Germination under eXtreme temperatures

Susanna Venn, Rachael Gallagher, Adrienne Nicotra

DEAKIN UNIVERSITY

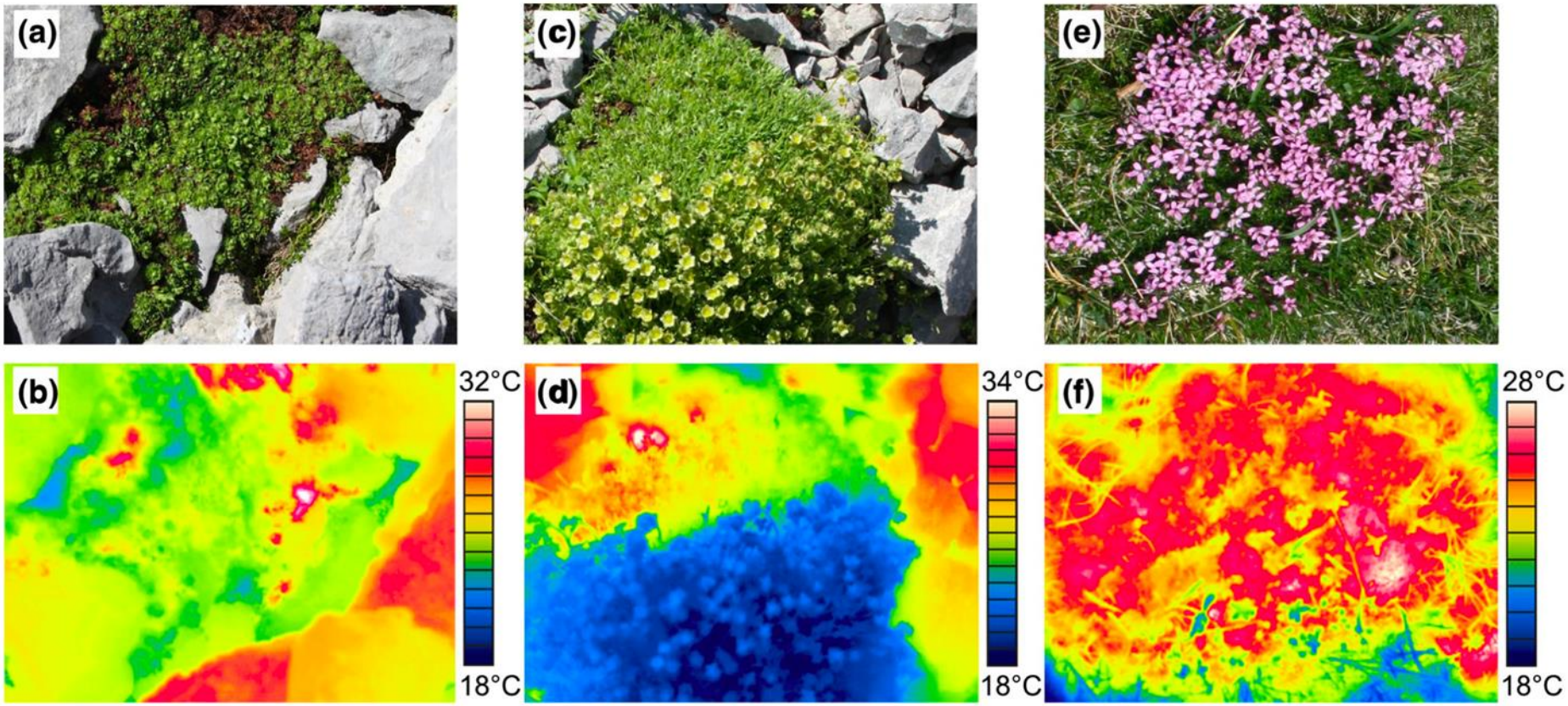
MACQUARIE University SYDNEY·AUSTRALIA

Australian National University

Australian Government
Australian Research Council

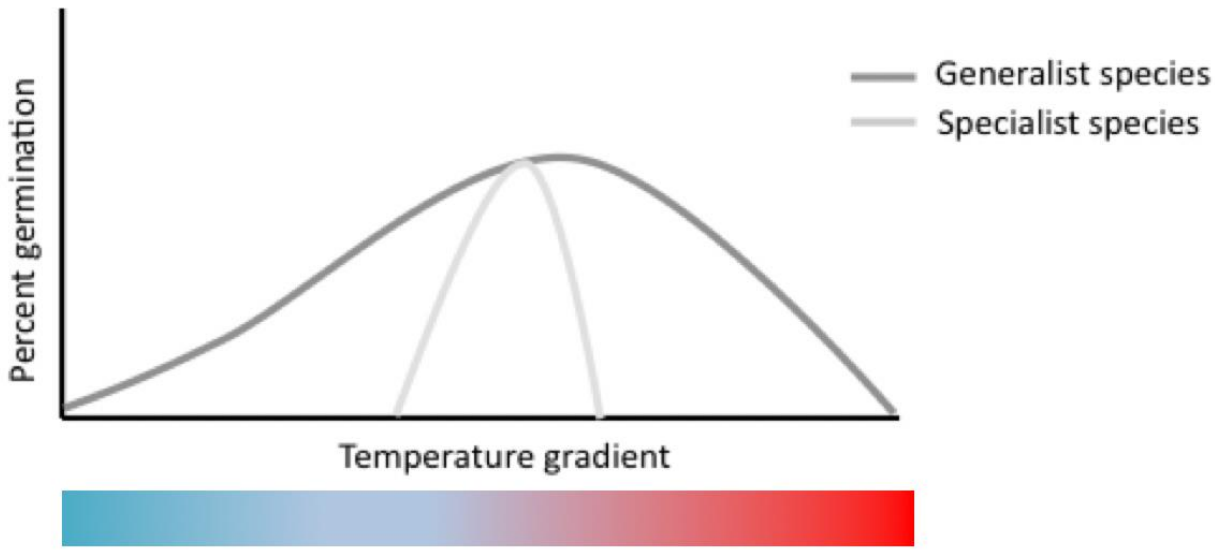
susanna.venn@deakin.edu.au
susannavenn.wordpress.com

