**SUPPLEMENTARY MATERIAL**

**Vegetation cover restricts habitat suitability predictions of endemic Atlantic Forest birds**

Anna Elizabeth de Oliveira-Silva, Augusto João Piratelli, Damaris Zurell, Fernando Rodrigues da Silva

**Perspectives in Ecology and Conservation**

**Table S1** – Description of the 36 endemic bird species of the Brazilian Atlantic Forest selected to the modeling procedures. Abbreviations are as follows. FD - Forest dependency (BirdLife International, 2018): H = high; M = medium; and L = low. IUCN - IUCN status(BirdLife International, 2018):LC = least concern; NT = near threatened;and VU = vulnerable.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Family | Species | Common name | FD | IUCN |
| Accipitridae | *Buteogallus lacernulatus* | White-necked Hawk | H | VU |
|  | *Pseudastur polionotus* | Mantled Hawk | H | NT |
| Bucconidae | *Malacoptila striata* | Crescent-chested Puffbird | M | NT |
| Corvidae | *Cyanocorax caeruleus* | Azure Jay | H | NT |
| Cotingidae | *Carpornis cucullata* | Hooded Berryeater | H | NT |
| Cracidae | *Ortalis squamata* | Scaled Chachalaca | L | LC |
| Fringillidae | *Cinclodes pabsti* | Long-tailed Cinclodes | L | NT |
|  | *Cranioleuca pallida* | Pallid Spinetail | H | LC |
|  | *Phacellodomus ferrugineigula* | Orange-breasted Thornbird | L | LC |
|  | *Synallaxis ruficapilla* | Rufous-capped Spinetail | M | LC |
| Picidae | *Melanerpes flavifrons* | Yellow-fronted Woodpecker | M | LC |
|  | *Veniliornis maculifrons* | Yellow-eared Woodpecker | M | LC |
| Pipridae | *Chiroxiphia caudata* | Blue Manakin | H | LC |
|  | *Neopelma aurifrons* | Wied's Tyrant-Manakin | H | VU |
| Psittacidae | *Brotogeris tirica* | Plain Parakeet | M | LC |
|  | *Pionopsitta pileata* | Pileated Parrot | M | LC |
|  | *Pyrrhura frontalis* | Maroon-bellied Parakeet | M | LC |
| Rallidae | *Aramides saracura* | Slaty-breasted Wood-Rail | M | LC |
| Ramphastidae | *Pteroglossus bailloni* | Saffron Toucanet | H | NT |
|  | *Ramphastos dicolorus* | Red-breasted Toucan | M | LC |
| Strigidae | *Megascops sanctaecatarinae* | Long-tufted Screech-owl | L | LC |
|  | *Pulsatrix koeniswaldiana* | Tawny-browed Owl | M | LC |
|  | *Strix hylophila* | Rusty-barred Owl | M | NT |
| Thamnophilidae | *Conopophaga melanops* | Black-cheeked Gnateater | M | LC |
|  | *Formicivora serrana* | Serra Antwren | M | LC |
|  | *Herpsilochmus pileatus* | Bahia Antwren | L | VU |
|  | *Pyriglena leucoptera* | White-shouldered Fire-eye | M | LC |
| Thraupidae | *Dacnis nigripes* | Black-legged Dacnis | M | NT |
|  | *Ramphocelus bresilius* | Brazilian Tanager | L | LC |
|  | *Sporophila frontalis* | Buffy-fronted Seedeater | M | VU |
|  | *Tangara seledon* | Green-headed Tanager | L | LC |
| Tinamidae | *Tinamus solitarius* | Solitary Tinamou | H | NT |
| Trochilidae | *Stephanoxis lalandi* | Green-crowned Plovercrest | M | LC |
|  | *Thalurania glaucopis* | Violet-capped Woodnymph | M | LC |
| Tyrannidae | *Mionectes rufiventris* | Grey-hooded Flycatcher | H | LC |
|  | *Phylloscartes kronei* | Restinga Tyrannulet | L | VU |

Table S2. ODMAP protocol for reporting species distribution models following Zurell et al. (2020).

