

# Recruitment of *Avicennia germinans* in a mosaic saltmarsh: A field study of patch-scale plant interactions

**Jennifer Peterson and Susan S. Bell**

Department of Integrative Biology



UNIVERSITY OF  
SOUTH FLORIDA

# **Role of plant-plant interactions in saltmarsh-mangrove communities**

**Interactions at ecotones that affect recruitment may shape patterns of range expansion**

**Saltmarsh plants affect mangrove recruitment via**

- Entrapment / stranding of propagules
- Facilitation / inhibition of seedling growth

**No studies on associational resistance / susceptibility of mangrove propagules to herbivory**

- Associational susceptibility may impede recruitment
- Plants that offer associational resistance may serve as spatial refuges for mangrove recruits

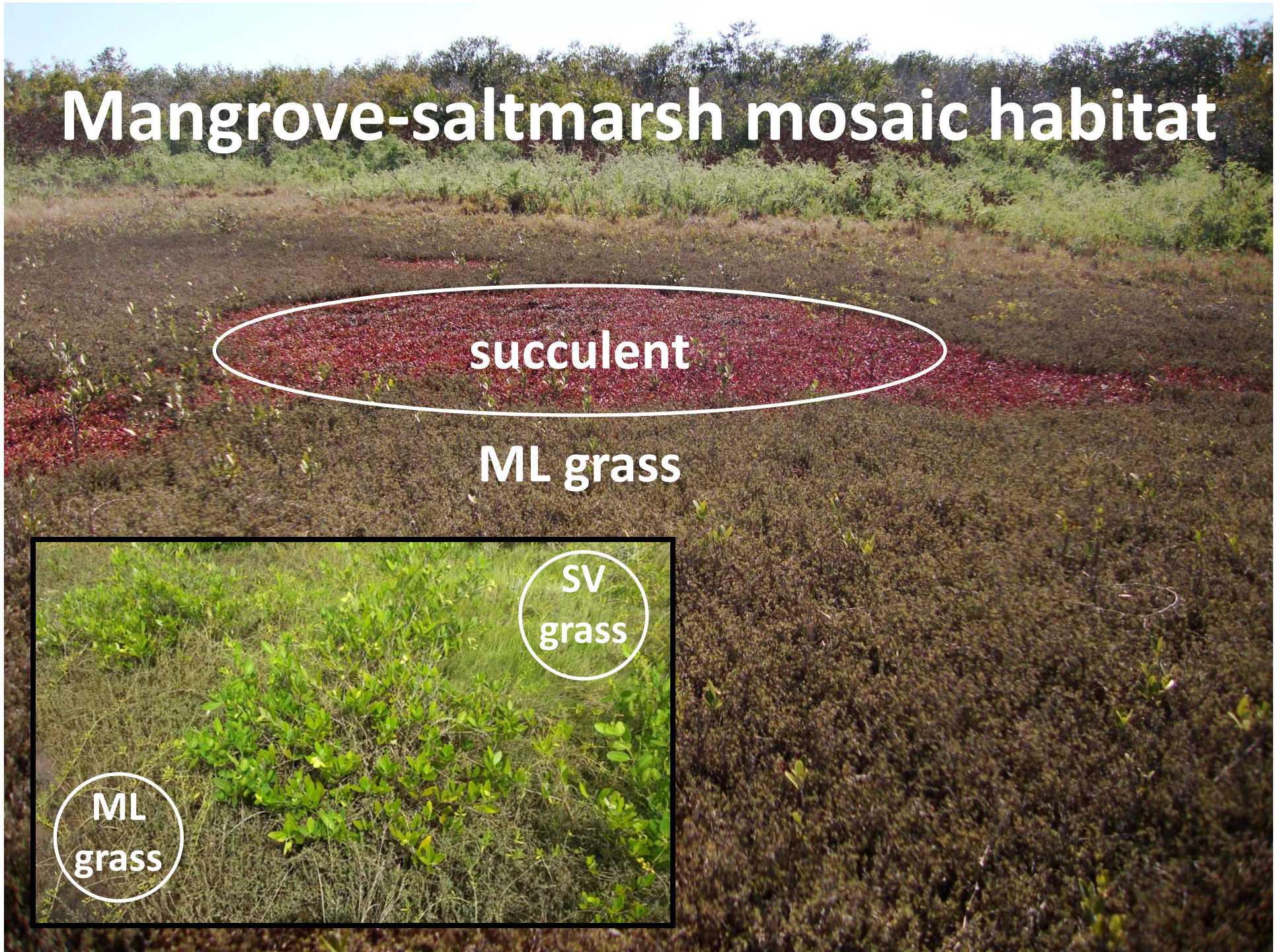
# Mangrove-saltmarsh mosaic habitat

succulent

ML grass

SV  
grass

ML  
grass

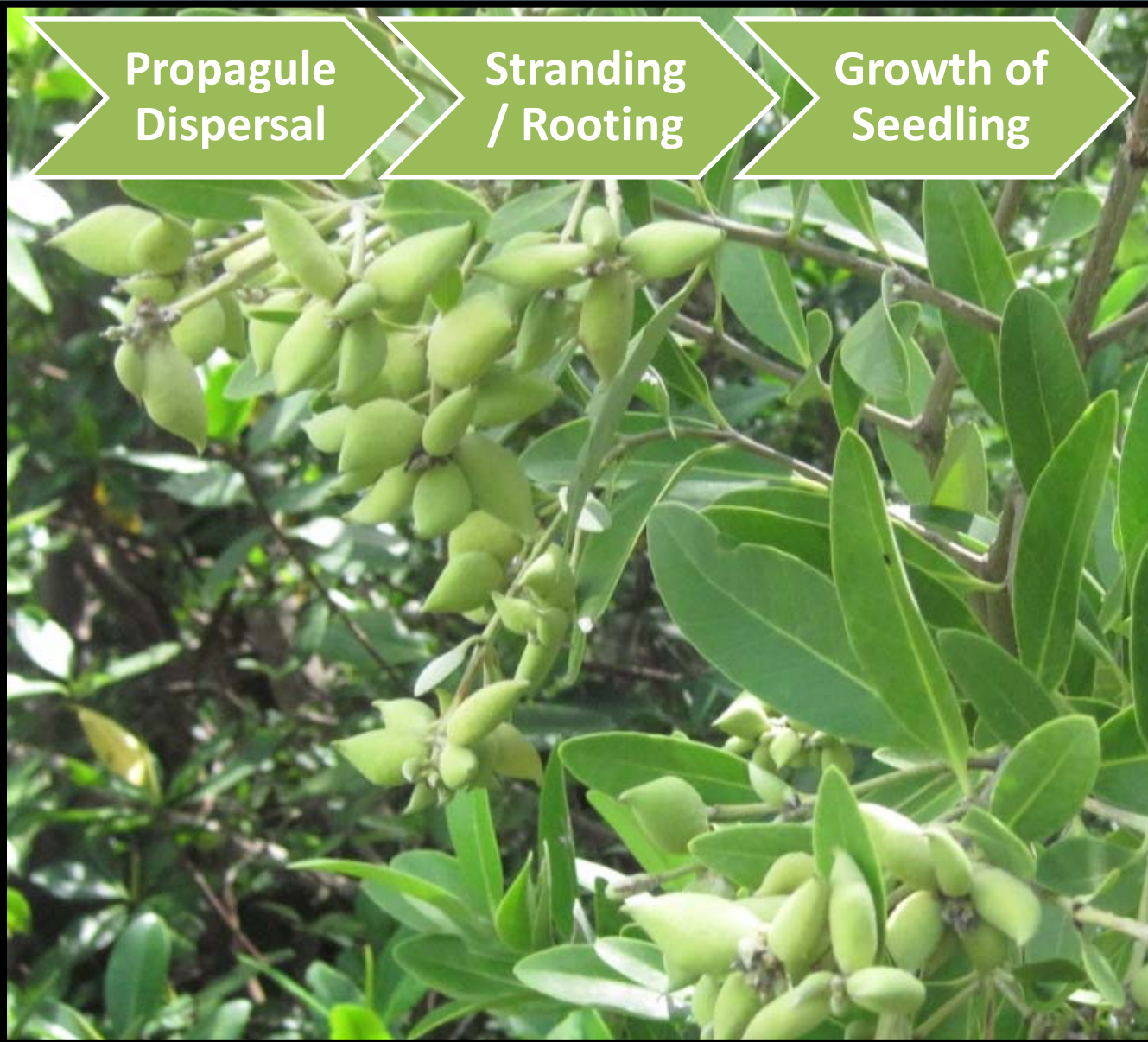


# FOCUS ON PROPAGULES

Propagule  
Dispersal

Stranding  
/ Rooting

Growth of  
Seedling





**Study Site:**  
Upper Tampa Bay Park



**Mature mangroves scattered  
throughout saltmarsh mosaic**



**Pine forest**

*Avicennia germinans*  
**Black mangrove**

**Saltmarsh-mangrove  
mosaic**

