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# **Analysis of 47 year long TPWD Catch Data**

## **on Texas Coast**

Looking at bull shark abundance in  
Corpus Christi and Aransas Bays

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# Overview

- Gillnet Surveys along the Texas Coast. Set at sunset, pick up no earlier than sunrise
- Time: 1975–2022 (47 years!), Fall and Spring Seasons
- This dataset has any and all species that were caught, but our focus is on the **Study Species: Bull shark (*C. leucas*)**

**Gear Description:** Coastal Fisheries gill nets cover the water column from the bottom to as much as 1.2 m (4 ft) above the bottom, have a total length of 182.9 m (600 ft) and are constructed of four continuous 45.7 m (150 ft) long panels with stretched mesh monofilament webbing sizes of 152 mm (6 in), 127 mm (5 in), 102 mm (4 in) and 76 mm (3 in).



**TEXAS PARKS AND WILDLIFE DEPARTMENT**  
**Coastal Fisheries Division**

# How to approach data



## Using R studio:

- filter/mutate to tidy data (a LOT of data)
- ggplot for visualizing data
- leaflet packages for mapping

## Research Question(s):

1. Where are hotspots for YOY and juvenile bull shark abundance in Nueces and Mission-Aransas Estuaries?
2. How do environmental conditions change presence/absence of this species?

MAJOR_A	MINOR_A	STATION_C	COMPLETENESS	X	START_TEI	START_SAI	START_TU	START_DIS	ELAPSED_SEASON	Blue_crab	Hardhead_Spo
1	700	20 18APR198	29.9833	-93.8583	22.4	0	23	8	15.35 SPRING	2	3
1	700	20 12APR199	29.9889	-93.8542	16	1	18	8.5	15.133 SPRING	1	2
1	700	20 10MAY199	29.9903	-93.8639	20.5	0	17	7.5	12.667 SPRING	3	5
1	700	20 22MAY199	29.9889	-93.8569	24.4	3	23	7	12.717 SPRING	2	2
1	700	20 12SEP1990	29.9889	-93.8542	28.4	10	25	6.2	15.1 FALL	4	0
1	700	20 06NOV199	29.9889	-93.8542	14.2	11	9	9.7	17.217 FALL	0	0
1	700	20 28OCT199	29.9889	-93.8542	25.8	12	8	8.1	14.5 FALL	3	3
1	700	20 05OCT199	29.9833	-93.8569	28.5	7	10	10.1	15.083 FALL	1	5
1	700	20 03NOV199	29.9889	-93.8528	21.3	10	9	5.6	15.067 FALL	2	0
1	700	20 05JUN199	29.9833	-93.8556	30.2	6.5	11	4.5	15.15 SPRING	1	1
1	700	20 08OCT199	29.9833	-93.8583	24.3	15	13	6.9	17.2 FALL	1	0
1	700	20 13MAY199	29.9833	-93.8569	22.7	2	16	7.5	13.067 SPRING	0	0
1	700	20 09JUN199	29.9833	-93.8569	29.6	9	8	9	13.517 SPRING	0	1
1	700	20 07OCT199	29.99	-93.8528	25.1	2	10	5.6	14.7 FALL	2	0
1	700	20 12MAY199	29.9833	-93.8539	26.3	6	25	7.1	13.967 SPRING	2	2
1	700	20 28SEP1999	29.9833	-93.8553	29.9	12	16	9.6	15.083 FALL	4	6
1	700	20 01NOV2000	29.9833	-93.8558	25.9	20	22	7.1	16.083 FALL	2	0
1	700	20 30MAY2000	29.9844	-93.8567	32.4	7	18	9	12.517 SPRING	5	1
1	700	20 15MAY2000	29.9842	-93.8558	27.1	1	45	9.4	13.367 SPRING	5	1
1	700	20 17SEP2000	29.9833	-93.8542	27.3	6	15	6.1	13.533 FALL	9	6
1	700	20 20NOV2000	29.9889	-93.8533	19.3	11	15	10.9	15.217 FALL	0	0
1	700	20 17JUN2000	29.9836	-93.8558	31.1	2.5	25	8.8	13.533 SPRING	3	4
1	700	20 07JUN2000	29.9833	-93.8544	30.7	12	17	8.1	14.5 SPRING	3	14
1	700	20 02NOV2000	29.9897	-93.8544	19.4	18	14	8.2	17.083 FALL	0	0
1	700	20 24MAY2000	29.9839	-93.8553	28.8	6	28	9.3	13.2 SPRING	2	8
1	700	20 07NOV2000	29.9833	-93.8586	20.2	1	21	7.6	14.983 FALL	0	1
1	700	20 12JUN2000	29.9839	-93.8544	32.8	4.5	12	7.7	13.283 SPRING	6	6
1	700	20 26SEP2000	29.9833	-93.8536	29.9	4.9	9	7.8	13.75 FALL	2	5
1	700	20 30SEP2000	29.9994	-93.8539	28	9	50	8.1	14.783 FALL	10	3
1	700	20 13MAY2000	29.9842	-93.8578	29.9	0	50	7.6	14.4 SPRING	3	4

