



Can alpine species “bank” on conservation?

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Alpine plant species

- Vulnerable to climate change – need for conservation
- Studies in Australia (Satyanti et al. 2018) and Italy (Mondoni et al. 2011) have shown that alpine species are **short-lived** in seed banks compared to low-elevation species

Heterotheca pumila



Saussurea weberi



Ipomopsis globularis



Physaria alpina



Castilleja puberula



Seed was collected from 5 alpine species to include in a germination and seed longevity experiment



Castilleja puberula

G3 and S2 in CO

22 occurrences in CO & MT



Physaria alpina

G2 and S2

Endemic to CO

6 occurrences



Ipomopsis globularis

G2 and S2

Endemic to CO

13 occurrences

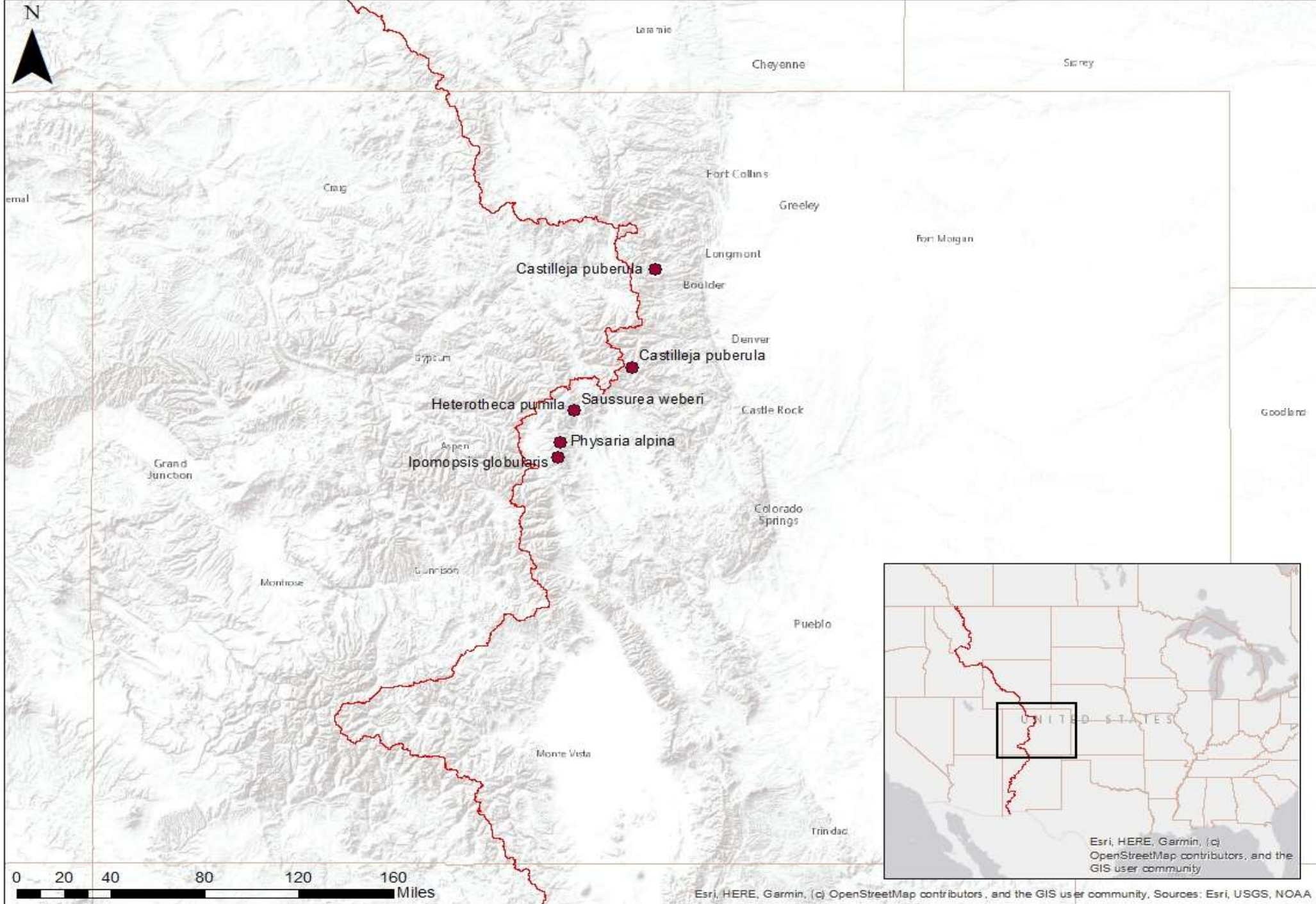


Saussurea weberi

G3 and S2 in CO

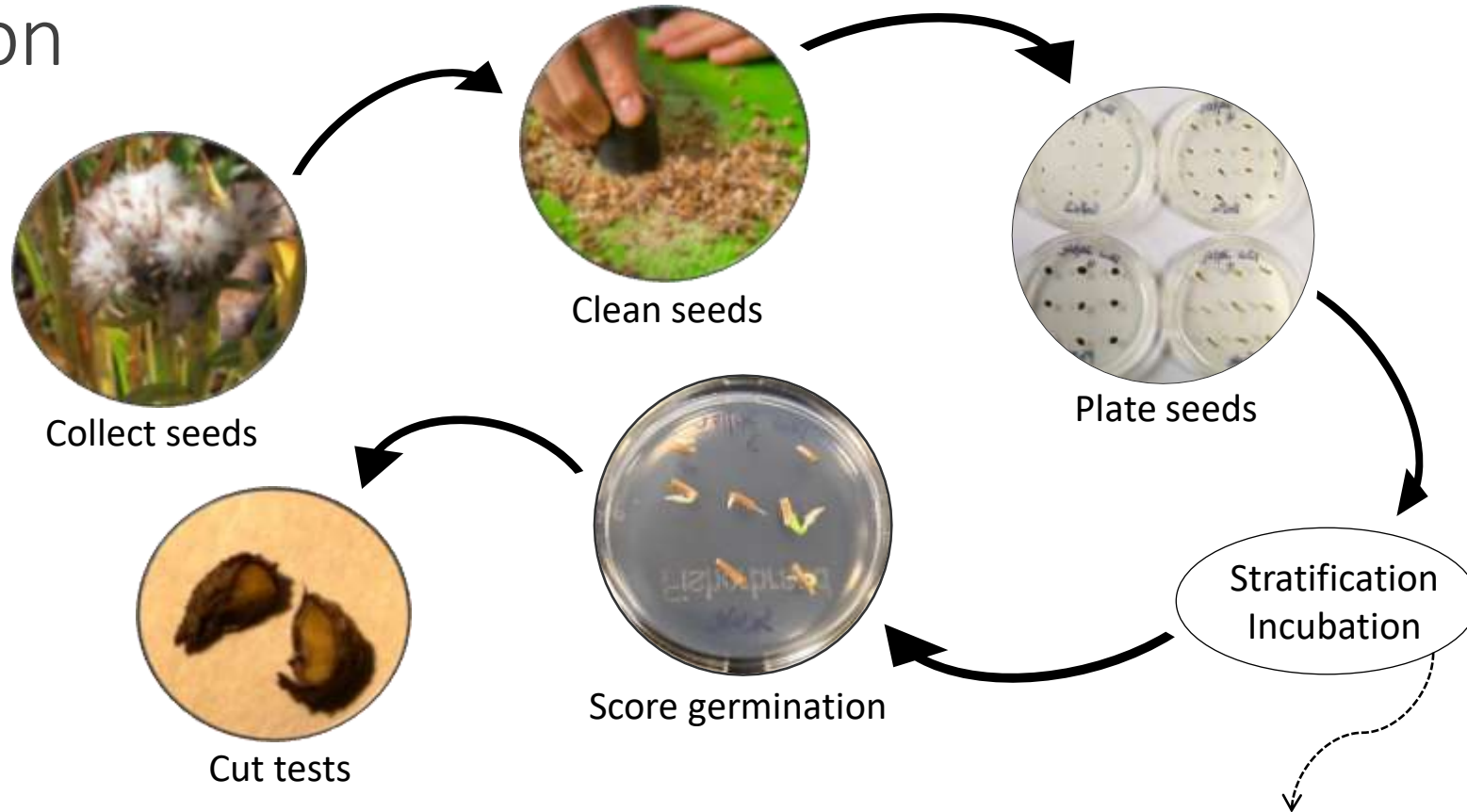
12 occurrences in CO,

