

# ANALYSIS OF VEGETATION AND SOIL SALINITIES RELATIVE TO SALT MARSH HARVEST MICE PRESENCE IN THE SUISUN MARSH

## AUTHORS

Kyra Amini, Maria Altamirano Chavez, Sophia Dehmer, and Katelyn Goodwin

Department of Biological Sciences, College of Science and Mathematics, California State University San Marcos  
Biology 484 ST: Applied Animal Ecology Field Experience

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This study aims to identify the relationship between salt marsh harvest mice habitat use and salinity. Fifty-six traps were used to capture mice for two days and record soil and vegetation samples in captured and non-captured sites. Salinity properties showed no correlation between pickleweed and soil, as well as no significant differences between captured and non-captured sites. These results provide no evidence towards salinity preferences in salt marsh harvest mice; however, further research needs to be conducted.

## INTRODUCTION

The salt marsh harvest mouse, *Reithrodontomys raviventris*, is an endangered species endemic to the San Francisco Bay estuary that relies heavily upon pickleweed (*Salicornia pacifica*) and other halophytic plant species. Pickleweed serves as a primary year around food source (Aylward et al. 2022) and a source of shelter for the salt marsh harvest mouse (SMHM). What role does salinity play in the relationship between SMHM and pickleweed? Does salinity of pickleweed and the soil surrounding correlate with the presence of SMHM?