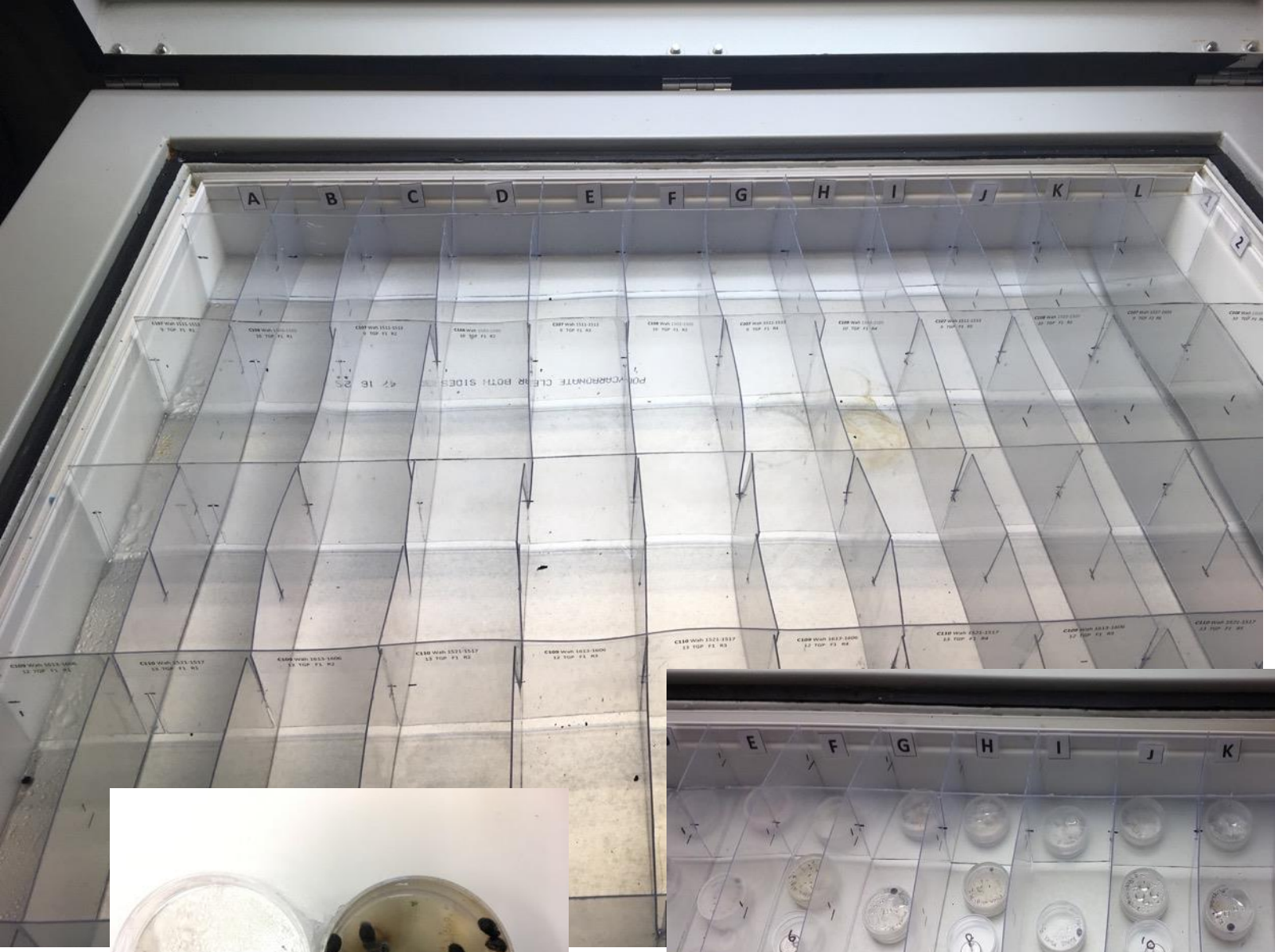
Ladinig et al. 2015 Oecologica



Saxifraga moschata in bud *Saxifraga moschata* in flower *Silene acaulis* in flower

- How do thermal extremes affect shrub germination and regeneration?
- Are alpine shrubs germination generalists or specialists?
- What does the germination niche of alpine shrubs look like?




