Salinity-Herbivore-Plant Interactions

Effects of Plant Health, Beetle Defoliation, and Local Adaptation on *Tamarix* Growth

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Thanks!

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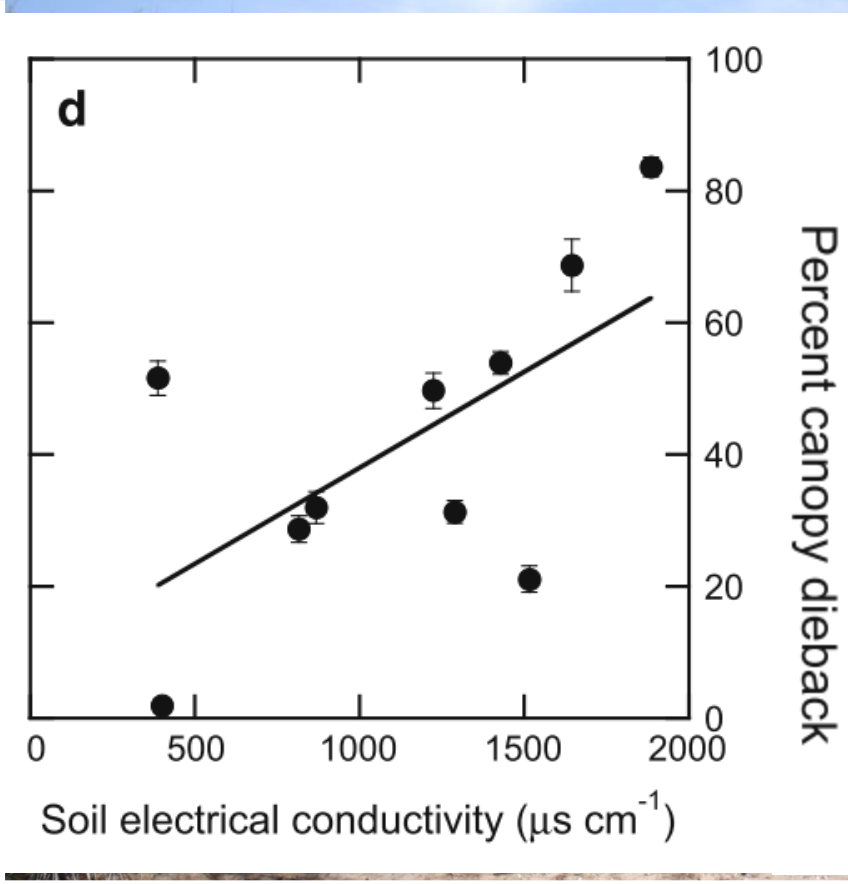
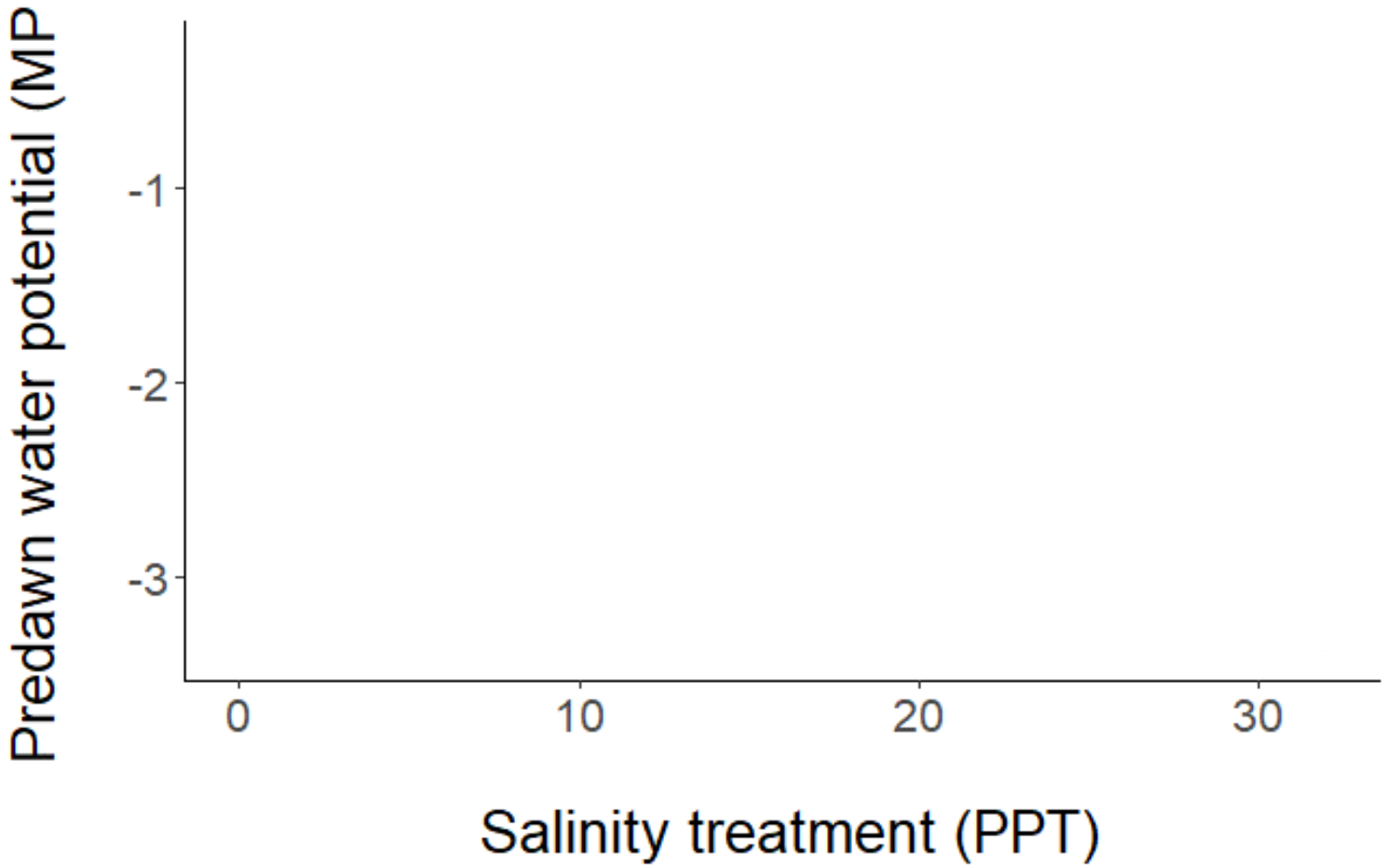
Salinity-Herbivore-Plant