## DATA & ANALYSIS

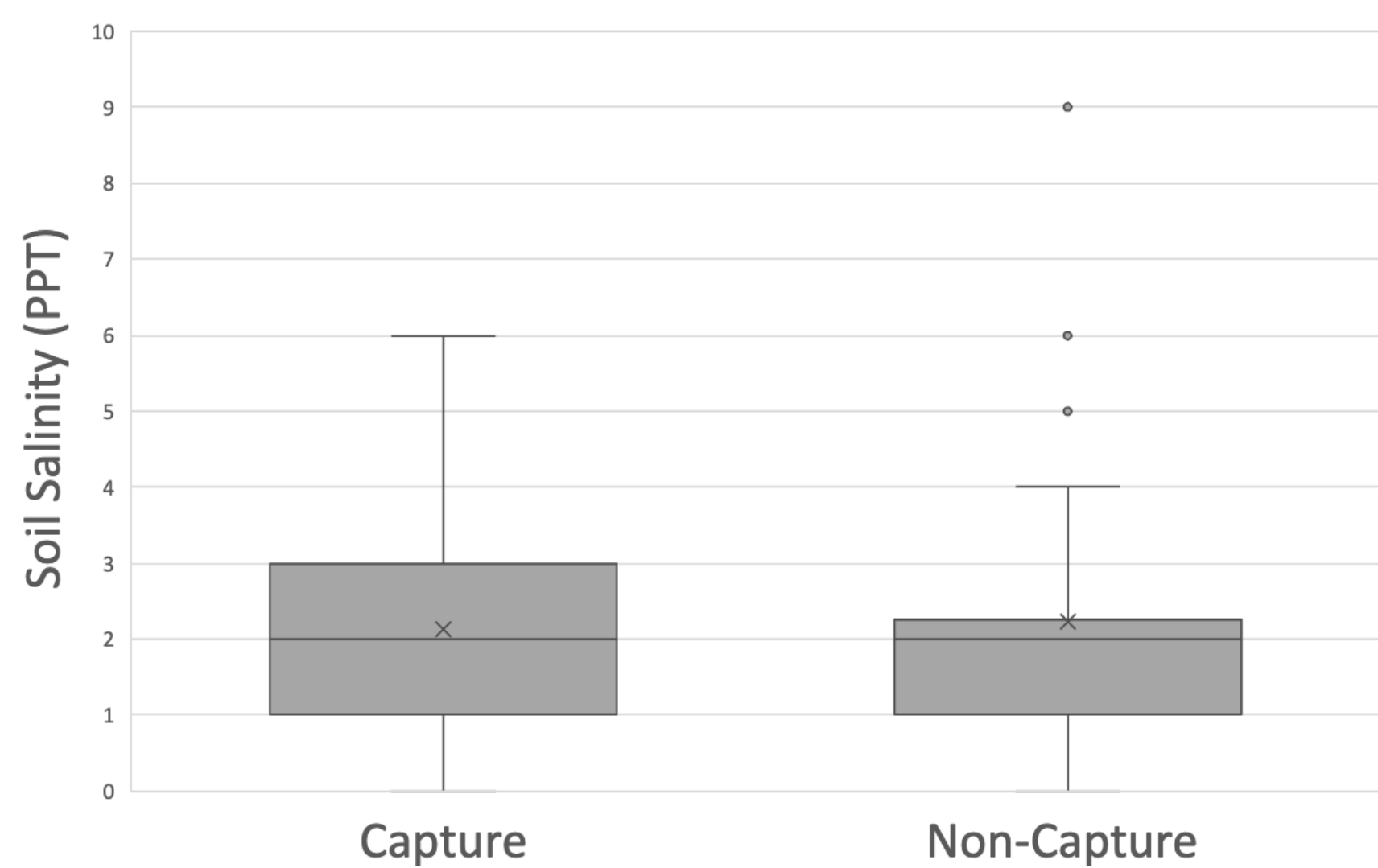


Figure 2. Salinity levels in PPT found in soil of both captured (n=29) and non-captured (n=33) trap sites. Two-sample t-Test assuming equal variances resulted in a p-value of 0.834.