MT, and WY



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

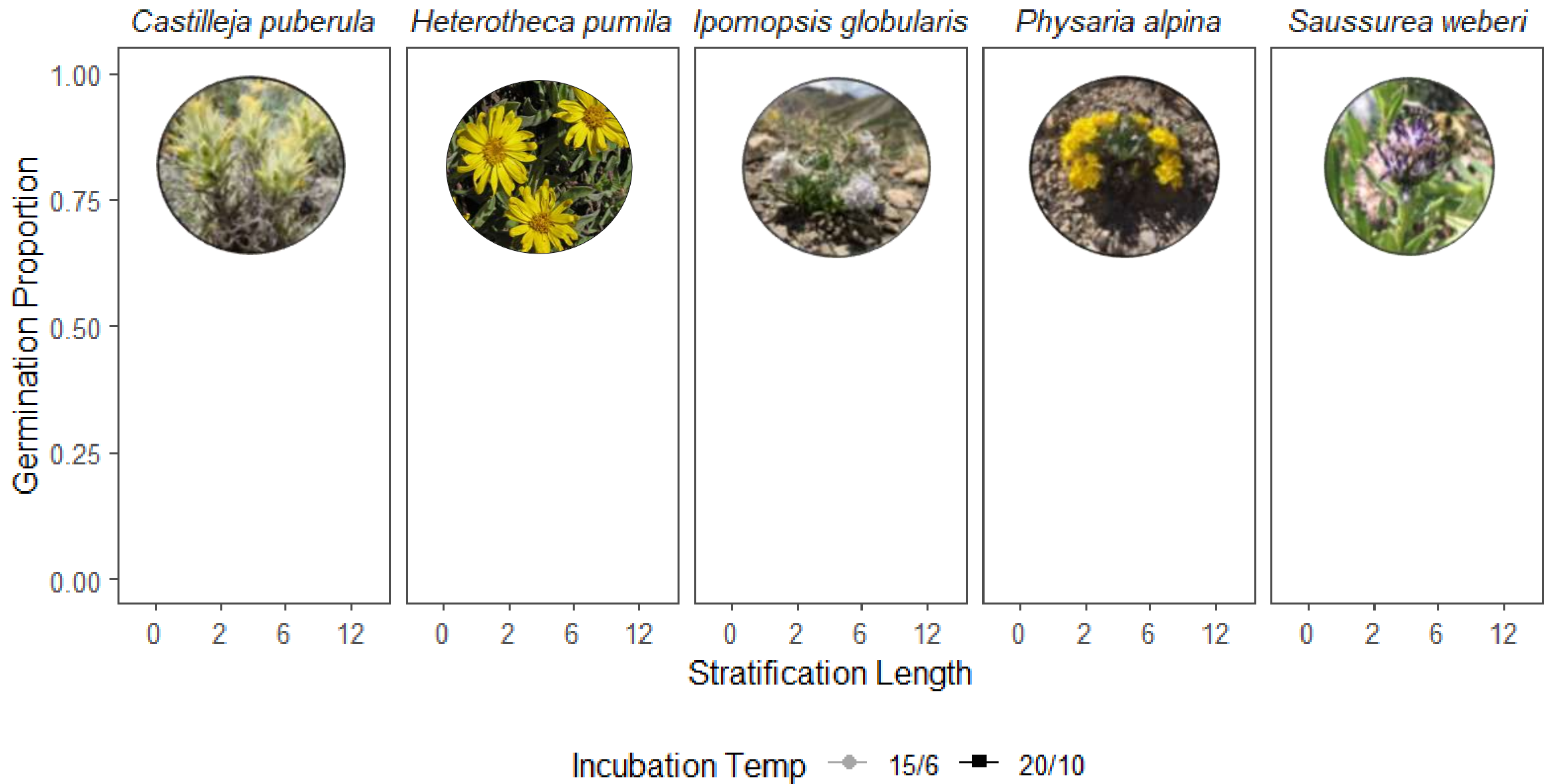
Germination Methods

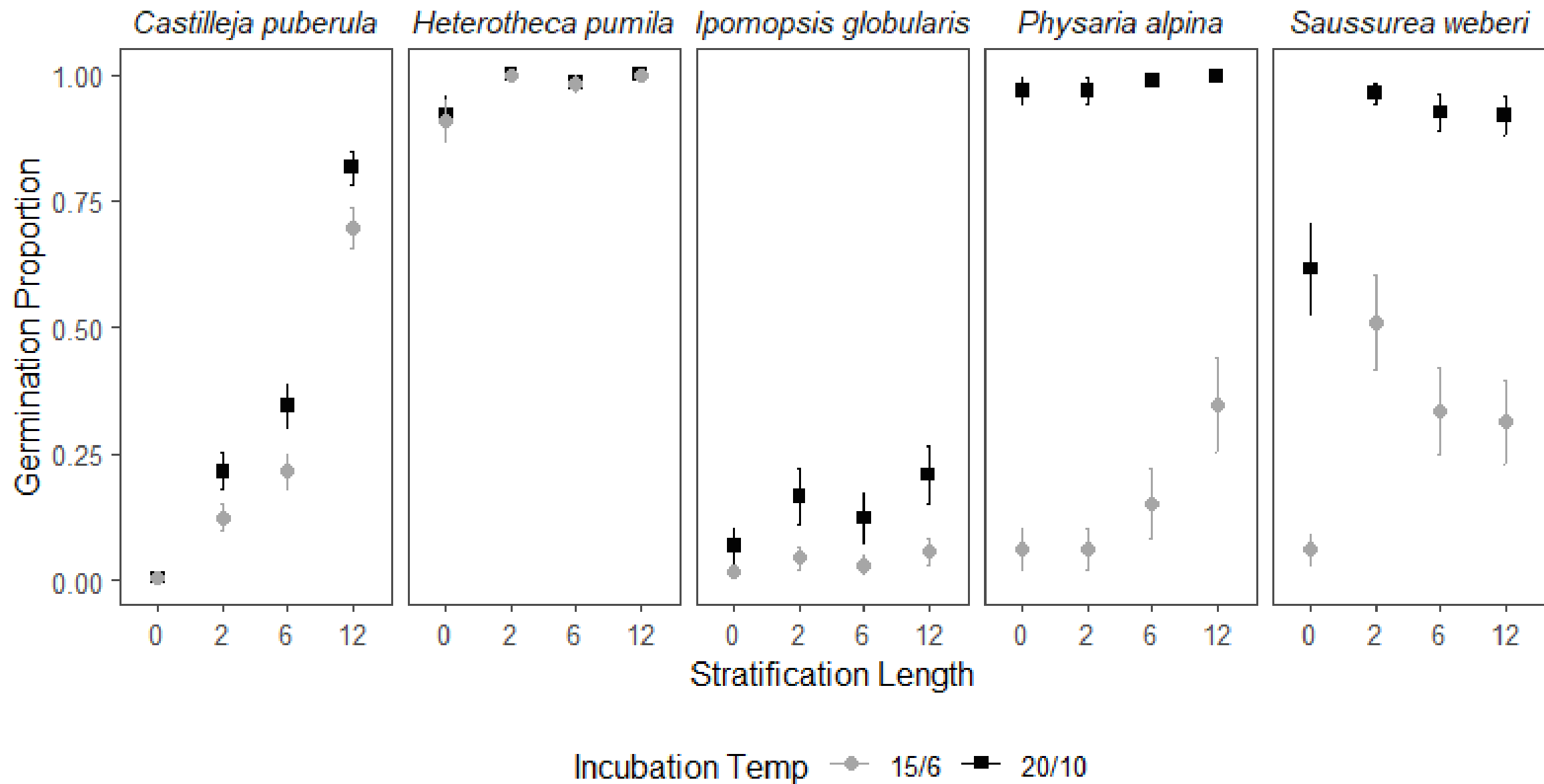


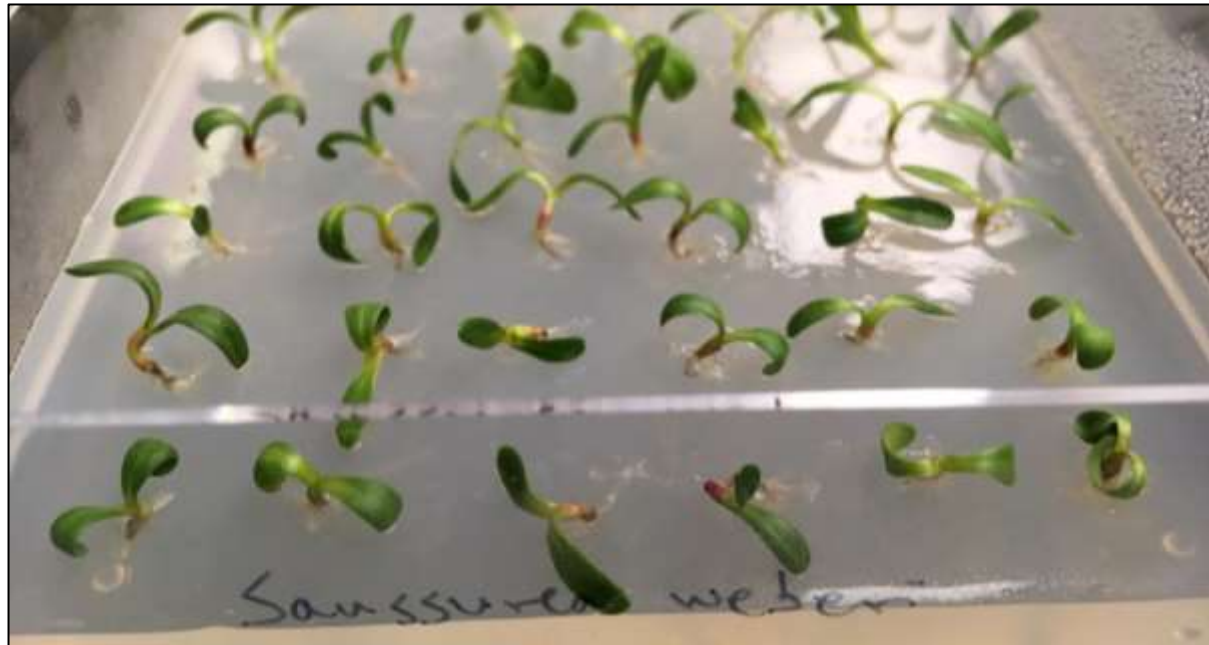