Vegetation cover restrict habitat suitability predictions of endemic Brazilian Atlantic Forest birds

– ODMAP Protocol –

Anna E. Oliveira-Silva, Augusto J. Piratelli, Damaris Zurell, Fernando R. da Silva

## Overview

#### Authorship

Contact : [fernandors@ufscar.br](mailto:fernandors@ufscar.br)

<Study link>

#### Model objective

Model objective: Mapping and interpolation

Target output: suitable vs unsuitable habitats

#### Focal Taxon

Focal Taxon: birds

#### Location

Location: Brazilian Atlantic Forest

#### Scale of Analysis

Spatial extent: -58.36508, -31.40443, -33.75527, -2.71122 (xmin, xmax, ymin, ymax)

Spatial resolution: ~10 km

Temporal extent: 1990 - 2017

Boundary: natural, political

#### Biodiversity data

Observation type: field survey, citizen science

Response data type: presence-only

#### Predictors

Predictor types: climatic, habitat

#### Hypotheses

Hypotheses: The inclusion of native vegetation data would decrease the potential range distribution of forest-dependent species by limiting their occurrence in regions harboring small areas of native vegetation habitats, despite otherwise favorable climatic conditions

#### Assumptions

The current distribution of species is at equilibrium with environment and mostly driven by climate and vegetation cover. There is no sampling bias in the species occurrence data.

#### Algorithms

Modelling techniques: maxent, randomForest, SVM

Model complexity: We fitted comparably complex models (using default settings within the SSDM package) to accurately describe the current distribution of species and the relevant predictors.

Model averaging: We applied the ensemble of forecasting approach to find a consensus among ENMs

#### Workflow

Model workflow: We obtained species occurrence records of 36 bird species from the Brazilian Atlantic Forest and fitted ENMs using the SSDM package (Schmitt et al., 2017) with three different algorithms (random forest, MaxEnt and support vector machines) and two candidate predictor sets (climate-only and climate-vegetation). Pseudo-absences were randomly selected from the background. Model predictions were combined in ensembles using a weighted-average approach. We evaluated predictive performance using AUC and used an AUC-maximising threshold to binarise predictions. We then calculated predicted range sizes from the binary maps and compared range sizes of climate-only and climate-vegetation models.

#### Software

Software: Software: R version 4.0, packages ‘SSDM’, ‘rJava’, ‘raster’, ‘rgdal’, and ‘sdm’

Code availability: Code are available at <https://figshare.com/s/818a21d34522e27d2562>Data availability: Data are available at <https://figshare.com/s/818a21d34522e27d2562>

## Data

#### Biodiversity data

Taxon names: 36 bird species: Aramides saracura, Brotogeris tirica, Buteogallus lacernulatus, Carpornis cucullata, Chiroxiphia caudata, Cinclodes pabsti, Conopophaga melanops, Cranioleuca pallida, Cyanocorax caeruleus, Dacnis nigripes, Formicivora serrana, Herpsilochmus pileatus, Malacoptila striata, Megascops sanctaecatarinae, Melanerpes flavifrons, Mionectes rufiventris, Neopelma aurifrons, Ortalis squamata, Phacellodomus ferrugineigula, Phylloscartes kronei, Pionopsitta pileata, Pseudastur polionotus, Pteroglossus bailloni, Pulsatrix koeniswaldiana, Pyriglena leucoptera, Pyrrhura frontalis, Ramphastos dicolorus, Ramphocelus bresilius, Sporophila frontalis, Stephanoxis lalandi, Strix hylophila, Synallaxis ruficapilla, Tangara seledon, Thalurania glaucopis, Tinamus solitarius, Veniliornis maculifrons

Taxonomic reference system: We followed the updated list of the South American Classification Committee of the American Ornithological Society (<http://www.museum.lsu.edu/~Remsen/SACCBaseline.htm>) for bird nomenclature

Ecological level: species

Data sources: The species occurrence points are available on the supplementary data of Hasui et al. (2018, Ecology, <https://doi.org/10.1002/ecy.2119>) and at the Global Biodiversity Information Facility online database (GBIF; <https://www.gbif.org/>).

Sampling design: random

Sample size: 2160 occurrence points encompassing all bird species

Clipping: Brazilian Atlantic Forest

Cleaning: We removed from our data: i) duplicate occurrence points; ii) occurrence points in Argentina and Paraguay because the vegetation layer used herein is restricted to Brazil; iii) imprecise point occurrences (e.g. coordinates assigned to municipalities); and iv) historical points (i.e. records before 1990, therefore, we evaluated point occurrences from 1990 to 2017).

Pseudo-absence/Background data: The same number of randomly created pseudo-absences as available presences (Barbet-Massin et al., 2012) for RandomForest and SVM. 10,000 randomly generated background points for MaxEnt.

