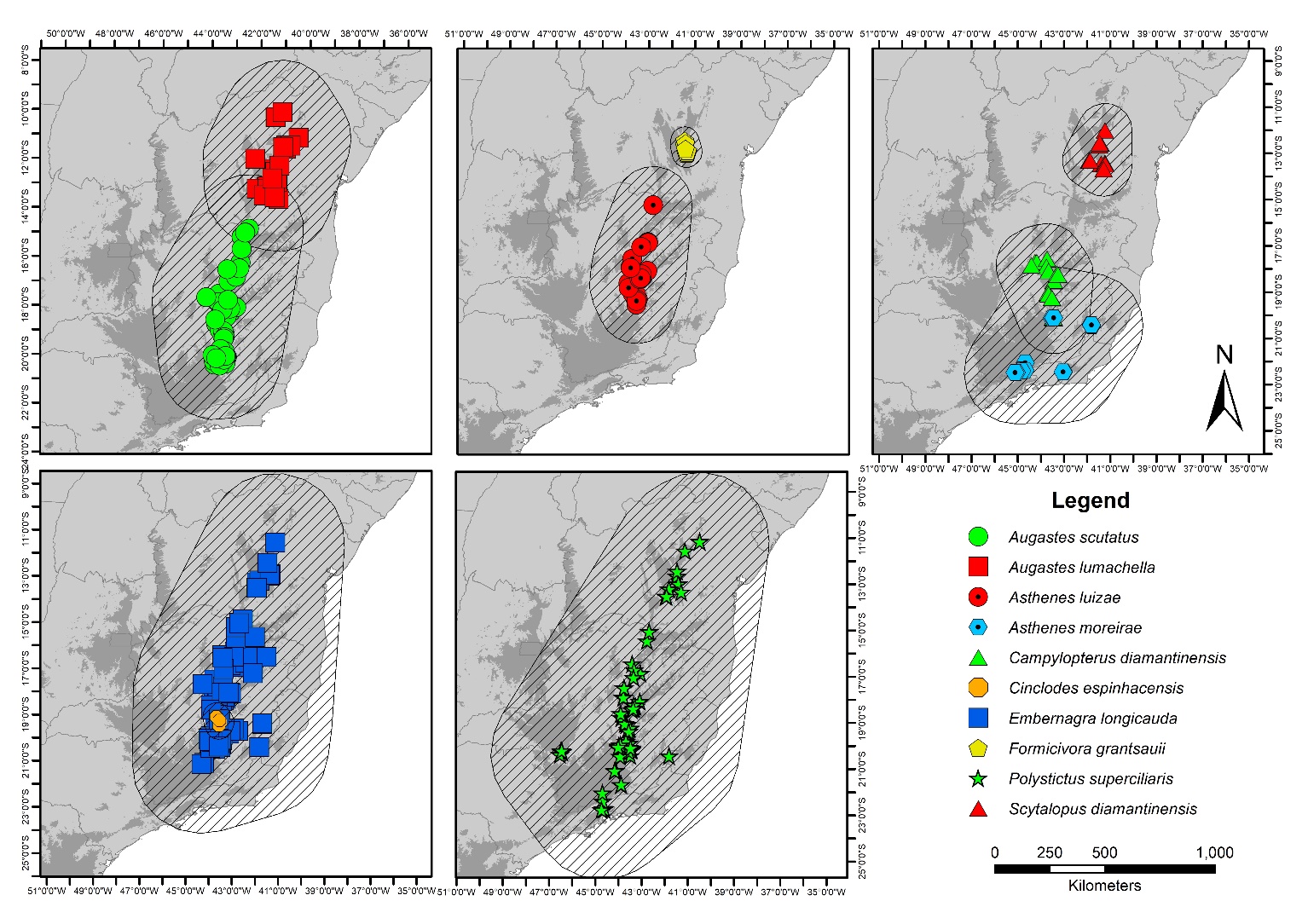
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**Fig. S1**. Maximum limits of the study area for model projections, including a buffer area (hatched area) of 300 km around each occurrence point (dots) for all species. Dark gray represents a mask with altitudinal limit of 800 meters above sea level, the lowest elevation at which at least one endemic species would occur and which was used to cut the projections within the study area.



**Fig. S2**. Records of occurrence and projection range for each of mountaintop endemic bird species in eastern Brazil. The extent of the projection buffer varies for each species according to the extent of distribution of its occurrence records (see Brown and Yoder, 2015) (*Asthenes luizae* = 168km; *Augastes lumachella* = 214km; *Augastes scutatus* = 223km; *Asthenes moreirae* = 221km; *Campylopterus diamantinensis* = 153km; *Cinclodes espinhacensis* = 58km; *Embernagra longicauda* = 300km; *Formicivora grantsaui* = 61km; *Polystictus superciliaris* = 300km and *Scytalopus diamantinensis* = 117km).

**Text S1.** Detailed methods description

**METHODS**

*Study area*

The study area is located in eastern Brazil between 37º-49ºW and 9º-25ºS. The projection area for models of all species consists of the elevated areas (above 800 m) of three mountain systems (Espinhaço Range, Mantiqueira, and Serra do Mar), within a buffer area of a maximum of 300 km around all records of occurrence of all species (Fig. S1). In this area, the projection area of the individual models produced for each species consists of a buffer area ranging from 30 to 300 km around the occurrence records of each species (Fig. S2). To calculate the radius of the buffer area for each species we utilized the equation proposed by Brown and Yoder (2015). The delimitation of the projection area of each species was intended to determine the areas with suitability within areas closest to its known distribution, in order to minimize over-prediction and restrict future projections (see Anderson, 2013; Brown, 2014).

*Species distribution models*

Ecological niche models (ENMs) are based on known presence and absence or pseudo-absences (PAs) of species to predict habitat suitability in regions where the current presence of the species are unknown (Peterson et al., 2011). For this, occurrence records until 2018, for ten bird species endemic to eastern Brazilian mountaintops were compiled from the literature, field observations and museum specimens whenever geographic coordinates were available (see Vasconcelos, 2008). All localities of species occurrence (museum records) were revisited during the study (Table 1, Fig. S2, Table S1). The bird species identification follows systematics and nomenclature of the last revision of the Brazilian Ornithological Committee (Aleixo, 2007; Piacentini et al., 2015). In addition, we added the species *Campylopterus diamantinensis*, which was split and validate as species later and that is endemic to the eastern Brazilian mountaintops.We stress that out of these ten species, *Campylopterus diamantinensis* and *Cinclodes espinhacensis* had been previously treated as *Campylopterus largipennis* (as a subspecies) and as *Cinclodes pabsti*, respectively; but recent taxonomic research has ranked them as full and valid species (Freitas et al., 2012; Lopes et al., 2017). Otherwise, due to their recent taxonomic changes they were still not considered by IUCN. True absences records are difficult to obtain and are usually replaced by Pseudo-absences (PAs) which consist of random points. These points are used for comparison with presence data and help to differentiate environmental conditions under which a species can potentially occur. Thus, an area of study that exceeds, to a large extent, the actual range of a species can lead to the selection of a higher proportion of less-informative pseudo-absence points (PAs) (Anderson and Raza, 2010; Barbet-Massin et al., 2012). According to Merow et al. (2013), PAs should be selected according to the study objectives, and if the objective is to discover new suitable areas, non-occupied habitats can be informative and PA points included. In the present study, we intended to determine the extent of occurrence of bird species throughout its know range in the highlands of eastern Brazil. Thus, a method is to sample PA points within a maximum radial distance from known occurrence range for each species (Thuiller et al., 2009), but the selection of such a maximum distance can be difficult to choose because it should reflect actual dispersal distance. In this way we utilized the equation proposed by Brown and Yoder (2015) that transforms the area of the minimum convex polygon of all occurrence points for each species to reflect the logistic curve of the maximum distance values, here ranging from 30 to 300 km. Thus, we randomly generated 10,000 PA points in a buffer area with a maximum radius of 300 km around the Minimum Convex Polygon that encompass the occurrence records for each specie. Following guidelines proposed by Barbet-Massin et al. (2012) to choose PAs number for each algorithm, we use all points generated for MaxEnt, GLM and GAM. For GBM and RF, we randomly subsampled the generated PAs to the same number of presence.

Because many climatic variables after elimination of the highly correlated (negatively or positively) can present a certain collinearity and so negatively affect the ENMs (e.g. De Marco Jr. and Nóbrega, 2018), we select two sets of predictors variables for building ENMs. The first set of predictor variables was formed by the least correlated climatic variables (*r* Pearson < 0.7) at the known distribution range of each species, from a set of 19 variables from the WorldClim v1.4 database (http://worldclim.org/) (Hijmans et al., 2005) (Table S2). To carry out the correlation analysis and selection of the set of climatic variables for each species, we used as sample points the 10,000 PAs selected for each species. To decrease collinearity and to represent a gain in results for species with few records (e.g. Zwiener et al., 2018), for the second set of predictor variables we performed a Principal Component Analysis (PCA) with the least correlated climatic variables for each species and use the axes that explained 95% of the variation to building models for each species. The set of predictor variables were obtained, for each species, for the current and future scenarios with a resolution of 30 arc-seconds (approximately 1 km2), which is the most detailed information available that is independent of the large variation in altitude. The set of PCA axes for each species in each future scenario, was obtained by the projection of the resultant linear combination of the Principal Component Analysis with climatic layers of current scenario, as performed by Zwiener et al. (2018). For future scenarios we considered two periods (2050 and 2070) with four Representative Concentration Pathways (RCPs: rcp26, rcp45, rcp60, rcp85) (see IPCC, 2013) and three Global Climate Models (GCMs: CCSM4, HadGEM2-ES, MIROC-ESM), resulting in 24 scenarios set per bird species. These GCMs are some of the gas circulation models used in the IPCC Fifth Assessment report, and the RCPs are four concentration trajectories of greenhouse gasses, adopted for the Fifth Assessment ICC report (IPCC, 2013). Since GCMs represent a source of variation in model results (e.g. Diniz-Filho et al., 2009; Thuiller et al., 2019), we used three GCMs to get a central tendency in an attempt to minimize these negative effects.

For better evaluation of ENMs, we partitioned the data into ‘calibration’ and ‘test’ set using the ENMeval package (Muscarella et al., 2014). For species with > 25 occurrence points, the data were partitioned ten times, four sets with ‘*block*’ methods, five with ‘*randomkfold*’ (see Muscarella et al., 2014), each set with 75% of data for calibration and 25% for test. The last set consisted of all records for calibration and test. For species with < 25 occurrences, we use the method ‘*jackknife*’ (*n-1 jackknife*), in which each of *n* occurrence localities is used for testing, while all others are used for training (see Muscarella et al., 2014 for details).

For each data partition set and each predictors sets, ENMs were created using five algorithms that we consider most efficient for our data set (GAM, GBM, GLM, MAXENT and RF) and implemented with the *Biomod2* framework (Thuiller et al., 2009) in the R programming environment (RStudio Team, 2015). *Biomod2* possesses eleven widely used ENM algorithms: Artificial Neural Networks (ANN), Classification Tree Analysis (CTA), Generalized Additive Models (GAM), Generalized Linear Models (GLM), Generalized Boosted Models (GBM), Flexible Discriminant Analysis (FDA), Multivariate Adaptive Regression Splines (MARS), Random Forest (RF), Surface Range Envelope (SRE), Maximum Entropy (MaxEnt) and MAXENT.Tsuruoka (about ENM methods references see Thuiller et al., 2009). These methods are at the forefront of species distribution modeling (Araújo et al., 2005; Li and Wang, 2013; Marmion et al., 2009; Roberts and Hamann, 2012), and some of them have proven to be very accurate in studies with localized distributions (Ledig et al., 2010; Lu et al., 2012). The models performance for species with > 25 records was assessed based on the average using the test data with the True Skill Statistic (TSS) (Allouche et al., 2006), where models with TSS >0.80 were selected (see the *Biomod2* manual for model selection to consensus building). We chose TSS scores >0.8 based on values used in the literature (e.g. Eskildsen et al., 2013). TSS ranges from -1 to +1, where +1 indicates a perfect fit and values of zero or low values indicate no better performance than chance (Allouche et al., 2006). For models evaluation of species with < 25 records we computed the *P-value* as proposed by Pearson et al. (2007). If the set of models by method was valid (*P-value* < 0.05), we selected the models that were able to predict the test record.

For each species, the selected models for each predictors set were projected for current and future scenarios. Projections were restricted to a buffer area around their records, ranging from 30 to 300 km (see Fig. S2). The projections were transformed into binary maps using the maximum sensitivity and specificity threshold and using the lowest presence value as a limit for occurrence, for species with more and less than 25 records respectively. The same estimated and used threshold for the current scenario was used for each projection in future scenarios.

*Analysis*

For the two sets of predictors variables, we estimate the current distribution of each species with >25 records that was obtained through the sum of the binary maps resulting from selected models of five methods with ten replicates (producing a maximum of 50 projections per species). For each of the eight future scenarios a single consensus map was obtained by summing up to 150 binary maps (5 methods x 10 replicates x 3 GCMs). For species with <25 records, the current distribution and the distribution under future scenarios were obtained by summing only the binary maps that were able to predict the test point. In both cases we consider the species present in a cell with 50 percent or more projection frequency. Considering these species restriction to mountaintops at altitudes 800 m a.s.l. (see Table 1) and to decrease over-projection, we applied a mask with a limit of 800 m in elevation on each consensus map (Fig. S1). To identify areas of uncertainty (models extrapolation) in projections over future scenarios (see Owens et al., 2013), we performed an Mobility-Oriented Parity (MOP) metric using the *kuenm* an Rpackage (Cobos et al., 2019). To determine if there is a difference between the projected areas by the models of the two sets of predictor variables, we performed the Wilcoxon paired test for non-parametric data.

To determine the areas with the highest predicted richness of endemism, we added the binary maps with the projected area of each species for the current scenario and for each future scenario. Thus, for example, if seven different species were projected in a single cell (pixel), richness for that cell is considered to be seven. To evaluate changes in species richness, the richness maps of each future scenario were superimposed on the current scenario to assess changes in environmental suitability for at least one species, indicating stable areas with expansion and retraction. For each scenario and for each richness class, we estimated the area occupied, the average altitude and the changes between the current and future scenarios. The mean elevation of each richness class and projection was calculated by averaging the elevation of all predicted pixels as suitable for the richness class. Elevation displacement was estimated by the difference between the current mean elevation for each class and the mean elevation under future scenarios.

To determine areas extinction conditions for all the endemic species, areas with conditions for maintaining at least one endemic species and areas with potential future occupation, we transformed the current richness map into a 2 or 0 binary map (2 = presence and 0 = absence of at least one endemic species) and the maps of future scenarios into 1 or 0 (1 = presence and 0 = absence of at least one endemic species). We summed the current map and the maps of future scenarios to obtain a map with values varying between 0 and 3, where 0 represents the absence of suitable conditions for any (at least one) endemic species of bird, 1 represents areas with future potential, 2 represents extinction conditions for all species, and 3 areas considered stable for at least one endemic species.

To evaluate changes in the distribution of each species (sites of contraction, expansion and stability), the binary maps of future scenarios were multiplied by 2 and added to the current binary map, with resultant values of 1 attributed to sites of contraction, 2 for expansion and 3 for sites where there is a prediction of each species maintaining its current distribution under future scenarios. Variation in distribution size for each species we estimated the percentage change in area size, distance and direction of displacement from the center of distribution area, and the variation in mean altitude between the current scenario and each future scenario. The distribution center consists of the Centre of Gravity (or also known as Centre of Mass) of points or raster spatial data, and was estimated using COGravity function from SDMTools an R package. The mean elevation of each projection was calculated by averaging the elevation of all pixels predicted as suitable for the species occurrence. Elevational displacement was estimated by the difference between the current mean elevation and the mean elevation under future scenarios. In order to evaluate the possibility of reevaluating the conservation status of the studied species, the percentage change in the range of each species between the scenarios was applied over the distribution area estimated by the IUCN. All analyzes were performed in the R environment (RStudio Team, 2015).