A
B
C
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K
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1
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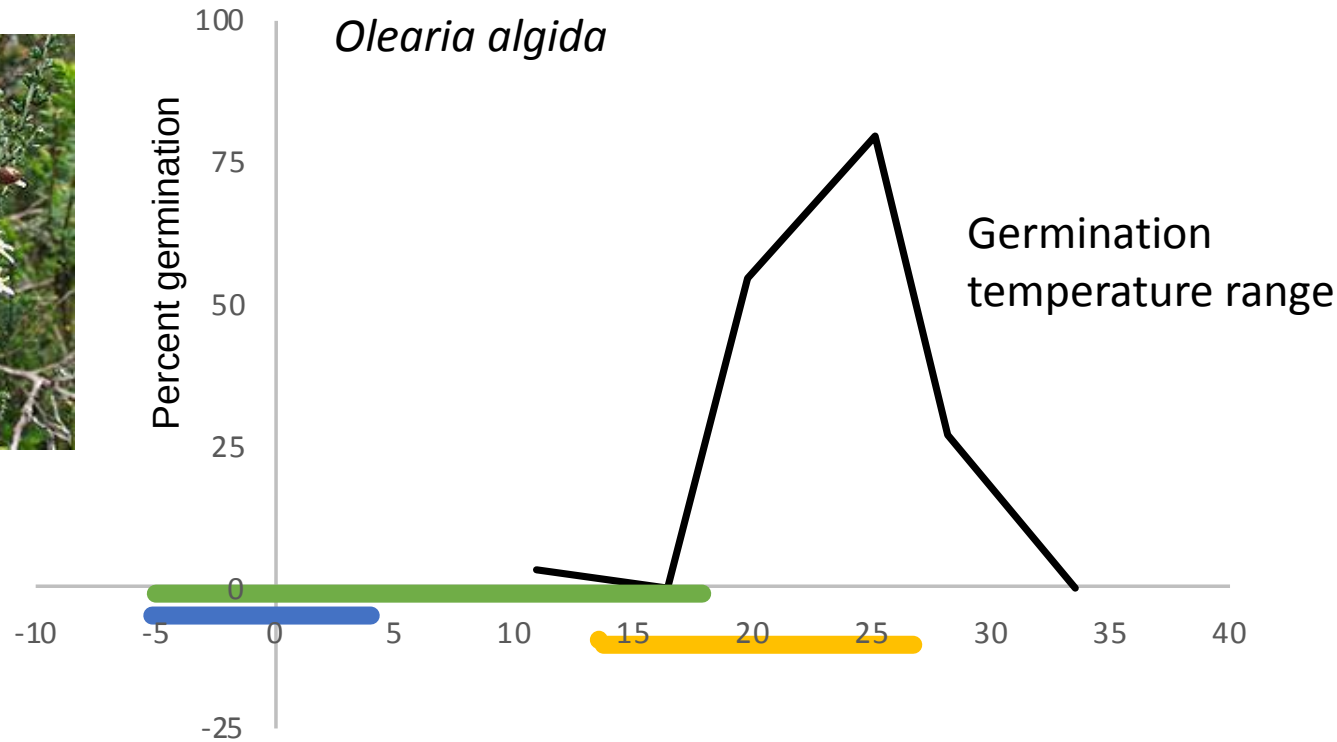
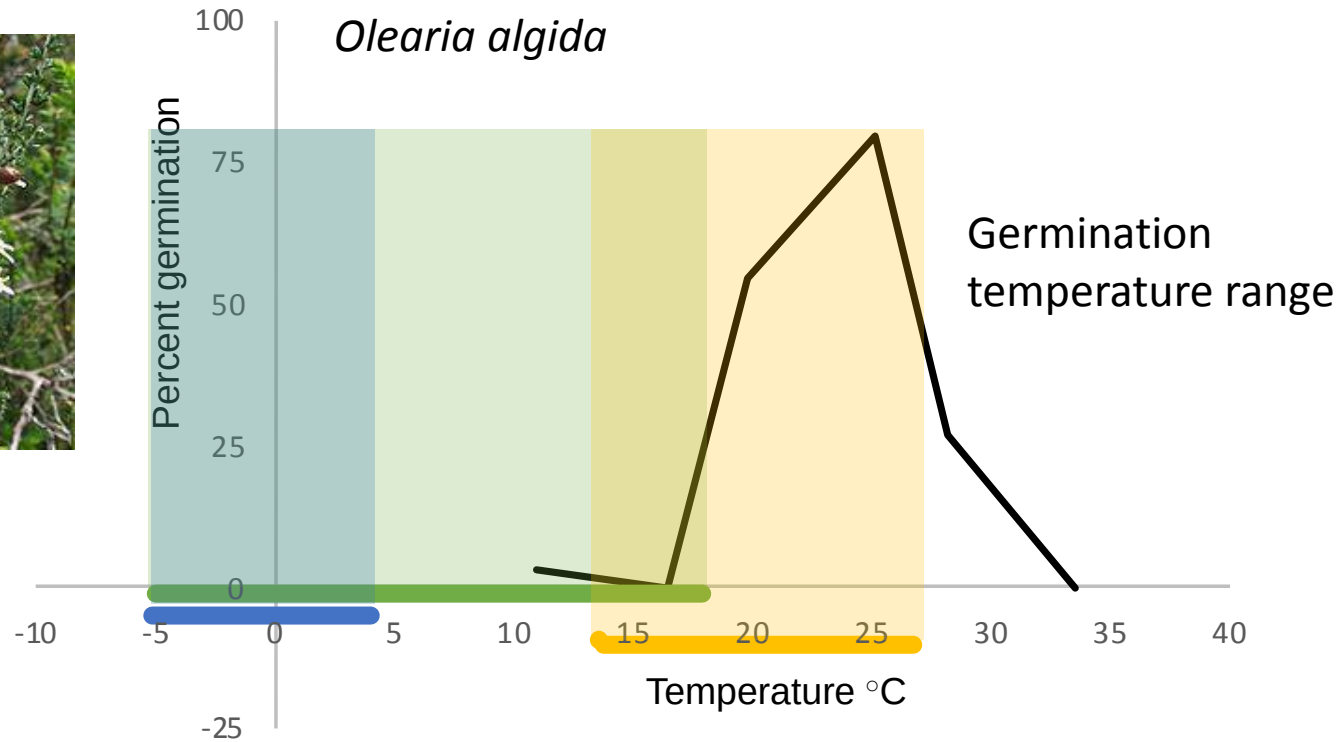
2
3
6
8
10
12

Germination niche of alpine shrubs



- Where across the <u>range</u> of the species could they germinate?
- Can we correlate breadth of germination temperatures and geographic temperature range?
- Can we make a ‘germination-envelope map’ to understand potential future distributions?