Salinity-Herbivore-Plant

Hultine *et al.* 2015

Water stress & salinity



$R^2 = 0.74$, $F_{1,34} = 94.68$, $p <<< 0.001$

Cibola

High salinity site

Low salinity site

Low Salinity Phenotype

High Salinity Phenotype

Salinity-Herbivore-Plant Questions

- What are effects of increased salinity?
  - Do *D. carinulata* show any preferences?
  - How do impacts of herbivory change?
- Does phenotype matter?

Cibola

High salinity site

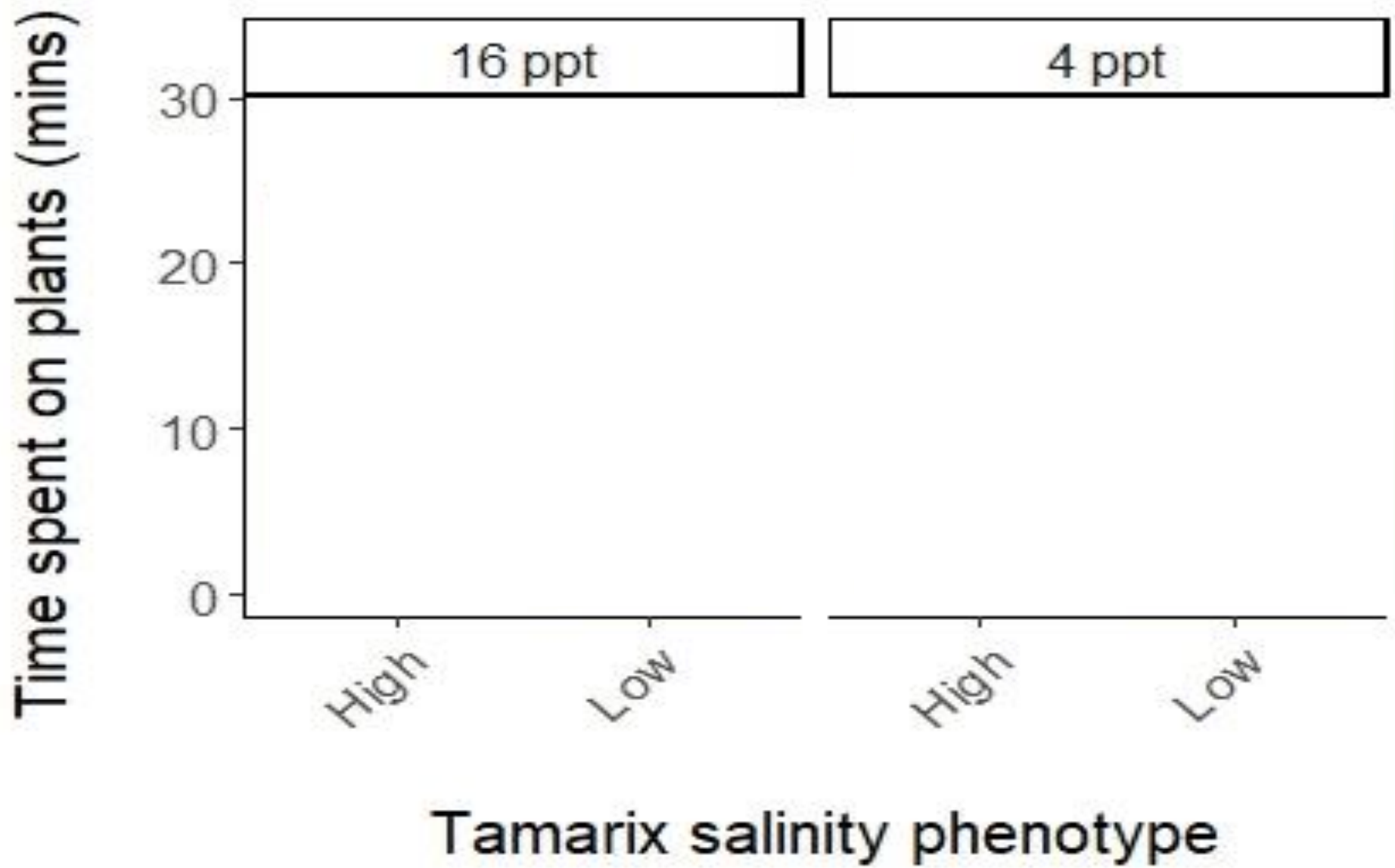
Low salinity site

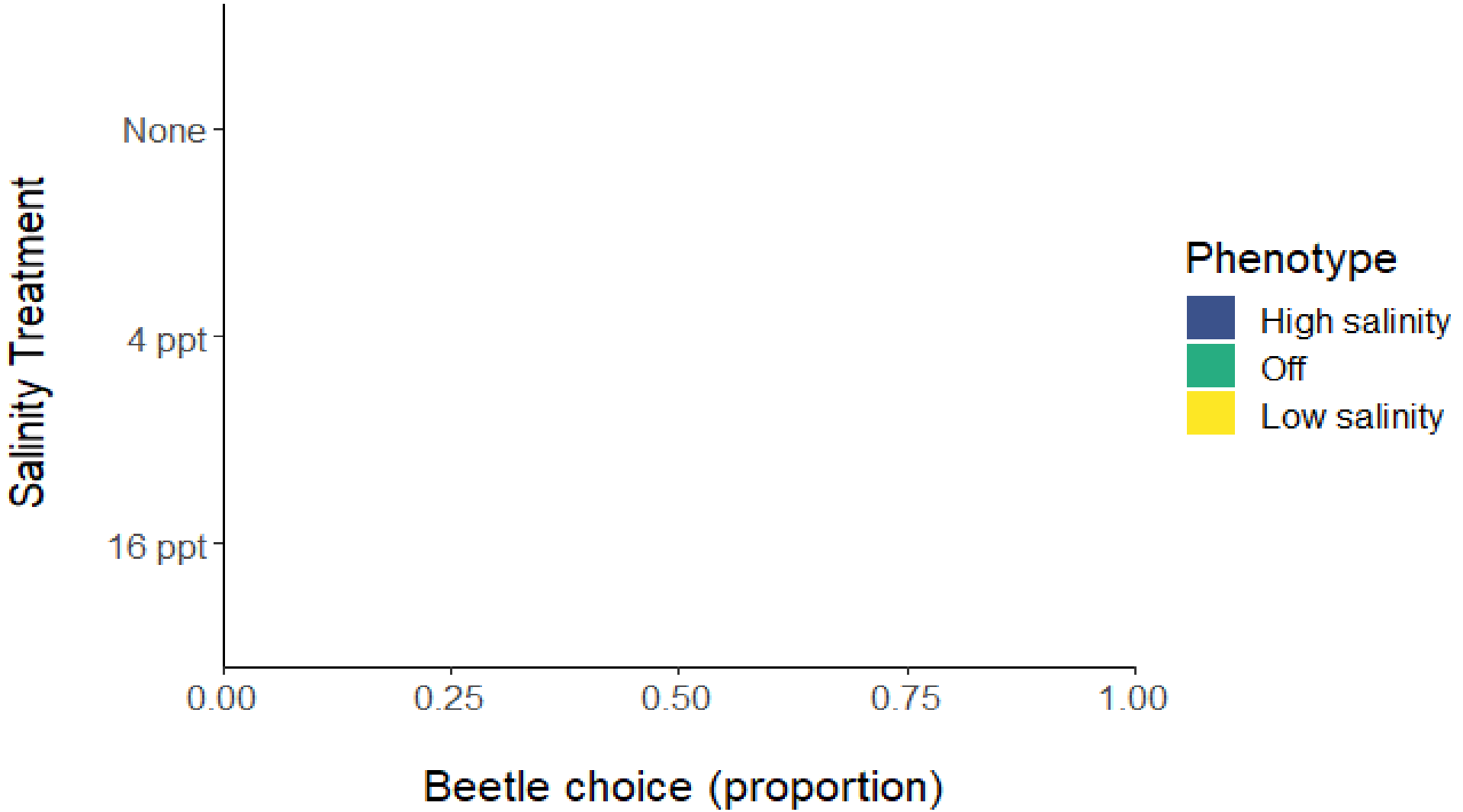
Greenhouse trials

- Behavior trials
  - No choice
  - Preference
- Herbivory experiments
  - Reciprocal salinities
  - Three defoliation events

Predictions

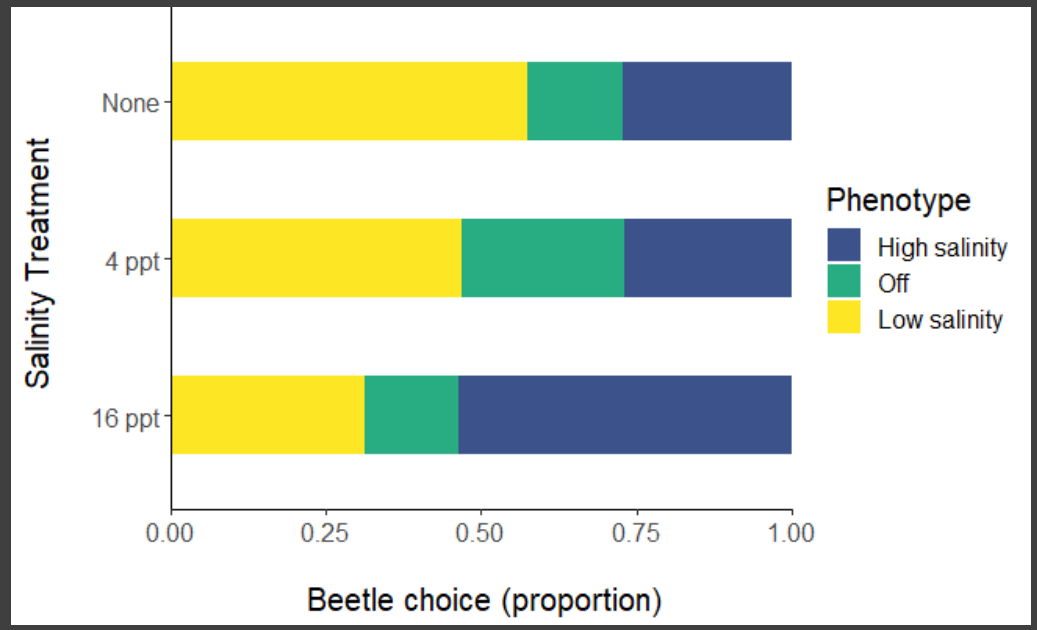
- ***D. carinulata*** **would prefer low salinities**
- **Plants with herbivory would be smaller**
- **Low salinity phenotype would be smallest**