# Tidy Data

## Location

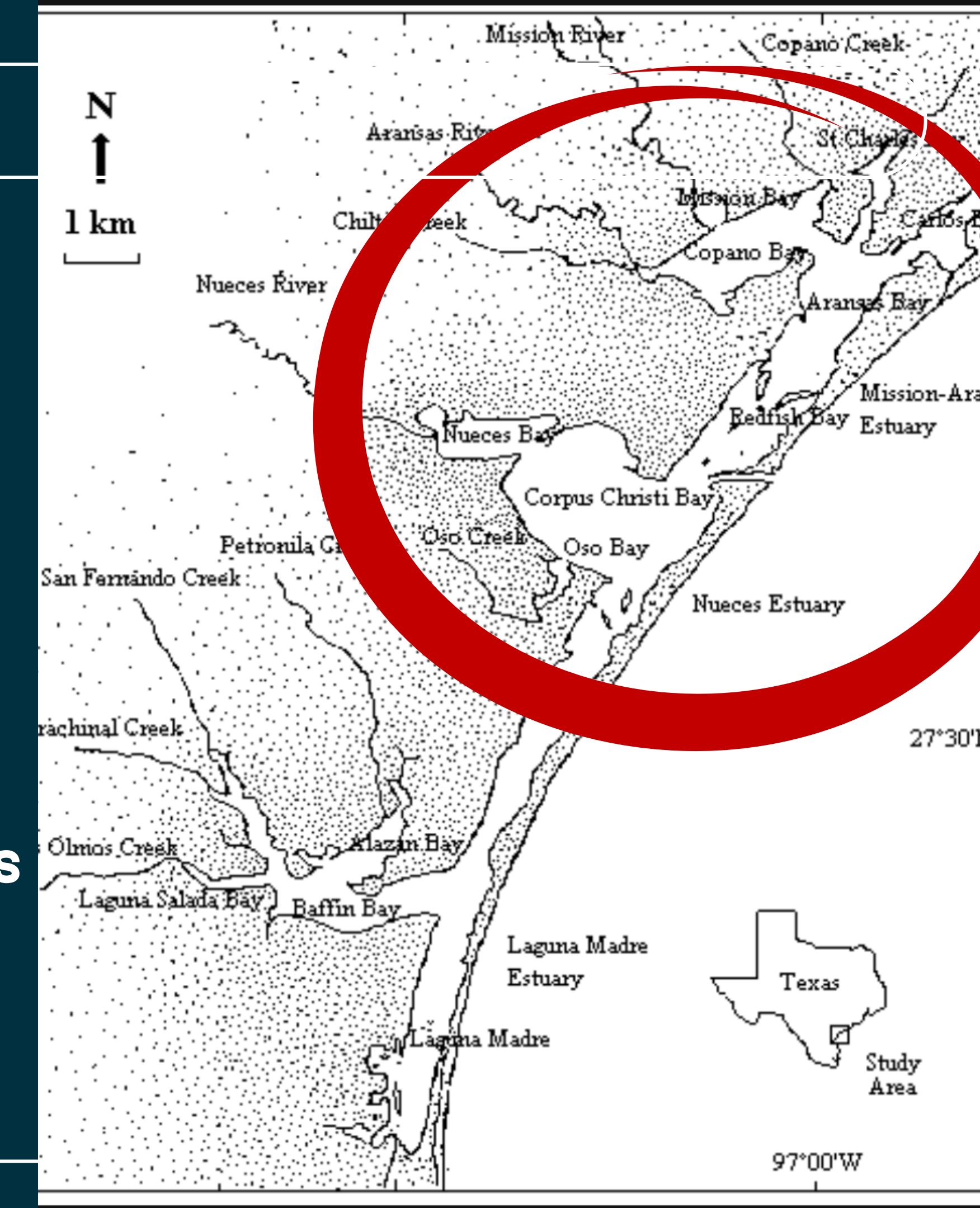
- Looking at Nueces and Mission Aransas Estuaries
- Nueces Bay (260), Corpus Christi Bay (6) and Aransas Bay (5)