#### Data partitioning

Validation data: threefold cross-validation (two times in the training set and once the evaluation set), repeated ten times.

#### Predictor variables

Predictor variables: i) temperature seasonality (bio4); ii) maximum temperature of the warmest month (bio5); iii) temperature annual range (bio7); iv) annual precipitation (bio12); v) precipitation seasonality (bio15); vi) precipitation of the driest quarter (bio17); and vii) percentage of vegetation cover

Data sources: We downloaded bioclimatic variables from the WorldClim 2.0 database (Fick and Hijmans 2017) and vegetation cover from SOS Mata Atlântica (<http://mapas.sosma.org.br/dados/>)

Spatial extent: bioclimatic variables (Worldwide) and Vegetation cover (Brazil)

Spatial resolution: bioclimatic variables (5.0 arc-minute spatial resolution) and vegetation cover (shapefile)

Temporal extent: bioclimatic variables (1970-2000) and vegetation cover (2018)

Temporal resolution:

Dimension reduction: We removed bio17 from subsequent analyses due to its high correlation with bio12 (r = 0.75) and bio15 (r = -0.94), and maintained other climatic variables which correlation ranged from 0 to 0.7, indicating low influence of multicollinearity (Dormann et al., 2013)

## Model

#### Multicollinearity

Multicollinearity: We applied a Pearson’s correlation test to check for multicollinearity among the environmental variables.

#### Model settings

Maxent: default from SSDM package (Schmitt et al., 2017) that uses presence-only data and 10,000 randomly generated background points.

randomForest: default from SSDM package (Schmitt et al., 2017) that set model with 2500 trees, minimum size of terminal nodes equal one, and the same number of randomly created pseudo-absences as available presences (Barbet-Massin et al., 2012).

SVM: default from SSDM package (Schmitt et al., 2017) that set the model with the epsilon parameter in the insensitive loss function equal 1e-08 and the same number of randomly created pseudo-absences as available presences (Barbet-Massin et al. 2012).

#### Model estimates

We did not assess model estimates explicitly. Variable importance was quantified using Pearson's correlation between predictions of the full model and the one without a variable, and returns the score 1-r: the highest the value, the more influence the variable has on the model (Schmitt et al., 2017).

#### Analysis and Correction of non-independence

We did not assess or correct for non-independence.

#### Threshold selection

Threshold selection: We created a binary map from each modeling output (climate-only and climate-vegetation models) based on True Skill Statistic (TSS) that maximizes the sum of sensitivity and specificity (Schmitt et al., 2017).

## Assessment

#### Performance statistics

Performance on validation data: AUC

#### Plausibility check

We did not explicitly assess response shapes.

## Prediction

#### Prediction output

Prediction unit: We predicted potential presence of the species. We overlapped the binary maps of predicted suitable area for each species to visualize the areas that are congruent between predicted models and areas that differed between climate-only and climate-vegetation models

****

**Figure S1.** Pearson’s correlation test among environmental variables ranging from 0 (no correlation) to -1 or 1 (high correlation). We consider values > 0.7 as a high correlation result. bio4 = temperature seasonality; bio5 = maximum temperature of the warmest month; bio7 = temperature annual range; bio12 = annual precipitation; v) bio15 = precipitation seasonality; bio 17 = precipitation of the driest quarter; and vegetation cover = percentage of native vegetation cover in the Brazilian Atlantic Forest.



**Figure S2.** Consensus maps for *Aramides saracura*, *Brotogeris tiririca*, *Buteogallus lacernulatus*, *Carpornis cucullate*, *Chiroxiphia caudata*, and *Cinclodes pabsti* based on predicted suitable areas by climate-only model (blue), climate-vegetation model (green), and the overlapping areas between models (orange) in the Brazilian Atlantic Forest. The dots represent the original occurrence points (n = 60). Bird images: *Aramides saracura* (Oliveira, J. G. 2016), *Brotogeris tiririca* (Sirgado, L. 2013), *Buteogallus lacernulatis* (Bottai, H. 2012), *Carponis cucullata* (Godoy, F.I.), *Chiroxiphia caudata* (Sanches, D. 2011a), and *Cinclodes pabsti* (Bottai, H. 2015a).