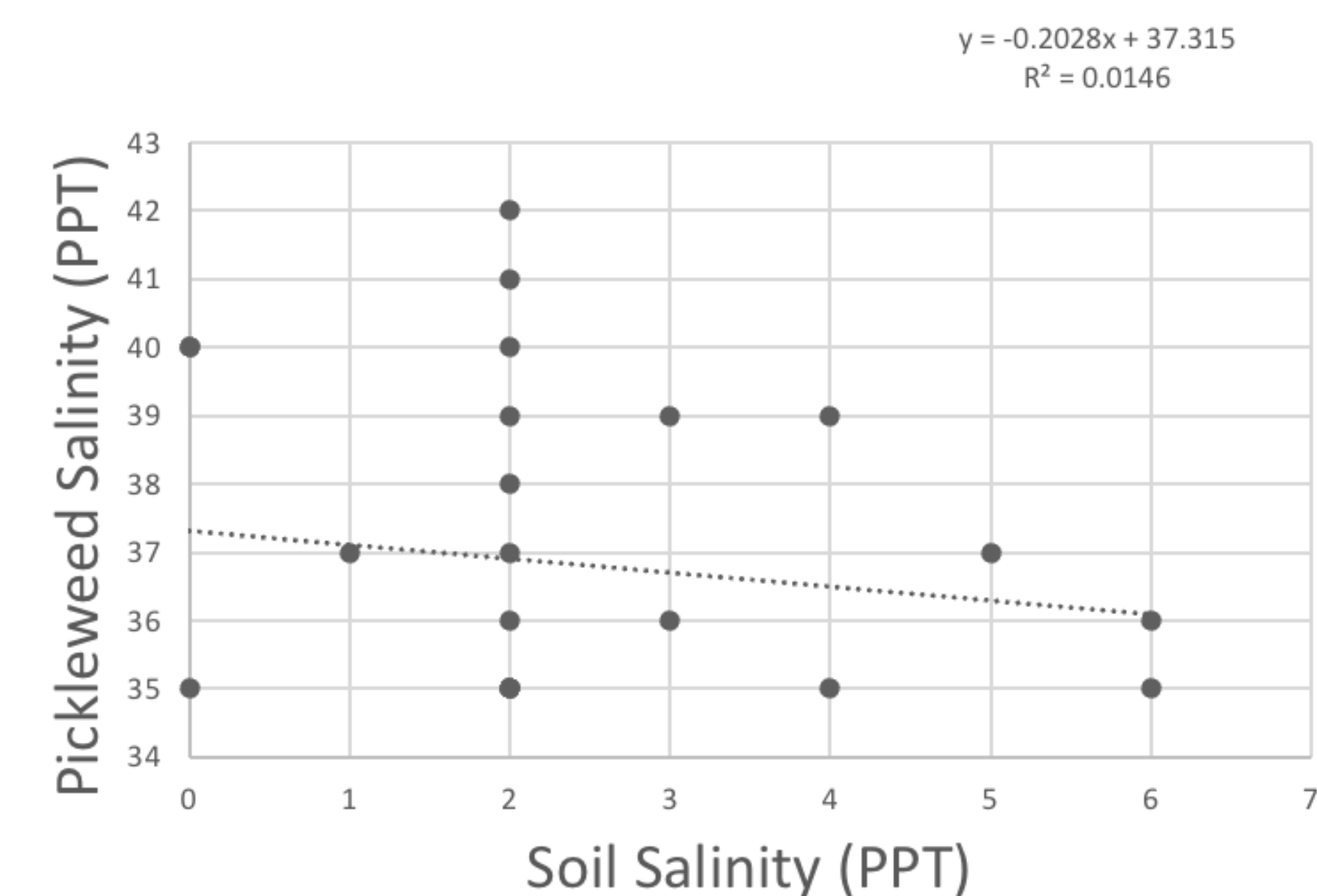


Figure 4. Scatterplot comparison of pickleweed and soil salinity in PPT, showing no significant relationship ( $R^2 = 0.0146$ , p-value= 0.688).

## LITERATURE CITED

Aylward C, Statham M, Barthman-Thompson L, Kelt D, Sacks, B. 2022. Dietary characterization of the endangered salt marsh harvest mouse and sympatric rodents using DNA metabarcoding. *Wiley Ecology and Evolution*. DOI: 10.1002/ece3.9121

Padgett-Flohr G, Isakson L. (2003) A random sampling of salt marsh harvest mice in a muted tidal marsh. *Journal of Wildlife Management*. 67(3):646-653

## METHODOLOGY

### Small mammal trapping procedure

- The trapping grid consisted of 7 by 8 Sherman live traps spaced 10 meters apart.
- Trapping was conducted on two nights following standard small mammal protocols and IACUC (#21-002)
- Petersen-Lincoln estimator was used to obtain population estimate of salt marsh harvest mice.

$$Y = Mn/m$$

M= # captured, marked and released on day 1

n= # captured on day 2

m= # marked recaptures on day 2

- Soil and pickleweed samples were collected at each capture site and at randomized non-capture sites.
- Samples were dehydrated at 60 °C for seven days, crushed, sifted, and rehydrated with an equivalent 1:1 ratio of H<sub>2</sub>O and grams of sample (soil/veg)

### Salinity Analysis

- Salinities were tested using methods adapted from Padgett-Flohr & Isakson (2003)
- Rehydrated samples were centrifuged, and the resulting supernatant removed. The salinity of the supernatant was recorded using a salinity refractometer.
- Results were analyzed using a t-test between capture and non-capture trap sites. We used linear regression to assess the relationship between soil and pickleweed salinity.