## Species

- Bull shark: code 755

## Environmental Factors

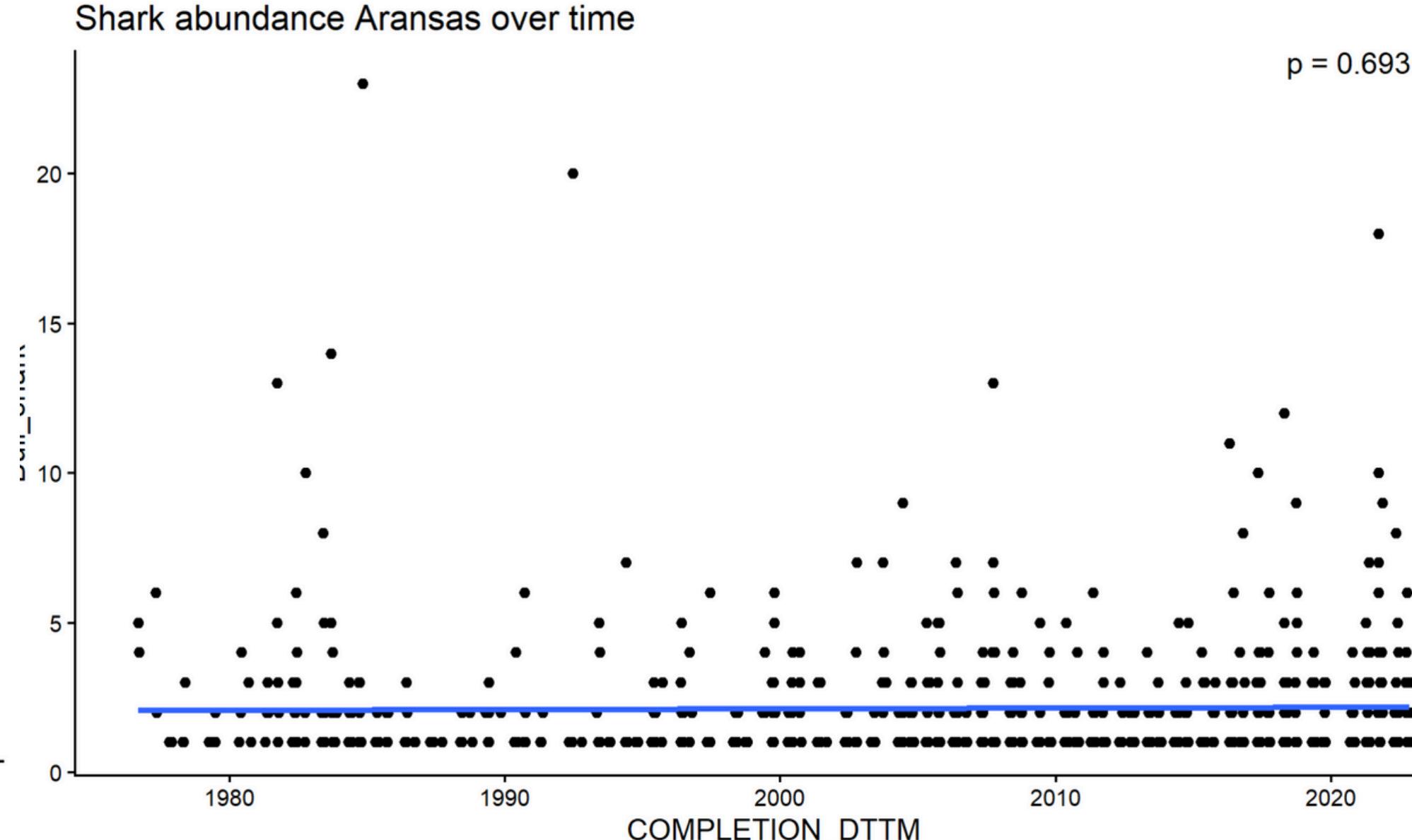
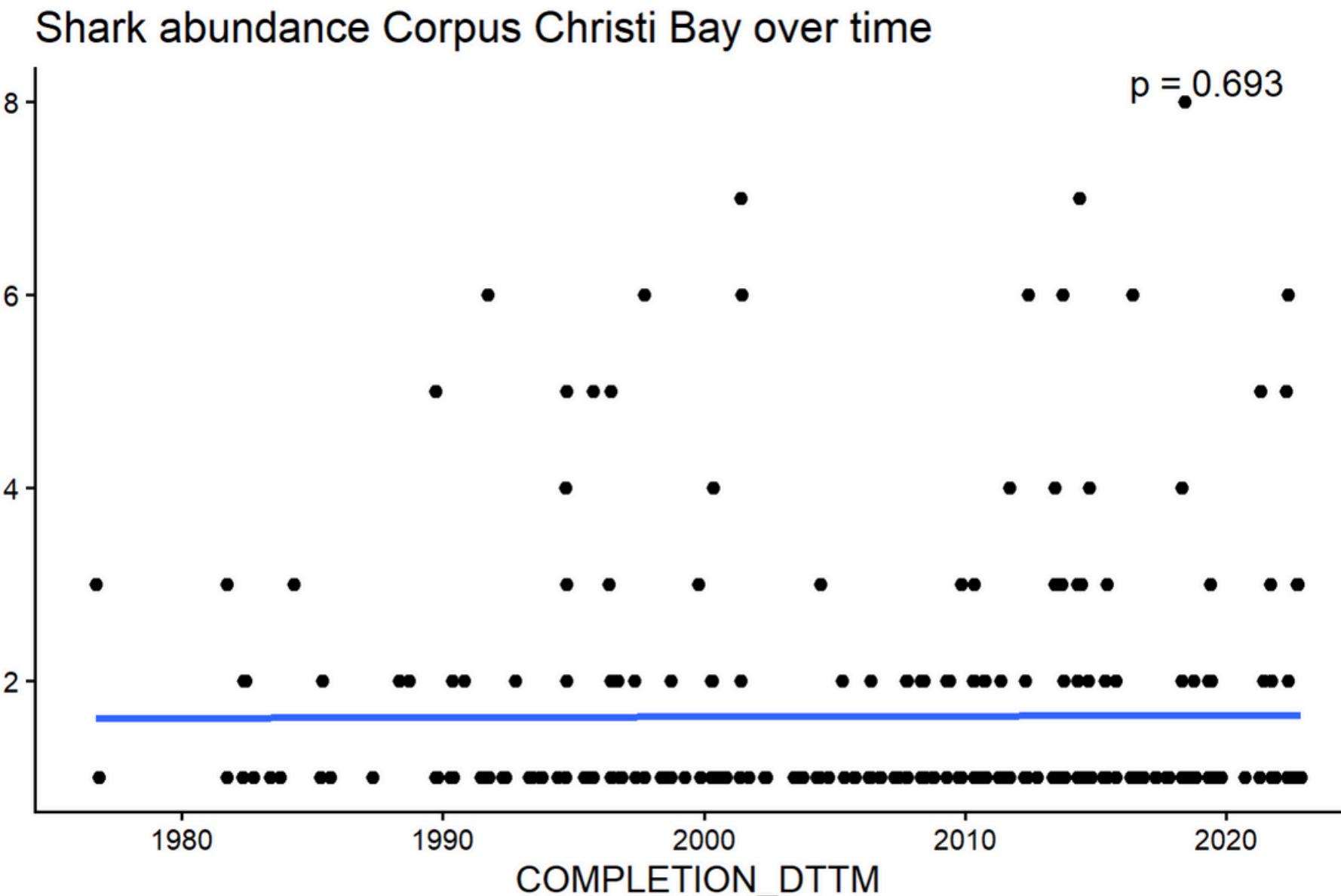
- Temperature
- Salinity
- Time (Year)
- Season



# How has bull shark abundance changed over time?

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No significant change in abundance in Nueces Bay and Aransas Bay