**Landward margin of mangroves**

# Saltmarsh taxa with *A. germinans*

	<b>% of quadrats</b>	<b>Mean <math>\pm</math>se % cover</b>	<b>Max % cover</b>
<b><i>Sporobolus virginicus</i></b>	68.8	59.8 (11.8)	100.0
<b><i>Monanthochloe littoralis</i></b>	68.8	56.3 (11.2)	100.0
<i>Batis maritima</i>	56.3	42.2 (10.7)	93.8
<i>Borrchia frutescens</i>	50.0	23.8 (8.4)	93.8
<i>Sesuvium portulacastrum</i>	43.8	27.3 (10.3)	100.0



# Small-scale spatial heterogeneity



# Used an experimental approach

Examined whether susceptibility of propagules to herbivory and establishment success of seedlings differs among saltmarsh patches containing the grasses *M. littoralis* and / or *S. virginicus*



# Experimental Design:

emplaced propagules into plots (0.25 m<sup>2</sup>)  
and monitored for 266 days

**30 plots total**, n = 10 per treatment

## **3 saltmarsh treatments:**

1) SV = *S. virginicus* monoculture

2) ML = *M. littoralis* monoculture

3) POLY = polyculture containing 3 – 6 taxa

(always contained *S. virginicus* and *M. littoralis*)

# *Avicennia germinans* propagules

- Collected at study site
- Pericarp removed
- Inspected for damage
- Emplaced on Sept. 29, 2012
- Nine per plot (N = 270 total)