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**Table S1.** List of occurrence records of the species studied with information about the recorded location (country, state, location and altitude), references, checked museum specimens, and field records.

| Species | Country | State | Localities | Altitude | References | Museum specimens | Field Records |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Asthenes luizae* | Brazil | MG | Alto da Boa Vista, Serra do Cipó | 1230 | (Andrade et al., 1998; Cordeiro et al., 1998; Costa and Rodrigues, 2012; Gomes, 2006; Gomes and Guerra, 2006; Gomes and Rodrigues, 2006a, 2006b; Guerra et al., 2006; Melo Jr. et al., 2001; Pearman, 1990; Studer and Teixeira, 1993; Vasconcelos, 2002; Vielliard, 1990) | DZUFMG 5331, MZUSP 73831 | X |
| *Asthenes luizae* | Brazil | MG | Brumas do Espinhaço, Lapinha de Cima | 1250 |  |  | X |
| *Asthenes luizae* | Brazil | MG | Cachoeira do Tabuleiro, Serra do Intendente | 1100 | (Cordeiro et al., 1998; Vasconcelos, 2002) |  |  |
| *Asthenes luizae* | Brazil | MG | Cachoeira do Travessão, Serra do Cipó | 1200 | (Cordeiro et al., 1998; Vasconcelos, 2002) |  |  |
| *Asthenes luizae* | Brazil | MG | Campina do Bananal | 1300 | (Vasconcelos, 2002; Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 2855, 5325-5326, 5673, MNHT 4825 | X |
| *Asthenes luizae* | Brazil | MG | Capivari | 1230 | (Cordeiro et al., 1998; Vasconcelos, 2002) | DZUFMG 5328-5330 | X |
| *Asthenes luizae* | Brazil | MG | Ribeirão da Farofa, Serra do Cipó | 1350 | (Cordeiro et al., 1998; Vasconcelos, 2002) |  |  |
| *Asthenes luizae* | Brazil | MG | Serra da Formosa, Monte Azul | 1520 |  |  | X |
| *Asthenes luizae* | Brazil | MG | Serra do Barro Preto | 1300 | (Vasconcelos et al., 2008a) |  |  |
| *Asthenes luizae* | Brazil | MG | Serra Resplandecente | 1210 | (Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 5327 | X |
| *Asthenes luizae* | Brazil | MG | Serra Talhada, Campo Alegre | 1035 | (Cordeiro et al., 1998; Vasconcelos, 2002) |  |  |
| *Asthenes luizae* | Brazil | MG | Serra do Galho, PN das Sempre Vivas | 1350 | (Vasconcelos et al., 2008b) |  |  |
| *Asthenes luizae* | Brazil | MG | Chapada, Parque Estadual do Rio Preto |  | (Vasconcelos et al., 2008a) |  |  |
| *Asthenes luizae* | Brazil | MG | Três Barras |  | (Vasconcelos et al., 2008a) |  |  |
| *Asthenes luizae* | Brazil | MG | Alto da Boa Vista, Serra do Cipó | 1230-1355 | (Gomes and Rodrigues, 2010) |  |  |
| *Asthenes moreirae* | Brazil | MG/RJ | Campos do Itatiaia | 2450 | (Holt, 1928; Melo Jr. et al., 1998; Pineschi, 1990; Pinto, 1951, 1954; Ribeiro, 1905, 1922; Sick, 1970, 1997; Vasconcelos, 2003; Velho, 1922) | AMNH 189050-189053, 189056-189058, 189060, 523707, 783956 | X |
| *Asthenes moreirae* | Brazil | MG | Pico da Canjerana, Serra do Caraça | 1870 | (Vasconcelos and Melo Jr., 2001) |  | X |
| *Asthenes moreirae* | Brazil | MG | Pico do Inficionado, Serra do Caraça | 2030 | (Vasconcelos, 2000; Vasconcelos et al., 2007; Vasconcelos and Melo Jr., 2001) | DZUFMG 2841, MCP 1281 | X |
| *Asthenes moreirae* | Brazil | MG | Pico do Sol, Serra do Caraça | 2000 | (Melo Jr. et al., 1998; Vasconcelos, 2000; Vasconcelos et al., 2007; Vasconcelos and Melo Jr., 2001) | DZUFMG 3280-3283 | X |
| *Asthenes moreirae* | Brazil | MG/ES | Serra do Caparaó | 2400 | (Bauer, 1999; Holt, 1928; Melo Jr. et al., 1998; Pinto, 1951, 1954; Sick, 1970, 1997; Vasconcelos, 2003) | AMNH 316791-316801, 316804-316807, 316809-316816 | X |
| *Asthenes moreirae* | Brazil | RJ | Serra dos Órgãos | 2165 | (Holt, 1928; Melo Jr. et al., 1998; Ribeiro, 1922; Sick, 1970, 1997) |  | X |
| *Asthenes moreirae* | Brazil | SP/MG | Pedra da Mina |  |  |  | X |
| *Asthenes moreirae* | Brazil | SP/MG | Pico do Itaguaré |  |  |  | X |
| *Asthenes moreirae* | Brazil | SP/MG | Pico dos Marins |  |  |  | X |
| *Augastes lumachella* | Brazil | BA | Andaraí | 1150 | (Almeida and Raposo, 1999; Ruschi, 1962, 1963a, 1963b) |  |  |
| *Augastes lumachella* | Brazil | BA | Arredores de Mucugê | 900 | (Almeida and Raposo, 1999; Machado et al., 2007; Parrini et al., 1999; Ruschi, 1962, 1963a, 1963b)) |  |  |
| *Augastes lumachella* | Brazil | BA | Arredores de Rio de Contas | 1450 | (Almeida and Raposo, 1999; Parrini et al., 1999) |  | X |
| *Augastes lumachella* | Brazil | BA | Barra da Estiva | 1300 | (Abreu, 2006; Almeida and Raposo, 1999; Ruschi, 1962, 1963a, 1963b) |  |  |
| *Augastes lumachella* | Brazil | BA | Beiçudo | 1000 | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Catinguiba | 730 | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Dias Coelho | 950 | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Espigão do Taquari | 1235 | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Gerais de Cascavel | 1220 | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Igatu, Andaraí | 885 | (Grantsau, 1967, 1968; Ruschi, 1962, 1963a, 1963b) | MZUSP 58007-58009 |  |
| *Augastes lumachella* | Brazil | BA | Izabel Dias | 850 | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Morro do Chapéu, Chapada Diamantina | 950 | (Almeida and Raposo, 1999; Mattos and Sick, 1985; Parrini et al., 1999; Ruschi, 1962, 1963a, 1963b) | AMNH 242267, 242269 |  |
| *Augastes lumachella* | Brazil | BA | Morro do Ouro | 1120 | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Paramirim | 1200 | (Almeida and Raposo, 1999; Ruschi, 1962, 1963a) |  |  |
| *Augastes lumachella* | Brazil | BA | Parque Nacional Chapada Diamantina, entre Palmeiras e Lençóis | 1140 | (Almeida and Raposo, 1999; Machado et al., 2003; Parrini et al., 1999) |  | X |
| *Augastes lumachella* | Brazil | BA | Piatã | 1300 | (Almeida and Raposo, 1999; Ruschi, 1962, 1963a) |  |  |
| *Augastes lumachella* | Brazil | BA | Roncador |  | (Ruschi, 1962) |  |  |
| *Augastes lumachella* | Brazil | BA | Serra do Cocal | 1030 | (Ruschi, 1962) |  |  |
| *Augastes scutatus* | Brazil | MG | Alto da Boa Vista, Serra do Cipó | 1230 | (Cordeiro et al., 1998; Costa and Rodrigues, 2012; Gomes and Guerra, 2006; Grantsau, 1967, 1968; Melo Jr. et al., 2001; Pearman, 1990; Ruschi, 1962, 1963a, 1963b; Sazima, 1977; Sazima and Sazima, 1990; Sick, 1997; Vasconcelos, 1999b; Vasconcelos and Lombardi, 2001; Vasconcelos et al., 2001; Willis and Oniki, 1991) | AMNH 801443-801444, DZUFMG 2857, 3331, 4898, 5192, MBML 1025, 1028, 1030, 1031, MNRJ 40605, 40606 | X |
| *Augastes scutatus* | Brazil | MG | Alto Palácio, Serra do Cipó | 1330 | (Cordeiro et al., 1998)  (Grantsau, 1967, 1968; Melo Jr. et al., 2001; Ruschi, 1962, 1963a, 1963b; Sazima, 1977; Sick, 1997; Vasconcelos, 1999b; Vasconcelos and Lombardi, 2001; Willis and Oniki, 1991) | AMNH 801443-801444, MBML 1025, 1028, 1030, 1031, MNRJ 40605, 40606 | X |
| *Augastes scutatus* | Brazil | MG | APA Felício, Felício dos Santos |  | (Alves et al., 2007) |  |  |
| *Augastes scutatus* | Brazil | MG | Brumas do Espinhaço, Lapinha de Cima | 1250 |  | DZUFMG 4344 | X |
| *Augastes scutatus* | Brazil | MG | Cachoeira do Tabuleiro, Serra do Intendente | 1100 | (Cordeiro et al., 1998) |  |  |
| *Augastes scutatus* | Brazil | MG | Cachoeira do Travessão, Serra do Cipó | 1200 | (Andrade et al., 1998) |  |  |
| *Augastes scutatus* | Brazil | MG | Campina do Bananal | 1300 | (Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 3345-3348, 3738 | X |
| *Augastes scutatus* | Brazil | MG | Canga do pé da vertente E da Serra do Caraça | 910 | (Ruschi, 1963a) | AMNH 801437, MBML 1013, 1015, 1018, 1019 |  |
| *Augastes scutatus* | Brazil | MG | Capivari | 1230 | (Cordeiro et al., 1998; Vasconcelos, 1999b, 2002) | DZUFMG 3332-3333, 4214 | X |
| *Augastes scutatus* | Brazil | MG | Diamantina | 1300 | (Pinto, 1952; Ruschi, 1951, 1962, 1963a, 1963b, 1963c; Sick, 1997) | AMNH 484298-484300, MNRJ 29135, 40119-40131 |  |
| *Augastes scutatus* | Brazil | MG | Morro do Chapéu, Nova Lima | 1450 | (Abreu, 2006) |  |  |
| *Augastes scutatus* | Brazil | MG | Pico do Inficionado, Serra do Caraça | 2030 | (Abreu, 2006; Grantsau, 1967, 1968, 1988; Ruschi, 1951, 1962, 1963a; Sick, 1997; Vasconcelos, 1999b, 2000; Vasconcelos and Lombardi, 2001; Vasconcelos and Melo Jr., 2001) | AMNH 801441-801442, MBML 1034, 1035, 1037, 1485, MNRJ 40132-40205, 40591-40596, 40599-40604, DZUFMG 3334-3344, MPEG 27547, 27581, 28484, MZUSP 2533, 4856, 11398, 58018-58020, 60133-60134,SG 2290, 2470, 2506, 2540, 3330, 3353, 3399, 3433, 3440, 3442, 3841, 3845, 3854, 3856 | X |
| *Augastes scutatus* | Brazil | MG | Pico do Itacolomi | 1530 | (Pinto, 1952; Ruschi, 1951, 1962, 1963a, 1963b; Vasconcelos et al., 1999) |  |  |
| *Augastes scutatus* | Brazil | MG | Pico do Monge, Serra do Capanema | 1700 |  |  | X |
| *Augastes scutatus* | Brazil | MG | Pico do Sol, Serra do Caraça | 2000 | (Abreu, 2006; Grantsau, 1967, 1968, 1988; Melo Jr. et al., 1998; Ruschi, 1951, 1962, 1963a; Sick, 1997); (Vasconcelos, 1999b, 2000; Vasconcelos and Lombardi, 2001; Vasconcelos and Melo Jr., 2001) | AMNH 801441-801442, MBML 1034, 1035, 1037, 1485, MNRJ 40132-40205, 40591-40596, 40599-40604, MPEG 27547, 27581, 28484, MZUSP 2533, 4856, 11398, 58018-58020, 60133-60134,SG 2290, 2470, 2506, 2540, 3330, 3353, 3399, 3433, 3440, 3442, 3841, 3845, 3854, 3856 | X |
| *Augastes scutatus* | Brazil | MG | Posto Seabra e Arredores | 1010 | (Vasconcelos and D'Angelo Neto, 2007) |  | X |
| *Augastes scutatus* | Brazil | MG | Retiro das Pedras | 1420 | (Vasconcelos et al., 1999) |  |  |
| *Augastes scutatus* | Brazil | MG | Ribeirão da Farofa, Serra do Cipó | 1350 | (Cordeiro et al., 1998) |  |  |
| *Augastes scutatus* | Brazil | MG | Serra da Água Limpa | 1280 |  |  | X |
| *Augastes scutatus* | Brazil | MG | Serra da Gandarela | 1635 |  |  | X |
| *Augastes scutatus* | Brazil | MG | Serra da Moeda | 1365 | (Vasconcelos, 1999b; Vasconcelos et al., 1999) |  | X |
| *Augastes scutatus* | Brazil | MG | Serra da Piedade | 1650 | (Abreu, 2006; Ruschi, 1962, 1963a; Vasconcelos, 1999b; Vasconcelos and Lombardi, 2001; Vasconcelos et al., 1999; Willis, 2002) | MBML 1017 | X |
| *Augastes scutatus* | Brazil | MG | Serra de Ouro Branco | 1460 | (Abreu, 2006) | MNRJ 40597, 40598 | X |
| *Augastes scutatus* | Brazil | MG | Serra do Ambrósio, distrito Pedra Menina | 1520 |  | DZUFMG 5163 |  |
| *Augastes scutatus* | Brazil | MG | Serra do Barão | 1250 | (Abreu, 2006; Ruschi, 1962, 1963a, 1963b; Sick, 1997; Vasconcelos and D'Angelo Neto, 2007) | MBML 1024 |  |
| *Augastes scutatus* | Brazil | MG | Serra do Barro Preto | 1300 |  |  | X |
| *Augastes scutatus* | Brazil | MG | Serra do Batatal | 1440 |  |  | X |
| *Augastes scutatus* | Brazil | MG | Serra do Cabral | 1155 |  | DZUFMG 5262-5264 | X |
| *Augastes scutatus* | Brazil | MG | Serra do Caraça (parte baixa) | 1360 | (Abreu, 2006; Alves et al., 2007; Grantsau, 1967, 1968; Ruschi, 1951, 1962, 1963a, 1963b; Vasconcelos, 1999b, 2000; Vasconcelos and Lombardi, 2001) | AMNH 801441-801442, MBML 1034, 1035, 1037, 1485, MNRJ 40132-40205, 40591-40596, 40599-40604, DZUFMG 4311, MPEG 27547, 27581, 28484, MZUSP 2533, 4856, 11398, 58018-58020, 60133-60134,SG 2290, 2470, 2506, 2540, 3330, 3353, 3399, 3433, 3440, 3442, 3841, 3845, 3854, 3856 | X |
| *Augastes scutatus* | Brazil | MG | Serra do Mascate, Congonhas | 1485 |  | DZUFMG 4802-4804 | X |
| *Augastes scutatus* | Brazil | MG | Serra do Pau D'Arco | 1400 |  | DZUFMG 5289-5290 | X |
| *Augastes scutatus* | Brazil | MG | Serra do Rola-Moça | 1440 |  |  | X |
| *Augastes scutatus* | Brazil | MG | Serra Resplandecente | 1210 | (Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 3910-3912 | X |
| *Augastes scutatus* | Brazil | MG | Serra Santa | 1285 | (Abreu, 2006; Grantsau, 1967, 1968) | SG 3130 |  |
| *Augastes scutatus* | Brazil | MG | Sítio Recanto, Grão Mogol | 1020 | (Vasconcelos and D'Angelo Neto, 2007) |  | X |
| *Augastes scutatus* | Brazil | MG | Três Barras | - |  |  | X |
| *Augastes scutatus* | Brazil | MG | Chapada, Parque Estadual do Rio Preto | - |  |  | X |
