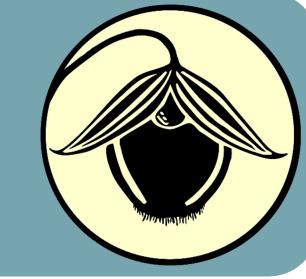


Mistletoe distributions and abundance in the forest canopy are vulnerable to climate change Kenneth Trang¹, Carol Wilson¹

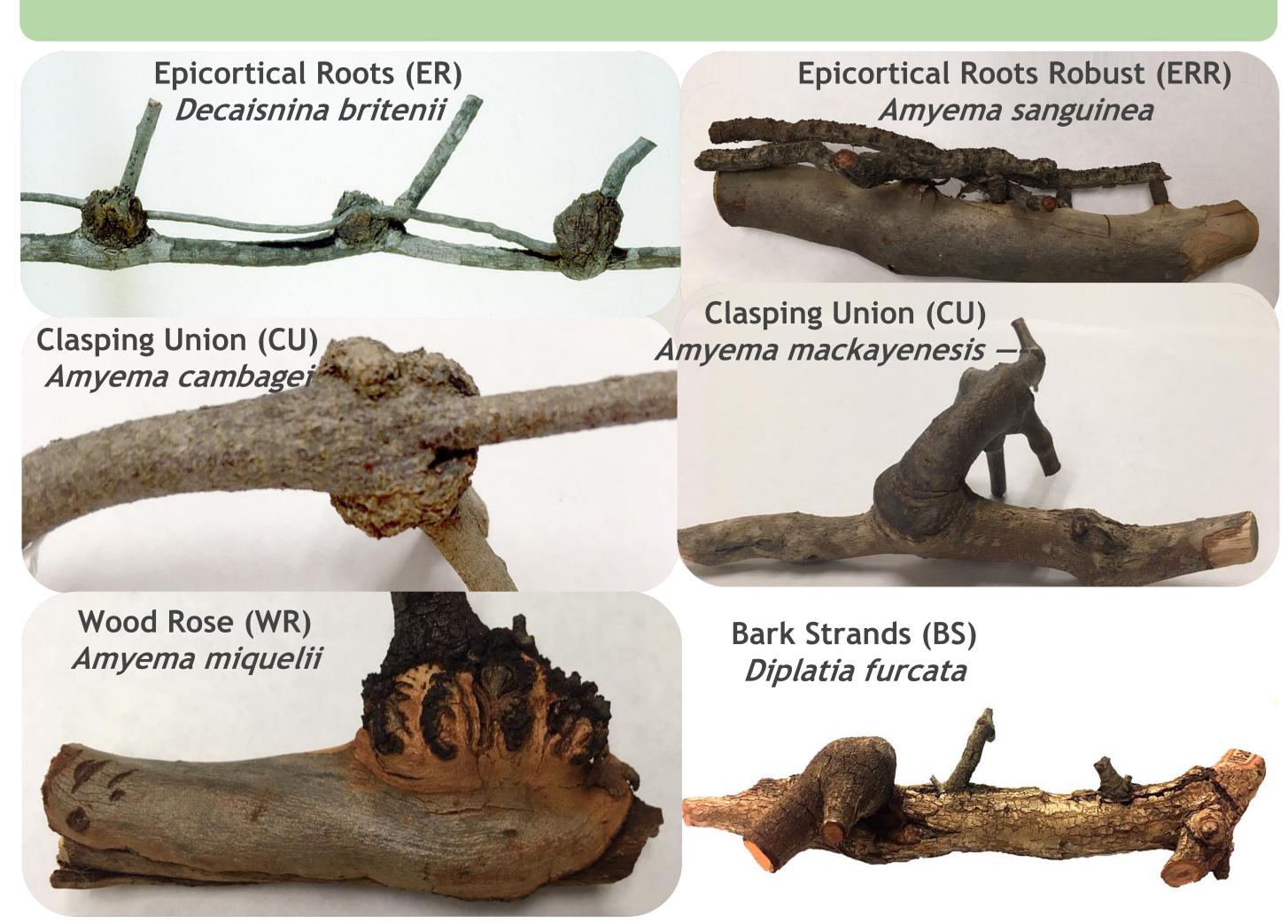
University and Jepson Herbarium, University of California, Berkeley¹