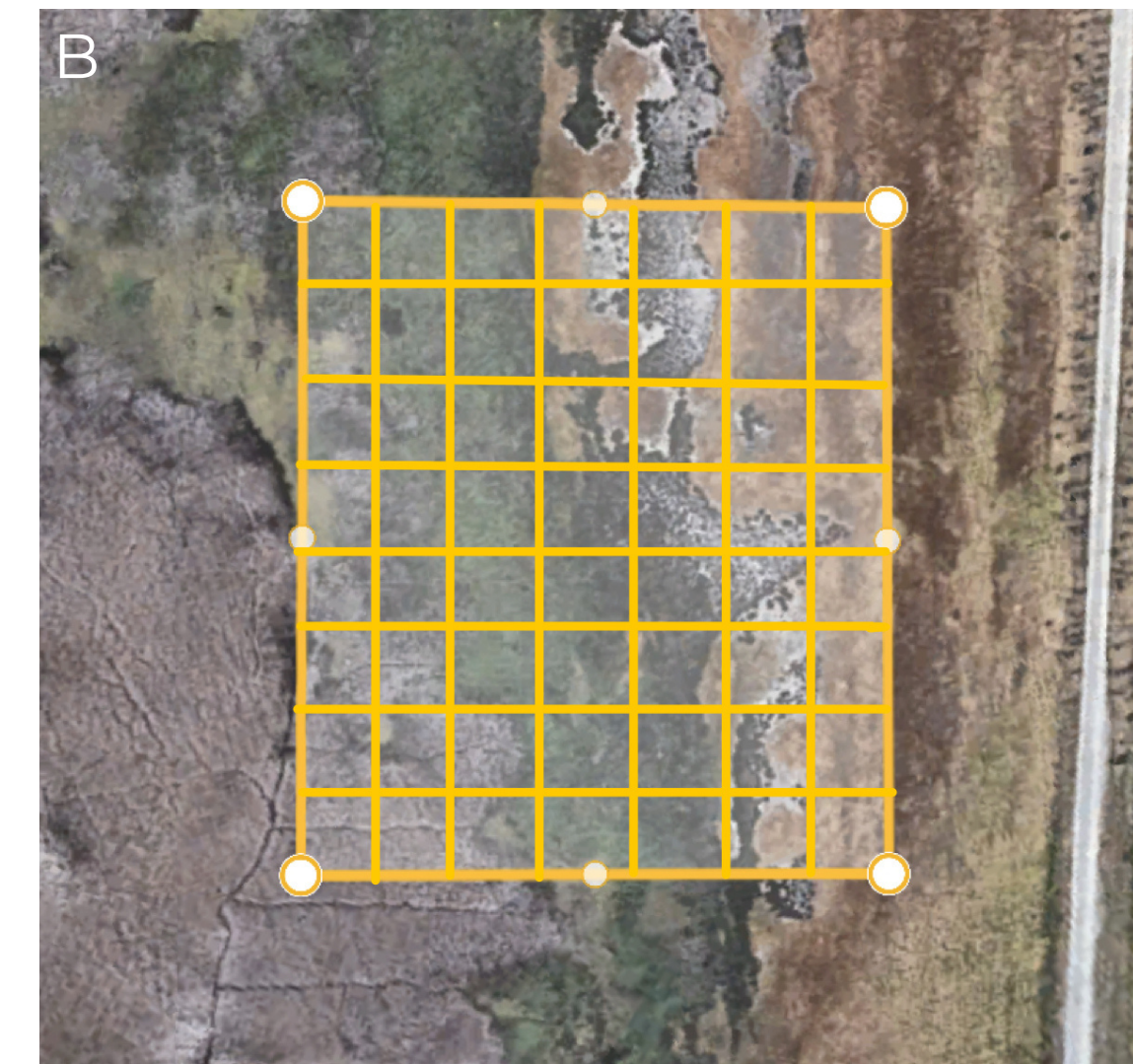