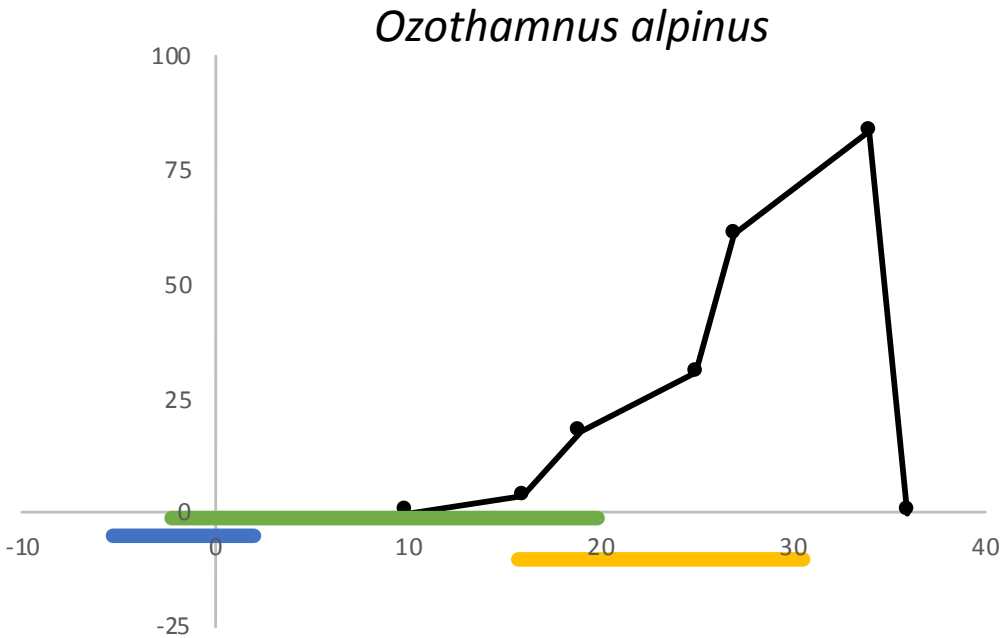
Germination niche of alpine shrubs

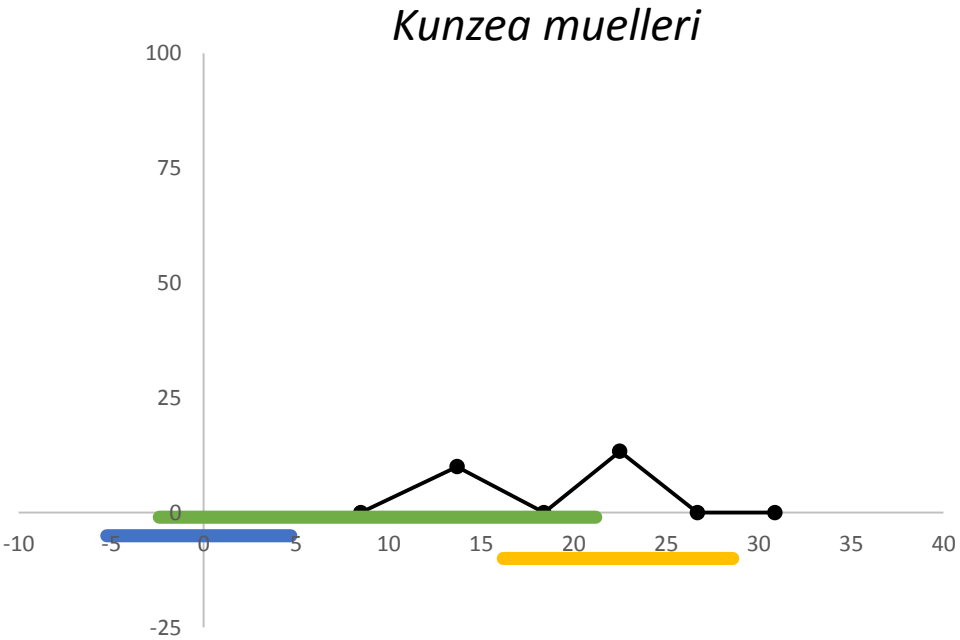


The accession temperature range: minimum temperature in the coldest month, to the maximum temperature in the warmest month, at the accession site

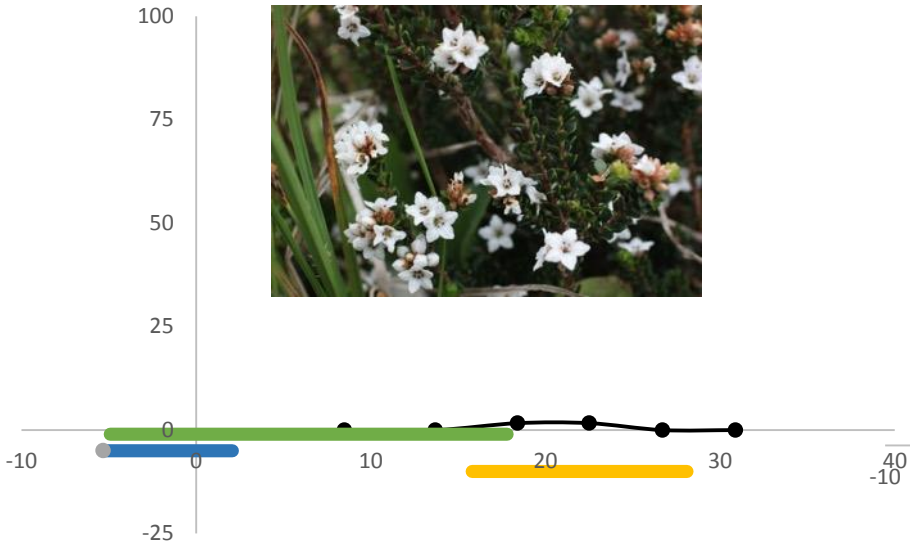
Min and max of the minimum temperatures of the coldest month across the species' range

