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

**Specific Comments:**

This study uses the index to assess the climatic suitability of terrestrial arthropod populations in the Mediterranean in the recent past (1980-2010 and 1995-2004) and does not provide any information about the future. Therefore, the following sentences are misleading and should be amended to accurately reflect the study.

line 19: *"*aiming to shed light on how climate change could affect their fundamental niches.*"*

line 69: *"evaluate the effects of climate change on terrestrial arthropod habitats,.."*

line 77: *"a critical analysis given the anticipated direct impacts of climate change on countless species."*

Authors should emphasize that the study evaluates the performance of the metric in the recent past using hindcast RCM data, and if it is found to perform well, it could be used to assess the impact of climate change on terrestrial arthropod habitats. The time periods (1980-2010 and 1995-2004) should be clearly stated in the Data & Methods section.

We agree with the suggested clarifications and will implement them in the next version of the manuscript.

Another concern is the temporal and spatial resolution. Authors should provide datasets with the same temporal and spatial resolution to be compared. This means that the Ens6 and EOBs datasets should also be examined in the period 1995-2004 in order to be compared with the WMD03 dataset.

We also agree with the reviewer that the temporal resolution should match for all datasets when comparing the different datasets. This is especially important for Figure 7 – and we can use the 1995-2004 time period for the EOBS and Ens6 datasets to match the time period of WMD03. However, we would suggest keeping the complete 1980-2010 time periods for the remainder of the analysis (Figures 1, 3-5) as a 30 year time period is more reliable climatologically than a 10 year period (unfortunately extending beyond 10 years for the WMD03 dataset is not attainable at this time).

In the Data & Methods section, authors should explain how they get climate datasets to the same spatial resolution so that they can be compared and how the Ens6 has been calculated?

We agree with the reviewer that a clarification of this material is required. In the next manuscript we will clarify as follows (within Section 2.2): All ensemble members are at the same spatial resolution, however 2 members (CNRM-ALADIN63, and ICTP-RegCM4-6) required interpolation from their native grid to a common grid using a nearest-neighbour approach. To minimize errors, the indices listed in Table 2 were calculated individually before any interpolation. Furthermore, the final Ens6 product was obtained with the use of an ensemble mean of the indices associated with each member.

The article does not discuss the ideal geographical-climatic conditions for terrestrial arthropods in the Mediterranean in the present and how they might expand in the future. Where do we see most populations and where are their numbers expected to increase due to climate change?

Determining the ideal conditions of each variable (in their respective units, not relative EI values) associated with a particular species is possible, and would be informative to users. We would add necessary change to the scripts to provide this information for users. It is worth exploring this within the study as a confirmation (to users and readers) that no abnormal conditions are being defined as

"ideal". Such values could be included in table within the supplementary information, however, we would avoid depending on these quantities within the main text so as not to mislead the readers, given that we are using the same variables for each species.

We would also add some comments within the main text, based on the results in Figure 3, how the distributions in Figures 3a-h can be used to extrapolate on expected changes due to climate change. For instance, with the expected aridification of the Mediterranean, one would expect that the impacted regions would become less hospitable to the species in question given the importance of prsum (Figure 3b). We would also comment on tasmean (Figure 3e), where we would expect the ideal conditions to migrate north, as southern regions become less hospitable with increasing temperatures, and northern regions become more hospitable. Speculating on the remaining indices would more specialized assessment based on future simulations, but the combination of prsum and tasmean alone could already represent a potentially dangerous reduction in habitable zones.

What were the criteria for selecting the climate indices used in the study?

In section 2.2 we would add this information. The first variables considered to assess the environmental conditions preferred by a given species were temperature (due to its importance to an organism's metabolism) and precipitation (due to the importance of a water source). Given the importance of these variables and their variability throughout the year, the mean conditions together with upper and lower extreme conditions were also deemed important. Thus, indices were selected that represent these conditions for both temperature and precipitation. Given the size of arthropods, average windspeed was also included. Finally, as organisms are known to have a preference to specific altitudes, elevation was also included. Beyond the proof-of-concept these criteria can be used to list starting indices but should not be used as strict rules to be satisfied.

Have you also checked if RCMs perform well in the representation of the selected indices? I would suggest a state-of-the-art literature review on this topic in the introduction section.

The evaluation of the RCMs was limited to the Ensemble means given the extensive research on individual EURO-CORDEX members conducted in Teichmann et al. (2021), Coppola, et al. (2021), and other studies. However, we will include the expand appropriately on this matter within the literature review.

How do you explain that p0.1 increases for n>4000 (see Figure 7)?

The higher values are associated with the RCM results for S. pandurus and X. violacea, which suggests that this "behaviour" may be attributed to the dataset, resulting in significant variation within the p0.1 value. It is possible that the bias in rx1day and/or hwfi (Figure 1), although small may result in variation within the p0.1 value – this could be explored by applying bias correction to the End6 dataset and evaluating the change. The change may also be related to the way subgroups of n "cluster" within each grid cell – hence given the lower resolution of RCM with respect to the CPM, or different grid of RCM with respect to OBS, this could result in variation p0.1. Verifying this hypothesis is more challenging, but we could gather some insight by analysing a subsample within a smaller area.

How do you explain that in Fig.3 a-c the EIs product is almost everywhere close to 1?

Given that the lower limit of the index of consecutive dry days is 0, these minimal drought conditions likely do not pose any additional stress to the species in question. We would be very happy to include this clarification, as further interpretation of the Figure.

**Technical corrections**

All technical corrections are achievable and will be addressed within the next manuscript.

**1 Introduction**

#1: line 30: Please add references that relate to the Mediterranean basin.

#2: line 38: I suggest you to move this citation list (Doblas-Reyes et al., 2021; Gutiérrez et al., 2021; Ranasinghe et al., 2021) at the end of the sentence.

#3: line 60: Please change the *"Coppola, Nogherotto, et al., 2021"* to *"Coppola et al., 2021"* throughout the text

#4: line 63: Please add references that relate to the Mediterranean basin.

#5: line 67: Please add references.

#6: line 71: what does this mean "*or experiments*"?

**2 Data & Methods**

#7: line 118: *ns* should be consistent throughout the text

#8: line 144: *please change "by the ECMWF-ERAINT" to "by the European Centre for Medium-Range Weather Forecasts ERA-Interim reanalysis (ECMWF-ERAINT)"*

#9: line 154: please change *"using the RegCM5"* to *"using the fifth generation regional climate modeling system, RegCM5"*

#10: line 155: please change *"driven by the ECMWF-ERA5 reanalysis"* to *"driven by the fifth generation ECMWF reanalysis for the global climate and weather, ERA5"*

#11: line 181: please indicate in the methods section that the EOBs is considered as the reference dataset

#12: line 181: Please explain how the data sets were combined.

#13: line 204: Please change *"this describes"* to *"they represent"*

#14: line 244: "*..but is almost consistently better than the Ens6." How is it better than Ens6?* Can you elaborate on that?

**Figures**

The resolution of the figures should be increased and the titles should be larger. Please add latitude and longitude to the maps.