| *Campylopterus diamantinensis* | Brazil | MG | Serro, Três Barras |  |  | MCNA-PUC/MG 971 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Joaquim Felício, Serra do Cabral | 1155 | (Lopes et al., 2017) | DZUFMG 5260 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Serro, Três Barras |  | (Lopes et al., 2017) | DZUFMG 4215 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Joaquim Felício, Serra do Cabral | 1025 | (Lopes et al., 2017) | DZUFMG 5261 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2060 | (Lopes et al., 2017) | DZUFMG 3783 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Santana do Riacho, Brumas do Espinhaço, Lapinha de Cima | 1320 | (Lopes et al., 2017) | DZUFMG 4343 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Morro do Pilar, Alto do Palácio, Parque Nacional da Serra do Cipó | 1260 | (Lopes et al., 2017) | DZUFMG 6689 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2050 |  | MCNA-PUC/MG 1942 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2050 |  | MCNA-PUC/MG 1943 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2050 |  | MCNA-PUC/MG 1944 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2050 |  | MCNA-PUC/MG 1945 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2050 |  | MCNA-PUC/MG 1946 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2050 |  | MCNA-PUC/MG 1947 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2057 |  | MCNA-PUC/MG 1948 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Olhos D’Água, Serra dos Ferreiras, Fazenda Álamo | 1135 |  | MCNA-PUC/MG 2511 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Morro do Pilar, Alto do Palácio, Parque Nacional da Serra do Cipó |  |  | MCNA-PUC/MG 3612 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Morro do Pilar, Alto do Palácio, Parque Nacional da Serra do Cipó |  |  | MCNA-PUC/MG 3628 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Morro do Pilar, Alto do Palácio, Parque Nacional da Serra do Cipó |  |  | MCNA-PUC/MG 3629 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça | 2060 |  | MCNA-PUC/MG 5557 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Sol, Serra do Caraça |  | (Lopes et al., 2017) | DZUFMG 2575 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Sol, Serra do Caraça |  | (Lopes et al., 2017) | DZUFMG 2576 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça |  | (Lopes et al., 2017) | DZUFMG 2738 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça |  | (Lopes et al., 2017) | DZUFMG 2739 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça |  | (Lopes et al., 2017) | DZUFMG 2838 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Pico do Inficionado, Serra do Caraça |  | (Lopes et al., 2017) | DZUFMG 2839 | X |
| *Campylopterus diamantinensis* | Brazil | MG | Bocaiúva, Morro da Torre (Landinho), PN das Sempre Vivas | 1403 | (Lopes et al., 2017) | DZUFMG 7010 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1486 | (Lopes et al., 2017) | DZUFMG 7138 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1486 | (Lopes et al., 2017) | DZUFMG 7139 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Lassance, Serra do Cabral, Fazenda V & M Florestal | 1108 |  | DZUFMG 7157 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Morro do Pilar, Alto do Palácio, Parque Nacional da Serra do Cipó |  |  | DZUFMG 7275 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Diamantina, Córrego das Pedras |  | (Lopes et al., 2017) | AMNH 801435 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Diamantina, Córrego das Pedras |  | (Lopes et al., 2017) | MBML 637 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Serra do Caraça |  | (Lopes et al., 2017) | MNRJ 40348 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Serra do Caraça |  | (Lopes et al., 2017) | MNRJ 40349 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Serra do Caraça |  | (Lopes et al., 2017) | MNRJ 40350 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Serra do Caraça |  | (Lopes et al., 2017) | CRG 8964 |  |
| *Campylopterus diamantinensis* | Brazil | MG | Catas Altas, Serra do Caraça |  | (Lopes et al., 2017) | MNRJ 40351 |  |
| *Campylopterus diamantinensis* | Brazil | MG | São Gonçalo do Rio Preto, Pico Dois Irmãos, Parque Estadual do Rio Preto | 1800 | (Lopes, 2009) |  |  |
| *Campylopterus diamantinensis* | Brazil | MG | Felício dos Santos, Cachoeira do Sumidouro, Serra do Gavião | 1390 | (Lopes, 2009) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Itambé do Mato Dentro, Nascente do Entancado, Barraco de Tábua, Parque Nacional da Serra do Cipó | 1495 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 5763 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Jaboticatubas, Casa dos Currais – PARNA Serra do Cipó | 1465 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 6357 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1430 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 6361 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1430 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 6362 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1430 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 6363 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1520 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 6364 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1520 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 6365 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1520 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 6366 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1530 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 7283 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu | 1530 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 7284 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Jaboticatubas, Serra da Mutuca | 1654 | (Freitas, 2011; Freitas et al., 2012) | DZUFMG 7287 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Itambé do Mato Dentro, Barraco de Tábua |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Morro do Pilar, Alto do Palácio lodge |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Morro do Pilar, Alto do Palácio lodge |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Jaboticatubas, Serra da Lagoa Dourada | 1584 | (Freitas, 2011; Freitas et al., 2012) | MZUSP 90449 |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Breu |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Jaboticatubas, Serra da Mutuca |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Jaboticatubas, Campo do Boi |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Jaboticatubas, Serra da Farrofa |  | (Freitas, 2011; Freitas et al., 2012) |  |  |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Serra do Abreu |  | (Freitas, 2011; Freitas et al., 2012) |  | X |
| *Cinclodes espinhacensis* | Brazil | MG | Santana do Riacho, Lapinha da Serra |  | (Chaves, 2014) |  | X |
| *Embernagra longicauda* | Brazil | MG | Alto da Boa Vista, Serra do Cipó | 1230 | (Carnevalli, 1982; Cordeiro et al., 1998; Gomes and Guerra, 2006; Guerra et al., 2006; Machado et al., 1998; Mattos and Sick, 1985; Melo Jr. et al., 2001; Pearman, 1990; Ridgely and Tudor, 1989; Vasconcelos, 2003; Willis and Oniki, 1991) | DZUFMG 2455-2456, 4510 | X |
| *Embernagra longicauda* | Brazil | MG | Alto da Pedra Menina, distrito Pedra Menina | 1520 |  | DZUFMG 5161 | X |
| *Embernagra longicauda* | Brazil | MG | Alto Palácio, Serra do Cipó | 1330 | (Carnevalli, 1982; Cordeiro et al., 1998; Machado et al., 1998; Mattos and Sick, 1985; Melo Jr. et al., 2001; Ridgely and Tudor, 1989; Vasconcelos, 2003) | DZUFMG 2455, 2456 | X |
| *Embernagra longicauda* | Brazil | MG | Antônio Dias | 800 | (Machado et al., 1998; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | APE Barreiro | 1300 | (Vasconcelos, 2001, 2003; Vasconcelos et al., 1999) | MCN 710, 762 |  |
| *Embernagra longicauda* | Brazil | MG | APE Mutuca | 1300 | (Vasconcelos, 2001, 2003; Vasconcelos et al., 1999) | MCN 624 |  |
| *Embernagra longicauda* | Brazil | MG | Arredores de Botumirim | 1130 | (Vasconcelos and D'Angelo Neto, 2007) |  | X |
| *Embernagra longicauda* | Brazil | MG | Arredores de Grão Mogol | 890 | (Vasconcelos and D'Angelo Neto, 2007) |  | X |
| *Embernagra longicauda* | Brazil | BA | Arredores de Mucugê | 900 | (Parrini et al., 1999; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | BA | Arredores de Rio de Contas | 1450 | (Parrini et al., 1999; Vasconcelos, 2003) |  | X |
| *Embernagra longicauda* | Brazil | MG | Bela Vista de Minas | 900 | (Machado et al., 1998; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Berilo |  | (Carnevalli, 1982; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Brumas do Espinhaço, Lapinha de Cima | 1250 |  | DZUFMG 4340 | X |
| *Embernagra longicauda* | Brazil | MG | Cachoeira do Tabuleiro, Serra do Intendente | 1100 | (Cordeiro et al., 1998; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Cachoeira do Travessão, Serra do Cipó | 1200 | (Cordeiro et al., 1998) |  |  |
| *Embernagra longicauda* | Brazil | MG | Campina do Bananal | 1300 | (Vasconcelos, 2003; Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 3038, 3326, 3739 | X |
| *Embernagra longicauda* | Brazil | MG | Canga do pé da vertente E da Serra do Caraça | 910 |  |  | X |
| *Embernagra longicauda* | Brazil | MG | Capivari | 1230 | (Machado et al., 1998; Mattos and Sick, 1985; Vasconcelos, 2002, 2003) | DZUFMG 2453-2454, 3041 | X |
| *Embernagra longicauda* | Brazil | MG | Chapada de Salinas | 750 | (Machado et al., 1998; Mattos and Sick, 1985; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Chapada de São Domingos | 770 | (Machado et al., 1998; Mattos and Sick, 1985; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Chapada de Taiobeiras | 870 | (Machado et al., 1998; Mattos and Sick, 1985; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Chapada do Catuni | 1100 | (Vasconcelos, 2003; Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 3039, 3040 | X |
| *Embernagra longicauda* | Brazil | MG | Chapada, Parque Estadual do Rio Preto | 1630 |  | DZUFMG 4170 | X |
| *Embernagra longicauda* | Brazil | MG | Coronel Murta | 785 | (Carnevalli, 1982; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Datas | 1300 | (Carnevalli, 1982; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Diamantina | 1300 | (Carnevalli, 1982; Mattos and Sick, 1985; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | EPDA-Peti | 800 | (Machado et al., 1998; Vasconcelos, 2003) | DZUFMG 2457 |  |
| *Embernagra longicauda* | Brazil | MG | Estrada de Quebra Ossos, Serra do Caraça | 1070 | (Vasconcelos, 2003) | DZUFMG 2449-2452 |  |
| *Embernagra longicauda* | Brazil | MG | Fazenda Bocaina | 750 | (Vasconcelos, 2000) | DZUFMG 3225, UFPE 1192 |  |
| *Embernagra longicauda* | Brazil | MG | Fazenda Taveira, Mariana | 900 | (Machado et al., 1998; Mattos and Sick, 1985; Sick, 1997; Vasconcelos, 2003) | MNRJ |  |
| *Embernagra longicauda* | Brazil | MG | Gerais de Santana, Porteirinha | 1260 |  |  | X |
| *Embernagra longicauda* | Brazil | MG | Itaobim | 775 | (Carnevalli, 1982; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Minas Novas | 890 | (Carnevalli, 1982; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | BA | Morro do Chapéu, Chapada Diamantina | 950 | (Carnevalli, 1982; Machado et al., 1998; Mattos and Sick, 1985; O'Brien, 1968; Ridgely and Tudor, 1989; Sick, 1997; Vasconcelos, 2003) | AMNH 245061, 245062, 245063 |  |
| *Embernagra longicauda* | Brazil | MG | Nova Era | 860 | (Machado et al., 1998; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Parque das Mangabeiras | 1200 | (Machado et al., 1998; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | BA | Parque Nacional Chapada Diamantina, entre Palmeiras e Lençóis | 1140 | (Parrini et al., 1999; Vasconcelos, 2003) |  | X |
