

# Terrebonne Paper Markdown

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## Data Exploration

This markdown document is for sharing the data exploration and analyses completed for the Terrebonne Bay marsh fragmentation paper tentatively titled : “Relating Marsh Fragmentation to Emergent and Submerged Vegetation Cover in a Rapidly Changing Coastal Landscape”.

Data was collected in April and September of 2016, at/near 3 CRMS sites (311, 345, 369), each representing areas of high, intermediate, and low annual salinity measurements. Within each site there were 9 sub-sites chosen which spanned the degree of marsh fragmentation at each site.

## Emergent Vegetation

At each of these subsites data was collected on the diversity and richness of emergent vegetation at 21 stations. At each station a 5m transect was surveyed, with quadrats done at 0m, 2.5m, and 5m from the marsh edge, recording the percent cover of each species present. Elevation was recorded during the April sampling period.

## Open Water Survey Data

At each subsite 20 open water stations were sampled to document submerged aquatic vegetation presence and record water quality parameters (depth, salinity, temperature, do, PAR)

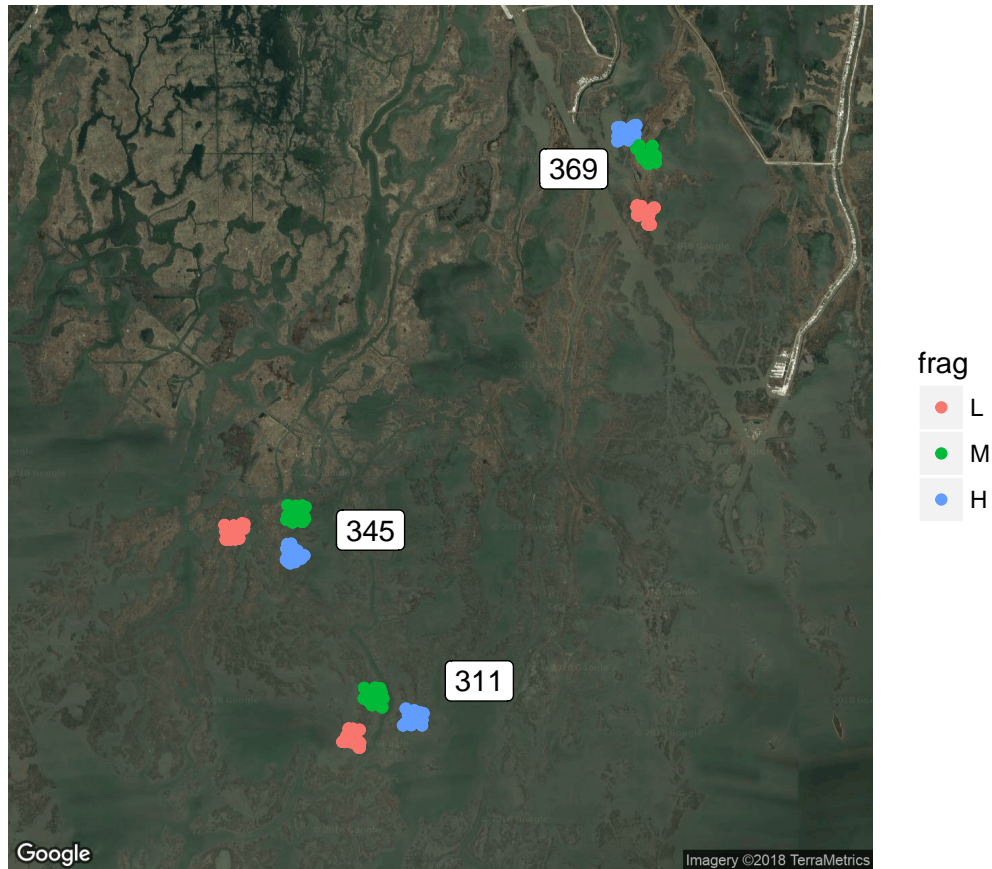
## CRMS site data

At each site a hydrographic datalogger records hourly data on certain water quality parameters which can be used to get yearly/monthly/daily averages for the site. The available parameters include: temperature, salinity, conductance, water level, and marsh mat elevation.

## 1. Marsh Fragmentation Dataset

This dataset will be used to investigate the potential impact of environmental factors on species richness/diversity, and community composition.