Min and max of the maximum temperatures of the warmest month across the species' range

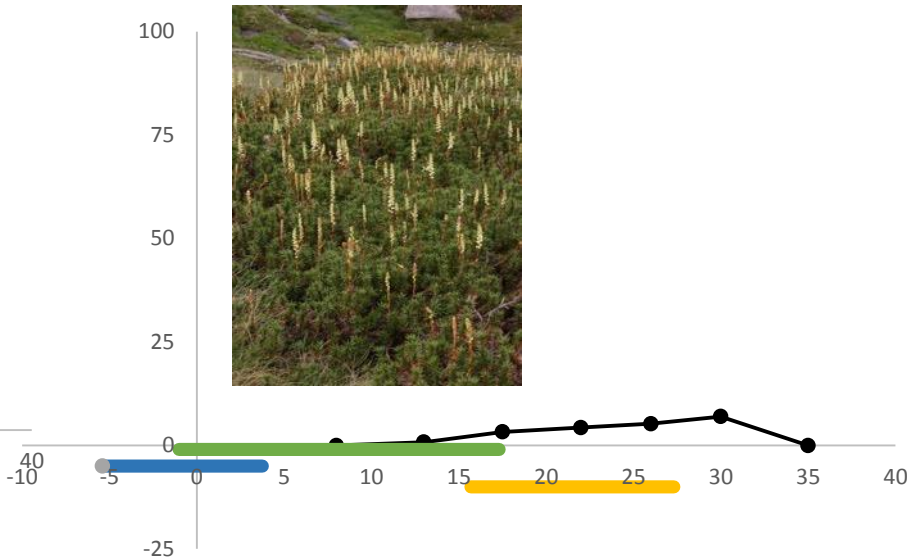

Ozothamnus alpinus
100
75
50
25
0
-25
-10
0
10
20
30
40


Kunzea muelleri
100
75
50
25
0
-25
-10
-5
0
5
10
15
20
25
30
35
40

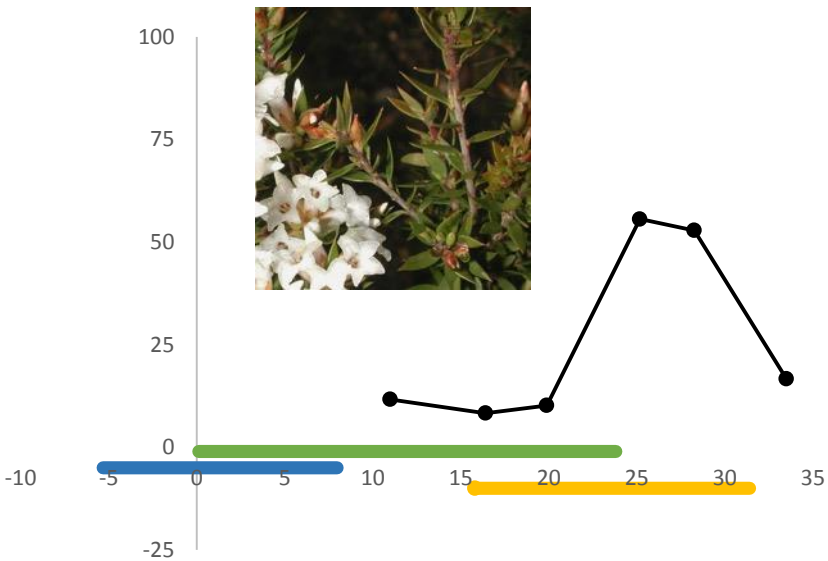