| *Embernagra longicauda* | Brazil | MG | Pico do Inficionado, Serra do Caraça | 2030 | (Carnevalli, 1980, 1982; Machado et al., 1998; Mattos and Sick, 1985; Melo Jr. et al., 1998; Sick, 1997; Vasconcelos, 2000, 2001, 2003; Vasconcelos and Melo Jr., 2001; Vasconcelos and Silva, 2003) | DZUFMG 3050 | X |
| *Embernagra longicauda* | Brazil | MG | Pico do Itacolomi | 1530 | (Mattos and Sick, 1985; Vasconcelos, 2003; Vasconcelos et al., 1999) |  | X |
| *Embernagra longicauda* | Brazil | MG | Pico do Monge, Serra do Capanema | 1700 | (Vasconcelos, 2003) | DZUFMG 3419-3420 | X |
| *Embernagra longicauda* | Brazil | MG | Pico do Sol, Serra do Caraça | 2000 | (Carnevalli, 1980, 1982; Machado et al., 1998; Mattos and Sick, 1985; Melo Jr. et al., 1998; Sick, 1997; Vasconcelos, 2000, 2001, 2003; Vasconcelos and Melo Jr., 2001) | DZUFMG 3047 | X |
| *Embernagra longicauda* | Brazil | MG | Posto Seabra e Arredores | 1010 | (Vasconcelos and D'Angelo Neto, 2007) |  | X |
| *Embernagra longicauda* | Brazil | MG | Retiro das Pedras | 1420 | (Vasconcelos, 2003; Vasconcelos et al., 1999) |  |  |
| *Embernagra longicauda* | Brazil | MG | Ribeirão da Farofa, Serra do Cipó | 1350 | (Cordeiro et al., 1998) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra da Formosa, Monte Azul | 1520 |  |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra da Gandarela | 1635 | (Machado et al., 1998; Mattos and Sick, 1985; Sick, 1997; Vasconcelos, 2003) | DZUFMG 5588 | X |
| *Embernagra longicauda* | Brazil | MG | Serra da Moeda | 1365 | (Machado et al., 1998; Mattos and Sick, 1985; Sick, 1997; Vasconcelos, 2003; Vasconcelos et al., 1999) |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra da Mombuca, Divisópolis | 770 | (Carnevalli, 1982; Machado et al., 1998; Mattos and Sick, 1985) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra da Piedade | 1650 | (Machado et al., 1998; Sick, 1997; Vasconcelos, 2003; Vasconcelos et al., 1999) |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra de Ouro Branco | 1460 | (Machado et al., 1998; Mattos and Sick, 1985; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra de São José | 1100 | (Machado et al., 1998; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra do Barão | 1250 | (Machado et al., 1998; Mattos and Sick, 1985; Vasconcelos, 2003; Vasconcelos and D'Angelo Neto, 2007) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra do Barro Preto | 1300 |  |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra do Batatal | 1440 | (Mattos and Sick, 1985; Vasconcelos, 2003) |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra do Cabral | 1155 |  | DZUFMG 5246-5247 | X |
| *Embernagra longicauda* | Brazil | MG/ES | Serra do Caparaó | 2400 | (Vasconcelos, 2003) |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra do Caraça (parte baixa) | 1360 | (Carnevalli, 1980, 1982; Machado et al., 1998; Mattos and Sick, 1985; Melo Jr. et al., 1998; Sick, 1997; Vasconcelos, 2000, 2001, 2003; Vasconcelos and Melo Jr., 2001; Vasconcelos and Silva, 2003) | DZUFMG 2953, 3048, 3049 | X |
| *Embernagra longicauda* | Brazil | MG | Serra do Curral | 1330 | (Vasconcelos, 1999b, 2003, 2007; Vasconcelos and Figueiredo, 1996; Vasconcelos et al., 1999) |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra do Lenheiro | 1150 | (Machado et al., 1998; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra do Mascate, Congonhas | 1485 |  | DZUFMG 4590-4591 | X |
| *Embernagra longicauda* | Brazil | MG | Serra do Pau D'Arco | 1400 | (Vasconcelos, 2003) | DZUFMG 3073, 5277-5279 | X |
| *Embernagra longicauda* | Brazil | MG | Serra do Rola-Moça | 1440 |  |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra dos Poções, Couto de Magalhães | 980 | (Carnevalli, 1982; Machado et al., 1998; Mattos and Sick, 1985; Vasconcelos, 2003) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra Resplandecente | 1210 | (Carnevalli, 1982; Vasconcelos, 2003; Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 3918-3920 | X |
| *Embernagra longicauda* | Brazil | MG | Serra Santa | 1285 | (Vasconcelos, 2003) | MZUSP 61718 |  |
| *Embernagra longicauda* | Brazil | MG | Serra Talhada, Campo Alegre | 1035 | (Cordeiro et al., 1998) |  |  |
| *Embernagra longicauda* | Brazil | MG | Sítio Recanto, Grão Mogol | 1020 | (Vasconcelos and D'Angelo Neto, 2007) |  | X |
| *Embernagra longicauda* | Brazil | MG | Estrada para Piedade do Paraopeba, em frente ao Condominio Alphaville |  | (Lopes, 2009) |  |  |
| *Embernagra longicauda* | Brazil | MG | Fazenda Chapéu do Sol, distrito Saramenha, Ouro Preto |  |  | DZUFMG |  |
| *Embernagra longicauda* | Brazil | MG | Serra do Ambrósio, distrito de Pedra Menina, Rio Vermelho |  | (Lopes, 2009) |  |  |
| *Embernagra longicauda* | Brazil | MG | Serra do Cipo (= Parque Nacional da Serra do Cipo) |  |  |  | X |
| *Embernagra longicauda* | Brazil | MG | Serra Dois Irmaos, distrito de Pedra Menina, Rio Vermelho |  |  |  |  |
| *Formicivora grantsaui* | Brazil | BA | Arredores de Mucugê | 900 | (Gonzaga et al., 2007; Parrini et al., 1999) |  |  |
| *Formicivora grantsaui* | Brazil | BA | Igatu, Andaraí | 885 | (Gonzaga et al., 2007) |  |  |
| *Formicivora grantsaui* | Brazil | BA | Parque Nacional Chapada Diamantina, entre Palmeiras e Lençóis | 1140 | (Gonzaga et al., 2007; Parrini et al., 1999) |  |  |
| *Formicivora grantsaui* | Brazil | BA | Serra do Ribeirão, Lençóis | 950 | (Gonzaga et al., 2007) |  |  |
| *Formicivora grantsaui* | Brazil | BA | Vale do Paty | 1035 | (Gonzaga et al., 2007) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Alto da Boa Vista, Serra do Cipó | 1230 | (Cordeiro et al., 1998; Gomes and Guerra, 2006; Guerra et al., 2006; Mattos and Sick, 1985; Melo Jr. et al., 2001; Pearman, 1990; Ridgely and Tudor, 1994; Sick, 1997; Vasconcelos, 1999b, 2003; Willis and Oniki, 1991) | DZUFMG 3035, 4509 | X |
| *Polystictus superciliaris* | Brazil | MG | Alto Palácio, Serra do Cipó | 1330 | (Cordeiro et al., 1998; Mattos and Sick, 1985; Melo Jr. et al., 2001; Ridgely and Tudor, 1994; Sick, 1997; Vasconcelos, 1999b, 2003) |  | X |
| *Polystictus superciliaris* | Brazil | MG | APE Barreiro | 1300 | (Vasconcelos, 2003; Vasconcelos et al., 1999) | DZUFMG 2797 |  |
| *Polystictus superciliaris* | Brazil | MG | APE Mutuca | 1300 | (Vasconcelos, 2003; Vasconcelos et al., 1999) |  |  |
| *Polystictus superciliaris* | Brazil | BA | Arredores de Rio de Contas | 1450 |  |  | X |
| *Polystictus superciliaris* | Brazil | MG | Brumas do Espinhaço, Lapinha de Cima | 1250 |  |  | X |
| *Polystictus superciliaris* | Brazil | MG | Campina do Bananal | 1300 | (Vasconcelos and D'Angelo Neto, 2007) |  | X |
| *Polystictus superciliaris* | Brazil | MG/RJ | Campos do Itatiaia | 2450 | (Vasconcelos, 2003) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Campos Geraes | 1200 |  | AMNH 6785, 6789 |  |
| *Polystictus superciliaris* | Brazil | MG | Canga do pé da vertente E da Serra do Caraça | 910 |  |  | X |
| *Polystictus superciliaris* | Brazil | MG | Capivari | 1230 | (Cordeiro et al., 1998; Vasconcelos, 1999b, 2002, 2003) |  | X |
| *Polystictus superciliaris* | Brazil | MG | Chapada do Catuni | 1100 | (Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 3037 | X |
| *Polystictus superciliaris* | Brazil | MG | Chapada, Parque Estadual do Rio Preto | 1630 |  | DZUFMG 4173 | X |
| *Polystictus superciliaris* | Brazil | MG | Chapadãozinho | 1350 | (Vasconcelos, 2003) | MHNT 2119 |  |
| *Polystictus superciliaris* | Brazil | MG | Estrada de Quebra Ossos, Serra do Caraça | 1070 | (Vasconcelos, 2003) | DZUFMG 1674 |  |
| *Polystictus superciliaris* | Brazil | BA | Morro do Chapéu, Chapada Diamantina | 950 | (Ridgely and Tudor, 1994; Sick, 1997; Vasconcelos, 2003) | AMNH 243792, 243793 |  |
| *Polystictus superciliaris* | Brazil | BA | Parque Nacional Chapada Diamantina, entre Palmeiras e Lençóis | 1140 | (Parrini et al., 1999; Vasconcelos, 2003) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Pico do Inficionado, Serra do Caraça | 2030 | (Carnevalli, 1980; Sick, 1997; Vasconcelos, 1999b, 2000, 2003; Vasconcelos and Melo Jr., 2001) | AMNH 825216-825217, MZUSP 61631-61632 | X |
| *Polystictus superciliaris* | Brazil | MG | Pico do Itacolomi | 1530 | (Vasconcelos, 2003; Vasconcelos et al., 1999) |  | X |
| *Polystictus superciliaris* | Brazil | MG | Pico do Monge, Serra do Capanema | 1700 | (Vasconcelos, 2003) | DZUFMG 3414-3415 | X |
| *Polystictus superciliaris* | Brazil | MG | Pico do Sol, Serra do Caraça | 2000 | (Carnevalli, 1980; Sick, 1997; Vasconcelos, 1999b, 2000, 2003; Vasconcelos and Melo Jr., 2001) | AMNH 825216-825217, DZUFMG 3036, 3043, MZUSP 61631-61632 | X |
| *Polystictus superciliaris* | Brazil | MG | Retiro das Pedras | 1420 | (Vasconcelos, 2003; Vasconcelos et al., 1999) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Ribeirão da Farofa, Serra do Cipó | 1350 | (Cordeiro et al., 1998) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Rio Congonhas | 980 | (Vasconcelos and D'Angelo Neto, 2007) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Serra da Água Limpa | 1280 |  |  | X |
| *Polystictus superciliaris* | Brazil | SP/RJ | Serra da Bocaina | 1670 | (Ridgely and Tudor, 1994; Sick, 1997; Vasconcelos, 2003) | MZUSP 43421 |  |
| *Polystictus superciliaris* | Brazil | MG | Serra da Canastra | 1415 | (Silveira, 1998; Vasconcelos, 1999b, 2003) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Serra da Gandarela | 1635 | (Sick, 1997; Vasconcelos, 2003) | DZUFMG 5589-5590 | X |
| *Polystictus superciliaris* | Brazil | MG | Serra da Piedade | 1650 | (Sick, 1997; Vasconcelos, 1999b, 2003; Vasconcelos et al., 1999) | DZUFMG 2830-2832 | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Barro Preto | 1300 |  |  | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Batatal | 1440 | (Sick, 1997; Vasconcelos, 2003) | DZUFMG 3042, MNRJ 13220 | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Caraça (parte baixa) | 1360 | (Carnevalli, 1980; Sick, 1997; Vasconcelos, 1999b, 2000, 2003; Vasconcelos and Melo Jr., 2001) | AMNH 825216-825217, DZUFMG 3034, MZUSP 61631-61632 | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Curral | 1330 | (Vasconcelos, 1999b, 2003, 2007; Vasconcelos and Figueiredo, 1996; Vasconcelos et al., 1999) |  | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Ibitipoca | 1635 | (Vasconcelos, 2003) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Serra do Mascate, Congonhas | 1485 |  | DZUFMG 4592, 4864-4867 | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Papagaio | 2045 | (Vasconcelos, 1999a, 2003) |  | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Pau D'Arco | 1400 |  |  | X |
| *Polystictus superciliaris* | Brazil | MG | Serra do Rola-Moça | 1440 | (Hoffmann, 2006; Hoffmann and Rodrigues, 2011; Hoffmann et al., 2007) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Serra Resplandecente | 1210 | (Vasconcelos and D'Angelo Neto, 2007) | DZUFMG 4046-4049 | X |
| *Polystictus superciliaris* | Brazil | BA | Sumidouro e Paulista, entre Mucugê e Ibicoara |  | (Parrini et al., 1999; Vasconcelos, 2003) |  |  |
| *Polystictus superciliaris* | Brazil | MG | Parque Estadual do Pico do Itambe |  | (Vasconcelos, 2002) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Capão do Vale, Ibicoara | 1200 | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Campo Redondo, entre Serra do Sincorá, Ibicoara | 1050 | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Serra do Ribeirão, Lençóis | 850 | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Rodovia Bonito/Utinga | x | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Rio Ribeirão, PN Chapada Diamantina, Lençóis | 850 | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Sítio Santa Teresinha, Base do Pico do Brabado, Catolés, Abaíra | 1400-1600 | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Perto de Ibicoara | 1015 | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Bonfim, Iramaia | 1130 | (Bornschein et al., 2007) |  |  |
| *Scytalopus diamantinensis* | Brazil | BA | Morros de Ouro, Barra da Estiva | 1135 | (Bornschein et al., 2007) |  |  |