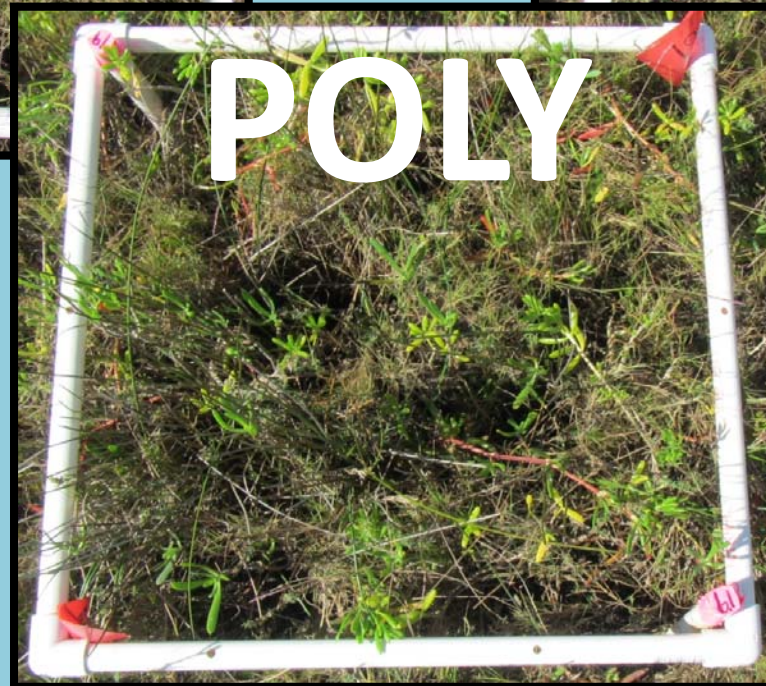
# Saltmarsh plant treatments



*Sporobolus virginicus*

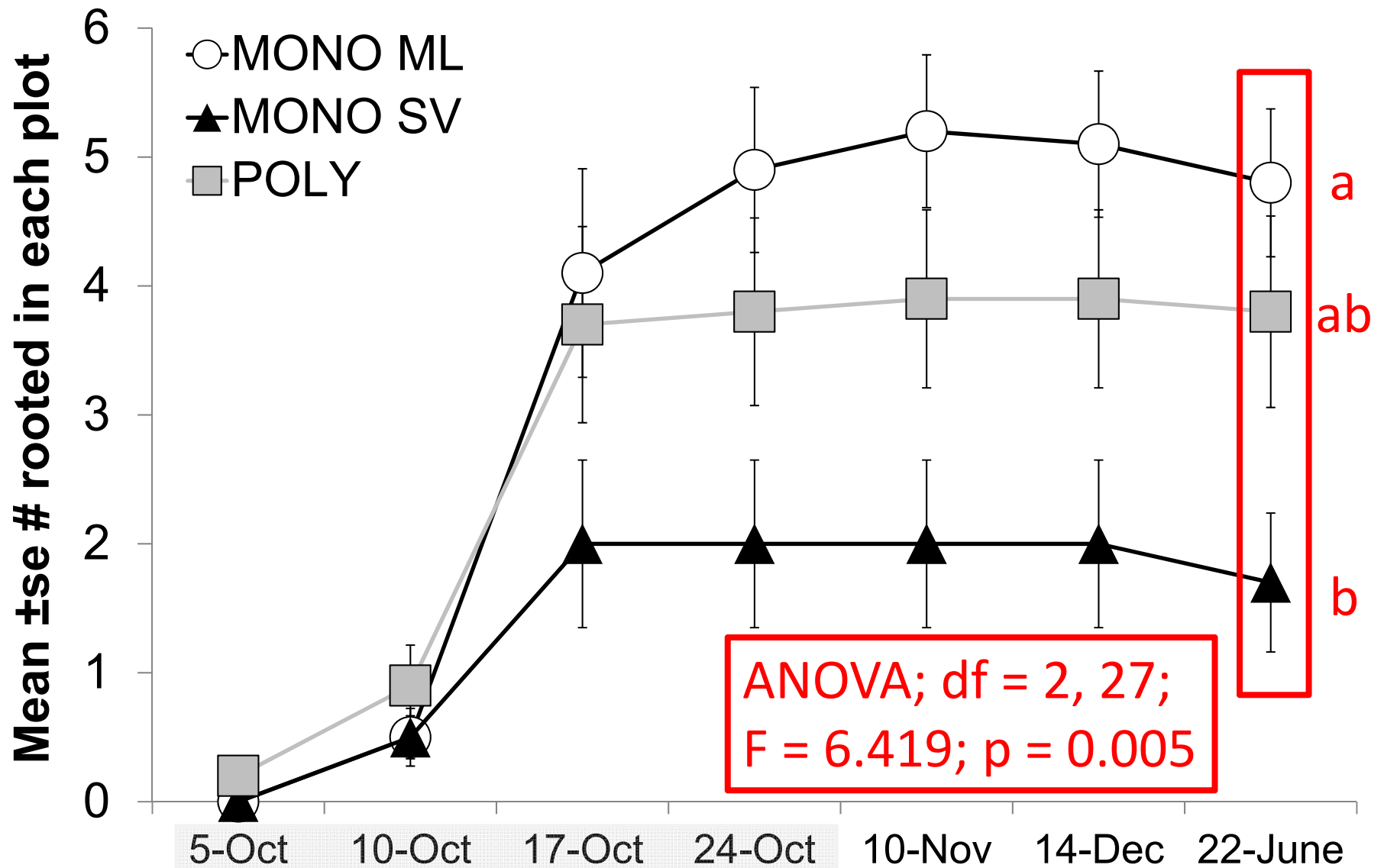


*Monanthochloe littoralis*



Polyculture

# Results: *A. germinans* establishment



# Observed causes of mangrove