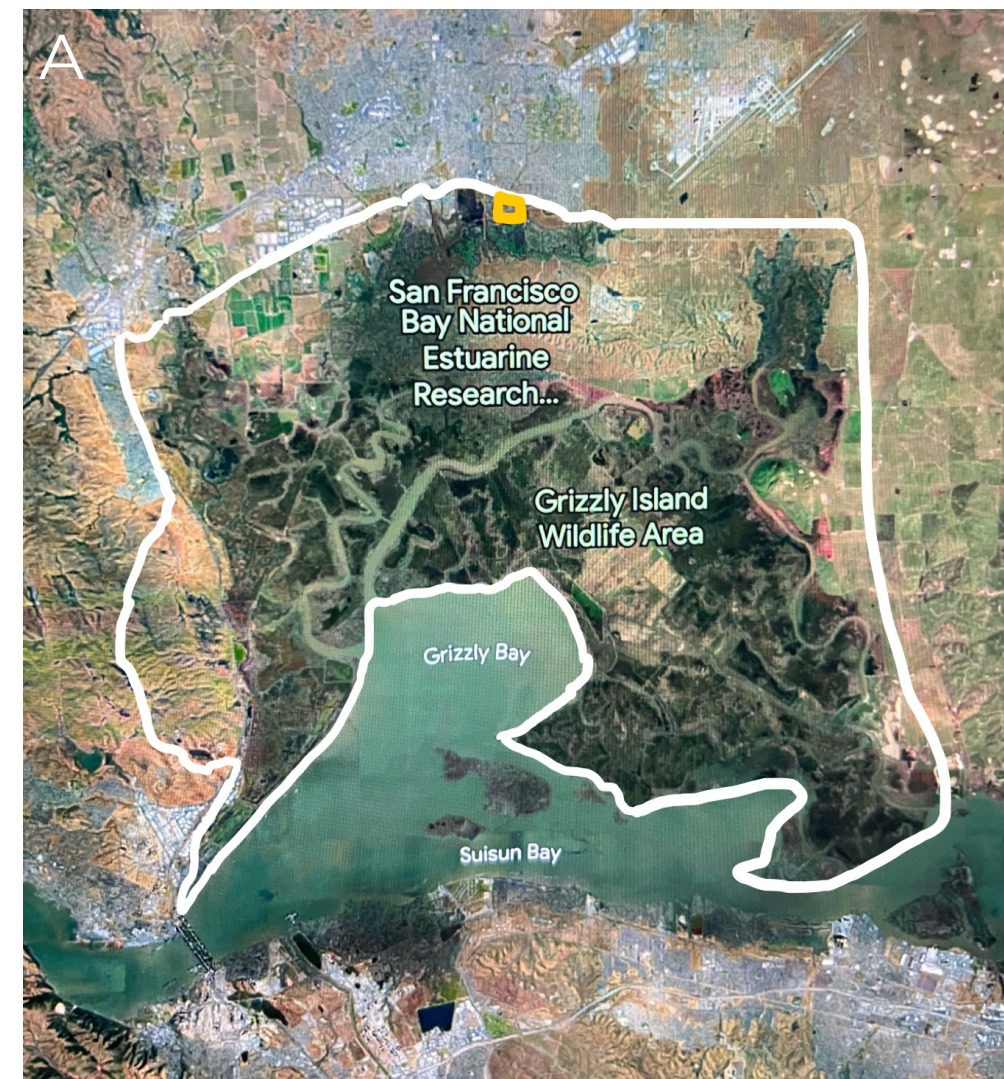