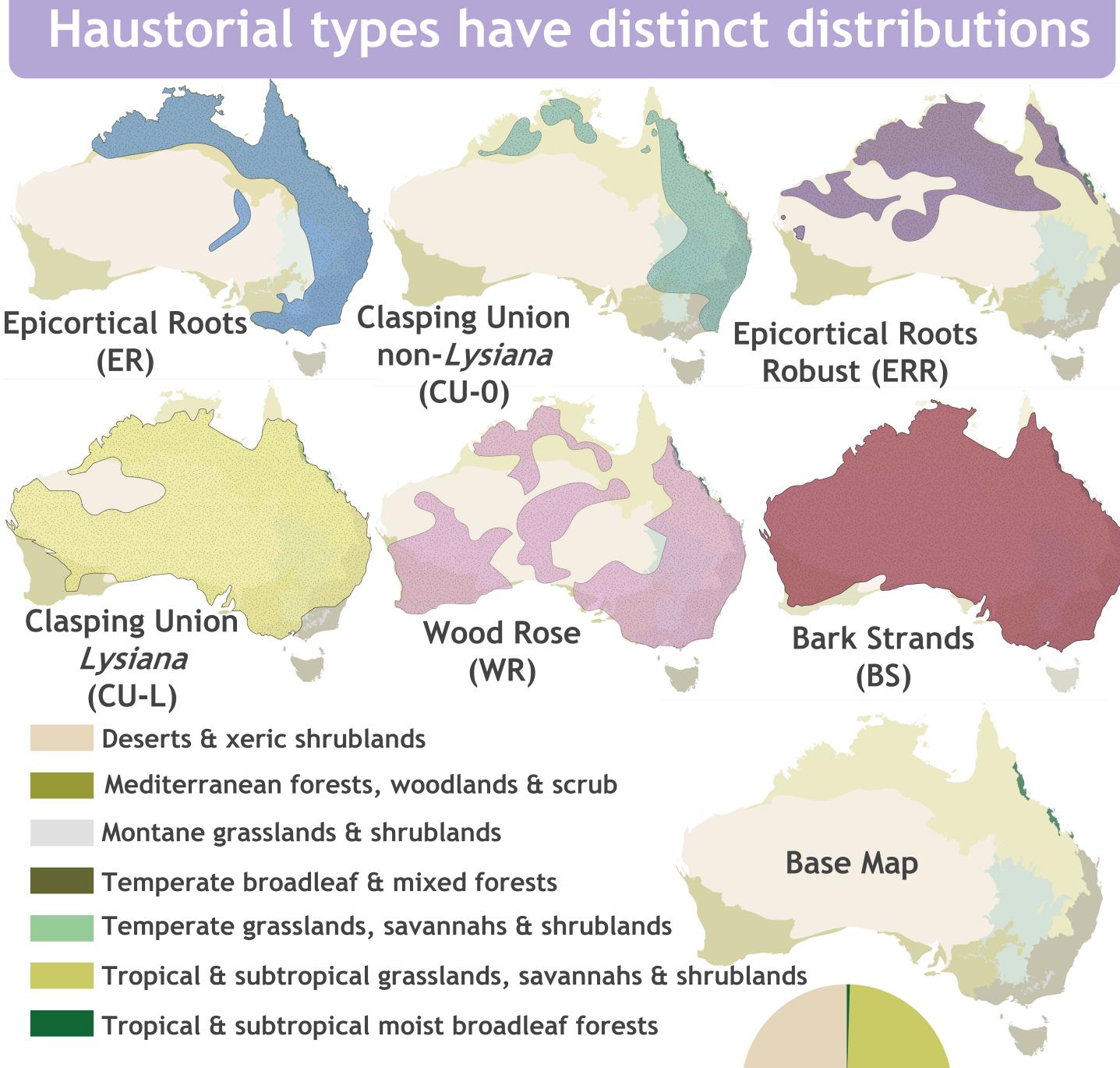


Introduction

Currently, mistletoe occurrence is largely attributed to host preference and availability, even though most mistletoes are generalists with smaller distributions than their host. Here, we investigate the effect of climate on mistletoe distribution in the context of their haustoria and construct models to predict future distributions in Australia.

