\* Page and lines numbers refer to the first manuscript version sent to the journal (without authors details).

­Reviewer A

*1) Does the title adequately reflect the content of the manuscript?:*

*Yes.*

*2) Is the manuscript a relevant scientific contribution to ecology?:*

*Yes, but it could be improved*

We believe the manuscript is more complete and better presented after the reviewers’ comments were taking into account.

*3) Does the summary present the main idea of the manuscript and its*

*objectives and main results and conclusions?:*

*Partially, it contains unnecessary details. I have deleted them using track changes in the file attached*

We appreciate the direct edits in the manuscript made by the reviewer, they really improved our contribution.

*4) Are the keywords pertinent and different from the words used in the manuscript title?:*

*Yes.*

*5) Does the introduction present the theoretical/empirical content in which the manuscript topic is inserted?:*

*Yes, the intro is very well written, with only a few excessive long and confusing sentences. I have edited them directly in the word document file. The English language is also good, but there're a few spots that require author's attention. Oxford comma is lacking along the ms. Also, include a comma after e.g.,*

Again, we thank to the reviewer for the language edits.

*6) Are the methods adequate and clearly presented? :*

*Yes. I'd just advise including a map for the region of study. Also, cite the sources for the occurrence records.*

We added a map showing the occurrence records and the studied area. In addition, the new supplementary table contains now a new column referring to the source.

*7) Are the results, discussion and conclusion clearly presented and do they*

*correctly address the objectives of the study?:*

*yes. A map for the predicted environmental suitability for each species under each scenario would be great.*

Our results include exactly 90 maps environmental distance values, different from common SDMs or ENMs methods a summary map would be misleading. Therefore, we opted for not including maps with environmental suitability.

*8) Are all the figures and tables essential and self-explanatory?:*

*Yes, all of them, but see my comment about including the sources of occurrence records in Suppl. table 1.*

The new supplementary table contains now a new column referring to the source.

*9) Are the references pertinent and up-to-date?:*

*Yes, but I have suggested others to be included in the intro, see comments in the .doc file.*

The suggestions were really useful to make our literature references more complete. All the reviewer’s citation suggestions were adopted.

*10) Final Considerations::*

*The paper is relatively well written and addressed an timely topic regarding poorly known frog species endemic to the Atlantic forest of NE Brazil. The modelling excercise includes data for small-ranged species to which we don't have much data.*

We appreciate the interest in our research shown by the reviewer.

*The intro or M&M could talk a bit more about these species. All of them are DD.*

We have added a table to describe the conservation status of the species and their respective taxonomic families.

*Also, I'd recommend treating them as "small-ranged species", instead of "rare", since studies using occupancy methods in the field to assess their detection probability have not been caried out. So, we don't really know if these absences are real ones or simply do to the low detection probability of species in the field (e.g., due to explosive breeding behavior).*

We have made the suggested changes, and rare species are now called small-ranged species throughout the text.

*It is hard to infer from your results alone that species will be able to move to track their environmental suitable habitats in the future scenarios, since you haven’t included any spatial proxy in the modelling exercise. Also, you haven’t modelled the distribution of the biome as a whole in the future to infer if there will be enough forested habitat. So, I'd adive to refrain from mentioning it in the discussion.*

Although we did not directly test biotic interaction, adaptation or migration models, we felt necessary to explore possible consequences of our results in the light of these aspects in a specific section of the discussion. We think that is mandatory for any paper that discuss effects of climate change on species range to bring these subjects to the discussion.

*Another potential issue is that the possibility of climatic niche evolution is not included in your models, which would turn species able to continue to inhabit the predicted unsuitable areas (see Hof et al. 2010 Ecography; Bonetti & Wiens 2014 Proc Royal Soc).*

We have an entire paragraph of the discussion dedicated to argue about potential issues caused by climatic niche evolution.

*Comments in the manuscript*

We really appreciate the reviewer effort to make changes directly in the manuscript. Most of hers/his suggestion was adopted as shown in the new version of the manuscript. We thank the reviewer for taking the time to improve our work.