Figure 1. A) Satellite image of the Suisun Marsh (outlined in white) within the San Francisco Bay estuary. Pond 4 highlighted in yellow. B) Picture on the right depicts the trapping grid (in yellow) located in Pond 4 of the Hill Slough Wild Area. Images obtained using Google Earth.



A) Researchers measuring trapping grids. B) SMHM in native vegetation. C) SMHM holding onto ruler during size measurements.

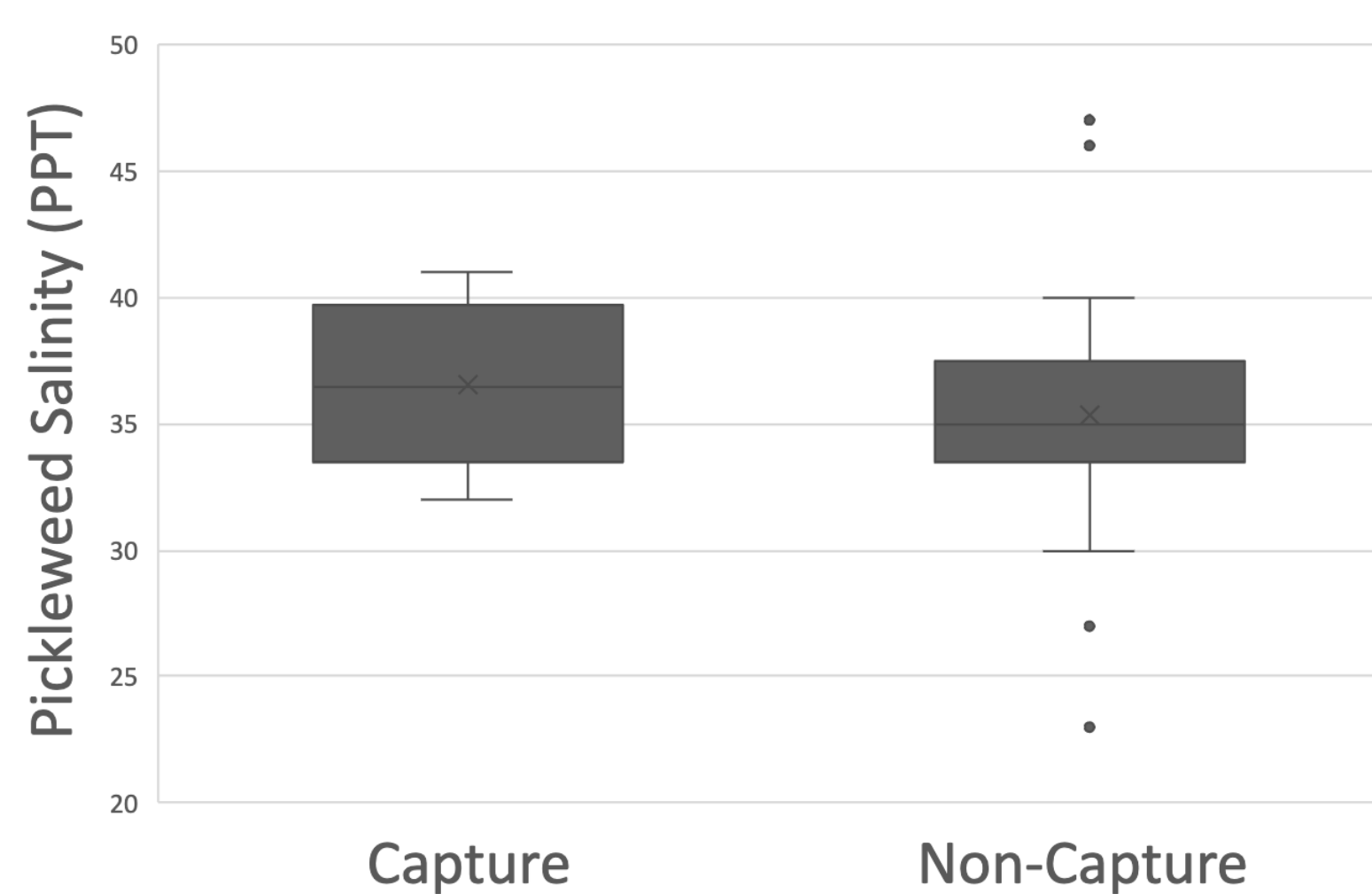


Figure 3. Salinity levels in PPT found in pickleweed of both captured (n=12) and non-captured (n=12) trap sites. Two-sample t-Test assuming unequal variances resulted in a p-value of 0.408.

## RESULTS

Salt marsh harvest mice were captured at a higher abundance in comparison to house mice (Table 1). The results of recaptured SMHM individuals allowed us to use the Petersen-Lincoln model to estimate their abundance. There were no significant differences in soil (Figure 2) or pickleweed (Figure 3) salinity between trap sites where salt marsh harvest mice were and were not captured.

There also proved to be no significant correlation between salinity levels of pickleweed and soil salinity (Figure 4.).

Table 1. Total recapture abundances for salt marsh harvest mice and house mice for the first and second days of trapping.

Species	Captured 3/23	Captured 3/24	Captured Both Days	Recaptures	P-L Estimator
salt marsh harvest mouse	12	22	34	10	29 ± 6
house mouse	2	3	5	0	
both	14	25		10	

## DISCUSSION

No correlation was found between pickleweed and soil salinity. There is high variability in pickleweed salinity values at the soil's mean value which could indicate that pickleweed salinity levels have more variability than soil. This could be further explored in future research on the driving variable in SMHM preference.

The study that inspired our methods (Padgett-Flohr & Isakson 2003) tested the relationship between salt marsh harvest mouse presence and pickleweed salinity levels over a much larger geographic area and found the mice were associated with mid-range salinity levels. Future work testing a larger geographic area encompassing more saltwater inundation could yield greater variation in soil and pickleweed salinity that may be correlated with salt marsh harvest mouse habitat use. Also, there was much more rain in the season and days prior than is typical for the area. The rain may have skewed the results by diluting the salinity of the soil while leaving the salt within the pickleweed relatively unaffected. Additionally, the weather could have affected the behavior of the mice, forcing them to higher ground or to be out foraging longer after the rain stopped.