Mistletoe feature diverse haustorial attachments





Relative Size of Each

Australian Biome

Distributions of each haustorial type were mapped onto a

base map detailing the seven biomes in Australia. Since

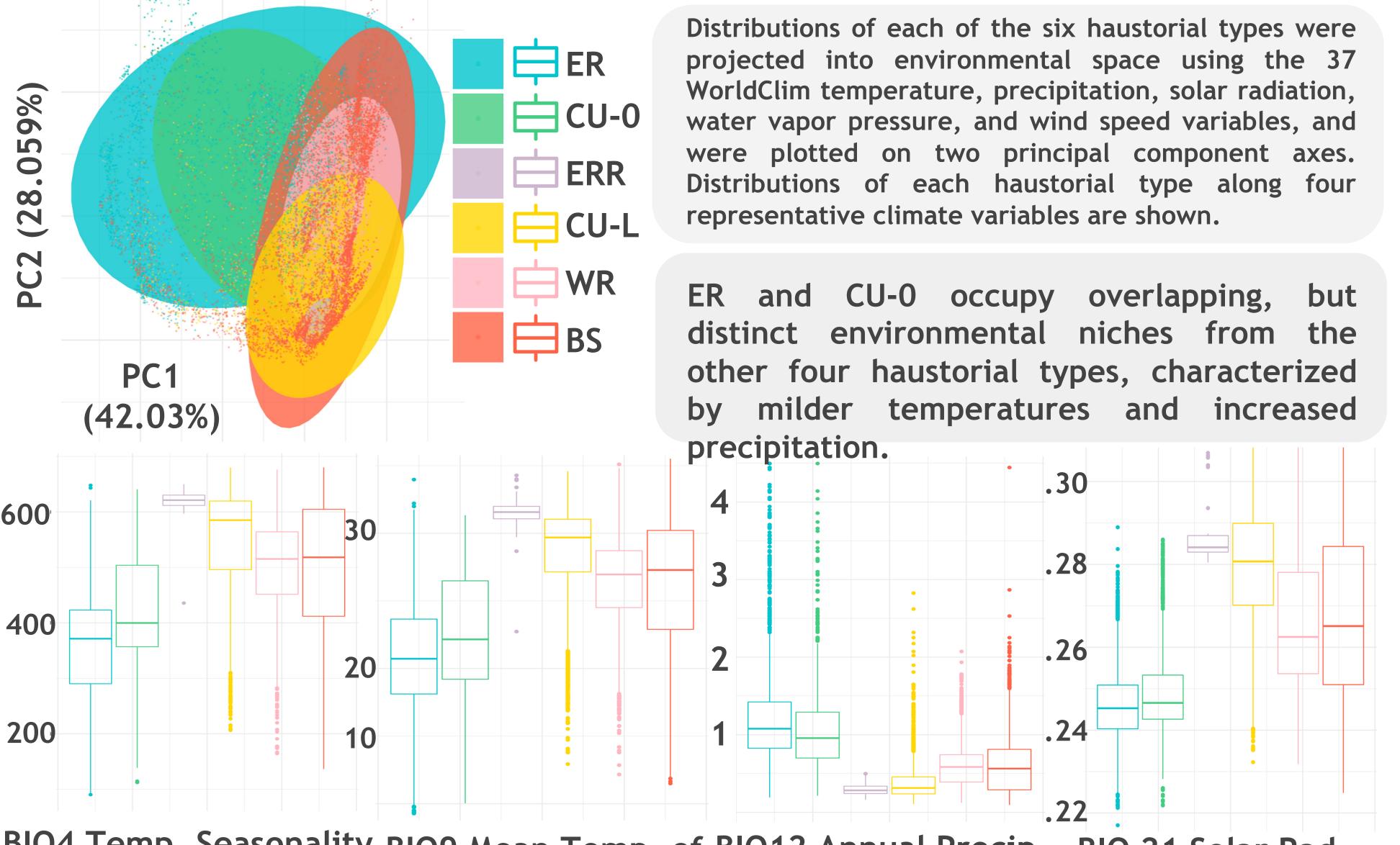
clasping union haustoria evolved convergently and