*Abstract.*

The abstract was changed according to the writing suggestions. We also clarified the results concerning the connectivity patterns comparison between present and future, which refer to the Moran’s I autocorrelogram results.

*Pg. 4; Line 36-37: it’s already happening, is not just a future thing. Also, there’re reviews about biodiversity in the Anthropocene that you could cite here: Garcia et al. 2014 Science; Young et al. 2016 AREES.*

The text was modified to acknowledge that climate change is already happening and the suggested references were adopted.

*Pg. 4; Line 40: See also Loyola et al. 2014 Ecography for the Atlantic Forest amphibians.*

We added the reference as suggested.

*Pg. 4; Line 54: See also Maguire et al. 2015 AREES.*

We added the reference as suggested.

*Pg. 5; Line 62: Environmental Niche Modelling.*

We removed the term added by the reviewer to the text, as we believe we are not performing Environmental Niche Modelling (ENM) following the nomenclature proposed in Peterson et al 2011.

* Peterson, A. Townsend. Ecological niches and geographic distributions (MPB-49). No. 49. Princeton University Press, 2011.

*Pg. 5; Line 69: Environmental similarity loss ???*

The environmental similarity loss here refers to how climate change will lead to environmental conditions in the whole region that are more distant to the observed environments presently occupied by the species. To clarify this point, we added more details when we expose the specific objectives of the work in the next line.

*Pg. 5; Line 80-81: I’d advise including a map of the region and also for the ENM of each species under the alternative scenarios.*

We also though about this earlier on the development of the manuscript. However, the total number of maps is 90, given that we are working on 10 species, with 1 present scenario, and 4 RCPs for 2 different future periods. We though that this number of maps would be quite confusing to the reader, that is why we summarize the results in other graphical ways. However, we have now added a map showing the studied area and the occurrence records.

*Pg. 6; Line 86: Please, cite all the sources. Maybe including a new column in this same table and citing the author’s name and collection acronym.*

Following the reviewer advise, the new supplementary table contains now a new column referring to the source.

*Pg. 6; Line 94: Is that right? Please, include the version you used.*

The version used was the 1.4, since the version 2.0 do not have data for future climates. It is now added to the text.

*Pg. 6; Lines 100-101: This is not made to “avoid disproportional contribution”, but because these variables have different scales (=measurement units).*

The reviewer is right in pointing out that the problem arises from the different scales in our variables. Still, in the Euclidean Distance context, if one variable has a scale that is much higher than another, as it happens with temperature and precipitation, the variable with higher range of values will have a disproportional contribution to the resulting distance. Nevertheless, following the reviewer suggestion and to avoid further confusion, we changed the text accordingly.

*Pg. 6; Line 105: Citation?*

The Euclidean Distance is a standard mathematical method developed first by Euclid, and later improved by Pythagoras, long before the advent of peer reviewed journals. However, following both reviewers’ suggestion, we extended this sentence to include a description of the Euclidean Distance and the mathematical notation of the method applied in this work.

*Pg. 6; Line 110: How many degrees is that?*

2.5 minutes is equal to 0.0416667 degrees. We preferred the units in minutes because most users of the well-known WorldClim database will understand it immediately. However, to make easier for readers that are used to units in degrees, we added to the text that 2.5 minutes approximately is 0.042 degrees.

*Pg. 7; Line 119: Which version?*

The serial version number was added to the manuscript.

*Pg. 9; Line 181: This is hard to infer from your results alone, since you haven’t included any spatial proxy in the modelling exercise. Also, you haven’t modelled the distribution of the biome as a whole in the future to infer if there will be enough forested habitat*

We make this point based only on the macroclimatic perspective. We have now modified the text to make this clear. Also, the following lines of the paragraph points out that from habitat perspective connectivity may decay.

*Pg. 10; Line 190: See also Loyola et al. 2014*.

The reference suggested was included.