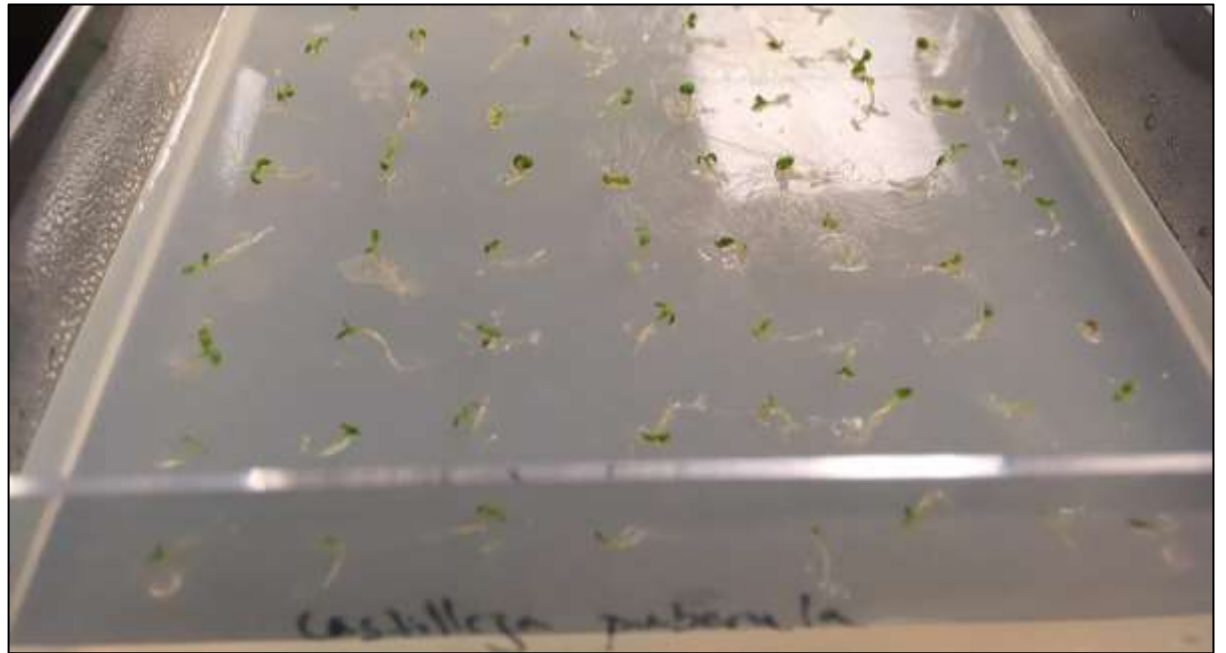
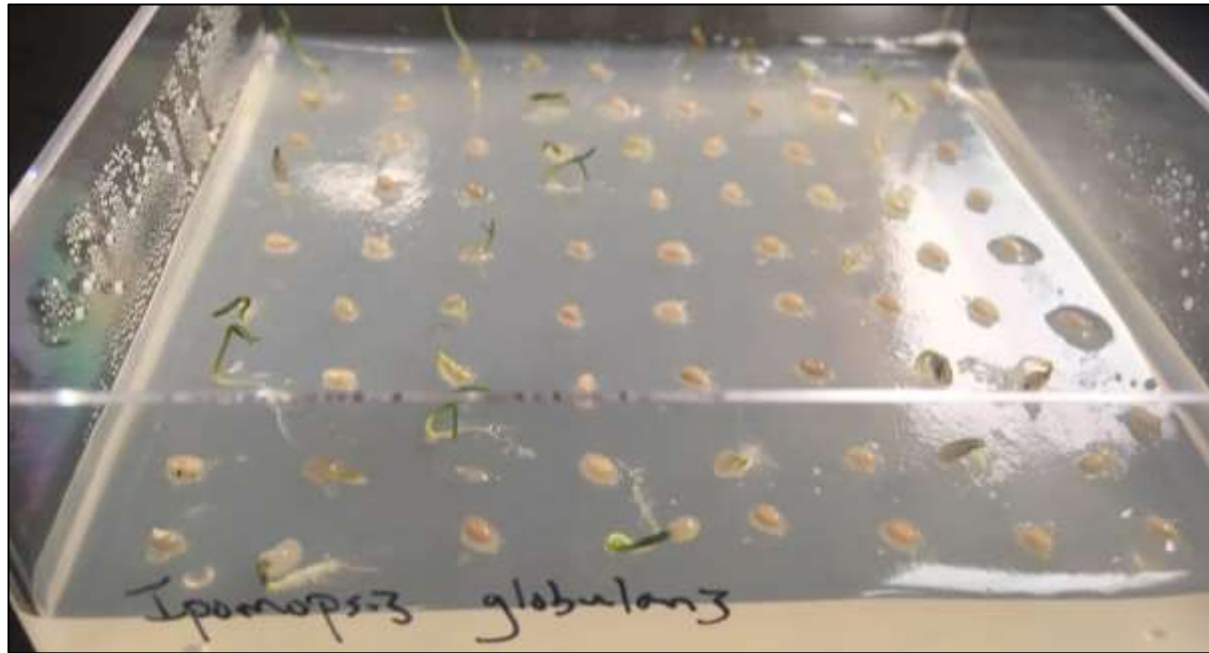
1. No stratification	2. 2 weeks at 3°C	3. 6 weeks at 3°C	4. 12 weeks at 3°C
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Incubation