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**Box S1**. Detail of key steps for model building and analyses based on ODMAP (Overview, Data, Model, Assessment and Prediction) protocol (Zurell et al., 2020).

|  |  |
| --- | --- |
| ***ODMAP element*** | **Contents** |
| **OVERVIEW** | |
| *Authorship* |  **Authors**: Diego Hoffmann, Marcelo Ferreira de Vasconcelos, G. Wilson Fernandes |
|  **Contact email**: diego\_hoffmann@hotmail.com |
|  **Title**:The fate of endemic birds of eastern Brazilian mountaintops due to climate change |
|  **DOI**: |
| *Model objective* |  **SDM objective/purpose**: mapping/interpolation |
|  **Main target output**: continuous and binary maps of environmental suitability for the occurrence of species for current and future scenarios |
| *Taxon* |  **Focal taxon**: *Asthenes luizae* (Furnariidae), *Asthenes moreirae* (Furnariidae), *Augastes lumachella* (Trochilidae), *Augastes scutatus* (Trochilidae), *Campylopterus diamantinensis* (Trochilidae), *Cinclodes espinhacensis* (Furnariidae), *Embernagra longicauda* (Thraupidae), *Formicivora grantsaui* (Thamnophilidae), *Polystictus superciliaris* (Tyrannidae) and *Scytalopus diamantinensis* (Rhinocryptidae) |
| *Location* |  **Location of study area**: eastern Brazilian mountaintops |
| *Scale of analysis* |  **Spatial Extent (Lon / Lat)**: 37°-49°W / 9°-25°S°S |
|  **Spatial resolution**: ~1x1 km |
|  **Temporal extent/time period**: Occurrence data extend from the year of the type of each species to present |
|  **Type of extent boundary**: natural |
| *Biodiversity data overview* |  **Observation type**: field survey, museuns data and literature (sites of museuns and literature were revisited) |
|  **Response/data type**: presence/pseudo-absence data |
| *Type of predictors* |  Climatic and PCA axes |
| *Conceptual model* |  **Hypotheses about species-environment relationships**: We assessed whether the same trends observed for the distribution of birds in high mountains in the world are observed in the lower mountains of eastern Brazil. We assess the impacts of climate change on the distribution of these species and possible consequences on their conservation status. |
| *Assumptions* |   **We assumed that**: (1) Relevant ecological drivers (or proxies) of species distributions are included; (2) Detectability does not change across habitat gradients; (3) Species are at equilibrium with their environment. (4) Sampling is adequate and representative. |
| *SDM algorithms* |   **Model algorithms**: We built ENMs using generalized Additive Models (GAM), Generalized Linear Models (GLM), Generalized Boosted Models (GBM), Random Forest (RF) and Maximum Entropy (MaxEnt) and implemented with the Biomod2 framework (Thuiller et al., 2009) in the R programming environment (RStudio Team, 2019). |
|   **Justification of model complexity**: The models were built using the standard configuration of *biomod2* for each algorithm. |
|   **Ensembles**: We sum the binary maps of each species and considered the species present in a cell with 50 percent or more projection frequency |
| *Model workflow* |  occurrence data (Duplicate records with the same coordinate were removed and spatial autocorrelation was minimized by randomly removing occurrences within 1 km of each other); accessible range determination for models calibration and projection (Minimum Convex Polygon and *buffer* area around occurrences for each specie); predictor variables (one set with uncorrelated variables for the accessible area for each specie and other with PCA axes that explained 95% of the variation); Pseudo Absence (PA) selection within the accessible area for each specie; Occurrence and PA data partition into calibration (75%) and test (25%) using ENMeval package; Models building with five algorithms (GAM, GLM, GBM, RF and MaxEnt) implemented with the Biomod2; models evaluation and selection performed with the True Skill Statistic (TSS), where models with TSS>0.8 were selected, for species with >25 records and with Pearson p-value for species with <25 records; the selected models were projected onto current and future scenarios (periods: 2050 e 2070, GCMs: CCSM4, HadGEM2-ES, MIROC-ESM, e RCP: rcp26, rcp45, rcp60, rcp85) within accessible area; to determine áreas with climatic uncertainties between current and future scenarios we performed a MOP analysis with kuenm package ; Binary predictions for mapping and further analysis we used the maximum sensitivity and specificity threshold and using the lowest presence value as a limit for occurrence, for species with more and less than 25 records respectively; we ensemble the binary maps of selected models and consider the species present in a cell with 50 percent or more projection frequency; metrics (a. differences in projected area between scenarios; b. distance and direction of range shift between scenarios; c. altitudinal shift; d. percentage of change in distribution range due climate change and projection of these percentage onto de extent of occurrence adopted by IUCN). |
| *Software, codes and data* |  **Software:** All analyses were conducted using R (RStudio Team, 2019) with packages biomod2 (Thuiller et al., 2009), dismo (Hijmans et al., 2017), ENMeval (Muscarella et al., 2014) and kuenm (Cobos et al., 2019). |
|  **Code availability**: Code not provided |
|  **Data availability**: Table S1 |
| **DATA** | |
| *Biodiversity data* |  **Taxon names**: *Asthenes luizae* (Furnariidae), *Asthenes moreirae* (Furnariidae), *Augastes lumachella* (Trochilidae), *Augastes scutatus* (Trochilidae), *Campylopterus diamantinensis* (Trochilidae), *Cinclodes espinhacensis* (Furnariidae), *Embernagra longicauda* (Thraupidae), *Formicivora grantsaui* (Thamnophilidae), *Polystictus superciliaris* (Tyrannidae), and *Scytalopus diamantinensis* (Rhinocryptidae) |
|  **Details on taxonomic reference system**: We follows systematics and nomenclature of the last revision of the Brazilian Ornithological Committee (Piacentini et al., 2015) with an additional endemic species, *Campylopterus diamantinensis*, described after 2015 (Lopes et al., 2017). |
|  **Ecological level**: Population level |
|  **Biodiversity data source**: For the ten bird species we compiled occurrence records until 2018, consulting specialized literature, field observations and museum specimens whenever geographic coordinates were available (see Vasconcelos, 2008; Vasconcelos and Rodrigues, 2010). All localities of species occurrence (e.g. museum records) were revisited during the study. |
|  **Sampling design**: opportunistic with visit to most of localities by MFV during field trip for their PhD. |
|  **Sample size per taxon**: Total of 634 (366) records (unique records): *Asthenes luizae -* 42 (30), *Asthenes moreirae* - 25 (18), *Augastes lumachella* - 54 (30), *Augastes scutatus* - 172 (54), *Campylopterus diamantinensis* - 39 (19), *Cinclodes espinhacensis* - 20 (7), *Embernagra longicauda* - 145 (111), *Formicivora grantsaui* - 12 (8), *Polystictus superciliaris* - 114 (78) and *Scytalopus diamantinensis* - 11 (11) |
|  **Country/region**: eastern Brazilian mountaintops, above 800 m a.s.l. |
|  **Scaling**: Duplicate records with the same coordinate were removed and spatial autocorrelation was minimized by randomly removing occurrences within 1 km of each other. |
|  **Background data**: We generated 10,000 random background points within a maximum radial distance around the minimum convex polygon from known occurrences for each species. The maximum radial distance was determined by using the equation proposed by Brown and Yoder (2015). |
|  **Errors and biases**: The record locations (recent and historical) were revisited and the coordinates were taken in locations with characteristic habitat for each species, based on our field experience. We considered the error rates to be low. |
| *Data partitioning* |  **Selection of training data**: For better evaluation of ENMs, we partitioned the data into ‘calibration’ and ‘test’ set using the ENMeval package (Muscarella et al., 2014). For species with > 25 occurrence points, the data were partitioned nine times, four sets with ‘block’ methods, five with ‘randomkfold’ (see Muscarella et al., 2014), each set with 75% of data for calibration and 25% for test. The tenth and the last set consisted of all records for calibration and test. For species with < 25 occurrences, we use the method ‘jackknife’ (n-1 jackknife), in which each of n occurrence localities is used for testing, while all others are used for training (see Muscarella et al., 2014 for details). |
|  **Selection of validation data**: (see selection of training data) |
| *Predictor variables* |  **State predictor variables used**: We create two sets of predictors variables for building ENMs. The first set of predictor variables was formed by the least correlated climatic variables (r Pearson < 0.7) at the occurrences records of each species (the list of variables selected for each species can be found at Table S2). Since these climatic variables present a certain collinearity and can negatively affect ENMs (De Marco Jr. and Nóbrega, 2018), for the second set of predictor variables we perform a Principal Component Analysis (PCA) with the least correlated climatic variables for each species and use the axes that explained 95% of the variation between variables to building models for each species. |
|  **Details on data sources**: WorldClim v1.4 database (http://worldclim.org/) (Hijmans et al., 2005) |
| ** Spatial resolution and spatial extent of raw data**: same as biodiversity data. The set of predictor variables were obtained, for each species, for the current and future scenarios with a resolution of 30 arc-seconds (approximately 1 km2). |
|  **Map projection**: WGS84 |
| *Transfer data for projection* |  **Details on data sources**: WorldClim v1.4 database (<http://worldclim.org/>) (Hijmans et al., 2005). |
|  **Spatial extent**: same as biodiversity data. |
|  **Spatial resolution**: ~1x1 km |
|  **Models and scenarios used**: For future scenarios we considered two periods (2050 and 2070) with four Representative Concentration Pathways (RCPs: rcp26, rcp45, rcp60, rcp85) (see IPCC, 2013) and three Global Climate Models (GCMs: CCSM4, HadGEM2-ES, MIROC-ESM), resulting in 25 scenarios set per bird species. |
|  **Quantification of novel environmental conditions and novel environmental combinations**: To identify areas of uncertainty (models extrapolation) in projections over future scenarios (see Owens et al., 2013), we performed an Mobility-Oriented Parity (MOP) metric using the kuenm an R package (Cobos et al., 2019) |
| **MODEL** | |
| *Variable pre-selection* |  We consider only the weakly correlated variables to build models for each species. |
| *Multicollinearity* |  To decrease collinearity we performed a Principal Component Analysis (PCA) with the least correlated climatic variables for each species and use the axes that explained 95% of the variation between variables to build models for each species. |
| *Model settings* |  **Models settings**: with biomod2 package Version 3.3: -Generalised linear models (GLMs): GLMs were generated assuming a logistic link function and a binomial error distribution of the response. Polynomial terms of each climatic predictor were included in the initial models, and a stepwise procedure using the AIC criterion was used to select the most significant terms. -Generalised additive models (GAMs): GAMs were generated with the default options of biomod2. A stepwise procedure similar to GLMs was used to select the most parsimonious models. -Generalised Boosted Models (GBMs): GBMs were fitted with gaussian distribution an interaction depth of 7, a learning rate of 0.001 (shrinkage), and a maximum of 2500 trees fitted to the data. -Random Forests (RFs): the number of trees grown were set to 500 and the number of predictors to be chosen randomly at each node (mtry) were set as 'default' on biomod2 package. -Maximum entropy (MaxEnt): To fit the MaxEnt models we kept all default options of the biomod2 package. |
|  Details on relevant model settings for extrapolation beyond sample range, if applicable: e.g., clamping |
| *Model estimates* |  **Assessment of model coefficients**: Not evaluated |
|  **Uncertainty in model coefficients**: Not evaluated |
|  **Assessment of variable importance**: only for Maxent, but without a critical analysis. |
| *Model selection / Model averaging / Ensembles* |  **Model selection strategy**: e.g. information-theoretic approach for variable selection, shrinkage and regularization -for species with > 25 records we tested the models using the test data with the True Skill Statistic (TSS) (Allouche et al., 2006), where models with TSS >0.80 were selected;  -for species with < 25 records we computed the P-value as proposed by Pearson et al. (2007). If the set of models by method was valid (P-value < 0.05), we selected the models that were able to predict the test record. |
| *Non-independence correction/analyses* |  **Method for addressing spatial autocorrelation**: Not evaluated |
| *Threshold selection* |  Binary predictions for mapping and further analysis we used the maximum sensitivity and specificity threshold and using the lowest presence value as a limit for occurrence, for species with more and less than 25 records respectively. |
| **ASSESSMENT** | |
| *Performance statistics* |  **Performance statistics estimated on validation data (from data partitioning)**:  Model performance was assessed based on the average true skill statistic (TSS) and by the P-value as proposed by Pearson et al. (2007), for species with more and less than 25 records, respectively. |
| *Plausibility check* |  Maps of modelled predictions were checked by experts. |
| **PREDICTION** | |
| *Prediction output* |  **Prediction unit**: Predictions of presence for each models were expressed on a binary map using the threshold selection method based on maximizing the sum of sensitivity and specificity |
|  **Post-processing**: we applied a mask with a limit of 800 m in elevation on each projection. |
| *Uncertainty quantification* |  **Algorithmic uncertainty**: Not evaluated. To minimize possible bias caused by the algorithms we ensemble the binary maps of selected models and consider the species present in a cell with 50 percent or more projection frequency. |
|  **Uncertainty in input data**: Not evaluated |
|  **Uncertainty in scenarios**: To identify areas of uncertainty (models extrapolation) in projections over future scenarios (see Owens et al., 2013), we performed an Mobility-Oriented Parity (MOP) metric using the Kuenm an R package (Cobos et al., 2019). |
| **REFERENCES** | |
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**Table S2**. Table with selected variables (1) (Pearson <0.7) used as climate predictors and for principal component analysis (PCA) whose axes were also used as predictors to build ecological niche models for each bird species endemic of eastern Brazilian mountaintops.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Species | bio\_1 | bio\_2 | bio\_3 | bio\_4 | bio\_5 | bio\_6 | bio\_7 | bio\_8 | bio\_9 | bio\_10 | bio\_11 | bio\_12 | bio\_13 | bio\_14 | bio\_15 | bio\_16 | bio\_17 | bio\_18 | bio\_19 | Total |
| *Asthenes luizae* | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| *Augastes lumachella* | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 7 |
| *Augastes scutatus* | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| *Asthenes moreirae* | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 6 |
| *Campylopterus diamantinensis* | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |
| *Cinclodes espinhacensis* | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 7 |
| *Embernagra longicauda* | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 4 |
| *Formicivora grantsaui* | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| *Polystictus superciliaris* | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 4 |
| *Scytalopus diamantinensis* | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 8 |
| Total | 0 | 0 | 10 | 5 | 9 | 2 | 5 | 0 | 0 | 0 | 0 | 2 | 10 | 0 | 7 | 0 | 1 | 2 | 3 | 56 |

**Legend**: BIO1 = Annual Mean Temperature; BIO2 = Mean Diurnal Range (Mean of monthly (max temp - min temp)); BIO3 = Isothermality (BIO2/BIO7) (\* 100); BIO4 = Temperature Seasonality (standard deviation \*100); BIO5 = Max Temperature of Warmest Month; BIO6 = Min Temperature of Coldest Month; BIO7 = Temperature Annual Range (BIO5-BIO6); BIO8 = Mean Temperature of Wettest Quarter; BIO9 = Mean Temperature of Driest Quarter; BIO10 = Mean Temperature of Warmest Quarter; BIO11 = Mean Temperature of Coldest Quarter; BIO12 = Annual Precipitation; BIO13 = Precipitation of Wettest Month; BIO14 = Precipitation of Driest Month; BIO15 = Precipitation Seasonality (Coefficient of Variation); BIO16 = Precipitation of Wettest Quarter; BIO17 = Precipitation of Driest Quarter; BIO18 = Precipitation of Warmest Quarter; BIO19 = Precipitation of Coldest Quarter.

**Table S3.** Results of the evaluation of the models created for each set of predictor variables, containing for each species and ENM method, number of models building, results of models evaluation by TSS and p-Value as proposed by Pearson et al. (2007), SD of TSS evaluation, number of selected (valid) models with TSS > 0.8 or with p-Value <0.05.

|  |  | Axes of Principal Components Analysis | | | | | Climatic Variables | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Species | ENM Methods | Nº Models | mean TSS / p-Value\* | SD TSS | Nº Selected Models | Threshold (mean) | Nº Models | mean TSS / p-Value | SD TSS | Nº Selected Models | Threshold (mean) |
| *Asthenes luizae* | GAM | 10 | 0.7375 | 0.3965 | 7 | 17 | 10 | 0.5435 | 0.4719 | 5 | 14 |
| GBM | 10 | 0.7390 | 0.2066 | 4 | 16 | 10 | 0.7051 | 0.3869 | 6 | 5 |
| GLM | 10 | 0.8942 | 0.1110 | 8 | 12 | 10 | 0.8067 | 0.2975 | 7 | 9 |
| MAXENT.Phillips | 10 | 0.9294 | 0.0871 | 9 | 380 | 10 | 0.9062 | 0.0807 | 9 | 328 |
| RF | 10 | 0.4019 | 0.4533 | 3 | 135 | 10 | 0.5996 | 0.4298 | 5 | 54 |
| **All** | **50** | **0.7404** | **0.3371** | **31** |  | **50** | **0.7122** | **0.3711** | **32** |  |
| *Asthenes moreirae* | GAM | 18 | 3.3E-36\* |  | 17\*\* | 363 | 18 | 9.8E-40 |  | 16\*\* |  |
| GBM | 18 | 2.1E-41\* |  | 14\*\* | 414 | 18 | 5.2E-33 |  | 11\*\* |  |
| GLM | 18 | 9.7E-30\* |  | 17\*\* | 366 | 18 | 4.2E-42 |  | 17\*\* |  |
| MAXENT.Phillips | 18 | 2.8E-34\* |  | 17\*\* | 661 | 18 | 1.6E-41 |  | 17\*\* |  |
| RF | 18 | 8.2E-16\* |  | 5\*\* | 366 | 18 | 6.3E-33 |  | 11\*\* |  |
| **All** | **90** |  |  | **70\*\*** |  | **90** |  |  | **72\*\*** |  |
| *Augastes lumachella* | GAM | 10 | 0.6635 | 0.3588 | 5 | 8 | 10 | 0.6778 | 0.3666 | 6 | 11 |
| GBM | 10 | 0.4901 | 0.3645 | 2 | 8 | 10 | 0.4391 | 0.4157 | 2 | 11 |
| GLM | 10 | 0.6526 | 0.3611 | 4 | 9 | 10 | 0.6400 | 0.3603 | 4 | 8 |
| MAXENT.Phillips | 10 | 0.7900 | 0.1211 | 4 | 395 | 10 | 0.8561 | 0.0913 | 7 | 206 |
| RF | 10 | 0.2921 | 0.3996 | 2 | 247 | 10 | 0.4578 | 0.4340 | 3 | 89 |
| **All** | **50** | **0.5777** | **0.3661** | **17** |  | **50** | **0.6142** | **0.3749** | **22** |  |
| *Augastes scutatus* | GAM | 10 | 0.8050 | 0.2962 | 8 | 24 | 10 | 0.9390 | 0.0561 | 10 | 40 |
| GBM | 10 | 0.7029 | 0.3744 | 8 | 10 | 10 | 0.7772 | 0.2943 | 6 | 21 |
| GLM | 10 | 0.7861 | 0.2835 | 8 | 9 | 10 | 0.9307 | 0.0568 | 10 | 18 |
| MAXENT.Phillips | 10 | 0.8913 | 0.0836 | 8 | 189 | 10 | 0.9424 | 0.0466 | 10 | 194 |
| RF | 10 | 0.4425 | 0.4708 | 4 | 130 | 10 | 0.6166 | 0.4446 | 6 | 98 |
| **All** | **50** | **0.7256** | **0.3503** | **36** |  | **50** | **0.8412** | **0.2657** | **42** |  |
| *Campylopterus diamantinensis\** | GAM | 19 | 6.0E-17\* |  | 17\*\* | 203 | 19 | 7.7E-13 |  | 17\*\* |  |
| GBM | 19 | 1.7E-09\* |  | 4\*\* | 126 | 19 | 4.0E-11 |  | 5\*\* |  |
| GLM | 19 | 1.1E-11\* |  | 18\*\* | 108 | 19 | 5.9E-09 |  | 18\*\* |  |
| MAXENT.Phillips | 19 | 4.5E-15\* |  | 18\*\* | 525 | 19 | 5.2E-17 |  | 18\*\* |  |
| RF | 19 | 2.9E-12\* |  | 4\*\* | 176 | 19 | 1.6E-10 |  | 4\*\* |  |
| **All** | **95** |  |  | **61\*\*** | **239** | **95** |  |  | **62\*\*** |  |
| *Cinclodes espinhacensis\** | GAM | 7 | 1\* |  | 0 | 21 | 7 | 1 |  | 0 |  |
| GBM | 7 | 1\* |  | 0 | 99 | 7 | 1 |  | 0 |  |
| GLM | 7 | 1\* |  | 0 | 20 | 7 | 3.7E-07 |  | 6\*\* |  |
| MAXENT.Phillips | 7 | 8.6E-07\* |  | 6\*\* | 805 | 7 | 1.9E-07 |  | 6\*\* |  |
| RF | 7 | 1\* |  | 0 | 114 | 7 | 1 |  | 0 |  |
| **All** | **35** |  |  | **6\*\*** | **250** | **35** |  |  | **12\*\*** |  |
| *Embernagra longicauda* | GAM | 10 | 0.5868 | 0.2123 | 0 | **-** | 10 | 0.6598 | 0.2475 | 2 | 12 |
| GBM | 10 | 0.5691 | 0.2330 | 1 | 6 | 10 | 0.7154 | 0.0990 | 1 | 5 |
| GLM | 10 | 0.6145 | 0.2381 | 1 | 13 | 10 | 0.6132 | 0.2440 | 1 | 20 |
| MAXENT.Phillips | 10 | 0.7065 | 0.1240 | 2 | 233 | 10 | 0.7169 | 0.1482 | 3 | 231 |
| RF | 10 | 0.4291 | 0.3866 | 1 | 320 | 10 | 0.6210 | 0.3512 | 3 | 57 |
| **All** | **50** | **0.5812** | **0.2591** | **5** |  | **50** | **0.6653** | **0.2295** | **10** |  |
| *Formicivora grantsaui\** | GAM | 8 | 0.0649\* |  | 0 | 2 | **8** | 1 |  | **0** |  |
| GBM | 8 | 1\* |  | 0 | 308 | 8 | 1 |  | 0 |  |
| GLM | 8 | 0.0486\* |  | 8\*\* | 2 | 8 | 0.0025 |  | 6\*\* |  |
| MAXENT.Phillips | 8 | 0.0084\* |  | 7\*\* | 814 | 8 | 0.0173 |  | 6\*\* |  |
| RF | 8 | 1\* |  | 0 | 188 | 8 | 1 |  | 0 |  |
| **All** | **40** |  |  | **15\*\*** | **329** | **40** |  |  | **12\*\*** |  |
| *Polystictus superciliaris* | GAM | 10 | 0.7627 | 0.2799 | 7 | 37 | 10 | 0.7795 | 0.2870 | 6 | 31 |
| GBM | 10 | 0.6056 | 0.4276 | 5 | 10 | 10 | 0.6740 | 0.3668 | 6 | 8 |
| GLM | 10 | 0.7450 | 0.2679 | 7 | 41 | 10 | 0.7506 | 0.2697 | 7 | 48 |
| MAXENT.Phillips | 10 | 0.7605 | 0.2753 | 7 | 285 | 10 | 0.7756 | 0.2825 | 7 | 304 |
| RF | 10 | 0.7991 | 0.2998 | 7 | 90 | 10 | 0.7480 | 0.3127 | 7 | 50 |
| **All** | **50** | **0.7346** | **0.3101** | **33** |  | **50** | **0.7455** | **0.2954** | **33** |  |
| *Scytalopus diamantinensis\** | GAM | 11 | 7.2E-11\* |  | 9\*\* | 10 | 11 | 1.2E-08 |  | 9\*\* |  |
| GBM | 11 | 1\* |  | 0 | 33 | 11 | 1 |  | 0 |  |
| GLM | 11 | 8.0E-09\* |  | 9\*\* | 9 | 11 | 4.5E-07 |  | 8\*\* |  |
| MAXENT.Phillips | 11 | 1.4E-09\* |  | 9\*\* | 617 | 11 | 4.2E-09 |  | 9\*\* |  |
| RF | 11 | 1\* |  | 0 | 97 | 11 | 1 |  | 0 |  |
| **All** | **55** |  |  | **27\*\*** |  | **55** |  |  | **26\*\*** |  |
| Total of Models |  | **565** |  |  | **301** |  | **565** |  |  | **323** |  |

**Legend**: \* Species with models evaluated by method proposed by Pearson et al. (2007) (the number of models depends on the occurrence records and not replicates); \*\* Number of models that were able to predict the excluded record and which were used for final projection and consensus.