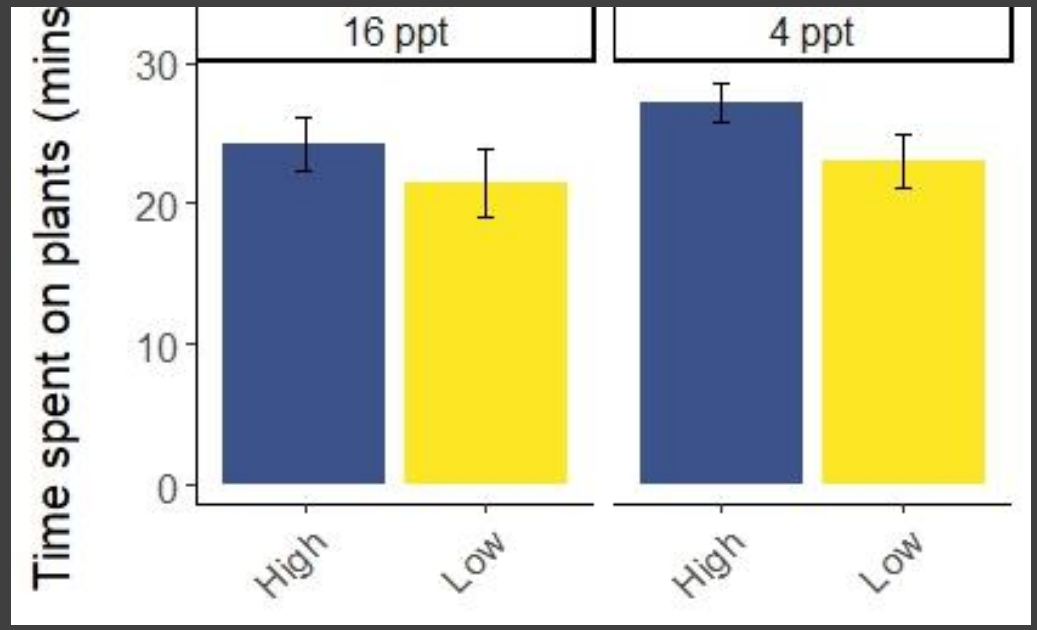

16 ppt
4 ppt
Time spent on plants (mins)
30
20
10
0
High
Low
High
Low
Tamarix salinity phenotype


Salinity Treatment
None
4 ppt
16 ppt
0.00
0.25
0.50
0.75
1.00
Beetle choice (proportion)
Phenotype
High salinity
Off
Low salinity

Results

- **No choice**
  - **Beetles will feed indiscriminately**
  - **No effect of salinity or phenotype**
- **Preference**
  - **Prefer plants at source salinity**