Lysiana (CU) inhabit distinct biomes from the other CU

genera, we chose to model Lysiana (CU-L) separately

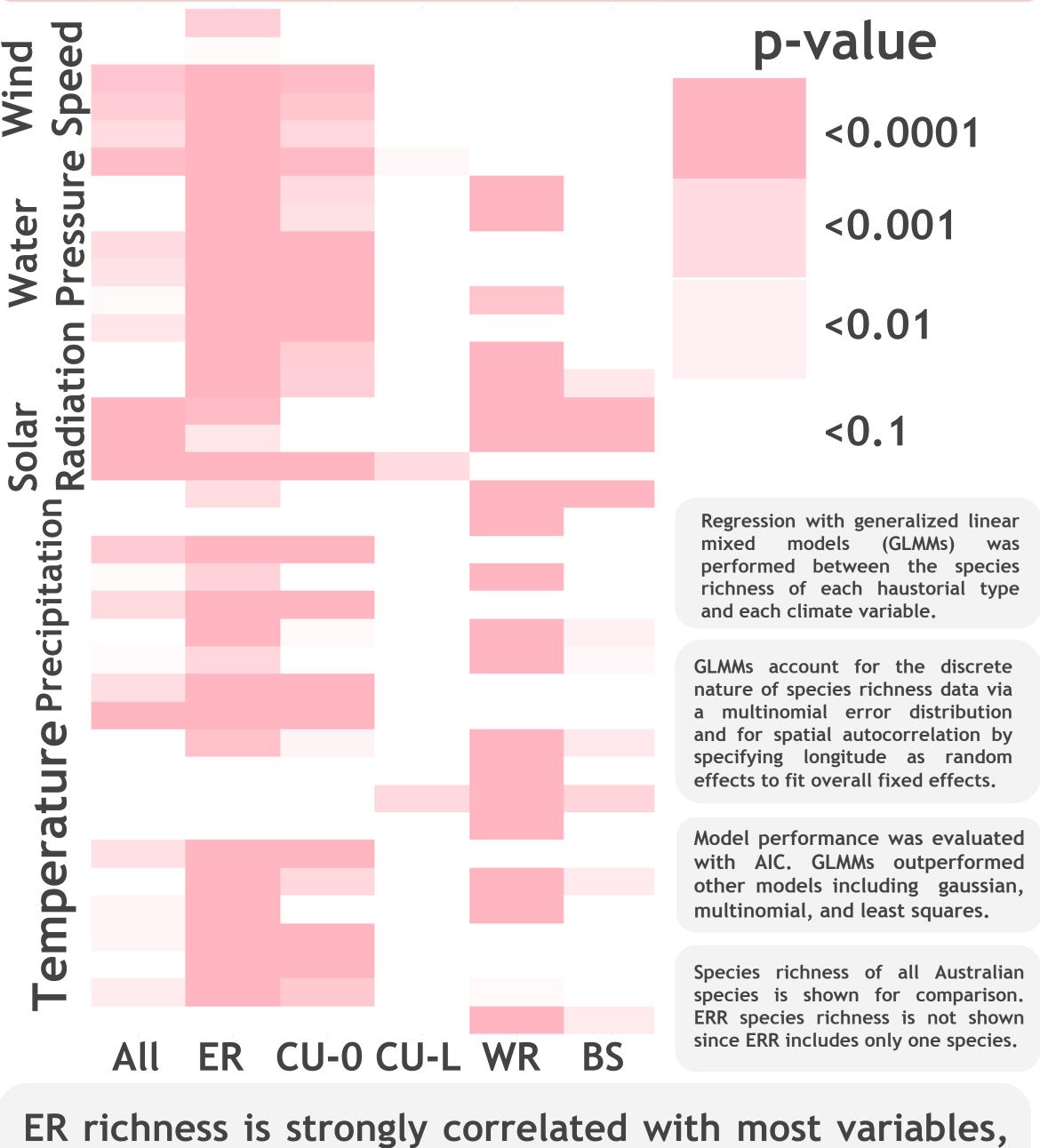
from the other three genera with CU (CU-0).