propagule mortality



**Herbivory**

**N = 33**



**Desiccation**

**N = 6**

# Propagule loss from plots

Proxy for mortality

Cox Proportional Hazard Analysis

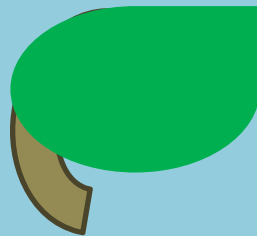
	<b>ML</b>	<b>SV</b>	<b>POLY</b>
<b>5-Oct</b>	14	26	22
<b>10-Oct</b>	15	36	29
<b>17-Oct</b>	19	65	39
<b>24-Oct</b>	25	67	41
<b>10-Nov</b>	32	69	45
<b>14-Dec</b>	33	70	48
<b>22-June</b>	<b>42</b>	<b>73</b>	<b>52</b>



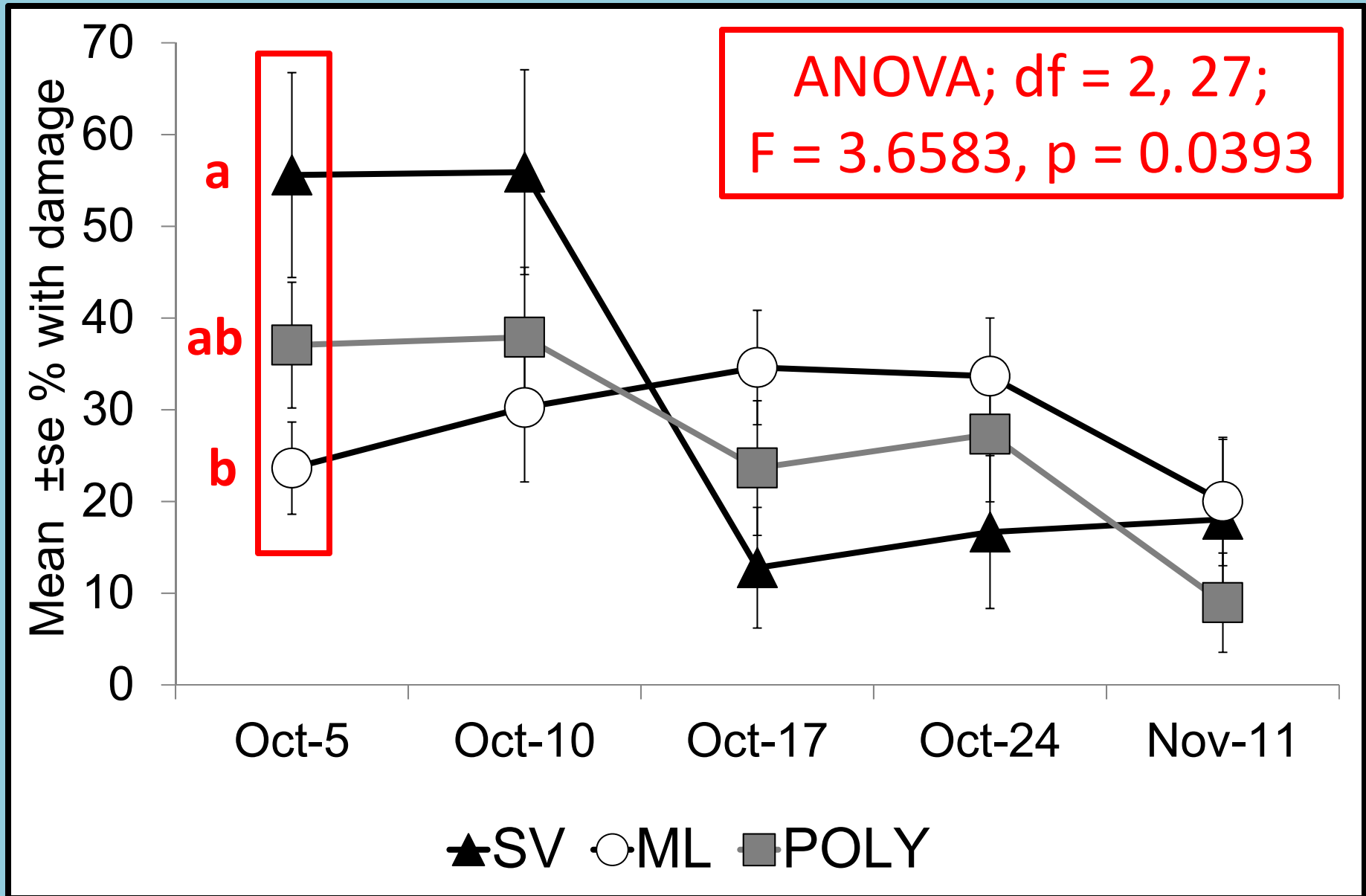
# What happened to the “lost” mangrove propagules?