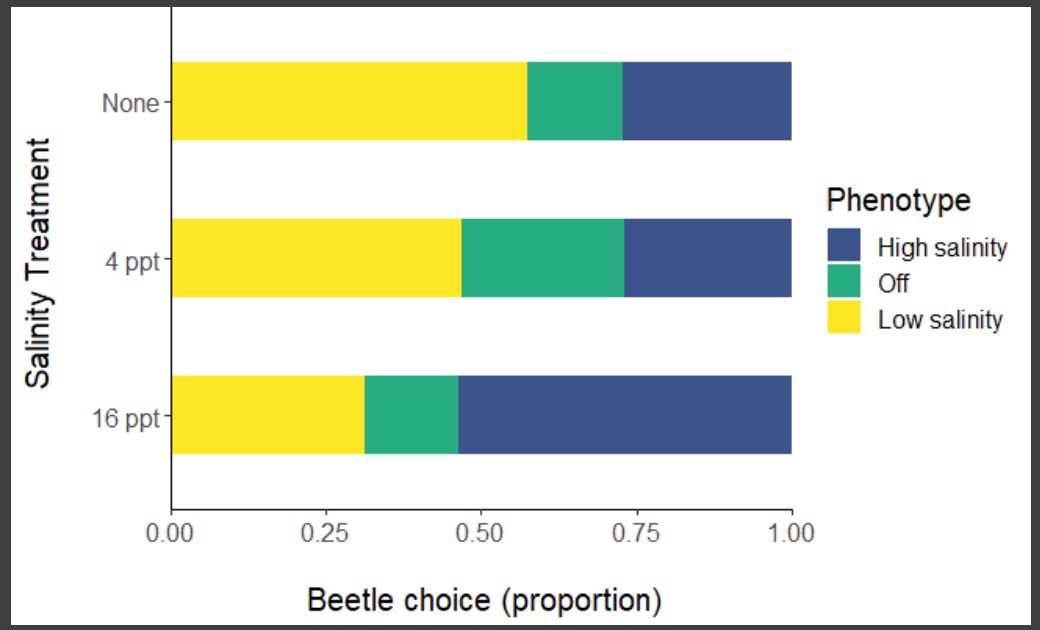


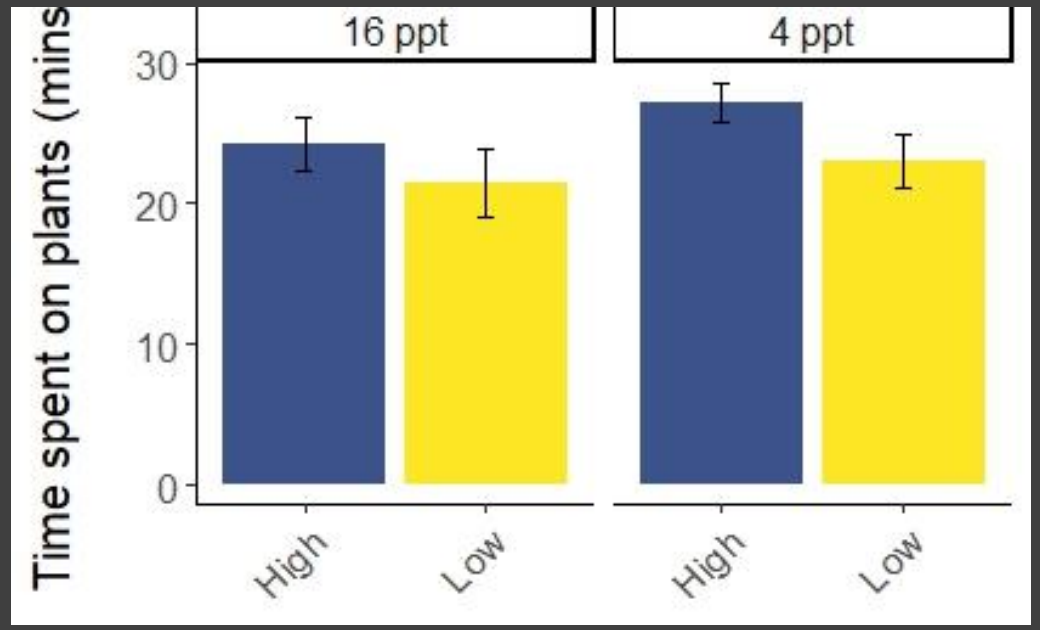
Low Salinity Phenotype

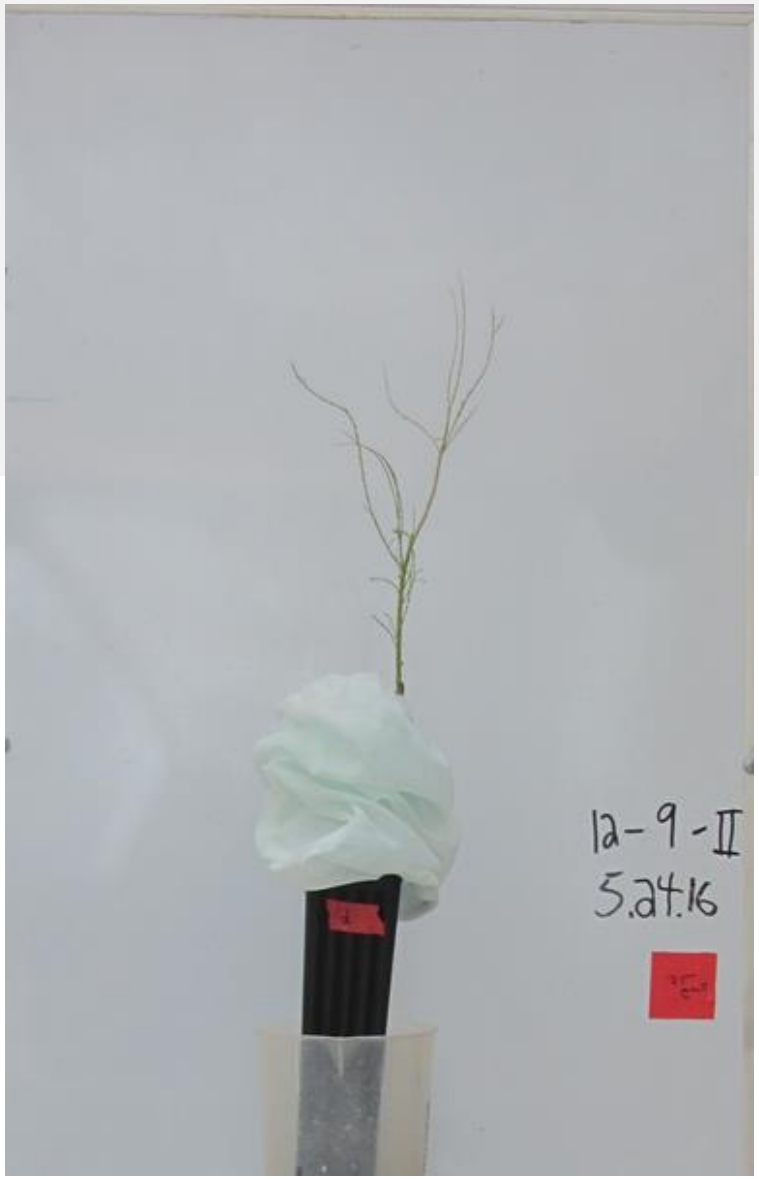
High Salinity Phenotype

Results

- **No choice**
  - **Beetles will feed indiscriminately**
  - **No effect of salinity or phenotype**
- **Preference**
  - **Prefer plants at source salinity**
  - **Prefer “healthy” plants**