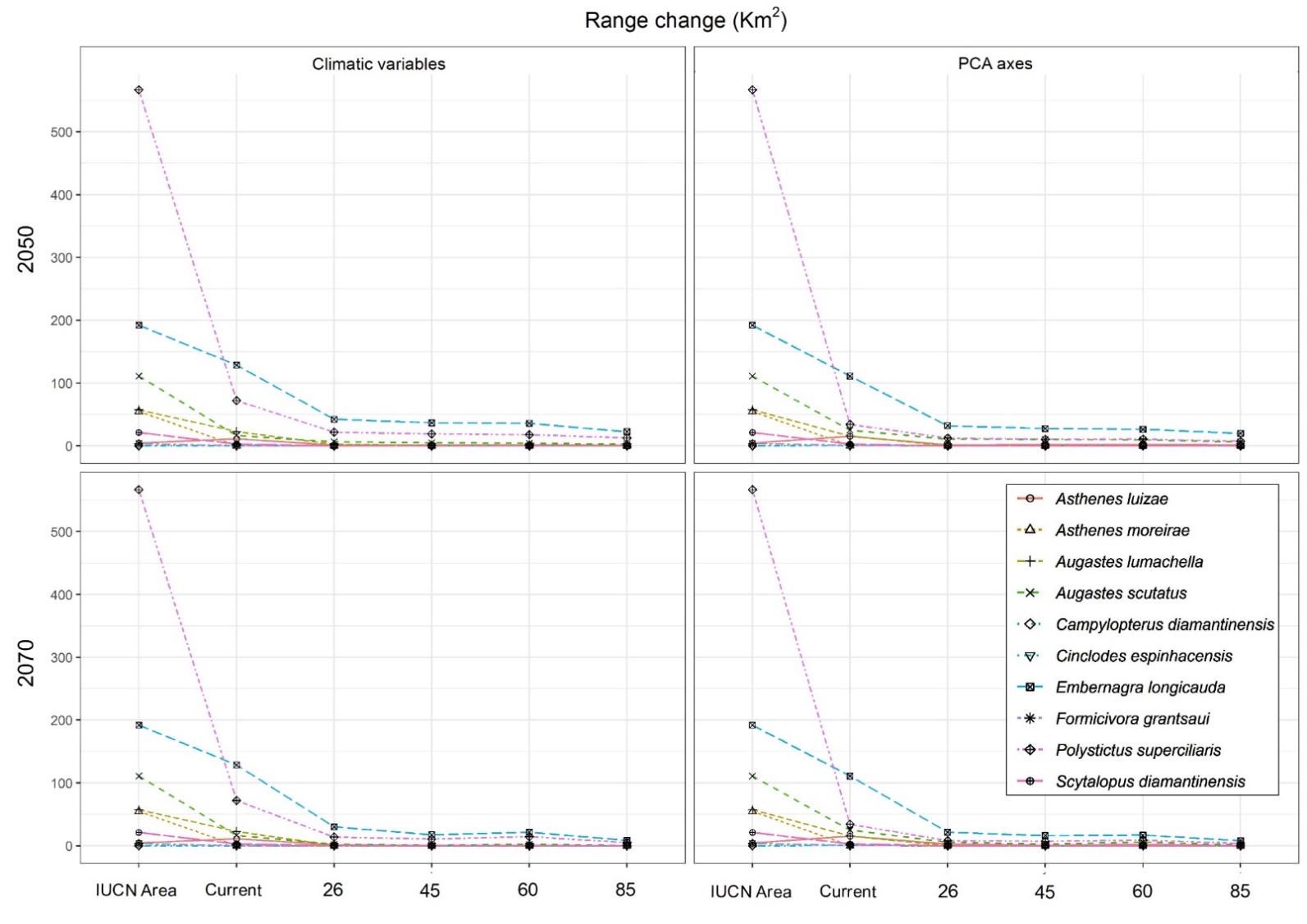
**Table S4**. Current and future (years 2050 and 2070) areas occupied by at least one mountaintop endemic bird species in eastern Brazil, considering two sets of predictor variables, for different Representative Concentration Pathways (RCP) scenarios, and the percentage of area remaining in future scenarios, extent of new areas with suitable conditions, and mean altitude.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Period | RCP | Predictor Set | Range  (x1000 Km2) | Range  contraction (%) | Gain area  (x1000 Km2) | Mean Altitude (m) |
| Current |  | Climatic Variables | 149.93 | - | - | 1039.1 |
| PCA axes | 123.15 | - | - | 1046.2 |
| 2050 | 26 | Climatic Variables | 45.05 | 72% | 3.02 | 1181.7 |
| PCA axes | 34.21 | 73% | 1.21 | 1205.3 |
| 45 | Climatic Variables | 38.15 | 76% | 2.27 | 1195.2 |
| PCA axes | 29.40 | 77% | 1.35 | 1218.3 |
| 60 | Climatic Variables | 37.81 | 76% | 1.18 | 1196.6 |
| PCA axes | 29.43 | 77% | 0.63 | 1226.8 |
| 85 | Climatic Variables | 23.36 | 85% | 0.28 | 1289.5 |
| PCA axes | 22.36 | 82% | 0.35 | 1278.6 |
| 2070 | 26 | Climatic Variables | 31.21 | 80% | 0.81 | 1241.1 |
| PCA axes | 24.37 | 80% | 0.22 | 1263.9 |
| 45 | Climatic Variables | 18.46 | 88% | 0.29 | 1317.3 |
| PCA axes | 17.47 | 86% | 0.78 | 1340.9 |
| 60 | Climatic Variables | 22.81 | 85% | 0.38 | 1272.0 |
| PCA axes | 19.23 | 85% | 0.49 | 1306.2 |
| 85 | Climatic Variables | 8.86 | 94% | 0.01 | 1470.6 |
| PCA axes | 8.08 | 93% | 0.06 | 1458.7 |

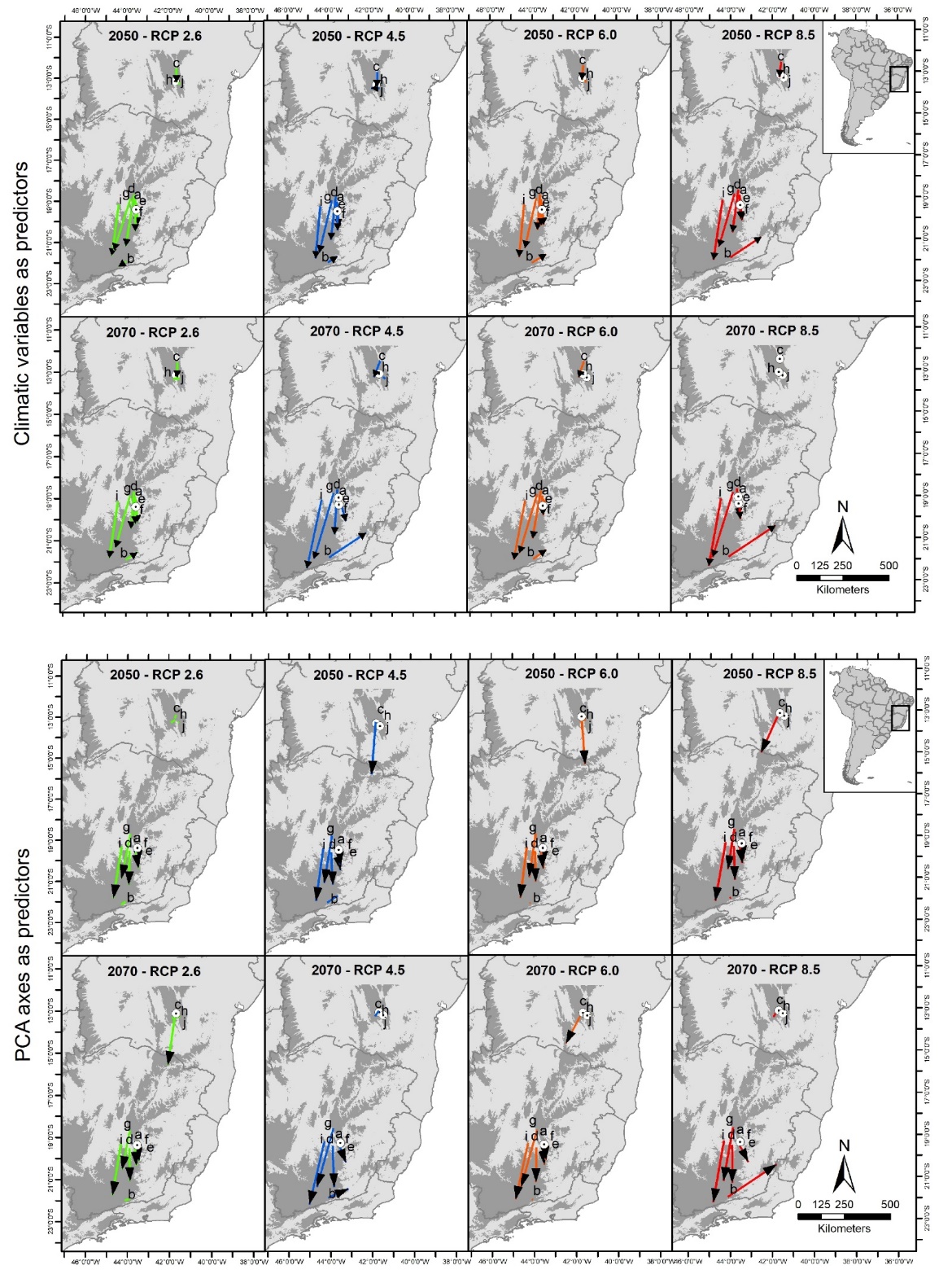
**Table S5**. Projected area from models from two predictor sets, with suitable conditions for the occurrence of ten bird species endemic of eastern Brazilian mountaintops in future periods (to years 2050 and 2070) and for different Representative Concentration Pathways (RCP) scenarios, with percentage of change in range size, extent that remains stable, amount that is lost and amount that is gained in relation to current projection.