Haustorial types occupy two distinct climate niches



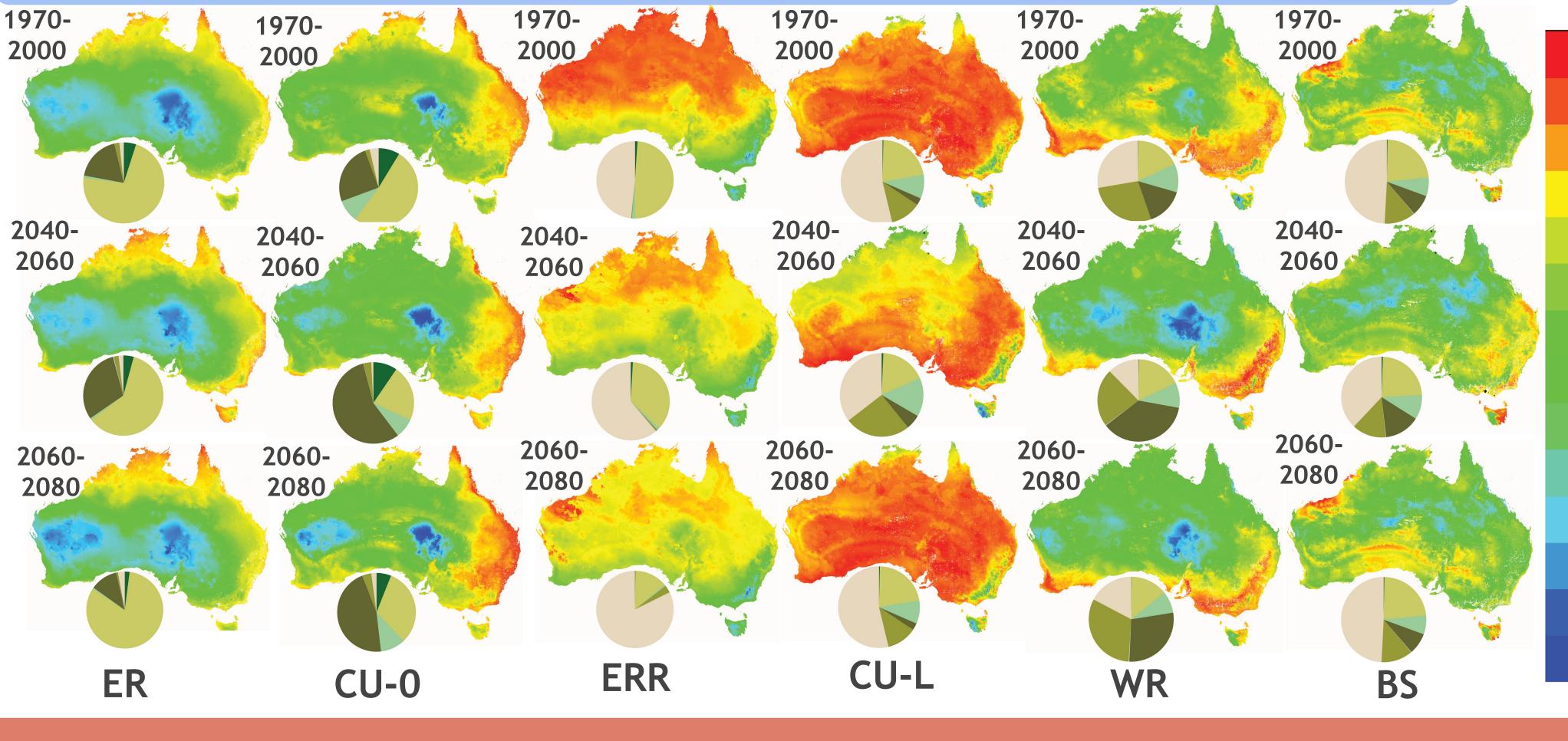
BIO4 Temp. Seasonality BIO9 Mean Temp. of BIO12 Annual Precip. BIO 21 Solar Rad. (standard deviation) Driest Quarter (°C) (m of rainfall) Mon. Max. (MJ m⁻² day⁻¹)

Species Richness & Climate



while CU-L and BS richness are not correlated or only weakly correlated with most variables.

Distributions are predicted to shift with their preferred biome



Conclusions

Each haustorial type features a distinct distribution, with ER, CU-0, ERR, and WR localized to particular regions, while CU-L and BS were found in most of Australia. Climate modeling suggest ER and CU-0 occupy a distinct climate niche from other haustorial types, characterized by more mild temperatures and higher precipitation. Regression between species richness and climate variables suggest that climate is important for ER, CU-0, and WR richness, but less so for CU-L and BS. Lastly, climate change models suggest ER, CU-0, ERR, and WR will shift with preferred biomes, while CU-L and BS will remain largely unaffected.

We estimated the probability of occurrence of each haustorial type for all locations across Australia for three different time periods using MaxEnt. Models were generated based on 11 climate variables selected to minimize variable correlation. Model performance across various parameters were evaluated with AIC to determine optimal model settings. MaxEnt models with 60,000 background points and B value of .25 performed best across all models. Sampling bias was adjusted by generating a bias layer containing all sampling of mistletoe in Australia. High relative probability of occurrence is represented in red, while low relative probability of occurrence is represented in blue.

Predicted 1970-2000 habitat for ER and CU-0 favor the northern and eastern coastal regions, characterized by mild temperatures and high precipitation. This preference increases in future models, with ER shifting towards the northern tropical regions and CU-0 shifting towards the eastern temperate regions.

Predicted 1970-2000 habitat for ERR favor Northern Australia, characterized by tropical grasslands and xeric deserts, with an increasing preference for xeric deserts predicted in future models.

Predicted 1970-2000 habitat for WR favor the southern and southeastern coastal regions, characterized by Mediterranean and temperate forests, with an increasing preference for temperate forests predicted in future

Predicted 1970-2000 habitat for CU-L and BS are similar to the relative size of each biome, suggesting that CU-L and BS are less affected by climate differences specific to each biome than other haustorial types. Predicted 2040-60 distributions shift away from the xeric region, but predicted 2060-80 return to similar distributions as 1970-2000.

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