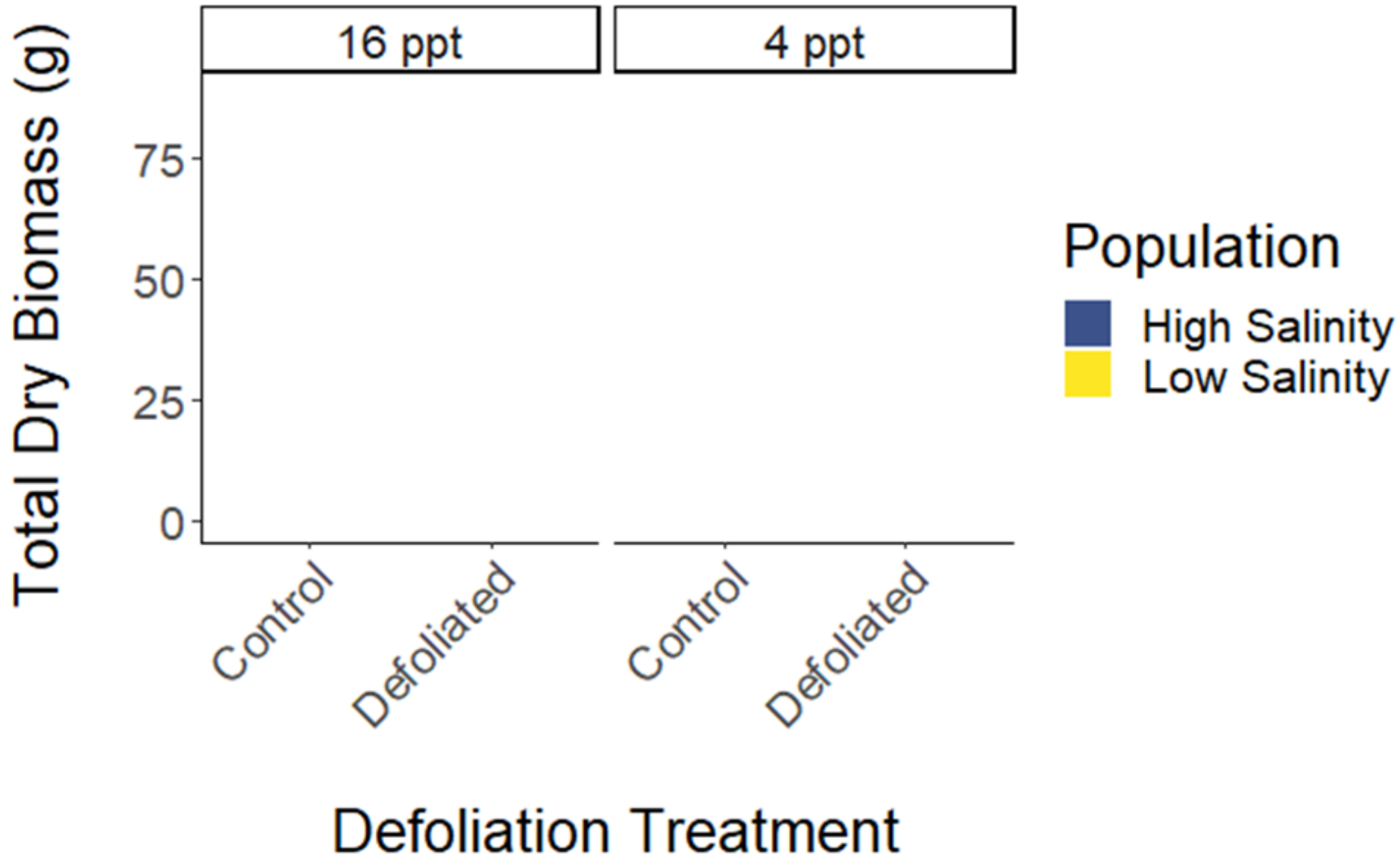


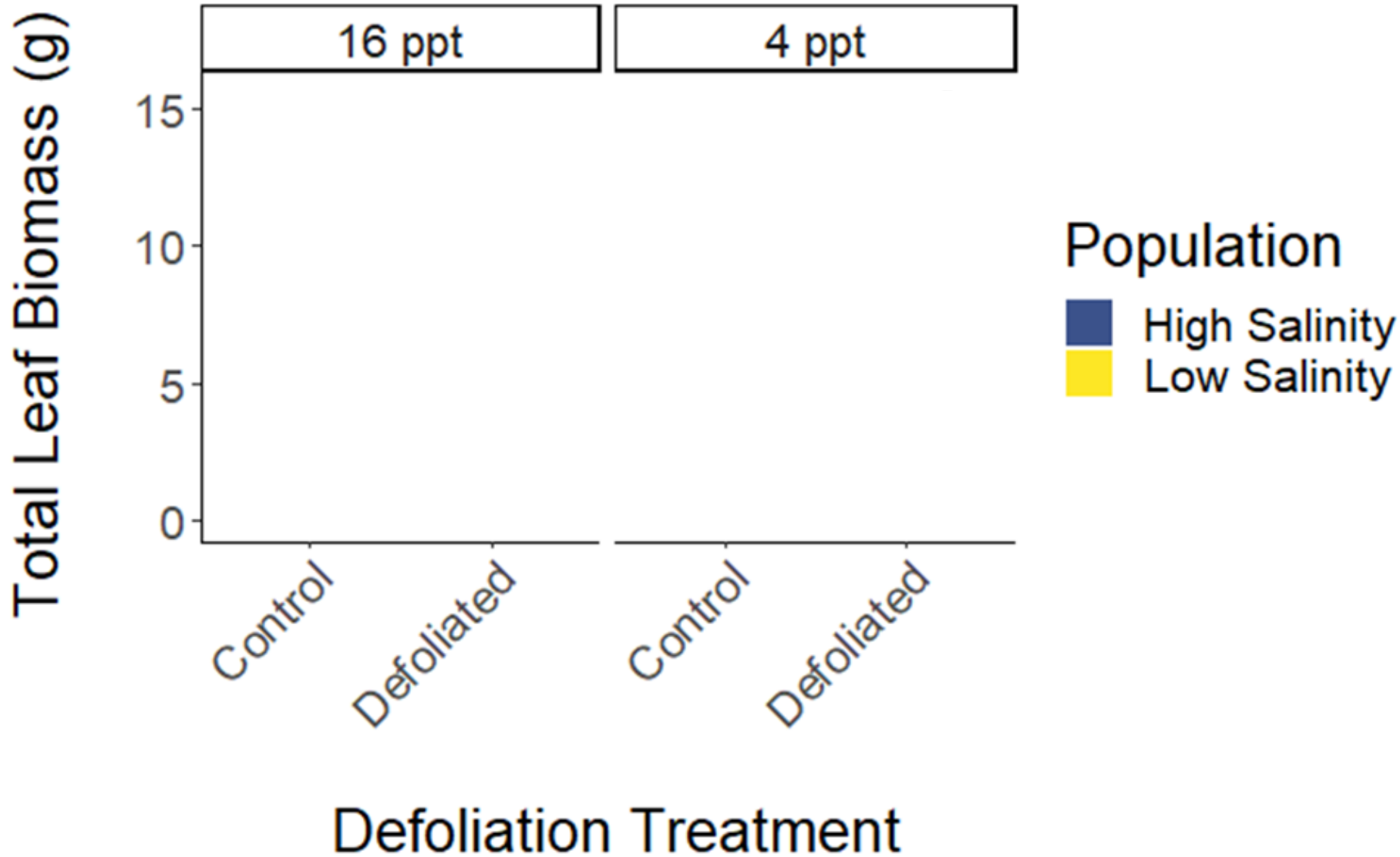


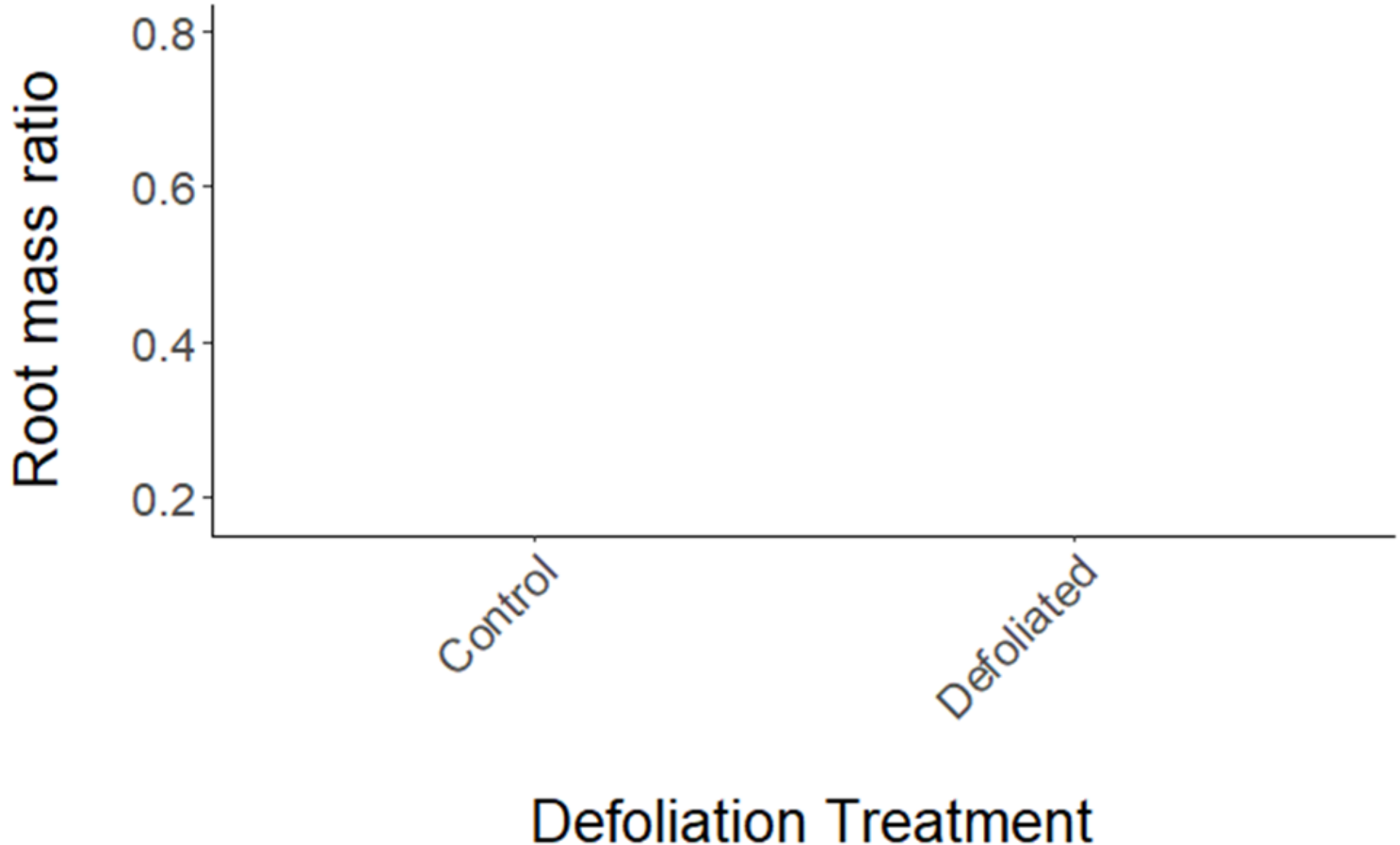


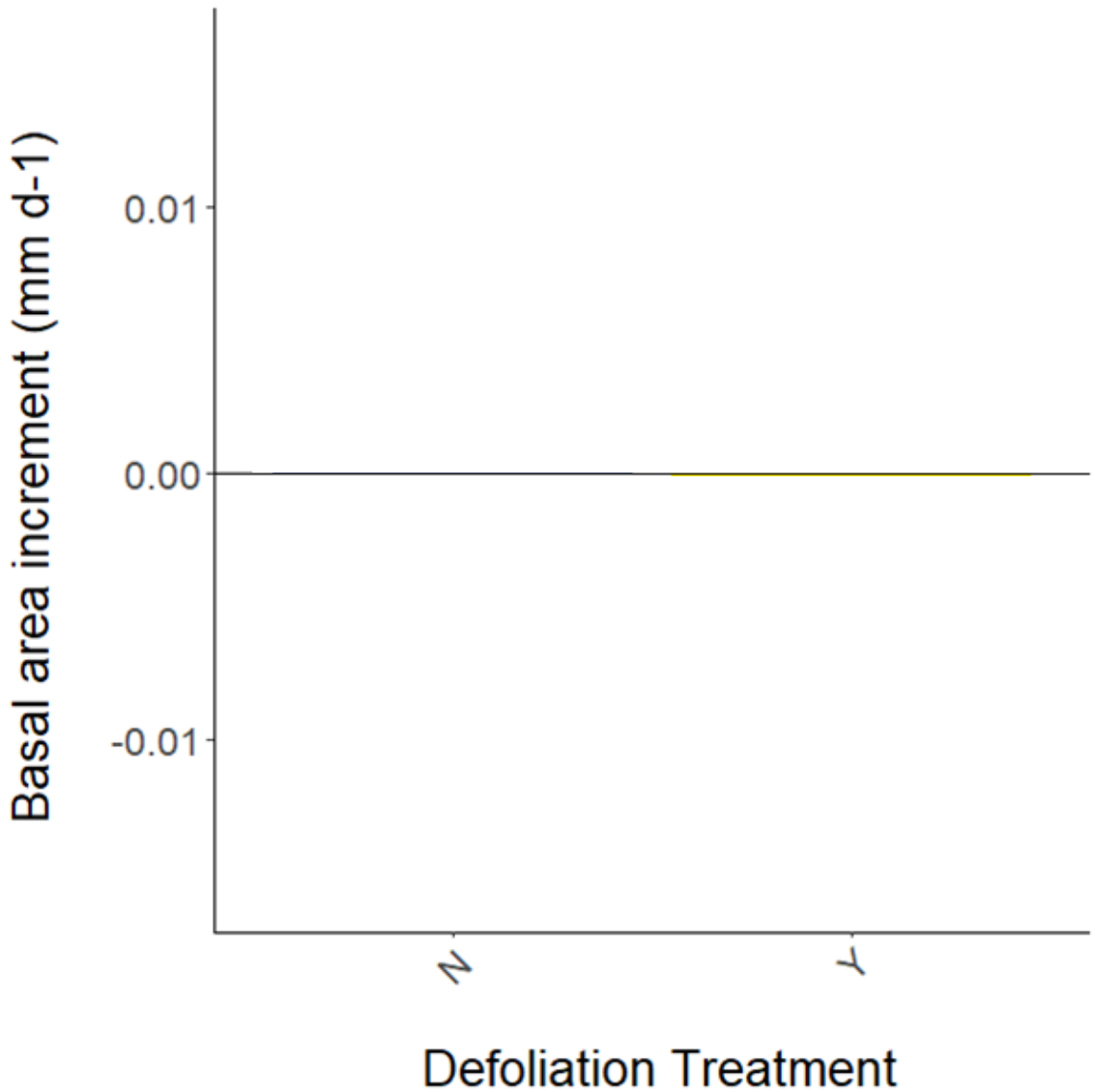
Herbivory Experiments

- **Beetles in mesh sleeves**
- **Three defoliation events**
- **Collected leaf litter**
- **Separated roots from sand**


16 ppt
4 ppt
Total Dry Biomass (g)
75
50
25
0
Control
Defoliated
Control
Defoliated
Defoliation Treatment