Epacris glacialis



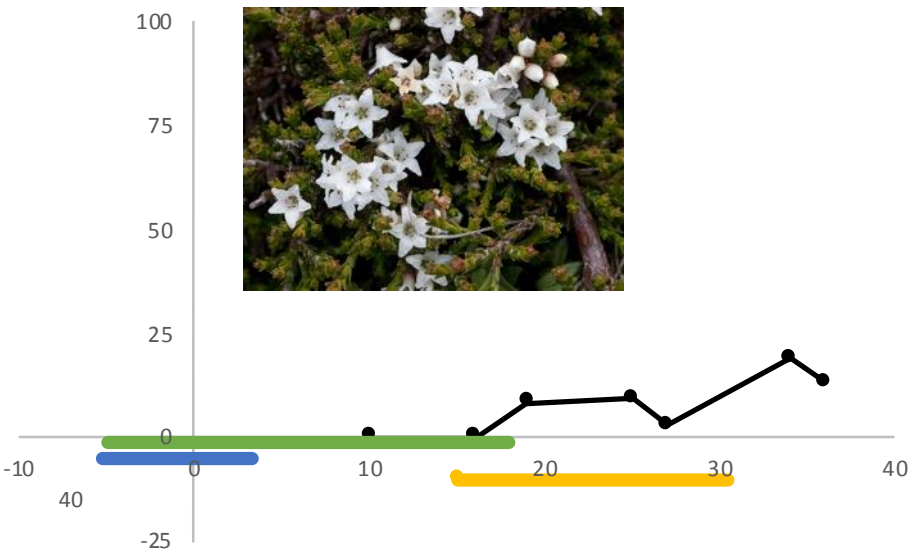
Richea continentis



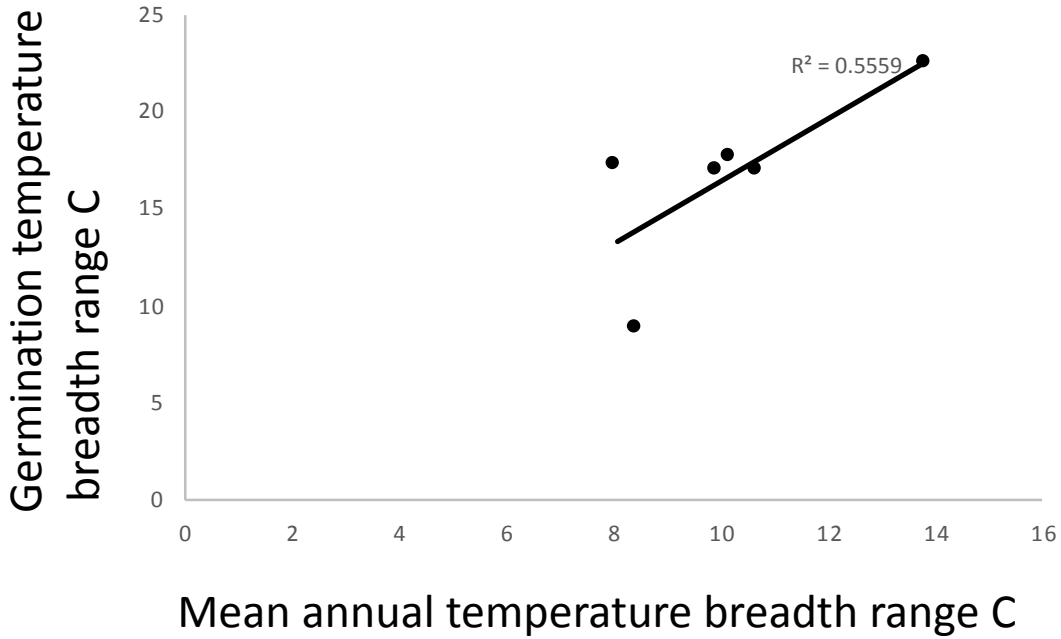
Epacris paludosa

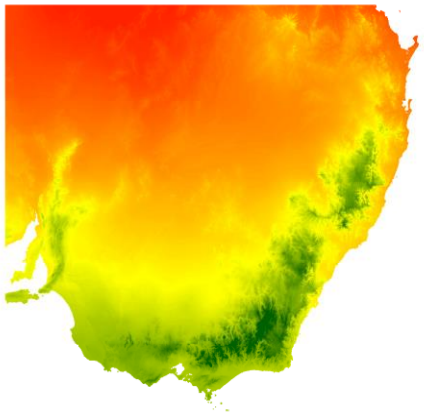


Epacris petrophila



Can we make a ‘germination-envelope map’ to understand potential future distributions?