| Species | Models predictor | Measurement type | Period | IUCN Current Area\* | Current area\* | RCP 2.6 | | RCP 4.5 | | RCP 6.0 | | RCP 8.5 | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Range\* | % | Range\* | % | Range\* | % | Range\* | % |
| *Asthenes luizae* | Climatic variables | Projected range | 2050 | 4.19 | 11.1 | 1.1 | -90.1 | 1.2 | -88.9 | 1.6 | -86.0 | 0.8 | -92.8 |
|  |  |  | 2070 |  |  | 1.5 | -86.3 | 0.1 | -99.0 | 0.5 | -95.3 | 0.0 | -99.9 |
|  |  | Gain range | 2050 |  |  | 0.2 | 1.9 | 0.2 | 1.7 | 0.2 | 1.5 | 0.0 | 0.3 |
|  |  |  | 2070 |  |  | 0.0 | 0.3 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 10.2 | 92.0 | 10.1 | 90.6 | 9.7 | 87.5 | 10.3 | 93.0 |
|  |  |  | 2070 |  |  | 9.6 | 86.6 | 11.0 | 99.3 | 10.6 | 95.3 | 11.1 | 99.9 |
|  |  | Stable range | 2050 |  |  | 0.9 | 8.0 | 1.0 | 9.4 | 1.4 | 12.5 | 0.8 | 7.0 |
|  |  |  | 2070 |  |  | 1.5 | 13.4 | 0.1 | 0.7 | 0.5 | 4.7 | 0.0 | 0.1 |
|  | PCA axes | Projected range | 2050 |  | 15.2 | 1.4 | -90.6 | 1.9 | -87.7 | 2.2 | -85.4 | 1.5 | -90.3 |
|  |  |  | 2070 |  |  | 2.6 | -83.0 | 0.4 | -97.4 | 1.8 | -87.8 | 0.1 | -99.1 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 13.7 | 90.6 | 13.3 | 87.9 | 12.9 | 85.4 | 13.7 | 90.3 |
|  |  |  | 2070 |  |  | 12.6 | 83.0 | 14.8 | 97.4 | 13.3 | 87.8 | 15.0 | 99.1 |
|  |  | Stable range | 2050 |  |  | 1.4 | 9.4 | 1.8 | 12.1 | 2.2 | 14.6 | 1.5 | 9.7 |
|  |  |  | 2070 |  |  | 2.6 | 17.0 | 0.4 | 2.6 | 1.8 | 12.2 | 0.1 | 0.9 |
| *Asthenes moreirae* | Climatic variables | Projected range | 2050 | 54.8 | 0.2 | 0.1 | -73.5 | 0.1 | -75.7 | 0.0 | -82.2 | 0.0 | -93.9 |
|  |  |  | 2070 |  |  | 0.0 | -80.6 | 0.0 | -95.0 | 0.0 | -89.4 | 0.0 | -99.6 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 0.2 | 73.5 | 0.2 | 75.7 | 0.2 | 82.2 | 0.2 | 93.9 |
|  |  |  | 2070 |  |  | 0.2 | 80.6 | 0.2 | 95.0 | 0.2 | 89.4 | 0.2 | 99.6 |
|  |  | Stable range | 2050 |  |  | 0.1 | 26.5 | 0.1 | 24.3 | 0.0 | 17.9 | 0.0 | 6.1 |
|  |  |  | 2070 |  |  | 0.0 | 19.4 | 0.0 | 5.0 | 0.0 | 10.6 | 0.0 | 0.4 |
|  | PCA axes | Projected range | 2050 |  | 0.2 | 0.1 | -63.7 | 0.1 | -44.5 | 0.1 | -67.1 | 0.0 | -81.0 |
|  |  |  | 2070 |  |  | 0.1 | -70.6 | 0.0 | -87.2 | 0.0 | -78.6 | 0.0 | -99.0 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 0.1 | 63.7 | 0.1 | 47.7 | 0.2 | 67.1 | 0.2 | 81.0 |
|  |  |  | 2070 |  |  | 0.2 | 70.6 | 0.2 | 87.2 | 0.2 | 78.6 | 0.2 | 99.0 |
|  |  | Stable range | 2050 |  |  | 0.1 | 36.3 | 0.1 | 52.3 | 0.1 | 32.9 | 0.0 | 19.0 |
|  |  |  | 2070 |  |  | 0.1 | 29.4 | 0.0 | 12.8 | 0.0 | 21.5 | 0.0 | 1.1 |
| *Augastes lumachella* | Climatic variables | Projected range | 2050 | 57.3 | 22.7 | 2.3 | -90.1 | 0.8 | -96.6 | 1.4 | -93.7 | 0.1 | -99.4 |
|  |  |  | 2070 |  |  | 0.5 | -97.6 | 0.0 | -100 | 0.0 | -99.9 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 20.4 | 90.1 | 21.9 | 96.6 | 21.2 | 93.7 | 22.5 | 99.4 |
|  |  |  | 2070 |  |  | 22.1 | 97.6 | 22.6 | 100 | 22.6 | 99.9 | 22.7 | 100 |
|  |  | Stable range | 2050 |  |  | 2.3 | 9.9 | 0.8 | 3.5 | 1.4 | 6.3 | 0.1 | 0.6 |
|  |  |  | 2070 |  |  | 0.5 | 2.4 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
|  | PCA axes | Projected range | 2050 |  | 15.6 | 0.3 | -98.1 | 0.0 | -100 | 0.3 | -98.2 | 0.0 | -99.7 |
|  |  |  | 2070 |  |  | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -99.9 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.5 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 15.3 | 98.1 | 15.6 | 100 | 15.5 | 99.8 | 15.5 | 99.8 |
|  |  |  | 2070 |  |  | 15.6 | 100 | 15.6 | 100 | 15.6 | 100 | 15.6 | 99.9 |
|  |  | Stable range | 2050 |  |  | 0.3 | 1.9 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.2 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| *Augastes scutatus* | Climatic variables | Projected range | 2050 | 111.0 | 16.4 | 6.3 | -61.4 | 4.8 | -71.0 | 3.9 | -76.1 | 2.7 | -83.8 |
|  |  |  | 2070 |  |  | 2.3 | -85.9 | 0.6 | -96.4 | 2.3 | -86.0 | 0.2 | -99.1 |
|  |  | Gain range | 2050 |  |  | 2.5 | 15.4 | 1.0 | 6.2 | 0.3 | 1.7 | 0.2 | 1.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.2 | 0.0 | 0.3 | 0.1 | 0.5 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 12.6 | 76.8 | 12.7 | 77.2 | 12.8 | 77.8 | 13.9 | 84.8 |
|  |  |  | 2070 |  |  | 14.2 | 86.1 | 15.9 | 96.7 | 14.2 | 86.6 | 16.3 | 99.1 |
|  |  | Stable range | 2050 |  |  | 3.8 | 23.2 | 3.7 | 22.8 | 3.6 | 22.2 | 2.5 | 15.2 |
|  |  |  | 2070 |  |  | 2.3 | 13.9 | 0.5 | 3.3 | 2.2 | 13.4 | 0.2 | 0.9 |
|  | PCA axes | Projected range | 2050 |  | 25.1 | 10.5 | -58.0 | 9.9 | -60.6 | 9.5 | -62.2 | 5.9 | -76.3 |
|  |  |  | 2070 |  |  | 5.5 | -78.0 | 2.6 | -89.7 | 5.6 | -77.5 | 1.0 | -96.0 |
|  |  | Gain range | 2050 |  |  | 1.6 | 6.6 | 1.7 | 6.8 | 1.0 | 3.8 | 0.7 | 2.6 |
|  |  |  | 2070 |  |  | 0.2 | 0.9 | 0.4 | 1.7 | 0.6 | 2.4 | 0.1 | 0.4 |
|  |  | Lost range | 2050 |  |  | 16.2 | 64.6 | 16.9 | 67.4 | 16.5 | 66.0 | 19.8 | 79.0 |
|  |  |  | 2070 |  |  | 19.8 | 78.9 | 22.9 | 91.4 | 20.0 | 79.9 | 24.2 | 96.4 |
|  |  | Stable range | 2050 |  |  | 8.9 | 35.4 | 8.2 | 32.6 | 8.5 | 34.0 | 5.3 | 21.0 |
|  |  |  | 2070 |  |  | 5.3 | 21.1 | 2.2 | 8.6 | 5.0 | 20.1 | 0.9 | 3.6 |
| *Campylopterus diamantinensis* | Climatic variables | Projected range | 2050 | - | 1.4 | 0.0 | -99.7 | 0.0 | -99.1 | 0.0 | -99.5 | 0.0 | -99.9 |
|  |  |  | 2070 |  |  | 0.0 | -99.7 | 0.0 | -100 | 0.0 | -99.4 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 1.4 | 99.7 | 1.4 | 99.1 | 1.4 | 99.5 | 1.4 | 99.9 |
|  |  |  | 2070 |  |  | 1.4 | 99.7 | 1.4 | 100 | 1.4 | 99.4 | 1.4 | 100 |
|  |  | Stable range | 2050 |  |  | 0.0 | 0.3 | 0.0 | 0.9 | 0.0 | 0.5 | 0.0 | 0.1 |
|  |  |  | 2070 |  |  | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
|  | PCA axes | Projected range | 2050 |  | 1.0 | 0.0 | -98.1 | 0.0 | -98.0 | 0.0 | -95.0 | 0.0 | -99.6 |
|  |  |  | 2070 |  |  | 0.0 | -99.4 | 0.0 | -100 | 0.0 | -99.6 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 1.0 | 98.1 | 1.0 | 98.0 | 0.9 | 95.0 | 1.0 | 99.6 |
|  |  |  | 2070 |  |  | 1.0 | 99.4 | 1.0 | 100 | 1.0 | 99.6 | 1.0 | 100 |
|  |  | Stable range | 2050 |  |  | 0.0 | 1.9 | 0.0 | 2.0 | 0.1 | 5.1 | 0.0 | 0.4 |
|  |  |  | 2070 |  |  | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 |
| *Cinclodes espinhacensis* | Climatic variables | Projected range | 2050 | - | 0.1 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  |  | 2070 |  |  | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 |
|  |  |  | 2070 |  |  | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 |
|  |  | Stable range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  | PCA axes | Projected range | 2050 |  | 0.2 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  |  | 2070 |  |  | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 0.2 | 100 | 0.2 | 100 | 0.2 | 100 | 0.2 | 100 |
|  |  |  | 2070 |  |  | 0.2 | 100 | 0.2 | 100 | 0.2 | 100 | 0.2 | 100 |
|  |  | Stable range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Embernagra longicauda* | Climatic variables | Projected range | 2050 | 192.0 | 128.6 | 42.4 | -67.0 | 36.6 | -71.5 | 35.8 | -72.1 | 22.5 | -82.5 |
|  |  |  | 2070 |  |  | 30.0 | -76.7 | 17.5 | -86.4 | 21.6 | -83.2 | 8.5 | -93.4 |
|  |  | Gain range | 2050 |  |  | 3.4 | 2.6 | 2.5 | 1.9 | 1.3 | 1.0 | 0.3 | 0.3 |
|  |  |  | 2070 |  |  | 0.9 | 0.7 | 0.3 | 0.2 | 0.5 | 0.4 | 0.1 | 0.1 |
|  |  | Lost range | 2050 |  |  | 89.6 | 69.7 | 94.4 | 73.4 | 94.0 | 73.1 | 106.4 | 82.8 |
|  |  |  | 2070 |  |  | 99.5 | 77.4 | 111.4 | 86.6 | 107.4 | 83.5 | 120.1 | 93.4 |
|  |  | Stable range | 2050 |  |  | 39.0 | 30.3 | 34.2 | 26.6 | 34.6 | 26.9 | 22.2 | 17.2 |
|  |  |  | 2070 |  |  | 29.1 | 22.6 | 17.2 | 13.4 | 21.2 | 16.5 | 8.5 | 6.6 |
|  | PCA axes | Projected range | 2050 |  | 111.0 | 32.0 | -71.2 | 27.5 | -75.3 | 26.3 | -76.3 | 19.8 | -82.2 |
|  |  |  | 2070 |  |  | 21.6 | -80.5 | 16.1 | -85.5 | 16.8 | -84.9 | 7.9 | -92.9 |
|  |  | Gain range | 2050 |  |  | 2.3 | 2.1 | 2.5 | 2.3 | 1.1 | 1.0 | 1.2 | 1.1 |
|  |  |  | 2070 |  |  | 0.5 | 0.5 | 2.5 | 2.2 | 2.2 | 2.0 | 1.0 | 0.9 |
|  |  | Lost range | 2050 |  |  | 81.3 | 73.3 | 86.1 | 77.6 | 85.8 | 77.3 | 92.4 | 83.3 |
|  |  |  | 2070 |  |  | 89.9 | 81.0 | 97.3 | 87.7 | 96.4 | 86.8 | 104.1 | 93.8 |
|  |  | Stable range | 2050 |  |  | 29.7 | 26.7 | 24.9 | 22.4 | 25.2 | 22.7 | 18.6 | 16.7 |
|  |  |  | 2070 |  |  | 21.1 | 19.0 | 13.7 | 12.3 | 14.6 | 13.2 | 6.9 | 6.2 |
| *Formicivora grantsaui* | Climatic variables | Projected range | 2050 | 3.6 | 0.1 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  |  | 2070 |  |  | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 |
|  |  |  | 2070 |  |  | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 | 0.1 | 100 |
|  |  | Stable range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  | PCA axes | Projected range | 2050 |  | 0.7 | 0.0 | -99.4 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  |  | 2070 |  |  | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 0.7 | 99.4 | 0.7 | 100 | 0.7 | 100 | 0.7 | 100 |
|  |  |  | 2070 |  |  | 0.7 | 100 | 0.7 | 100 | 0.7 | 100 | 0.7 | 100 |
|  |  | Stable range | 2050 |  |  | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Polystictus superciliaris* | Climatic variables | Projected range | 2050 | 567.0 | 72.1 | 21.8 | -69.7 | 18.9 | -73.7 | 17.8 | -75.3 | 12.5 | -82.7 |
|  |  |  | 2070 |  |  | 13.9 | -80.8 | 10.6 | -85.3 | 14.4 | -80.1 | 5.1 | -93.0 |
|  |  | Gain range | 2050 |  |  | 1.8 | 2.4 | 1.1 | 1.6 | 0.5 | 0.7 | 0.1 | 0.1 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.2 | 0.3 | 0.0 | 0.1 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 52.0 | 72.2 | 54.3 | 75.3 | 54.8 | 76.0 | 59.7 | 82.8 |
|  |  |  | 2070 |  |  | 58.2 | 80.8 | 61.7 | 85.6 | 57.8 | 80.1 | 67.1 | 93.0 |
|  |  | Stable range | 2050 |  |  | 20.1 | 27.9 | 17.8 | 24.7 | 17.3 | 24.0 | 12.4 | 17.2 |
|  |  |  | 2070 |  |  | 13.9 | 19.2 | 10.4 | 14.4 | 14.3 | 19.9 | 5.1 | 7.0 |
|  | PCA axes | Projected range | 2050 |  | 34.1 | 12.3 | -64.0 | 10.4 | -69.6 | 10.6 | -68.8 | 7.1 | -79.2 |
|  |  |  | 2070 |  |  | 8.1 | -76.2 | 6.9 | -79.7 | 8.8 | -74.3 | 3.6 | -89.4 |
|  |  | Gain range | 2050 |  |  | 1.7 | 5.1 | 1.0 | 2.9 | 0.8 | 2.3 | 0.1 | 0.4 |
|  |  |  | 2070 |  |  | 0.0 | 0.1 | 0.3 | 0.8 | 0.2 | 0.6 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 23.6 | 69.1 | 24.7 | 72.4 | 24.2 | 71.1 | 27.1 | 79.6 |
|  |  |  | 2070 |  |  | 26.0 | 76.3 | 27.4 | 80.5 | 25.5 | 74.9 | 30.5 | 89.4 |
|  |  | Stable range | 2050 |  |  | 10.5 | 30.9 | 9.4 | 27.6 | 9.9 | 28.9 | 7.0 | 20.4 |
|  |  |  | 2070 |  |  | 8.1 | 23.7 | 6.7 | 19.5 | 8.6 | 25.2 | 3.6 | 10.6 |
| *Scytalopus diamantinensis* | Climatic variables | Projected range | 2050 | 21.2 | 2.8 | 0.1 | -97.8 | 0.0 | -99.8 | 0.1 | -95.7 | 0.0 | -100 |
|  |  |  | 2070 |  |  | 0.1 | -96.0 | 0.0 | -99.9 | 0.0 | -100 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 2.8 | 97.8 | 2.8 | 99.8 | 2.7 | 95.7 | 2.8 | 100 |
|  |  |  | 2070 |  |  | 2.7 | 96.0 | 2.8 | 99.9 | 2.8 | 100 | 2.8 | 100 |
|  |  | Stable range | 2050 |  |  | 0.1 | 2.2 | 0.0 | 0.2 | 0.1 | 4.3 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.1 | 4.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
|  | PCA axes | Projected range | 2050 |  | 2.7 | 0.0 | -99.6 | 0.0 | -100 | 0.0 | -99.7 | 0.0 | -100 |
|  |  |  | 2070 |  |  | 0.0 | -99.6 | 0.0 | -100 | 0.0 | -100 | 0.0 | -100 |
|  |  | Gain range | 2050 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
|  |  | Lost range | 2050 |  |  | 2.7 | 99.6 | 2.7 | 100 | 2.7 | 99.7 | 2.7 | 100 |
|  |  |  | 2070 |  |  | 2.7 | 99.6 | 2.7 | 100 | 2.7 | 100 | 2.7 | 100 |
|  |  | Stable range | 2050 |  |  | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 |
|  |  |  | 2070 |  |  | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

**Legend: \*** x1000 (Km²)



**Fig. S3.** Projected change in extent of suitable range for each mountaintop endemic bird species for 2050 and 2070 (graph lines) in relation to IUCN area and current projections, considering four scenarios of Representative Concentration Pathways (RCPs), from Ecological Niche Models (ENM) building with two predictors sets (graphs columns – Climatic variables and PCA axes).



**Fig. S4.** Direction of range shift from the central point of the distribution of ten bird species endemic of eastern Brazilian mountaintops for two future periods (2050 and 2070) and for four different Representative Concentration Pathways (RCP) scenarios (arrows of different colors), considering models building with two predictor sets (climatic variables and PCA axes). The letters represent the species: (a) *Asthenes luizae*, (b) *A. moreirae*, (c) *Augastes lumachella*, (d) *A. scutatus*, (e) *Campylopterus diamantinensis*, (f) *Cinclodes espinhacensis*, (g) *Embernagra longicauda*, (h) *Formicivora grantsaui*, (i) *Polystictus superciliaris* and (j) *Scytalopus diamantinensis*. White dotted circles indicate the center of the current distribution of species that did not present suitable areas in this scenario.