**Even though we don't see a significant difference in these areas, globally, bull shark populations 'Vulnerable'.**

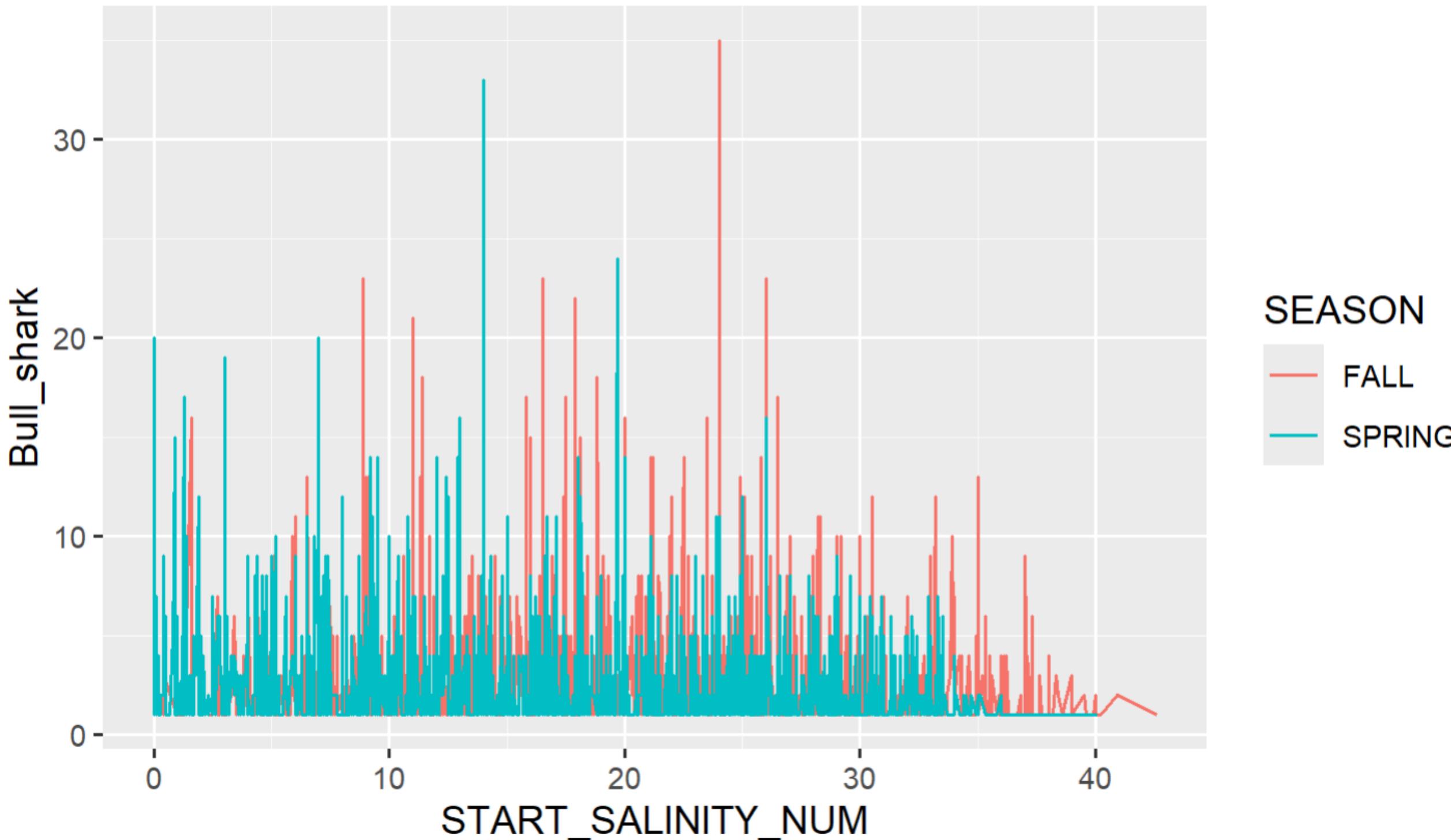


Use this area of high density as a study sight for tagging and tracking to better understand their behavior ecology. We can use this to predict behavior, presence, or absence in different environmental conditions.