**Figure S3.** Consensus maps for *Conopophaga melanops*, *Cranioleuca pallida*, *Cyanocorax caeruleus*, *Dacnis nigripes*, *Euphonia pectoralis*, and *Formicivora serrana* based on predicted suitable areas by climate-only model (blue), climate-vegetation model (green), and the overlapping areas between models (orange) in the Brazilian Atlantic Forest. The dots represent the original occurrence points (n = 60).Bird images: *Conopophaga melanops* (Sanches, D. 2011b), *Cranioleuca pallida* (Danbrazil 2013), *Cyanocorax caeruleus* (Firma, N. 2018), *Dacnis nigripes* (Sanches, D. 2011c), *Formicivora serrana* (Bottai, H. 2016), and *Herpsilochmus pileatus* (Godoy, F.I.).

****

**Figure S4.** Consensus maps for *Malacoptila striata*, *Megascops sanctaecatarinae*, *Melanerpes flavifrons*, *Mionectes rufiventris*, and *Neoplema aurifrons* based on predicted suitable areas by climate-only model (blue), climate-vegetation model (green), and the overlapping areas between models (orange) in the Brazilian Atlantic Forest. The dots represent the original occurrence points (n = 60). Bird images: *Malacoptila striata* (Sanches, D. 2010a), *Megascops sanctaecatarinae* (Bottai, H. 2015b), *Melanerpes flavifrons* (Sanches, D. 2010b), *Mionectes rufiventris* (Sanches, D. 2012a), *Neoplema aurifrons* (Bottai, H. 2017), and *Ortalis squamata* (Timm, C.D. 2011)*.*



**Figure S5.** Consensus maps for *Phacellodomus ferrugineigula*, *Phyllocartes kronei*, *Pionopsitta pileate*, *Pseudastur polionotus*, *Pteroglossus bailloni,* and *Pulsatrix koeniswaldiana* based on predicted suitable areas by climate-only model (blue), climate-vegetation model (green), and the overlapping areas between models (orange) in the Brazilian Atlantic Forest. The dots represent the original occurrence points (n = 60).Bird images: *Phacellodomus ferrugineigula* (Sanches, D. 2012b), *Phyllocartes kronei* (Bottai, H. 2015c), *Pionopsitta pileata* (Friedel, T. 2008), *Pseudastur polionotus* (Brasileiro, C. 2014), *Pteroglossus bailloni* (Martins, R.A. 2016a)*,* and *Pulsatrix koeniswaldiana* (Dias, A. 2016)*.*



**Figure S6.** Consensus maps for *Pyriglena leucoptera*, *Pyrrhura frontalis*, *Ramphastos dicolorus*, *Ramphocelus bresilius*, *Sporophila frontalis*, and *Stephanoxis lalandi* based on predicted suitable areas by climate-only model (blue), climate-vegetation model (green), and the overlapping areas between models (orange) in the Brazilian Atlantic Forest. The dots represent the original occurrence points (n = 60). Bird images: *Pyriglena leucoptera* (Sanches, D. 2009), *Pyrrhura frontalis* (Moreira, J. 2016a), *Ramphastos dicolorus* (Moreira, J. 2016b), *Ramphocelus bresilius* (Sanches, D. 2010c), *Sporophila frontalis* (Sanches, D. 2011d), and *Stephanoxis lalandi* (Sanches, D. 2011e).



**Figure S7**. Consensus maps for *Strix hylophila*, *Synallaxis ruficapilla*, *Tangara seledon*, *Thalurania glaucopis*, *Tinamus solitarius*, and *Veniliornis maculifrons* based on predicted suitable areas by climate-only model (blue), climate-vegetation model (green), and the overlapping areas between models (orange) in the Brazilian Atlantic Forest. The dots represent the original occurrence points (n = 60). Bird images: *Strix hylophila* (Sanches, D. 2010d), *Synallaxis ruficapilla* (Sanches, D. 2011f), *Tangara seledon* (Martins, R.A. 2016b), *Thalurania glaucopis* (Sanches, D. 2008), *Tinamus solitarius* (Soares, M.R. 2015), and *Veniliornis maculifrons* (Sanches, D. 2007).