## The Study Area:



## Possible Response Variables:

Richness Diversity Indices (Shannon, Simpson) Dissimilarity Indices (Bray-Curtis)

## Fixed Effects:

Local:

Depth

Elevation

Distance From Edge

Bogaert fragmentation score ?

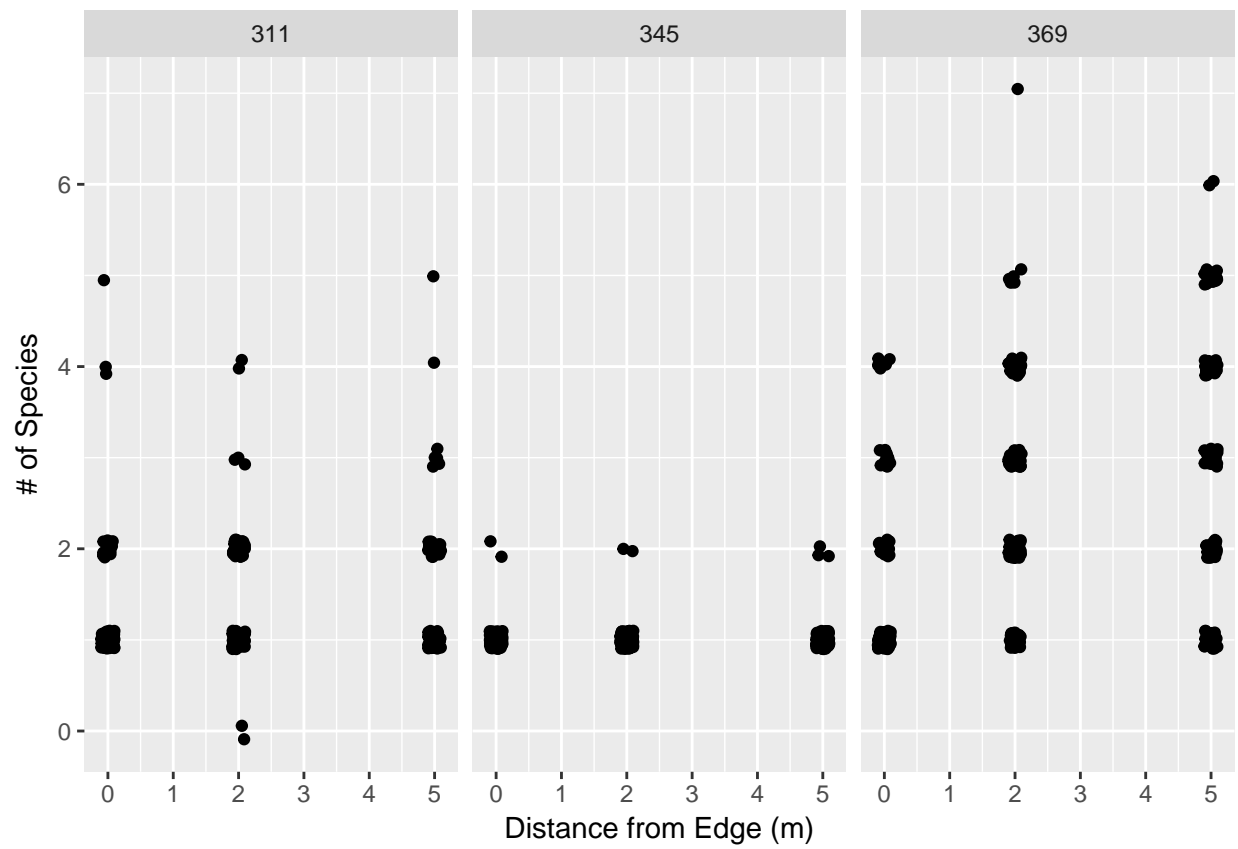
Site level:

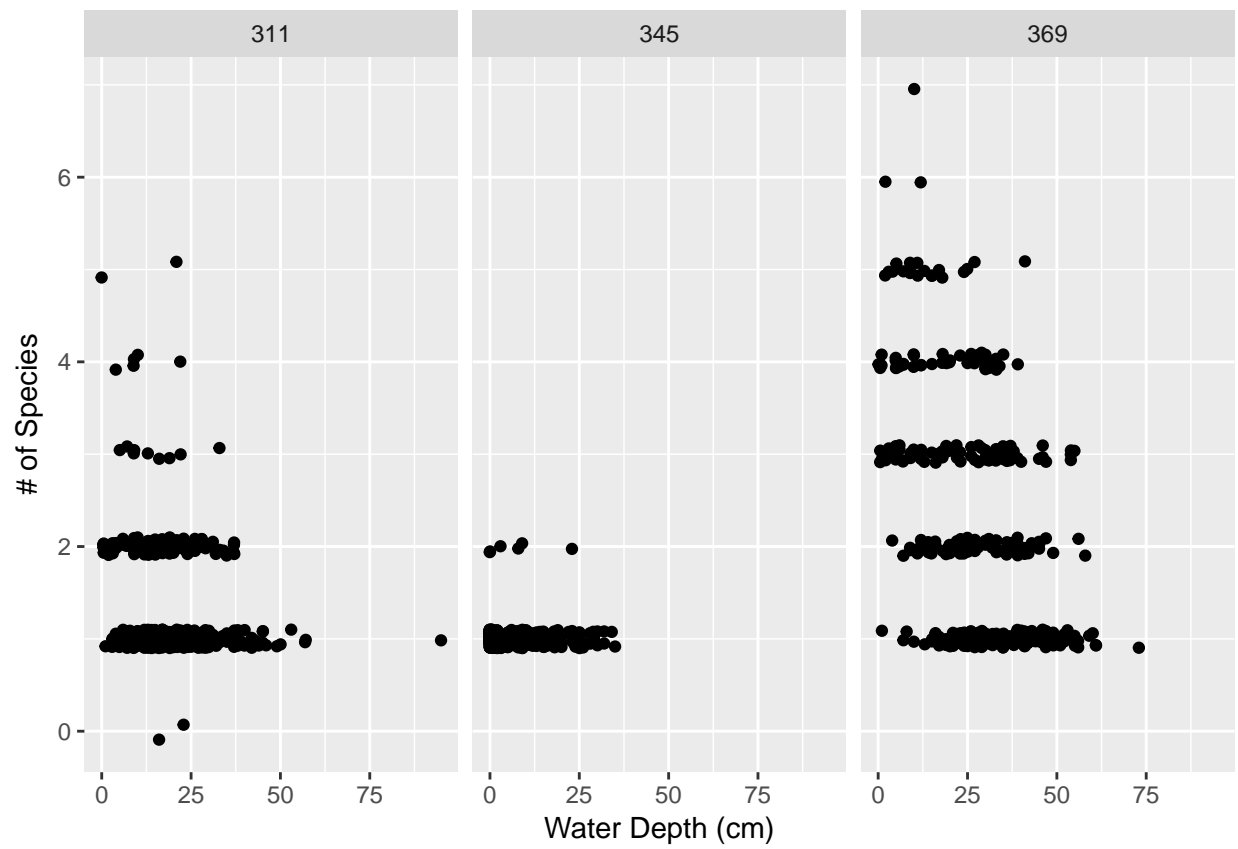
\*Accompanying CRMS Data, yearly max/min/average