# Environmental Condition effect on CPUE

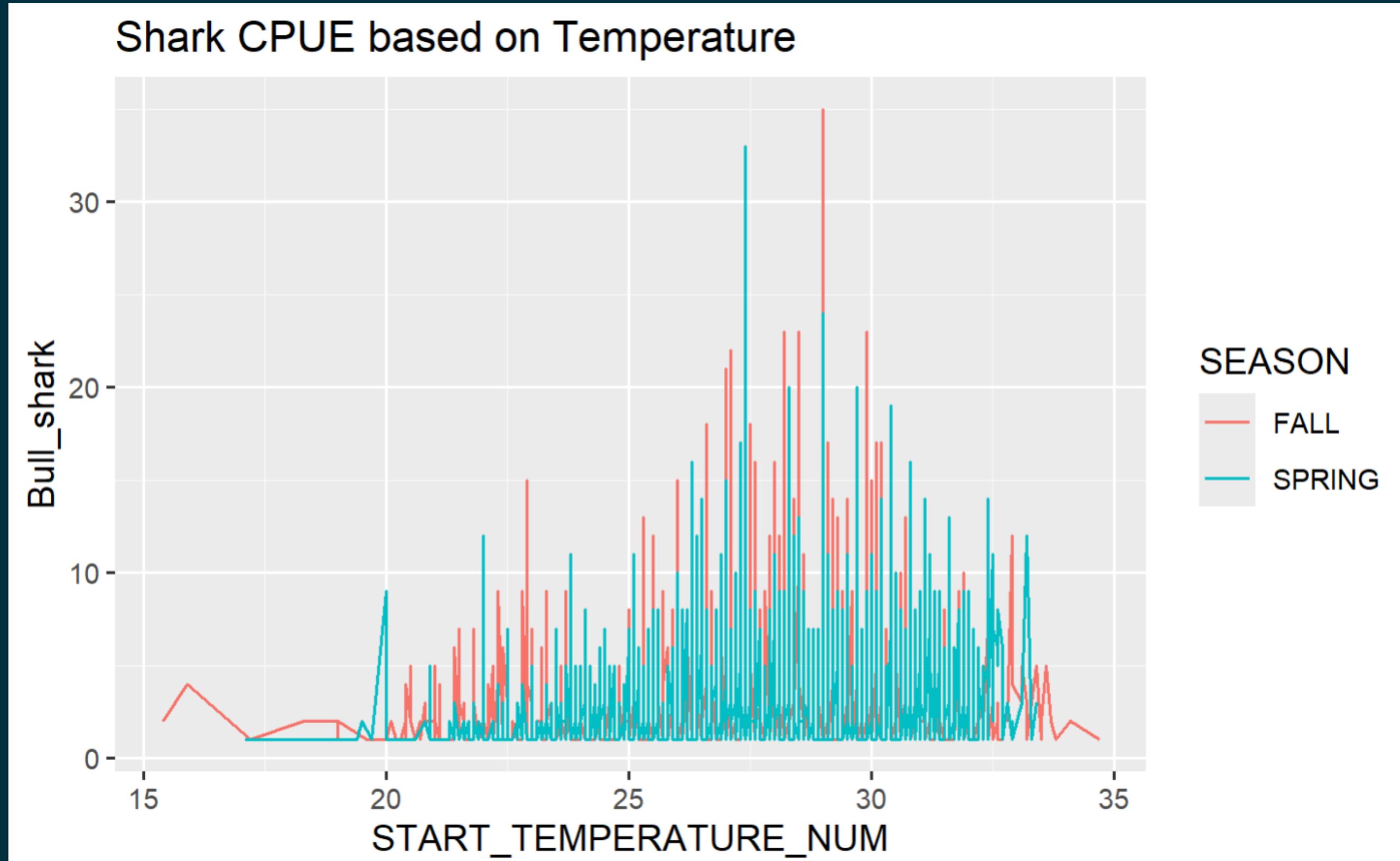
Shark CPUE based on Salinity



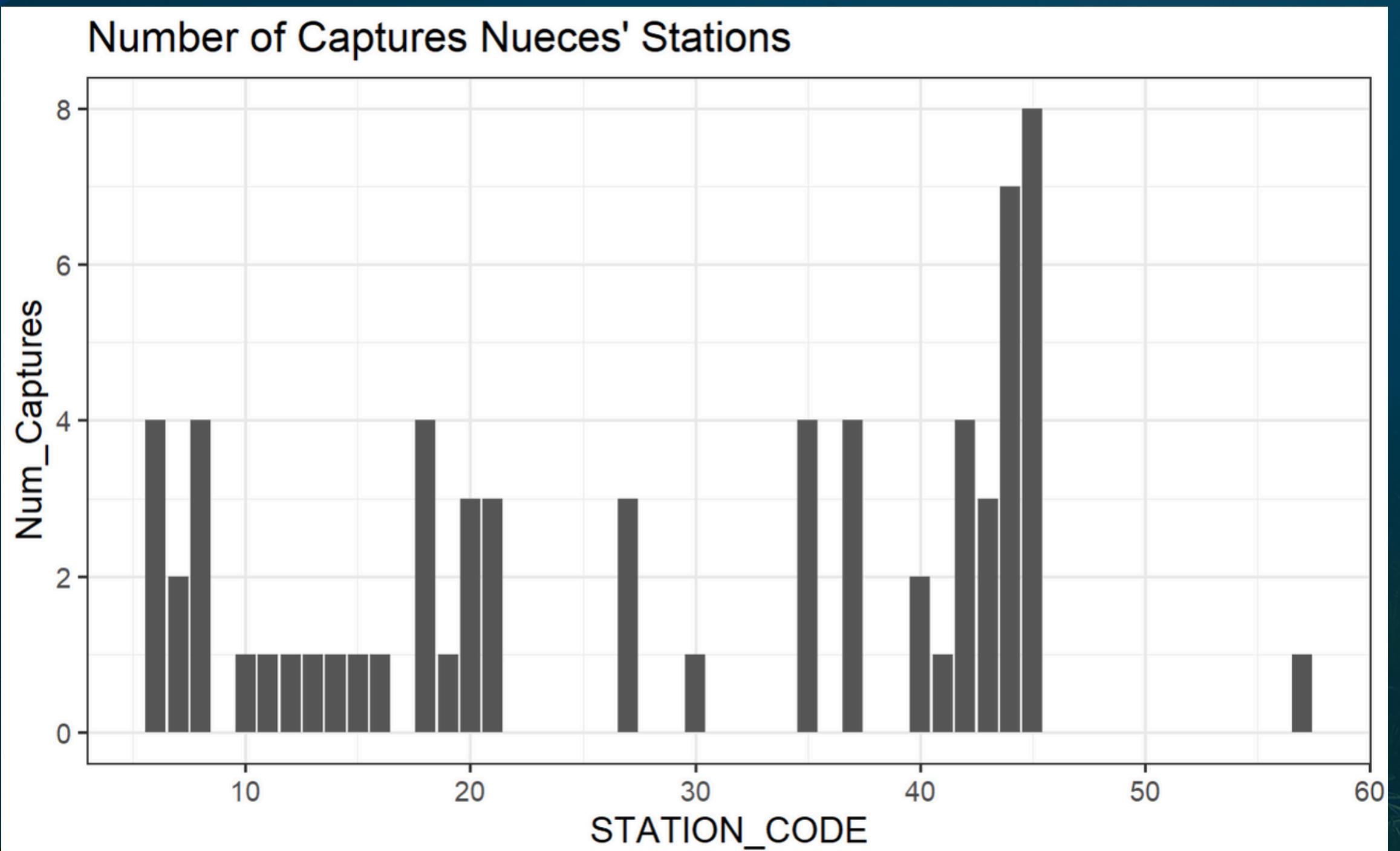
Preference for intermediate salinity values