Population
High Salinity
Low Salinity

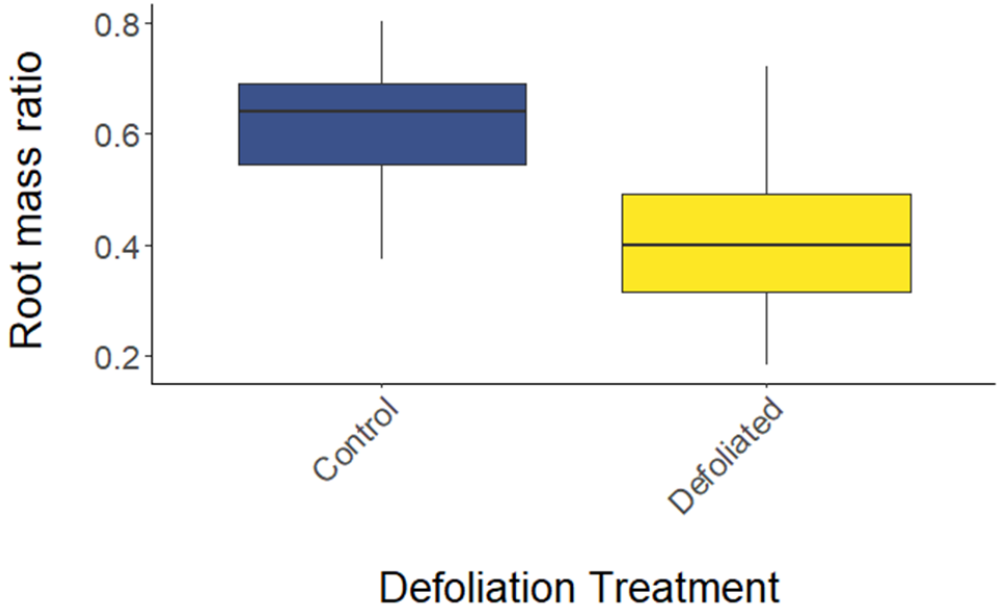

16 ppt
4 ppt
Total Leaf Biomass (g)
15
10
5
0
Control
Defoliated
Control
Defoliated
Defoliation Treatment
Population
High Salinity
Low Salinity

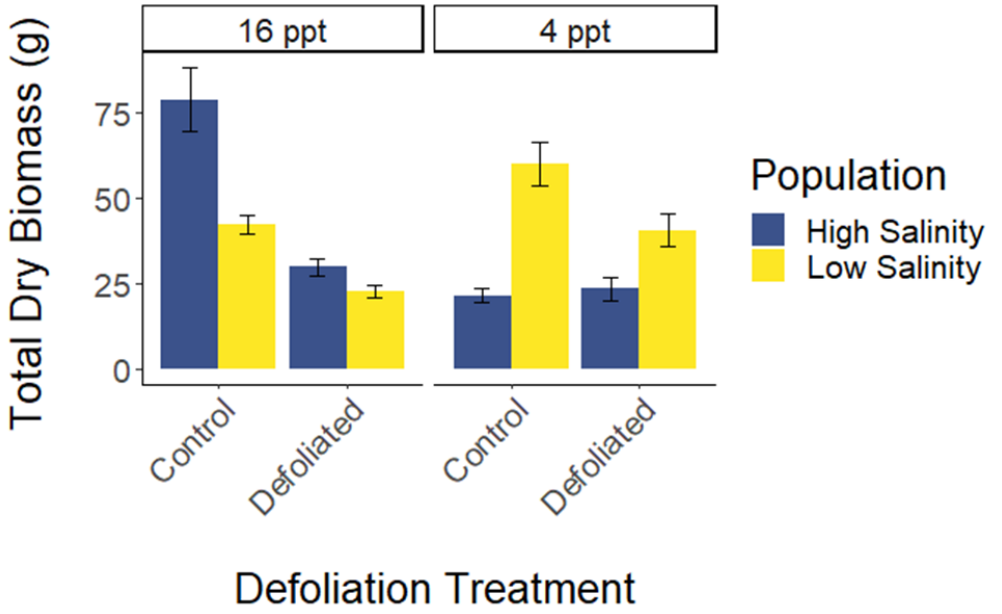

Root mass ratio
0.8
0.6
0.4
0.2
Control
Defoliated
Defoliation Treatment


Basal area increment (mm d-1)
0.01
0.00
-0.01
N
Y
Defoliation Treatment

Results

- Herbivory makes a difference
- Greatest impact was in high salinity
  - High salinity phenotype most affected
  - Opposite of prediction
- Plant health is important





Conclusions

- Plants prioritized growing leaf tissue
- Changing salinity will increase beetle effectiveness
- Target high salinity sites for restoration
  - Beetles have greater impacts
  - At least at small scales


TAMARISK