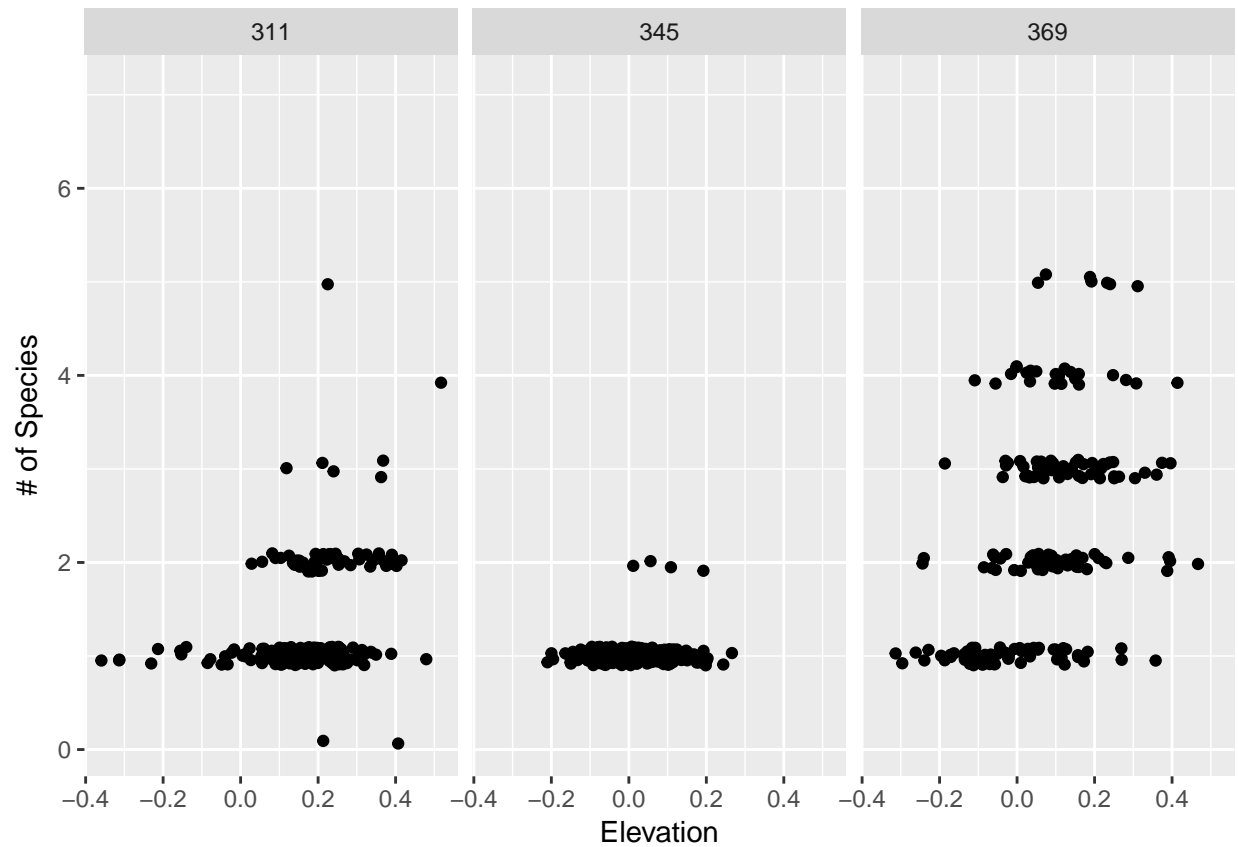
salinity

temperature

water level







## Random Effects:

Month