- Important for understanding how their presence changes with salinity increase

# Environmental Condition effect on CPUE

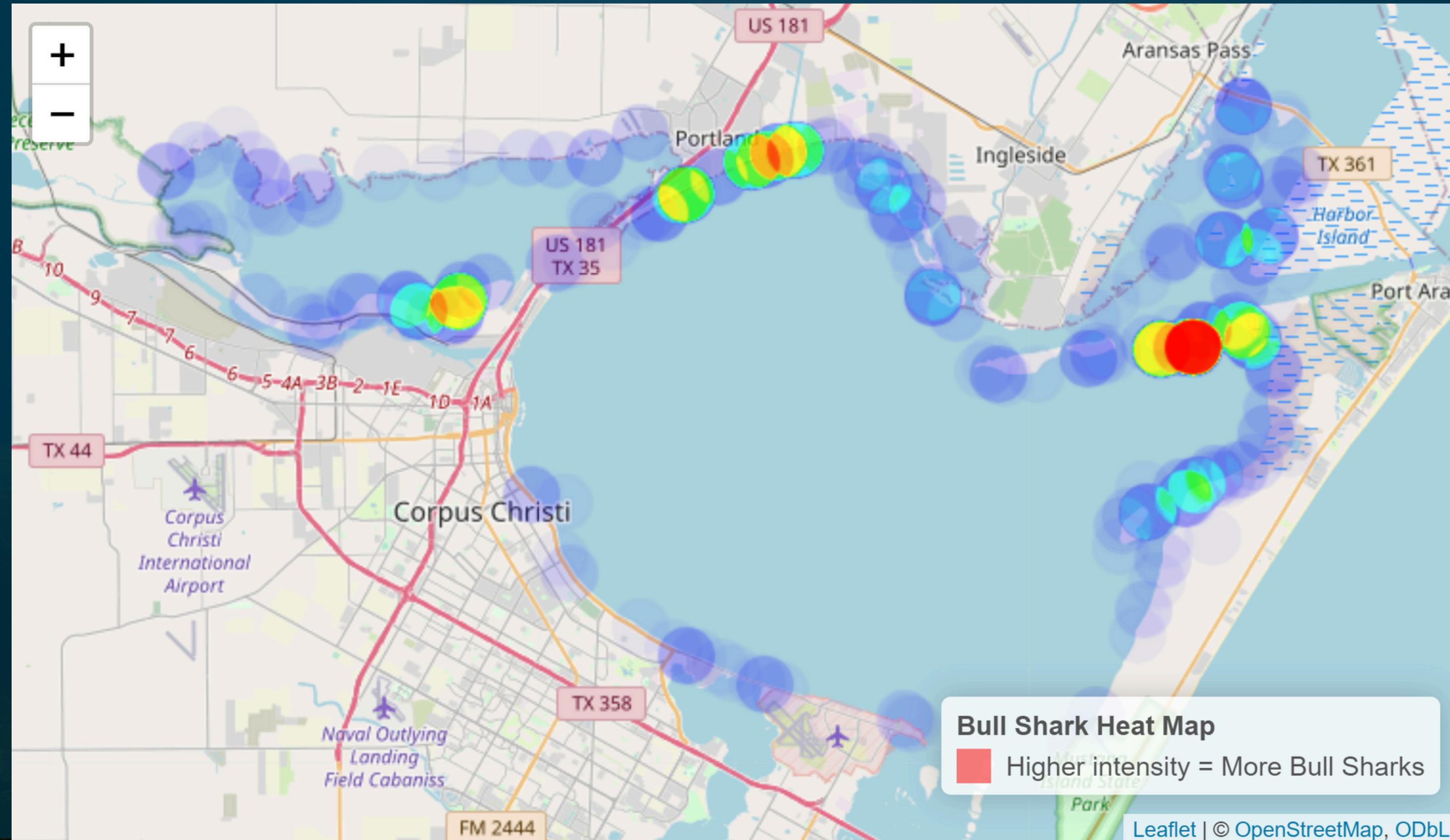


# Nueces TPWD Catch Data by Station

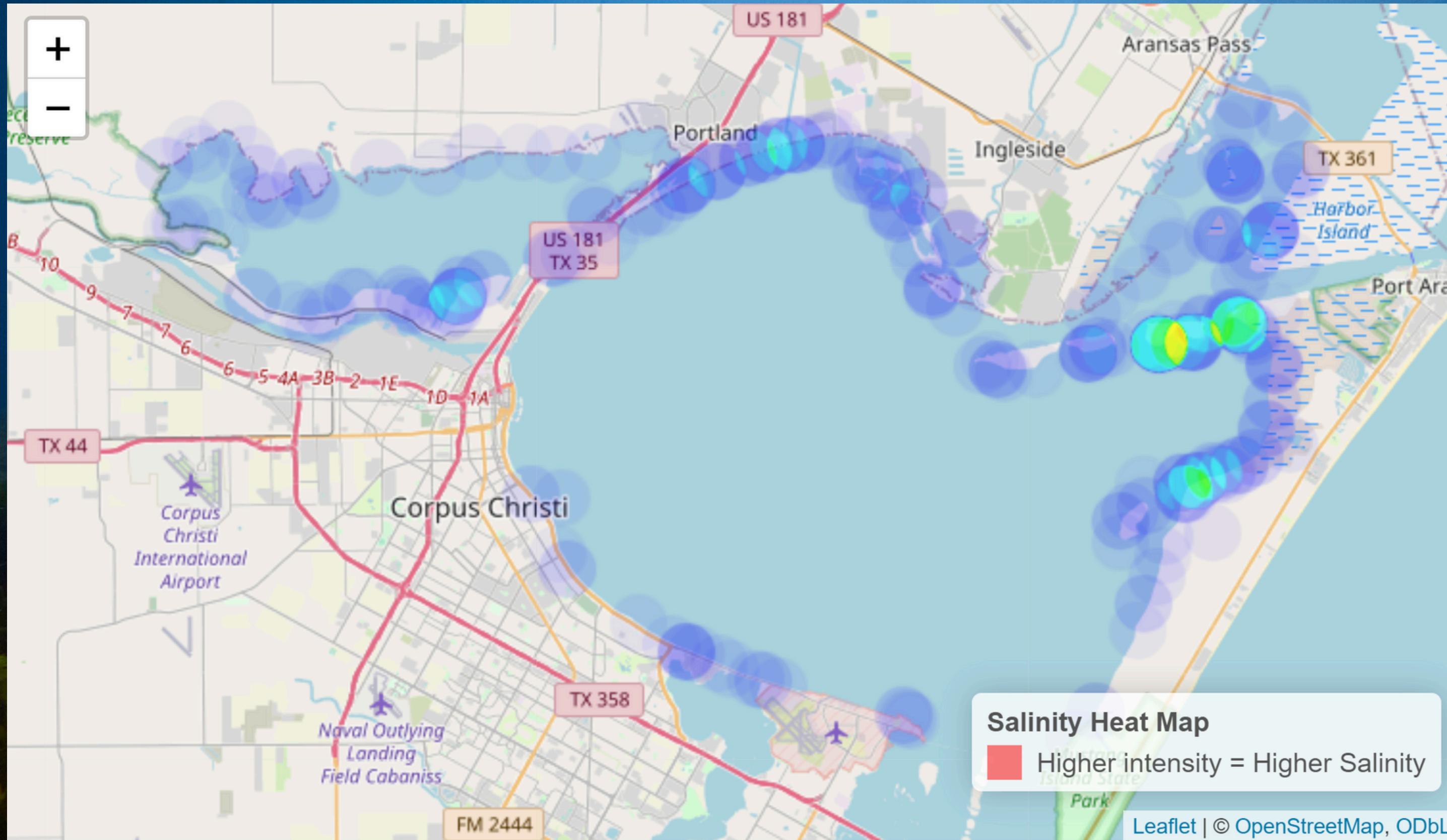


Can we  
visualize this  
on a map?