1. 15/6°C	2. 20/10°C
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Experimental Ageing

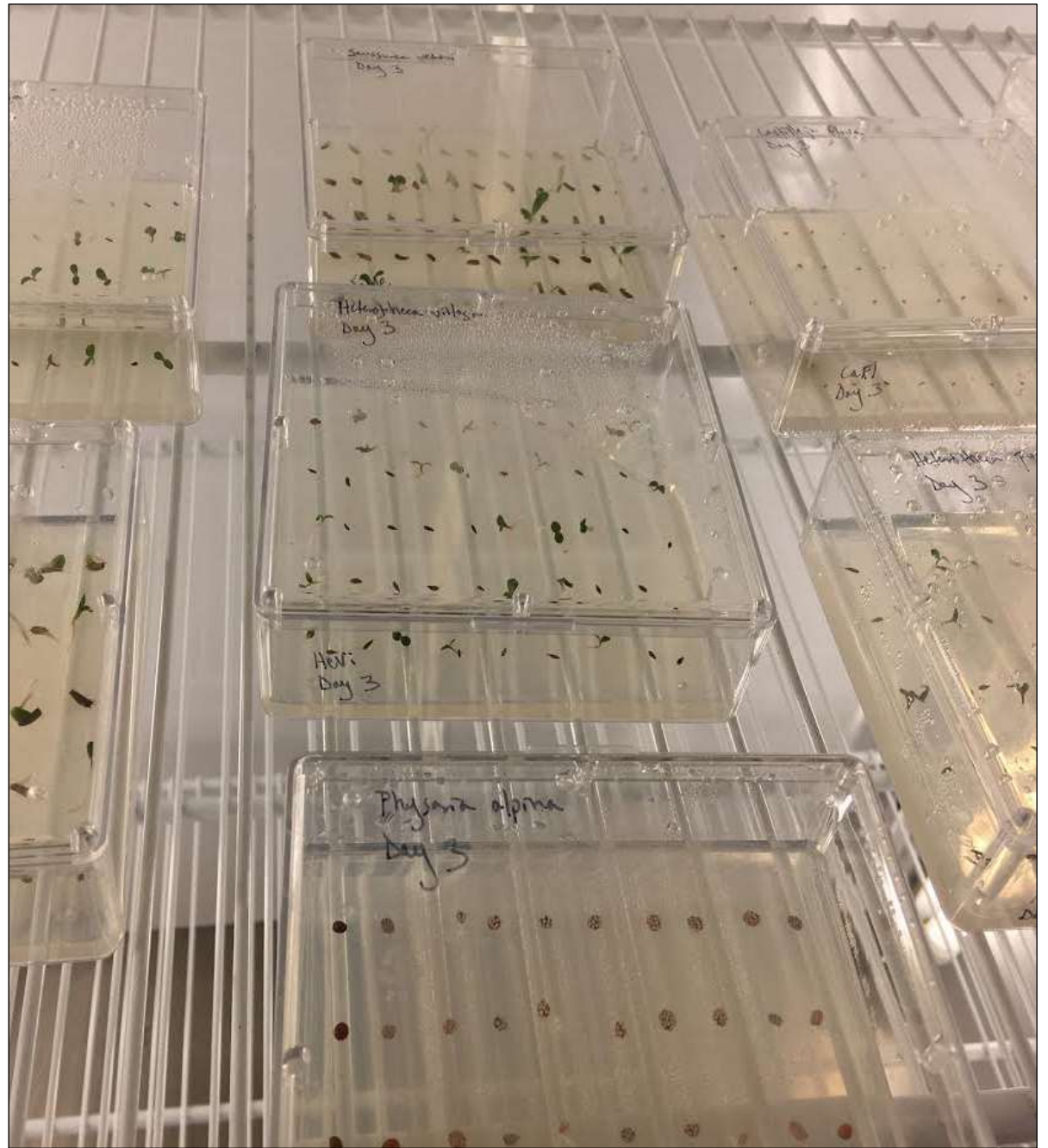
- Expose seeds to warm and humid conditions
- Expedites ageing process while decreasing seed viability
- Use of lithium chloride (LiCl) over a period of one hundred days
- Compare results to species with known storage longevity