**REFERENCES**

Barbet-Massin, M., Jiguet, F., Albert, C.H., Thuiller, W. 2012. Selecting pseudo-absences for species distribution models: how, where and how many? Methods Ecol. Evol. 3, 327–338. <http://doi.org/10.1111/j.2041-210X.2011.00172.x>

Bottai, H. (2012). *Buteogallus lacernulatus*. <https://pt.m.wikipedia.org/wiki/Ficheiro:Amadonastur_(Leucopternis)_lacernulatus_-_White-necked_Hawk.JPG>

Bottai, H. (2015a). *Cinclodes pabsti*. <https://commons.wikimedia.org/wiki/File:Cinclodes_pabsti_-_Long-tailed_cinclodes.JPG>

Bottai, H. (2015b). *Megascops sanctaecatarinae*. <https://commons.wikimedia.org/wiki/File:Megascops_sanctaecatarinae_-_Long-tufted_Screech_Owl.JPG>

Bottai, H. (2015c). *Phylloscartes kronei*. <https://commons.wikimedia.org/wiki/File:Phylloscartes_kronei_-_Restinga_tyrannulet.JPG>

Bottai, H. (2016). *Formicivora serrana*. <https://commons.wikimedia.org/wiki/File:Formicivora_serrana_-_Serra_anwren_(male).jpg>

Bottai, H. (2017). *Neopelma aurifrons*. <https://commons.wikimedia.org/wiki/File:Neopelma_aurifrons_-_Wied%27s_Tyrant-Manakin.jpg>

Brasileiro, C. (2014). *Pseudastur polionotus*. eBird ML107207491. <https://macaulaylibrary.org/asset/107207491>

Danbrazil (2013). *Cranioleuca pallida*. <https://commons.wikimedia.org/wiki/File:Arredio-p%C3%A1lido_(Cranioleuca_pallida).JPG>

Dias, A. (2016). *Pulsatrix koeniswaldiana*. <https://pt.wikipedia.org/wiki/Ficheiro:Murucututu-de-barriga-amarela_(Pulsatrix_koeniswaldiana)_Itagib%C3%A1.jpg>

Dormann, C.F., Elith, J., Bacher, S., Buchmann, C., Carl, G., Carré, G., Marquéz, J.R.G., Gruber, B., Lafourcade, B., Leitão, P.J., Münkemüller, T., McClean, C., Osborne, P.E., Reineking, B., Schröder, B., Skidmore, A.K., Zurell, D., Lautenbach, S. (2013). Collinearity: A review of methods to deal with it and a simulation study evaluating their performance. Ecography 36, 27–46. <https://doi.org/10.1111/j.1600-0587.2012.07348.x>

Fick, S.E., Hijmans, R.J., 2017. WorldClim 2: new 1‐km spatial resolution climate surfaces for global land areas. Int. J. Climatol. 37, 4302–4315. <https://doi.org/10.1002/joc.5086>

Firma, N. (2018). *Cyanocorax caeruleus*. <https://commons.wikimedia.org/wiki/File:Gralha_Azul_no_Parque_Nacional_de_Aparados_da_Serra.jpg>

Friedel, T. (2008). *Pianopsitta pileata*. <https://commons.wikimedia.org/wiki/File:Pileated_Parrot.jpg>

Hasui, E., et al., 2018. ATLANTIC BIRDS: a data set of bird species from the Brazilian Atlantic Forest. Ecology 99, 497. <https://doi.org/10.1002/ecy.2119>

Martins, R.A. (2016a). *Pteroglossus bailloni*. <https://commons.wikimedia.org/wiki/File:Ara%C3%A7ari-banana_-_Pteroglossus_bailloni.jpg>

Martins, R.A. (2016b). *Tangara seledon*. <https://pt.wikipedia.org/wiki/Ficheiro:Sa%C3%ADra-sete-cores_-_Tangara_seledon.jpg>

Moreira, J. (2016a). *Pyrrhura frontalis*. <https://commons.wikimedia.org/wiki/File:Tiriba-de-testa-vermelha.jpg>

Moreira, J. (2016b). *Ramphastos dicolorus*. <https://commons.wikimedia.org/wiki/File:Tucano_de_bico_verde_(Ramphastos_dicolorus).jpg>

Oliveira, J.G. (2016). *Aramides saracura*. <https://pt.wikipedia.org/wiki/Ficheiro:Saracura_do_mato_(Aramides_saracura)_no_Jd_Bot%C3%A2nico_S_Paulo_SP.jpg>

Sanches, D. (2007). *Veniliornis maculifrons*. <https://commons.wikimedia.org/wiki/File:Veniliornis_maculifrons-2.jpg>

Sanches, D. (2008). *Thalurania glaucopis*. <https://commons.wikimedia.org/wiki/File:ThaluraniaGlaucopis200805DarioSanches.jpg>

Sanches, D. (2009). *Pyriglena leucoptera*. <https://commons.wikimedia.org/wiki/File:Pyriglena_leucoptera1.jpg>