**Table S6.** Projected average altitude, altitudinal shift, latitudinal range shift and latitudinal shift direction from models of two predictor sets for current and future periods (2050 and 2070) and four different Representative Concentration Pathways (RCP) scenarios, for the projected extent of occurrence of ten mountaintop endemic bird species of eastern Brazil.

| Species | Measurement type | Models predictor | Current Altitude mean | RCP 2.6 - 2050 | RCP 4.5 - 2050 | RCP 6.0 - 2050 | RCP 8.5 - 2050 | RCP 2.6 - 2070 | RCP 4.5 - 2070 | RCP 6.0 - 2070 | RCP 8.5 - 2070 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Asthenes luizae* | Average altitude (m) | Climatic variables | 1193 | 1314 | 1342 | 1341 | 1406 | 1317 | 1667 | 1475 | 1887 |
|  |  | PCA axes | 1170 | 1331 | 1312 | 1286 | 1336 | 1282 | 1457 | 1311 | 1635 |
|  | Altitudinal shift (m) | Climatic variables |  | 121 | 149 | 148 | 213 | 124 | 474 | 282 | 694 |
|  |  | PCA axes |  | 161 | 142 | 116 | 166 | 112 | 287 | 141 | 465 |
|  | Range Shift (km) | Climatic variables |  | 172 | 158 | 138 | 127 | 144 | 147 | 104 | 135 |
|  |  | PCA axes |  | 116 | 119 | 112 | 110 | 111 | 113 | 112 | 121 |
|  | Shift direction (angle) | Climatic variables |  | -180 | 179 | 180 | 177 | 180 | 165 | 177 | 175 |
|  |  | PCA axes |  | 171 | 170 | 173 | 172 | 176 | 160 | 173 | 154 |
| *Asthenes moreirae* | Average altitude (m) | Climatic variables | 2254 | 2431 | 2452 | 2467 | 2550 | 2470 | 2558 | 2522 | 2663 |
|  |  | PCA axes | 2229 | 2378 | 2336 | 2391 | 2465 | 2408 | 2439 | 2444 | 2620 |
|  | Altitudinal shift (m) | Climatic variables |  | 177 | 198 | 213 | 296 | 216 | 304 | 268 | 409 |
|  |  | PCA axes |  | 149 | 107 | 162 | 236 | 179 | 210 | 215 | 391 |
|  | Range Shift (km) | Climatic variables |  | 49 | 58 | 84 | 189 | 71 | 225 | 82 | 283 |
|  |  | PCA axes |  | 27 | 66 | 4 | 9 | 27 | 111 | 7 | 297 |
|  | Shift direction (angle) | Climatic variables |  | -125 | 56 | 58 | 54 | 54 | 54 | 54 | 54 |
|  |  | PCA axes |  | -130 | 55 | -116 | 72 | 72 | 64 | 116 | 54 |
| *Augastes lumachella* | Average altitude (m) | Climatic variables | 1060 | 1303 | 1411 | 1370 | 1586 | 1430 | 1797 | 1750 | - |
|  |  | PCA axes | 1057 | 1449 | 1115 | 936 | 1455 | 1180 | 1801 | 1743 | 1741 |
|  | Altitudinal shift (m) | Climatic variables |  | 243 | 351 | 310 | 526 | 370 | 737 | 690 | - |
|  |  | PCA axes |  | 392 | 58 | -121 | 398 | 123 | 744 | 686 | 684 |
|  | Range Shift (km) | Climatic variables |  | 76 | 82 | 80 | 83 | 81 | 94 | 92 | - |
|  |  | PCA axes |  | 20 | 290 | 261 | 238 | 282 | 35 | 192 | 49 |
|  | Shift direction (angle) | Climatic variables |  | 178 | -179 | -176 | -174 | 179 | -159 | -161 | - |
|  |  | PCA axes |  | 18 | -176 | 176 | -156 | -172 | -149 | -153 | -148 |
| *Augastes scutatus* | Average altitude (m) | Climatic variables | 1204 | 1336 | 1331 | 1316 | 1439 | 1376 | 1477 | 1516 | 1622 |
|  |  | PCA axes | 1171 | 1252 | 1277 | 1279 | 1375 | 1350 | 1523 | 1375 | 1772 |
|  | Altitudinal shift (m) | Climatic variables |  | 132 | 127 | 112 | 235 | 172 | 273 | 312 | 418 |
|  |  | PCA axes |  | 81 | 106 | 108 | 204 | 179 | 352 | 204 | 601 |
|  | Range Shift (km) | Climatic variables |  | 283 | 240 | 189 | 229 | 196 | 240 | 257 | 143 |
|  |  | PCA axes |  | 186 | 178 | 163 | 178 | 174 | 219 | 184 | 200 |
|  | Shift direction (angle) | Climatic variables |  | -171 | -174 | -176 | -173 | -176 | -177 | -171 | 175 |
|  |  | PCA axes |  | -179 | 177 | 179 | 178 | 179 | 178 | -180 | 180 |
| *Campylopterus diamantinensis* | Average altitude (m) | Climatic variables | 1376 | 1995 | 1877 | 1935 | 2040 | 1995 | - | 1856 | - |
|  |  | PCA axes | 1388 | 1846 | 1841 | 1744 | 1995 | 1955 | - | 1995 | - |
|  | Altitudinal shift (m) | Climatic variables |  | 619 | 501 | 559 | 664 | 619 | - | 480 | - |
|  |  | PCA axes |  | 458 | 453 | 356 | 607 | 567 | - | 607 | - |
|  | Range Shift (km) | Climatic variables |  | 118 | 117 | 118 | 119 | 118 | - | 26 | - |
|  |  | PCA axes |  | 85 | 83 | 87 | 83 | 83 | - | 83 | - |
|  | Shift direction (angle) | Climatic variables |  | 174 | 175 | 174 | 174 | 174 | - | 138 | - |
|  |  | PCA axes |  | 178 | 177 | 179 | 175 | 175 | - | 175 | - |
| *Cinclodes espinhacensis* | Average altitude (m) | Climatic variables | 1492 | - | - | - | - | - | - | - | - |
|  |  | PCA axes | 1460 | - | - | - | - | - | - | - | - |
|  | Altitudinal shift (m) | Climatic variables |  | - | - | - | - | - | - | - | - |
|  |  | PCA axes |  | - | - | - | - | - | - | - | - |
|  | Range Shift (km) | Climatic variables |  | - | - | - | - | - | - | - | - |
|  |  | PCA axes |  | - | - | - | - | - | - | - | - |
|  | Shift direction (angle) | Climatic variables |  | - | - | - | - | - | - | - | - |
|  |  | PCA axes |  | - | - | - | - | - | - | - | - |
| *Embernagra longicauda* | Average altitude (m) | Climatic variables | 1045 | 1179 | 1194 | 1193 | 1297 | 1242 | 1336 | 1281 | 1477 |
|  |  | PCA axes | 1041 | 1194 | 1211 | 1211 | 1270 | 1247 | 1336 | 1311 | 1452 |
|  | Altitudinal shift (m) | Climatic variables |  | 134 | 149 | 148 | 252 | 197 | 291 | 236 | 432 |
|  |  | PCA axes |  | 153 | 170 | 170 | 229 | 206 | 295 | 270 | 411 |
|  | Range Shift (km) | Climatic variables |  | 295 | 296 | 270 | 294 | 286 | 362 | 323 | 359 |
|  |  | PCA axes |  | 246 | 264 | 234 | 217 | 210 | 322 | 314 | 287 |
|  | Shift direction (angle) | Climatic variables |  | -163 | -167 | -168 | -164 | -165 | -164 | -164 | -163 |
|  |  | PCA axes |  | -169 | -171 | -172 | -171 | -169 | -165 | -165 | -170 |
| *Formicivora grantsaui* | Average altitude (m) | Climatic variables | 1346 | - | - | - | - | - | - | - | - |
|  |  | PCA axes | 1292 | 1718 | - | - | - | - | - | - | - |
|  | Altitudinal shift (m) | Climatic variables |  | - | - | - | - | - | - | - | - |
|  |  | PCA axes |  | 426 | - | - | - | - | - | - | - |
|  | Range Shift (km) | Climatic variables |  | - | - | - | - | - | - | - | - |
|  |  | PCA axes |  | 28 | - | - | - | - | - | - | - |
|  | Shift direction (angle) | Climatic variables |  | - | - | - | - | - | - | - | - |
|  |  | PCA axes |  | -123 | - | - | - | - | - | - | - |
| *Polystictus superciliaris* | Average altitude (m) | Climatic variables | 1136 | 1298 | 1319 | 1334 | 1400 | 1383 | 1415 | 1372 | 1593 |
|  |  | PCA axes | 1244 | 1390 | 1430 | 1430 | 1511 | 1478 | 1535 | 1477 | 1652 |
|  | Altitudinal shift (m) | Climatic variables |  | 162 | 183 | 198 | 264 | 247 | 279 | 236 | 457 |
|  |  | PCA axes |  | 146 | 186 | 186 | 267 | 234 | 291 | 233 | 408 |
|  | Range Shift (km) | Climatic variables |  | 280 | 288 | 280 | 324 | 301 | 373 | 318 | 363 |
|  |  | PCA axes |  | 283 | 292 | 274 | 318 | 275 | 342 | 305 | 331 |
|  | Shift direction (angle) | Climatic variables |  | -173 | -175 | -175 | -172 | -171 | -169 | -170 | -170 |
|  |  | PCA axes |  | -171 | -173 | -173 | -171 | -171 | -167 | -168 | -171 |
| *Scytalopus diamantinensis* | Average altitude (m) | Climatic variables | 1213 | 1489 | 1830 | 1474 | - | 1607 | 1586 | - | - |
|  |  | PCA axes | 1249 | 1642 | - | 1781 | - | 1818 | - | - | - |
|  | Altitudinal shift (m) | Climatic variables |  | 276 | 617 | 261 | - | 394 | 373 | - | - |
|  |  | PCA axes |  | 393 | - | 532 | - | 569 | - | - | - |
|  | Range Shift (km) | Climatic variables |  | 12 | 46 | 3 | - | 34 | 16 | - | - |
|  |  | PCA axes |  | 7 | - | 31 | - | 43 | - | - | - |
|  | Shift direction (angle) | Climatic variables |  | 12 | -92 | -101 | - | -93 | 128 | - | - |
|  |  | PCA axes |  | -87 | - | -104 | - | -101 | - | - | - |

**Table S7**. Remaining area of the area estimated by IUCN, after application of the percentage of change obtained by the analysis of ENM projections, and indication of the possibility of the need to reassess the conservation status of ten bird species endemic to mountaintops in eastern Brazil. The green color indicates that it is not necessary to review its conservation status; the gradient between yellow and red indicates that the species may be at some level of threat, and black when we do not check the availability of areas with environmental suitability in future scenarios, or when they could not be estimated.

| Species | Models predictor | Period | IUCN area | RCP 2.6 | RCP 4.5 | RCP 6.0 | RCP 8.5 | RCP 2.6 | RCP 4.5 | RCP 6.0 | RCP 8.5 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Percentage of Change | | | | Remaining area | | | |
| *Asthenes luizae* | Climatic variables | 2050 | 4190 | -90.1 | -88.9 | -86.0 | -92.8 | 415 | 463 | 588 | 303 |
|  |  | 2070 |  | -86.3 | -99.0 | -95.3 | -99.9 | 576 | 42 | 197 | 4 |
|  | PCA axes | 2050 |  | -90.6 | -87.7 | -85.4 | -90.3 | 393 | 515 | 612 | 407 |
|  |  | 2070 |  | -83.0 | -97.4 | -87.8 | -99.1 | 713 | 109 | 510 | 36 |
| *Asthenes moreirae* | Climatic variables | 2050 | 54800 | -73.5 | -75.7 | -82.2 | -93.9 | 14506 | 13311 | 9782 | 3343 |
|  |  | 2070 |  | -80.6 | -95.0 | -89.4 | -99.6 | 10615 | 2718 | 5831 | 208 |
|  | PCA axes | 2050 |  | -63.7 | -44.5 | -67.1 | -81.0 | 19887 | 30409 | 18013 | 10428 |
|  |  | 2070 |  | -70.6 | -87.2 | -78.6 | -99.0 | 16128 | 7036 | 11755 | 575 |
| *Augastes lumachella* | Climatic variables | 2050 | 57300 | -90.1 | -96.6 | -93.7 | -99.4 | 5696 | 1977 | 3621 | 321 |
|  |  | 2070 |  | -97.6 | -100 | -99.9 | -100 | 1358 | 23 | 69 | 0 |
|  | PCA axes | 2050 |  | -98.1 | -100 | -98.2 | -99.7 | 1117 | 17 | 1008 | 149 |
|  |  | 2070 |  | -100 | -100 | -100 | -99.9 | 6 | 11 | 11 | 40 |
| *Augastes scutatus* | Climatic variables | 2050 | 111000 | -61.4 | -71.0 | -76.1 | -83.8 | 42813 | 32168 | 26540 | 17982 |
|  |  | 2070 |  | -85.9 | -96.4 | -86.0 | -99.1 | 15629 | 3985 | 15507 | 1043 |
|  | PCA axes | 2050 |  | -58.0 | -60.6 | -62.2 | -76.3 | 46598 | 43745 | 41991 | 26263 |
|  |  | 2070 |  | -78.0 | -89.7 | -77.5 | -96.0 | 24431 | 11433 | 25008 | 4462 |
| *Campylopterus diamantinensis* | Climatic variables | 2050 | - | -99.7 | -99.1 | -99.5 | -99.9 | - | - | - | - |
|  |  | 2070 |  | -99.7 | -100 | -99.4 | -100 | - | - | - | - |
|  | PCA axes | 2050 |  | -98.1 | -98.0 | -95.0 | -99.6 | - | - | - | - |
|  |  | 2070 |  | -99.4 | -100 | -99.6 | -100 | - | - | - | - |
| *Cinclodes espinhacensis* | Climatic variables | 2050 | - | -100 | -100 | -100 | -100 | - | - | - | - |
|  |  | 2070 |  | -100 | -100 | -100 | -100 | - | - | - | - |
|  | PCA axes | 2050 |  | -100 | -100 | -100 | -100 | - | - | - | - |
|  |  | 2070 |  | -100 | -100 | -100 | -100 | - | - | - | - |
| *Embernagra longicauda* | Climatic variables | 2050 | 192000 | -67.0 | -71.5 | -72.1 | -82.5 | 63283 | 54720 | 53530 | 33581 |
|  |  | 2070 |  | -76.7 | -86.4 | -83.2 | -93.4 | 44755 | 26131 | 32275 | 12768 |
|  | PCA axes | 2050 |  | -71.2 | -75.3 | -76.3 | -82.2 | 55296 | 47501 | 45485 | 34253 |
|  |  | 2070 |  | -80.5 | -85.5 | -84.9 | -92.9 | 37363 | 27917 | 29088 | 13594 |
| *Formicivora grantsaui* | Climatic variables | 2050 | 3600 | -100 | -100 | -100 | -100 | 0 | 0 | 0 | 0 |
|  |  | 2070 |  | -100 | -100 | -100 | -100 | 0 | 0 | 0 | 0 |
|  | PCA axes | 2050 |  | -99.4 | -100 | -100 | -100 | 22 | 0 | 0 | 0 |
|  |  | 2070 |  | -100 | -100 | -100 | -100 | 0 | 0 | 0 | 0 |
| *Polystictus superciliaris* | Climatic variables | 2050 | 567000 | -69.7 | -73.7 | -75.3 | -82.7 | 171688 | 148894 | 140219 | 98204 |
|  |  | 2070 |  | -80.8 | -85.3 | -80.1 | -93.0 | 109034 | 83179 | 112833 | 39747 |
|  | PCA axes | 2050 |  | -64.0 | -69.6 | -68.8 | -79.2 | 204404 | 172538 | 176904 | 117936 |
|  |  | 2070 |  | -76.2 | -79.7 | -74.3 | -89.4 | 135003 | 115271 | 145719 | 60215 |
| *Scytalopus diamantinensis* | Climatic variables | 2050 | 21200 | -97.8 | -99.8 | -95.7 | -100 | 462 | 45 | 920 | 0 |
|  |  | 2070 |  | -96.0 | -99.9 | -100 | -100 | 856 | 13 | 0 | 0 |
|  | PCA axes | 2050 |  | -99.6 | -100 | -99.7 | -100 | 91 | 0 | 72 | 0 |
|  |  | 2070 |  | -99.6 | -100 | -100 | -100 | 85 | 0 | 0 | 0 |