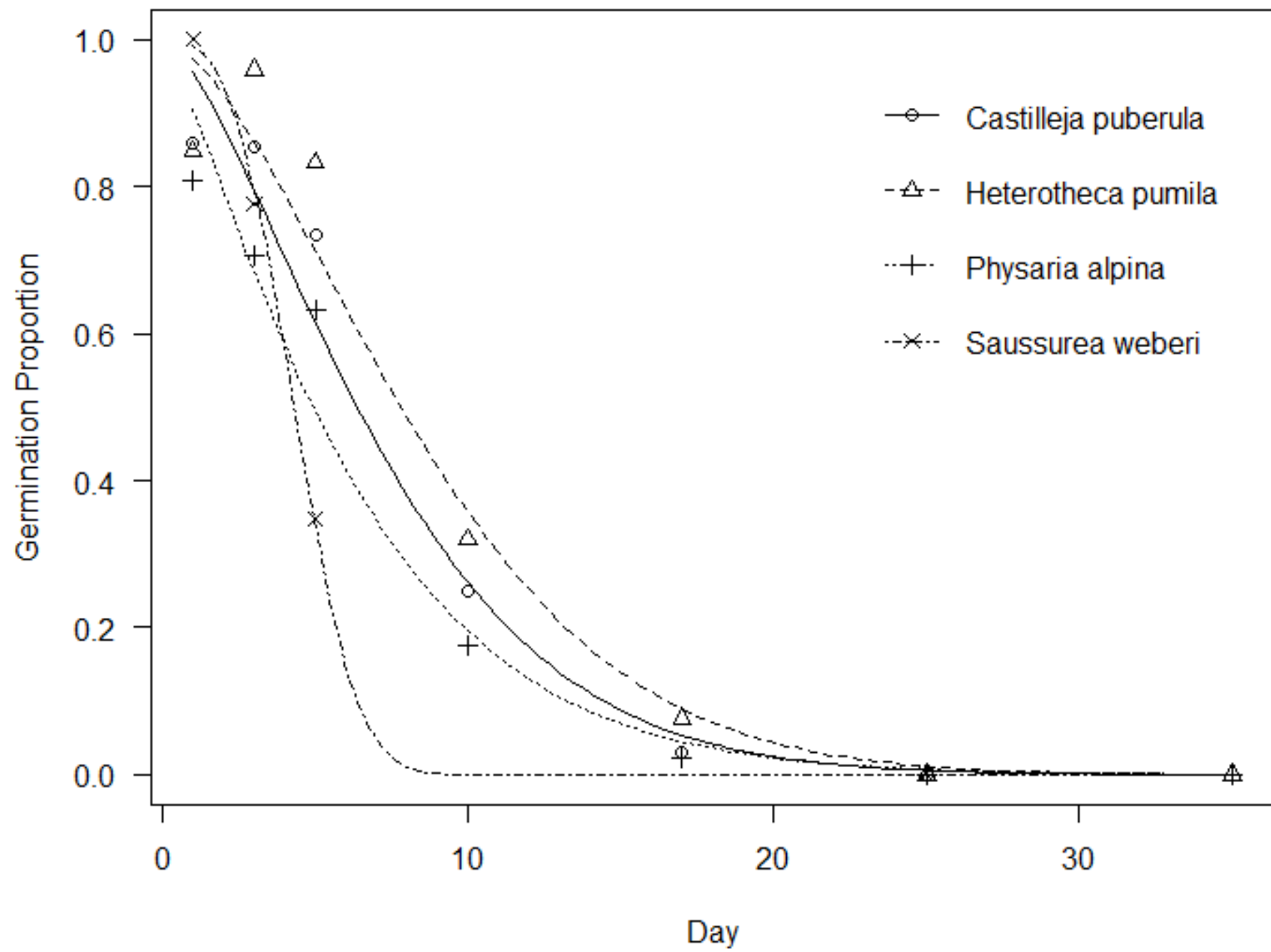


Methods

- Samples of 50 seeds at each time interval: 1, 3, 5, 10, 17, 25, 35 days
- Rehydration: 385 g LiCl in 1 liter water in illuminated incubator for 2 weeks at 20°C
 - 47% RH
- Ageing: 300 g LiCl in 1 liter water in dark drying oven at 45°C
 - 60% RH
- Seeds removed at each time interval and placed in pre-determined germination conditions
 - 4-wk strat, 20/10°C incubation
 - 6-wk strat for CaPu









Significance

- Alpine species are short-lived in seed banks
- Collections go into storage often with no plans for future use
- Need to establish protocols for management
 - Distributing seeds back to source site
 - Growing up plants in greenhouse
 - Research purposes
- North American Botanic Gardens Strategy for Alpine Plant Conservation

North American Botanic Gardens Strategy for Alpine Plant Conservation

2. Conserve Plants and Habitats

5. Protect 50% of Important Alpine
Plant Areas

6. Conserve 25% of all alpine plants
in situ

7. Conserve 60% of all threatened
alpine plants *in situ*

8. Ensure 60% of all alpine plants
conserved *ex situ*

9. Ensure 75% of all threatened alpine
plants conserved *ex situ*

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9. Ensure 75% of all threatened alpine
plants conserved *ex situ*

Future Directions

- What conservation methods need to be implemented – cryopreservation, seed collection and out planting every few years, etc.?
- Can the species survive in reintroduction/restoration projects in the face of climate change?
- How will already established populations and those established after reintroduction respond to climate change *in situ*?





Thank you!
Questions?