Mean annual temperature (1990-2009 epoch)

current_1990-2009_bio1.tif

Value

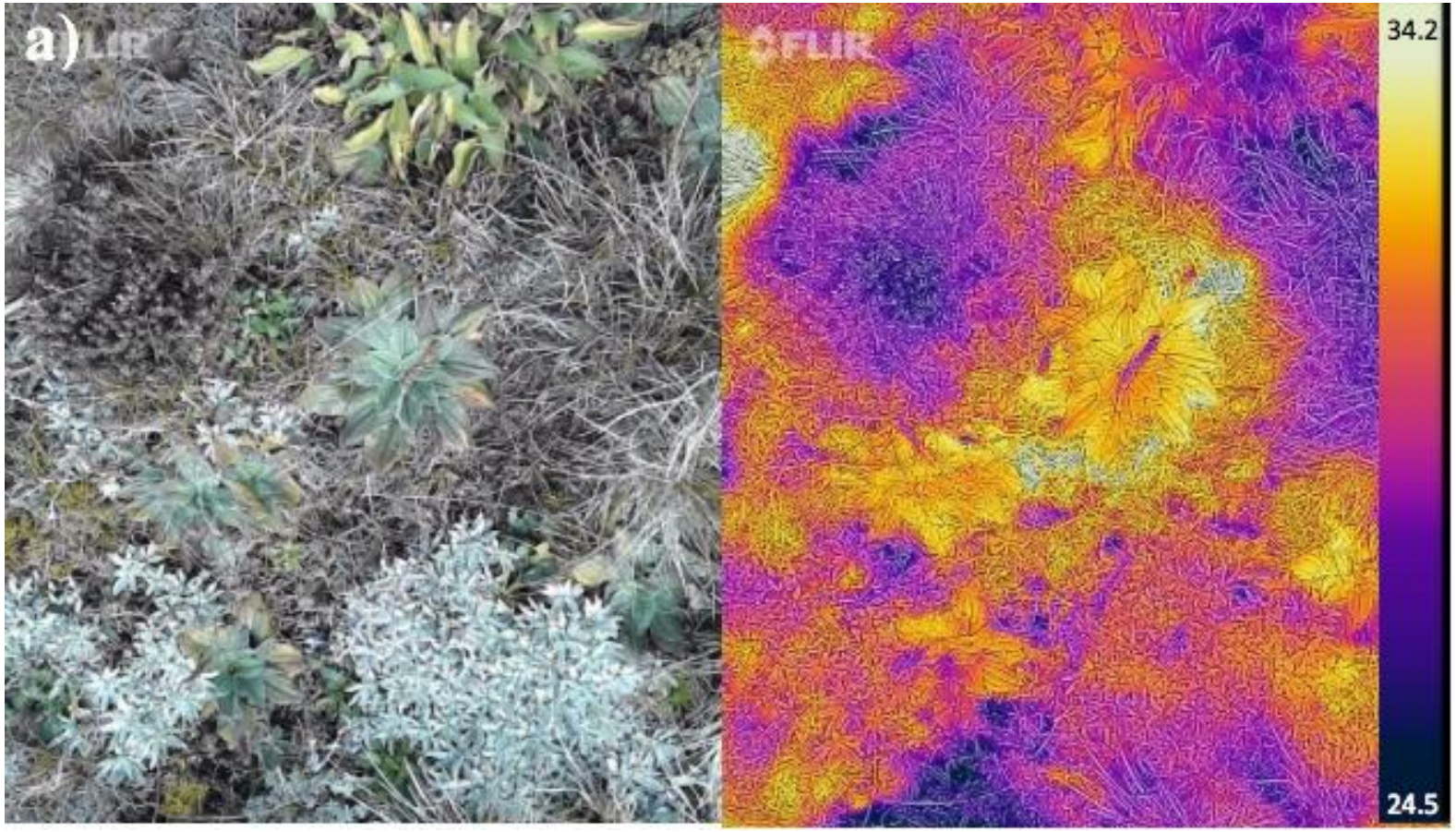
High : 24.355

Low : 3.80079

Highest mean annual temperature across the study region is 24.4 C.
Many species optimum germination temp is higher than this – e.g., higher than the mean temps in the field. Mapping future germination potential is impossible with mean temp data.

Take home messages:

- The germination niche among alpine shrubs can be broad
- Ambient and mean air temperatures are probably not useful at the plant level
- Understanding the microclimate will be more important for determining plant responses to changes in heat and frosts



Thinking of a PhD?

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– Woody plant encroachment
– Thermal tolerance of plants
– Plant adaptations to environment
– Community composition dynamics
– Treeline dynamics

Susanna.venn@deakin.edu.au
Susannavenn.wordpress.com

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