## Were they completely consumed?

Evidence suggests that this is a plausible explanation



# Results: *A. germinans* with damaged cotyledons



# Summary of Results

1. Greater number of seedlings established in ML (48) than in POLY (38) and SV (17)
2. Majority (62%) of propagules were lost; greatest risk loss from SV
3. Observed mortality due to herbivory and desiccation; desiccation only in ML
4. Herbivory significantly greater in SV than ML

# Key Findings

Interactions with saltmarsh plants influenced mangrove survival during initial life-history stages (propagule – seedling)

Mangroves experienced associational susceptibility to herbivory in patches of *S. virginicus*

- Do herbivores preferentially forage in *S. virginicus*?
- Does canopy cover / shading influence herbivory?

# Results in Context

## Previous work:

Herbivory on mangroves differs with intertidal position and mangrove canopy (presence / type)

## This study adds:

Patch-level differences in saltmarsh composition (i.e., grass type)





## Conclusions

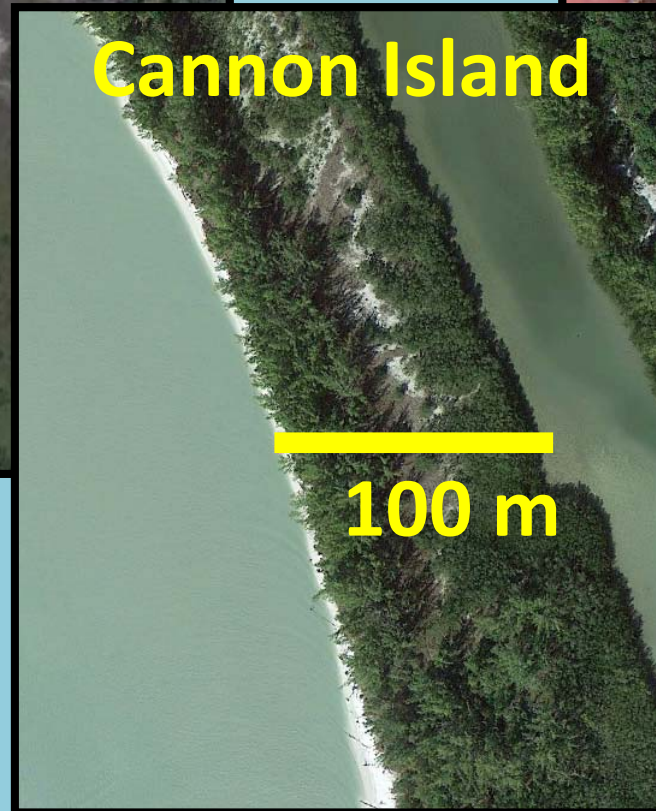
Saltmarsh mosaic produced meter-scale heterogeneity in mangrove survival

Spatial distribution of mature mangroves at landward boundaries may reflect saltmarsh patches into which propagules initially recruited

**Interactions between *A. germinans* and *S. virginicus* may differ among sites due to ecological factors (i.e., physical and biological constraints on recruitment)**



Tidal dispersal  
Entrapment



Susceptibility to  
herbivory

# Questions?

