

sDiv working group meeting summary

sTraitChange

How do trait responses to climate change translate into demographic rates and population dynamics?

Our first workshop focused on how we were going to set-up out two main objectives:

- carrying out a meta-analysis addressing the question of how climate-driven changes in traits affect demographic rates, and in turn, population dynamics across animal species worldwide.
- carrying out simulations to address the contributions of changes in mean and in variation of climatic variables to changes in traits, and in turn in demographic rates of the species.

With regard to the first objective, we i) identified additional potential data sources with which we will aim to extend the existing dataset, ii) formulated hypotheses about the expected pathways from climatic factor to demographic rates and population dynamics depending on the species life histories, type of the habitat they are living in and location of the population with regard to the species distribution range; and iii) discussed potential challenges and practical aspects of the analyses and agreed on the most appropriate ways to cope with them / take them into account.

With regard to the second objective, we spent quite some time discussing whether analyses of empirical data would allow separating the effects of changes in climatic means from those in variation. The views diverged. Generally, it seems like there is a possibility to address this question using empirically collected data, and we discussed whether we should write an opinion manuscript outlining the framework for doing so. However, since this is a rather controversial topic, we will keep our original idea and address this question with simulations first. Guillaume Chero presented a conceptual model that can be used to address these questions. The processes included in the model and its assumptions were discussed with a larger group and subsequently in a subgroup and several further improvements were identified.

We limited presentations to a minimum required to motivate discussions and get everyone on the same page. The presentations were given i) to set up the scene for the workshop and outline main challenges on which the decisions have to be taken during the workshop (Viktoriia Radchuk), ii) to present the current state of the dataset and its structure (Carys

Jones), iii) to highlight the challenge of dealing with density dependence when assessing the effects of climate-driven trait changes on demography and population dynamics (Tom Reed), iv) to present the preliminary results using SEM for already collated data (Viktoriia Radchuk), v) to discuss pros and cons of structural equation modelling and integrated population modelling when addressing our research questions (Bernt-Erik Saether, Martijn van de Pol and Stephanie Jenouvrier), vi) to present the simulation model developed to separate the effects of changes in means and variation of climate on traits, and, in turn, demography (Guillaume Chero). We also enjoyed and were inspired by the talk given by Nina McLean to the whole iDiv community 'Consequences of climate-induced trait changes on demographic and population dynamics'.

The balance between work on outputs/ general brainstorming and information exchange / participants presentations was approximately 25% / 50 % / 25%. Our discussion stimulated development of further ideas, beyond those envisioned in the proposal. As an example, we decided to test the appropriateness of SEM for our purposes by applying it to the simulated data closely mimicking our empirical data. We also agreed that a dedicated post-doc would be of great value for the overall project and for carrying on with these further ideas. Nina McLean would be an ideal person given her expertise on the overall topic, and we discussed possibilities of how further funding for her could be secured.

The working atmosphere in the group was positive and discussions very fruitful, even though on the first day it took us some time to find a common language. The meeting was very inspiring and some of the existing collaborations strengthened as well as a few new ones formed. Such successful and pleasant meeting would have not been possible without the support from iDiv. We are very much looking forward towards the second meeting in April 2019.