*Pg.10; Lines 194 -205: This all can be barelly inferred from your results, since you haven’t included any biotic or spatial component in the model.*

We appreciate the concern of the reviewer, but we never claimed to have inferred this from our results. Since we are discussing effects of climate change on species distribution, we here show that it is also possible that species will just adapt to new conditions, we base our arguments on the literature in the field. Remove this section from the discussion is disregard the body of knowledge concerning species evolution and its role in mitigating climate change impacts.

*Pg.10; Lines 207-209: This is also not entirely correct. The Check List journal alone publishes a number of new records for AF anurans species, in addition to other specialized venues, like Herp Notes and Herp Review. So, our knowledge of the geographical distribution of these species is poor, but it’s constantly changing, improving*

We agree with the reviewer that the statement was speculative, and based on the authors personal experience. Therefore, we have now removed the sentence.

*Pg. 11; Lines 222-223: This should be emphasized much earlier in the paper. This is a key information that should be used to justify the need for your work.*

We do think that this is an important information, however we cannot use it to justify our work, since we did not know the species prior to the data collection. However, we have now added detail information on the species status in a table to which we refer in the methods section.

**Reviewer C**

*1) Does the title adequately reflect the content of the manuscript?:*

*Yes.*

*2) Is the manuscript a relevant scientific contribution to ecology?:*

*In part. Whereas there is a need to analyze for rare species (or very rare, in this case), this is an important contribution. However, I'm not sure if the amount of data (occurrence points; to some species N=1) is evidence enough to suggest ecological tendencies.*

We appreciate the concern of the reviewer, but the role of the manuscript is exactly explorer what we can understand about the impact of climate change in very rare species. We understand the limitations of the methods applied, and we made sure that the language in the manuscript transmit such caution. Still, we believe that we were able to extract a lot of interesting findings even with very little a priori information about the distribution of the species, making this an interesting contribution to the field.

*3) Does the summary present the main idea of the manuscript and its objectives and main results and conclusions?:*

*Yes*

*4) Are the keywords pertinent and different from the words used in the manuscript title?:*

*In part. Authors did not perform Species Distribution Modelling, which is a very specific methodology. They should remove it from keywords.*

We agree with the reviewer and modified the words ‘Species Distribution Modelling’ by ‘Euclidean Distance’. We previously though that the word would be useful for researchers looking for discussions on how to evaluate the impacts of climate change on rare species geographic distribution.

*5) Does the introduction present the theoretical/empirical content in which the manuscript topic is inserted?:*

*In part. The authors did not include current discussion on rare species methods for spatially explicit models. E.g.: i) Guisan et al. 2006 – Using Niche-Based Models to Improve the Sampling of Rare Species (Conservation Biology 20, No. 2, 501–511); ii) Lomba et al. 2010 - Overcoming the rare species modelling paradox: A novel hierarchical framework applied to an*

*Iberian endemic plant (Biological Conservation 143, 2647–2657).*

We thank for the reviewer for pointing this flaw in our introduction. We have now added a new set of sentences to include these papers in the manuscript introduction.

*6) Are the methods adequate and clearly presented? :*

*Not so sure if they are adequate, but they're not clearly presented. The authors used a Euclidean distance to infer on how climate will change in the occurrence records of the very rare species. However, the methodology they seemed to use is usually indicated to track more probable areas to improve sampling (i.e., increase number of occurrence records). Therefore, not publishable.*

We have extended the methods section to give more details about the Euclidean Distance method and added further discussion to the introduction about why we think this is the best approach. We understand that the only previous research to use this method intended to indicate probable areas to improve sampling. But we argue in the paper that a similar approach could be taken to explorer the impacts of climate changes, given the necessary caution as pointed out in the manuscript. We hope that the new clarifications made in the manuscript will convince the reviewer of our approach.

*I believe that using traditional Euclidean distance on occurrence vs. environment matrices (matrices algebra) would be a more suitable methodology.*

We did not fully understand what the reviewer is proposing here. If he/she can be clearer we may provide a better answer.