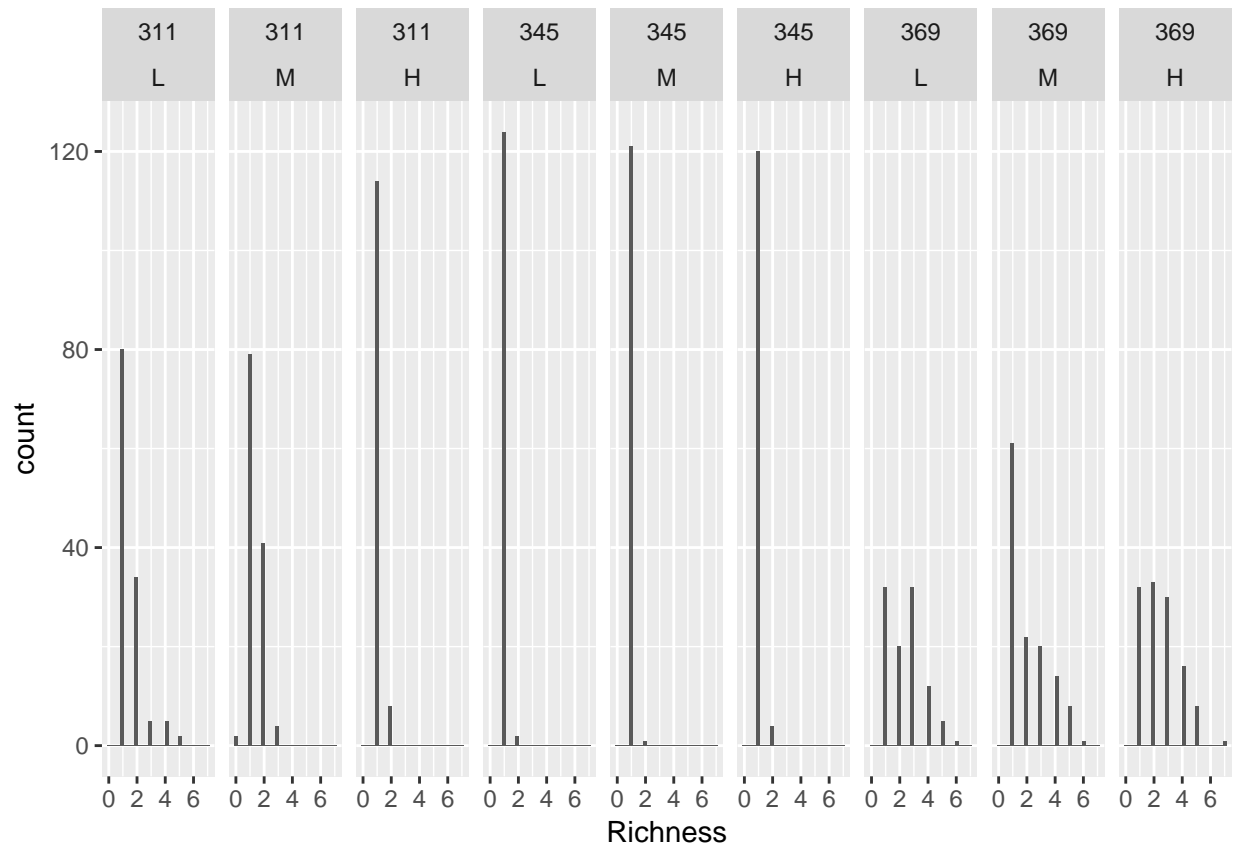
Fragmentation

Site

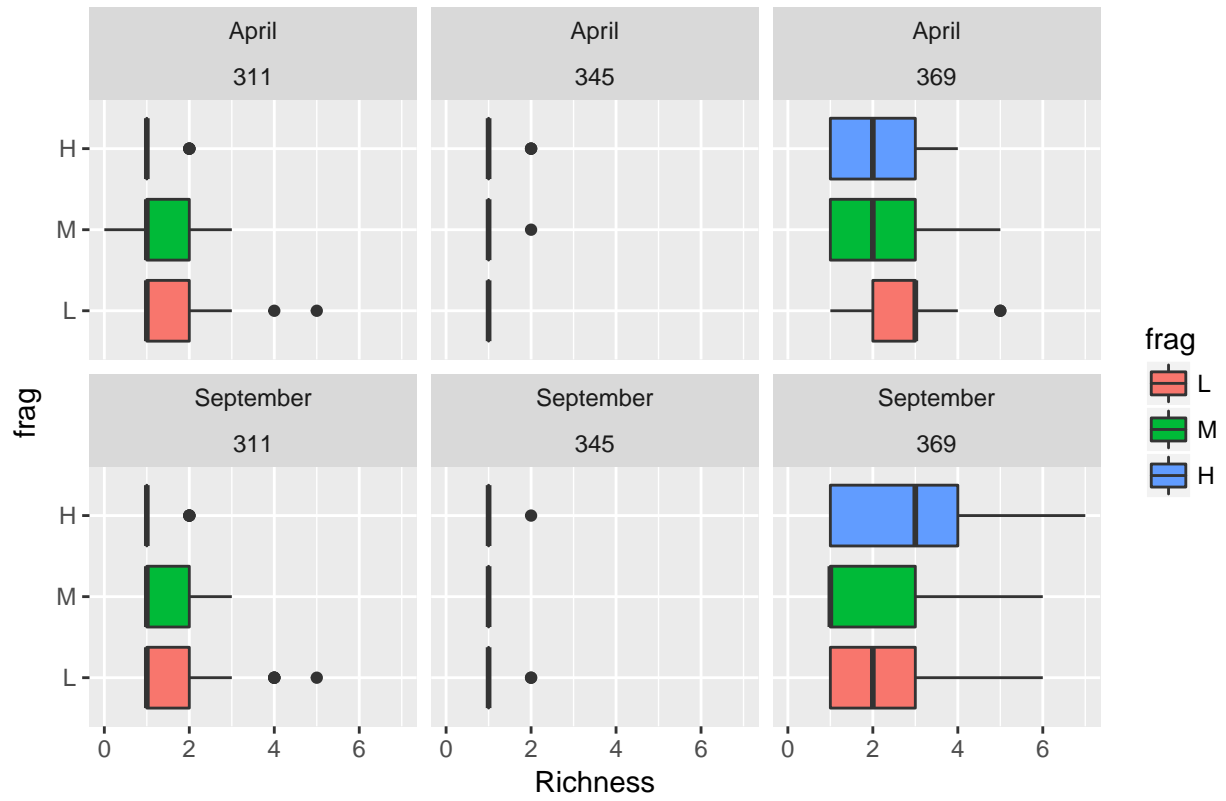
Subsite

Transect/station