# Corpus Christi Bay Shark Densities

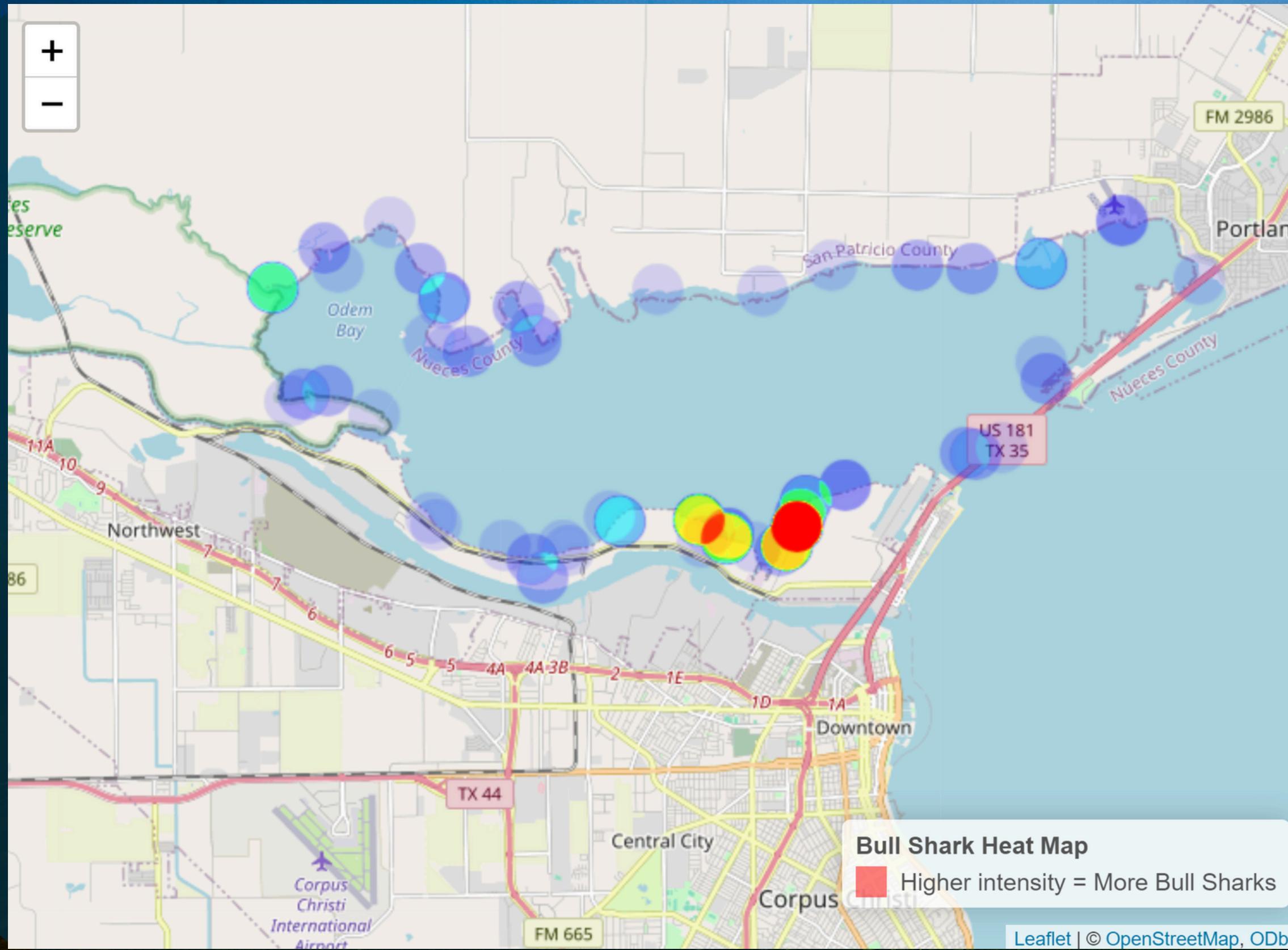


# How does salinity change abundance?



Salinity  
Range: 0.2-  
39.9 ppm

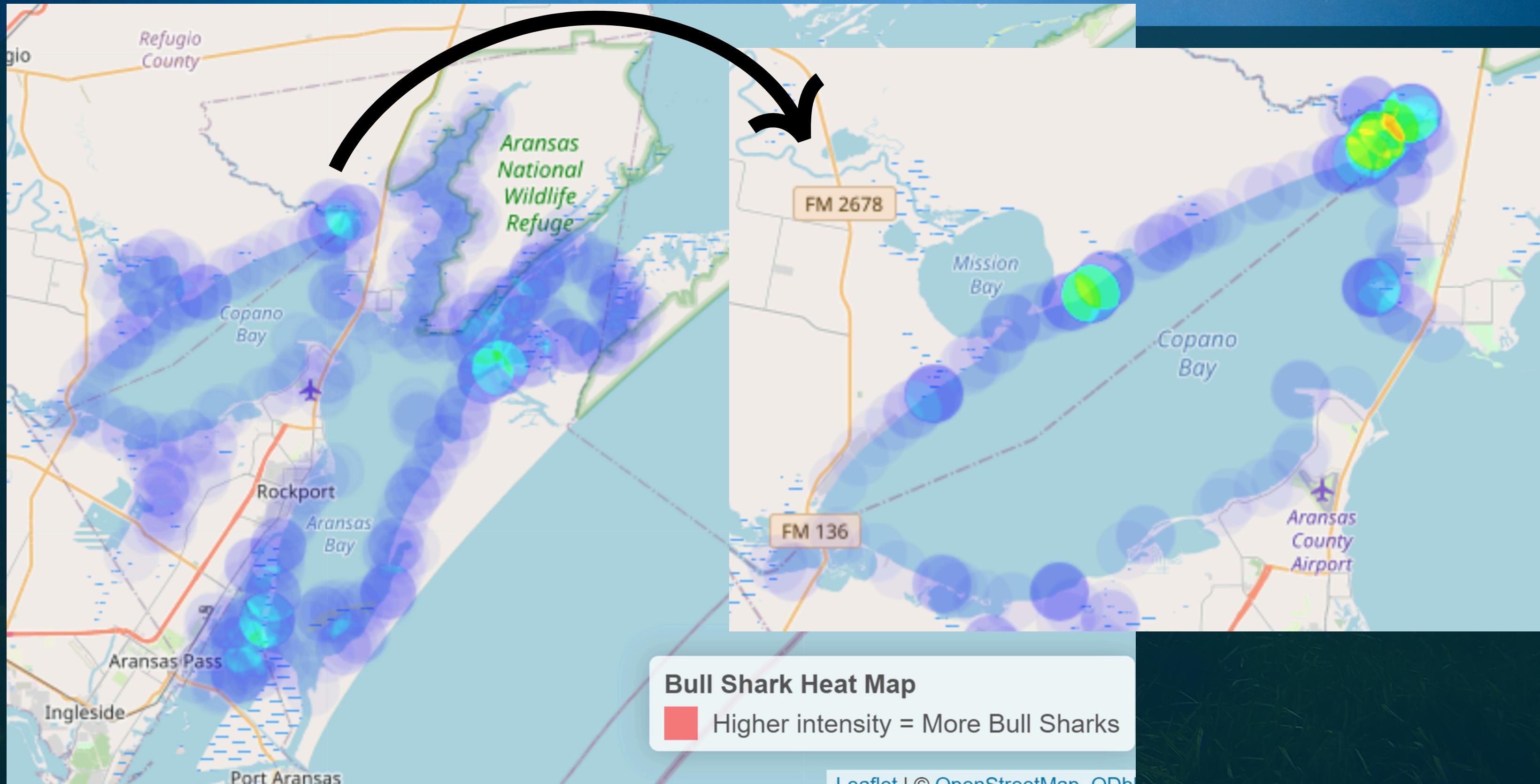
# Zooming in: Nueces Catch Data



```
nuecesmap <- leaflet(Nueces) %>%
  addTiles() %>%
  addHeatmap(
    lng = ~X,
    lat = ~Y,
    intensity = ~Bull_shark * 50,  #
    weights the heat by # of sharks
    blur = 1,                      # smoothing
    max = max(Nueces$Bull_shark, na.rm =
      TRUE),
    radius = 15) %>%
  addLegend("bottomright",
    colors = "red",
    labels = "Higher intensity = More
    Bull Sharks",
    title = "Bull Shark Heat Map")
```

nuecesmap

# Zooming out (Aransas Bay Shark Densities)



# Discussion

## Dissertation

- Fishing areas plotted in Corpus Christi!

## Stats

- Abundance in both areas has not changed significantly since 1975
- Bull sharks prefer 'higher' salinity areas based on mapping data
- Overall, bulls prefer intermediate temperatures and salinities along the Texas Coast

## What did I learn?

- How to use R on my own data to answer my own created questions.
- Sometimes Chatgpt is your friend but sometimes google is simpler
- If you can't figure something out, take a step back before spending too much time on it.



Thank You  
Questions?

tiktok @riverrofnight