*Also, to species with very low occurrence records (N<3), to use even two environmental variables is an important statistical issue.*

The Euclidean Distance metric is not a statistical model. Therefore, the idea of degrees of freedom do not apply here. The Euclidean distance can be calculated for any two points (N = 2) with any positive number of variables as long as it is less than infinite. This is equivalent to calculate the geographical distance between occurrence records. Given that we are calculating the Euclidean distance from the occurrence records to each cell in our grid, our calculation always uses an N = 2, independent of the number of occurrences in our dataset.

The reviewer can refer to Legendre and Legendre (2012) for further information on distance metrics.

* Legendre, Pierre, and Loic FJ Legendre. Numerical ecology. Vol. 24. Elsevier, 2012.

7) Are the results, discussion and conclusion clearly presented and do they

correctly address the objectives of the study?:

In part. Results and discussion should be more clear (language). Also, Results section lacks "numeric" results (e.g., environmental distances among years), which difficults reader's interpretation.

We have improved the language throughout the paper based on the first reviewer’s suggestions. We now believe that the results and the entire manuscript is easier to read. For each of our numerical results, 90 values are calculated, this is why we preferred to provide the summary statistics in graphics rather than direct in the text. We disagree in this point with the reviewer as we believe that as we think that adding all these numerical results direct to the text would make the manuscript very hard to follow.

8) Are all the figures and tables essential and self-explanatory?:

Yes. However, it is not possible to observe how occurrence records are spatially distributed. I would ask to include a lat/lon plot or a map. In a map, it would also be interesting to include a forest layer to provide habitat fragmentation visualization.

We followed both reviewers’ suggestion and added a map showing the occurrence records and the studied area with a forest layer to visualize habitat fragmentation.

9) Are the references pertinent and up-to-date?:

In part. Authors refers to Siqueira et al. (2009; J. Nat. Conserv. 17:25–32) to argue on rare species modelling; however, some important references are lacking (Guisan et al. 2006, Loma et al. 2010).

We appreciate the reviewer’s suggestion, and we have now included them in the introduction to discuss the choice of the method used.

10) Final Considerations::

Despite the interesting subject, I am not so sure if the authors assessed it properly due to: i) a not clear Methods section; ii) the lack of evidence (number of occurrence records). At this moment, the manuscript is not publishable.

We appreciate that the reviewer found the subject interesting for publication. We believe that we now have a much-improved version of the manuscript. We hope to have satisfactorily answered all the concerns raised by the reviewer.

*Comments direct on the manuscript*

*Pg. 2; Line 25-27: Where are those results?*

Our work includes the results of four different representative concentration pathways (RCP; see section 2.2. Environmental variables of the article). The four RCPs represent different expected trajectories of greenhouse gas concentration emissions. The RCP 2.6 assumes that human emissions will decline after a peak in 2010-2020, the RCP 4.5 in 2040, the RCP 6 in 2080, and RCP 8.5 assumes continuous growth in greenhouse gases emissions. As you can see in the results, and graphically in the figure 1, our findings indicate that declines in greenhouse gas concentration emissions may decrease the potential impact of climate change on the species.

*Pg. 3; Line 31: You did not perform SDM.*

We initially though that, although we did not perform SDMs in the work, people interested in impacts of climate change on species distribution would primarily search for this term. However, we agree with the reviewer that it would be better to remove the term to avoid confusion. Accordingly, we changed it to ‘Euclidean Distance’.

*Pg. 4; Line 40-43: Strange wording, please revise it.*

The first reviewer suggested some specific changes in this sentence that we believe made the text easier to read.

*Pg. 5; Line 66-67: Explicit that you are not performing SDM.*

We modified accordingly to the reviewer suggestion to make it explicit that we are not performing neither SDMs nor ENMs.

*Pg. 5; Line 75: This section is not clear enough to allow replication.*

We have now expanded some parts of this section to make sure readers can replicate the work. We also indicate that readers can request the full R script to the authors.

*Pg. 6; Line 86: Websites? Please review.*

After reviewing the data, we decided to remove this part of the text since we now provide the source reference or the collection ID for each occurrence record.