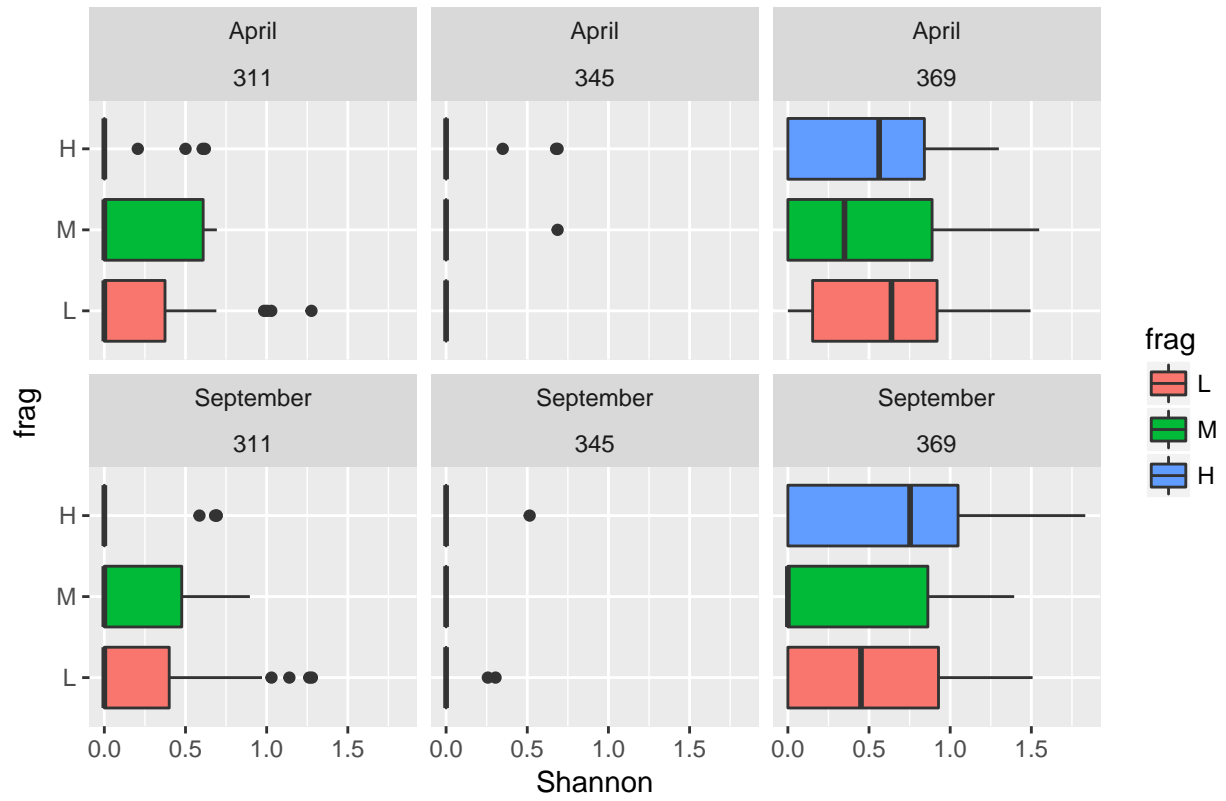
## ``stat_bin()`` using ``bins = 30``. Pick better value with ``binwidth``.



