GENERAL COMMENTS

This research presents a novel approach to habitat suitability modelling based on climatic parameters. The approach is based on the calculation of an index which is conceptually simple, theoretically well-founded, easy to understand and versatile.

The authors clearly explain the advantages and the limits of their approach. The new approach is described in a clear and detailed way, and then applied to arthropod data to show how it works.

The study is surely interesting and has a great potential, especially given the importance of modelling species' climatic niches to forecast how species distributions will be affected by the ongoing climate change. Although the authors developed their approach for modelling arthropod distributions, it can be applied to a diversity of taxa, and hence has a general validity.

The results of the applications shown in the manuscript are clear and convincing.

The manuscript is well-organised and easy to follow.

We are grateful for the reviewer's helpful comments. Please find our responses below (in red text).

In general, I do not have any major concern, but I can offer a few suggestions which might improve manuscript readability and appeal.

SPECIFIC COMMENTS

Title

I think the title does not adequately explain the importance of the paper. Also, the expression "for ecological habitats" sounds me not very appropriate. I would suggest something like: "A new climate suitability index for species distribution modelling applied to terrestrial arthropods in the Mediterranean Region".

The title suggestion is received with gratitude and will be applied in the upcoming version.

Introduction

The Introduction is very well articulated. However, at lines 24-28, I suggest introducing some references supporting these sentences. In fact, they may appear obvious to any reader sufficiently familiar with arthropods, but not for people working on other subject. Thus, including a few, very basic references, may be useful for a broader readership.

69: I'm not convinced that the sentence "This study utilises RCM data to evaluate the effects of climate change on terrestrial arthropod habitats, introducing a novel" really describes the contents of this manuscript, as the authors do not use their approach to model future distributions, but current ones (although it can be actually used also for modelling future distributions). Thus, I would

suggest writing: “This study utilises RCM data to evaluate the influence of climate parameters on terrestrial arthropod distribution patterns, introducing a novel”.

74: Similarly, I suggest changing “and demonstrate its applicability in assessing climate change impacts onarthropod habitats.” to “and demonstrate its applicability in modelling arthropod species distribution on the basis of their climatic niches.”

The suggestions above are understandable and will be applied in the upcoming version.

Methos

Methos are clearly illustrated. However, I think that the paper might more appealing, especially for a broader readership, if the use of the selected species is better justified. Why did you used these arthropods, and not others? For example, I would explain that these are representative of different sampling densities, trophic roles, dispersal capabilities, climatic preferences, and so on. This information might be presented in the main text and neatly summarised in Table 1 (where differences in sampling density is already apparent).

Also, it is not well explained what the percentage bias is. Please, introduce a clear definition.

The suggestions above are understandable and will be applied in the upcoming version.

Typos/style/ miscellanea

Although is accepted to consider data as singular, it is actually the plural of datum. Thus, I suggest using it as plural. So, at line 52: “resolution; Karger et al., 2017) is preferred” -> “resolution; Karger et al., 2017) are preferred”

While we acknowledge that data is etymologically the plural of datum, it is also widely used as a collective noun (such as council, team, public, or swarm), as noted by Oxford Dictionaries. In such contexts, data is often treated as a singular, though its usage has sparked ongoing discussion in academic circles. With respect for these differing perspectives, we will continue to use data as a collective noun in this context.

I’m aware that most people use species’ also to indicate possession when the noun species is treated as singular. However, in such a case, species’s should be used (see Chicago Manual of Style):

Species': Used to indicate possession when the noun species is treated as plural. Example: "The species' habitats were destroyed." (The habitats belonging to multiple species were destroyed.)

Species's: Used to indicate possession when the noun species is treated as singular. Example: "The species's survival is at risk." (The survival of a single species is at risk.)

Thus, line 99 climatological component of a species’ ecological niche-> climatological component of a species’s ecological niche

The suggestions above are understandable and will be applied in the upcoming version.

Fundamental niche and realised niche are well known terms in ecology, but to help readers not familiar with their meaning I suggest providing a definition. In particular, I suggesting clearly indicating that your use of fundamental niche refer to the climatic niche.

15 This study introduces a simple index designed to assess the climate suitability of ecological habitats, with a specific focus on terrestrial Mediterranean arthropods -> This study introduces a simple index designed to model species' distribution on the basis of their climatic nice, with a specific focus on terrestrial Mediterranean arthropods

62: Delete "small and". I would not define the Mediterranean a small area.

65-66: I suggest including a few references supporting the association of arthropods with microclimates

75: "on certain terrestrial arthropod habitats, a critical analysis" -> ""on the distribution of certain terrestrial arthropod, a critical analysis"

80: I think that "necessary" is not the best choice here. I would say: "Hence, a collection of locations where the organism was observed can describe the range of climate parameters of its fundamental niche"

84: indices include, annual-> indices include annual

87: The ideal conditions for s would occur when -> The most appropriate conditions for s would occur when

89: the climate index becomes less ideal, -> the climate index identifies less favourable conditions,

The suggestions above are understandable and will be applied in the upcoming version.

109: I would avoid using "to test", as this is not a statistical test.

We have changed "test" to "evaluate" in the upcoming version.

117: add reference: Buzzetti, F.M., Fontana, P., Hochkirch, A., Kleukers, R., Massa, B. & Odé, B. 2016. Brachytrupes megacephalus (Europe assessment). The IUCN Red List of Threatened Species 2016: e.T64550733A70738413. https://www.iucnredlist.org/species/64550733/70738413 Accessed on 10 January 2025.

The suggestions above are understandable and will be applied in the upcoming version.

118 is ns = starting sample size (i.e., number of occurrences)?

Yes, this was clarified in the upcoming version.

128: impacts -> influence

129: indices (Coppola, Nogherotto, et al., 2021 -> indices (Coppola et al., 2021

The suggestions above are understandable and will be applied in the upcoming version.

157-158: This part is not very clear to me.

This is a mistake in the referencing system. It will be applied in the upcoming version.

221: Table 1, provide the opportunity -> Table 1 provide the opportunity

248: Figure 7 clearly reveals that instead, the -> Figure 7 clearly reveals that, instead, the

259: assessing the climate suitability of ecological habitats, with a -> assessing climate suitability for species' occurrences

263: This sentence is not very appropriate, as you did not use the new approach to predict future changes. I would reformulate it to stress that the new approach allows a suitable representation of species distribution on the basis of their climatic niche and hence might represent an important tool to model future change in response to climate change.

386: Recognizing -> Recognising (British English)

290: of any given species' habitat -> of any given species's niche

293: customization -> customisation (British English)

The suggestions above are understandable and will be applied in the upcoming version.