Sanches, D. (2010a). *Malacoptila striata*. <https://commons.wikimedia.org/wiki/File:BARBUDO-RAJADO_(_Malacoptila_striata_).jpg>

Sanches, D. (2010b). *Melanerpes flavifrons*. <https://pt.m.wikipedia.org/wiki/Ficheiro:Melanerpes_flavifrons_-Parque_Nacional_do_Itatiaia,_Rio_de_Janeiro,_Brazil-8.jpg>

Sanches, D. (2010c). *Ramphocelus bresilius*. <https://commons.wikimedia.org/wiki/File:Ramphocelus_bresilius_-Sao_Paulo_Bagre,_Cananeia,_Sao_Paulo,_Brasil_-male-8.jpg>

Sanches, D. (2010d). *Strix hylophila*. <https://commons.wikimedia.org/wiki/File:Strix_hylophila_-Reserva_Guainumbi,_Sao_Luis_do_Paraitinga,_Sao_Paulo,_Brasil-8.jpg>

Sanches, D. (2011a). *Chiroxiphia caudata*. <https://commons.wikimedia.org/wiki/File:Chiroxiphia_caudata_-Piraju,_Sao_Paulo,_Brazil_-male-8_(1).jpg>

Sanches, D. (2011b). *Conopophaga melanops*. <https://commons.wikimedia.org/wiki/File:Conopophaga_melanops_-Vale_do_Ribeira,_Juquia,_Sao_Paulo,_Brazil_-male-8.jpg>

Sanches, D. (2011c). *Dacnis nigripes*. <https://commons.wikimedia.org/wiki/File:Dacnis_nigripes_-Vale_do_Ribeira,_Juquia,_Sao_Paulo,_Brasil_-female-8.jpg>

Sanches, D. (2011d). *Sporophila frontalis*. <https://commons.wikimedia.org/wiki/File:Sporophila_frontalis_-Parque_Estadual_da_Serra_da_Cantareira,_Sao_Paulo,_Brazil-8.jpg>

Sanches, D. (2011e). *Stephanoxis lalandi*. <https://commons.wikimedia.org/wiki/File:Stephanoxis_lalandi_-Campos_do_Jordao,_Sao_Paulo,_Brazil-8.jpg>

Sanches, D. (2011f). *Synallaxis ruficapilla*. <https://commons.wikimedia.org/wiki/File:Synallaxis_ruficapilla_-Piraju,_Sao_Paulo,_Brazil-8.jpg>

Sanches, D. (2012a). *Mionectes rufiventris*. <https://pt.wikipedia.org/wiki/Ficheiro:Mionectes_rufiventris_-Parque_Estadual_da_Cantareira,_Sao_Paulo,_Brazil-8.jpg>

Sanches, D. (2012b). *Phacellodomus ferrugineigula*. <https://commons.wikimedia.org/wiki/File:Phacellodomus_ferrugineigula_-Mairipora,_Sao_Paulo,_Brazil-8.jpg>

Sirgado, L. (2013). *Brotogeris tirica*. <https://pt.wikipedia.org/wiki/Ficheiro:Periquito-rico_(Brotogeris_tirica).jpg>

Schmitt, S., Pouteau, R., Justeau, D., de Boissieu, F., Birnbaum, P., 2017. SSDM: An r package to predict distribution of species richness and composition based on stacked species distribution models. Methods Ecol. Evol. 8, 1795–1803. <https://doi.org/10.1111/2041-210X.12841>

Soares, M.R. (2015). *Tinamus solitarius*. <https://commons.wikimedia.org/wiki/File:Tinamus_solitarius_5.jpg>

Timm, C.D. (2011). *Ortalis squamata*. <https://commons.wikimedia.org/wiki/File:Ortalis_squamata_-_Pelotas,_Rio_Grande_do_Sul,_Brazil.jpg>

Zurell, D., Franklin, J., König, C., Bouchet, P. J., Dormann, C.F., Elith, J., Fandos, G., Feng, X., Guillera-Arroita, G., Guisan, A., Lahoz-Monfort, J.J., Leitão, P. J., Park, D.S., Peterson, A.T., Rapacciuolo, G., Schmatz, D.R., Schröder, B., Serra-Diaz, J.M., Thuiller, W., Yates, K.L., Zimmermann, N.E., Merow, C. 2020. A standard protocol for reporting species distribution models. Ecography 43, 1261–1277. <https://doi.org/10.1111/ecog.04960>