# Species Richness

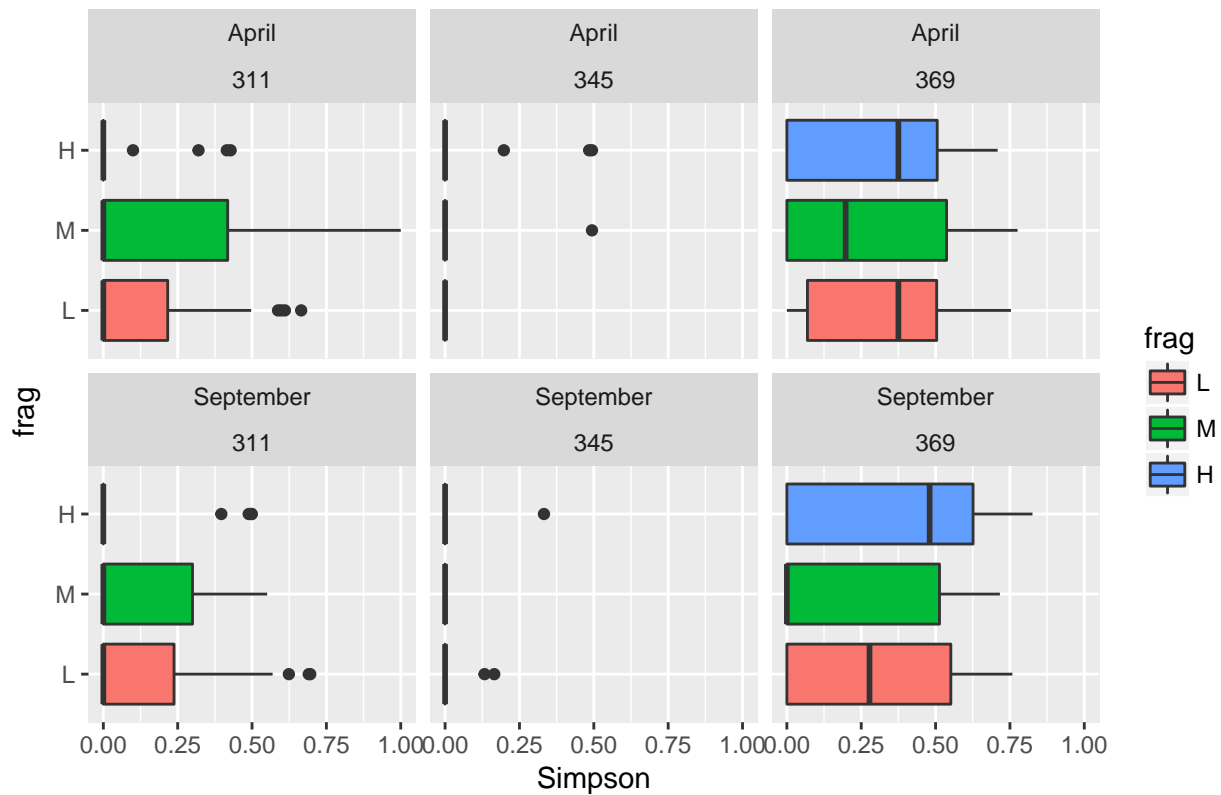


# Shannon Diversity





## Simpsons Diversity



Note that the data available through the freely available crms site data is down to the site level, and would serve to characterize any significant difference we may see between sites.

## Open Water Survey Dataset

This dataset will be used to investigate the potential impact of environmental factors on the presence of various SAV species at different levels of fragmentation.

### Possible Response Variables:

presence/abundance seagrass

### Fixed Effects:

salinity  
depth  
temperature  
PAR  
light attenuation ( $K_d$ )

## Random Effects

Month  
Fragmentation  
Site  
Subsite

## Calculating Light Attenuation

The Texas seagrass monitoring protocols give two equations to use with the Li-cor PAR measurements:

1. Percent surface irradiance available at the seagrass canopy is calculated as follows:

$$\%SI = (i_z/i_o) * 100$$

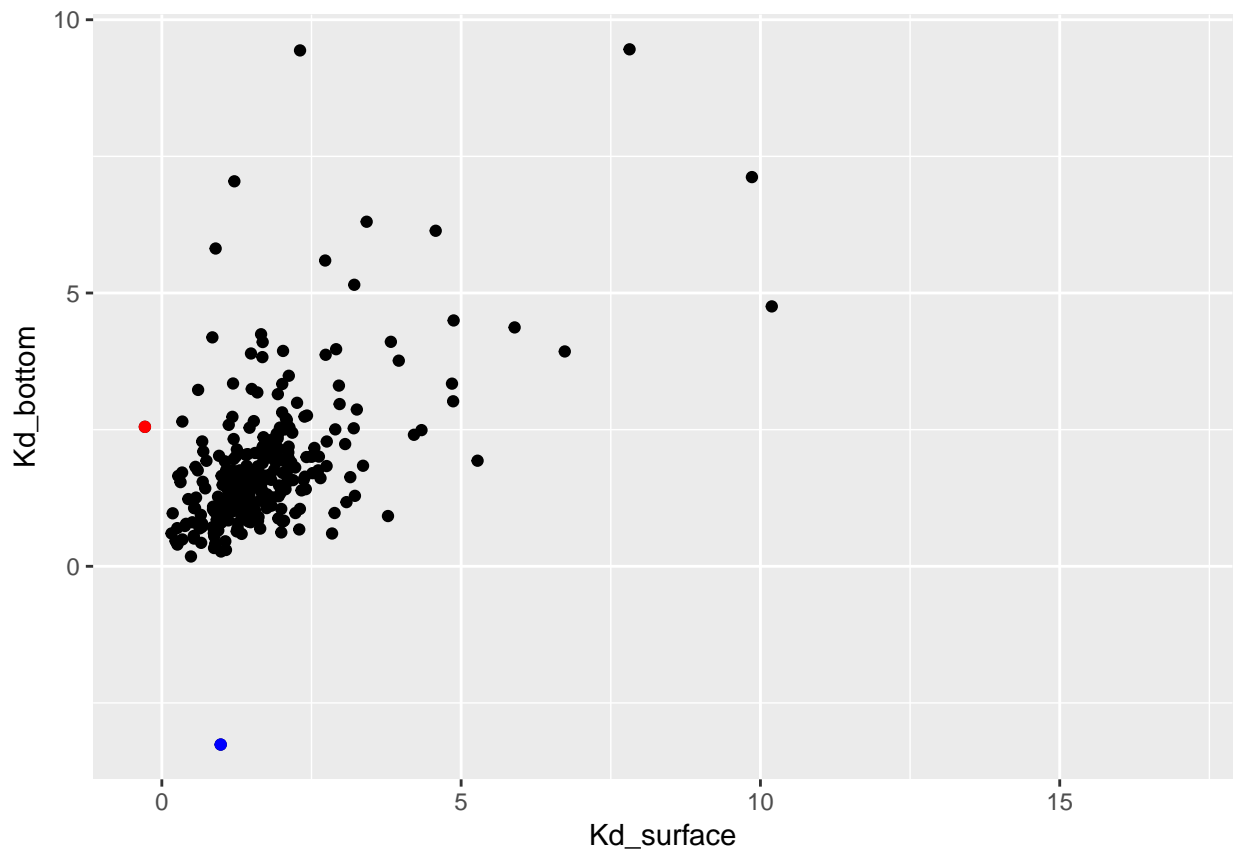
This equation gives the percent of light lost between measurements at depth  $I_z$  and at the surface  $I_o$ , and ranges from 0-1.

2. Light attenuation is calculated using the transformed Beer-Lambert equation:

$$k_d = \frac{-[\ln(I_z/I_o)]}{z}$$

where  $k$  is the attenuation coefficient ( $m^{-1}$ ) and  $I_z$  and  $I_o$  are irradiance ( $\mu mol$  photons  $m^{-2} sec^{-1}$ ) at depth  $z$  (meters) and at the surface, respectively. With a distance of  $z=0.15$  between bulbs,  $k_d$  calculates for attenuation per 15cm and doesn't necessarily scale 0-1.

## [1] "Measuring Light Attenuation in Shallow Coastal Systems\nAna C. Brito1, Alice Newton, Teresa F. I



red = bottom bulb has greater value than top bulb for surface measurement or  $\text{top\_par2} > \text{top\_par1}$   
blue =  $\text{bot\_par\_2} > \text{bot\_par\_1}$