*Pg. 6; Lines 105-106: How?*

We extended this sentence to include a description of the Euclidean Distance and the mathematical notation of the method applied in the work.

*Pg. 6; Lines 106-107: If you have just one occurrence, then you have just one distance, not a minimum. Please revise it.*

As stated in the sentence: “For species that have more than one occurrence point, the minimum Euclidean distance value was chosen.”. We only used the minimum distance for the species with more than one occurrence point. We now extended the methods to present the mathematical notation that may be more intuitive for some readers.

*Pg. 7; Lines 110-112:* *Confusing. Not sure if I understand the purpose.*

We now state the purpose before presenting the methods, and after we give further explanation of the method applied.

*Pg. 7; Lines 116: Then why are negative values in the graphics?*

The text was modified to include the description of negative values in Moran’s I correlogram.

*Pg. 7; Lines 119-121: Which one did you use to perform Euclidean Distance?*

The Euclidean distance calculation was performed using scripts made by the authors following the methods described in the section. We added this information to the manuscript, and indicate that the script can be obtained upon request.

*Pg. 7; Lines 125-131: Please insert your results.*

The figure 1 summarize the numerical results presented in this section. The figure contains exactly 90 summary statics, show them directly in the text or in a table would be very hard to follow. We believe the figure is more useful to transmit the results, but if the editor requires we can provide the written results. This is also the case for all the other results presented.

*Pg. 9; Line 162: I believe this is a great place to restate exactly what is important about the study. Maybe the three most important results, and then build the entire discussion in ways that results support completely those main ideas. So, expose your thoughts more directly, and end up with a strong conclusion. Your last paragraph brings a (too) broad conclusion. Under climate change, all biodiversity is potentially threatened, not only rare species. Thus, what makes these few rare species from the Northern portion of Atlantic Forest so important? Why should we conserve it? Or what this study adds to the current information?*

Based on both reviewers’ suggestions, we have now modified the text throughout the discussion. However, we would like to point out that we do restate the major results of the manuscript and discuss all of them in the light of the current literature, we made sure that in the new version there is no misunderstanding when we are referring to our results in the discussion. We go beyond to discuss other possibilities that could be important but that were not tested here, like potential adaptation to changes and possible problems caused by the interaction of fragmentation and climate change. We believe that the last paragraph (the conclusion paragraph) should emphasize the broader conclusions of the paper and not specific details (that have been discussed before). We disagree that all species will be threatened under climate change, as some of them may actually benefit from it. The message that we want to transmit with this paper is that we may be underestimating the threaten caused by climate change on small-ranged species by not considering them in traditional analysis using SDMs or ENMs, because of methodological limitations. Therefore, focusing on the discussion of the role of each species ecological impact would deviate the reader from this message.

*Pg. 9; Line 72-73: Why not test it, using information from matrices already used to niche characterization (Euclidean distance analysis)?*

This was actually tested, we modified the sentence to make sure that the reader understand that this is part of our results.

*Pg. 9; Line 74: Sounds like a hypothesis. Here you should explicit your results and argue based on it.*

We modified the sentence to make sure that the reader understand that we are discussing actual results.

*Pg. 9; Line 86: What do you mean by that?*

To track the climate is to migrate following the changes in the environmental condition required by the species. This is a common word in the climate change literature. To confirm my statement, the reviewer can check the following document of the IPCC, which uses the term ‘track’ multiple times:

https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/ar5\_wgII\_spm\_en.pdf

*Pg. 10; Line 89-90: It is not the temperature what “moves” the species, it influences species to move to higher altitudes.*

The sentence was modified accordingly.

*Pg. 10; Line 210-213: Where are these results?*

As answered before, these conclusions are based on the differences among the RCP models results. Mainly shown in the figure 1.

*Pg. 16; Line 338: Please review the coordinates from your table. Some are lacking minus (-) sign.*

Thanks for the reviewer for catching this mistake. It has now been corrected.