RAINWATER KILLIFISH IN NEARSHORE EPIFAUNAL COMMUNITIES OF SOUTHERN BISCAYNE BAY: INDICATOR OF ECOSYSTEM CHANGE FOR SOUTH FLORIDA RESTORATION ASSESSMENTS

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➢ Biscayne Bay

- ❖ Biscayne Bay will be affected by structural and operational changes in the water management system planned under the Comprehensive Everglades Restoration Plan (CERP).

- ❖ As part of CERP RECOVER, the Integrated Biscayne Bay Ecosystem Assessment and Monitoring (IBBEAM) Team is monitoring and assessing nearshore flora and fauna in relation to salinity.

- ❖ Results are being used to help prepare ecological indicators and performance measures to assess effects of water management changes as they are implemented.

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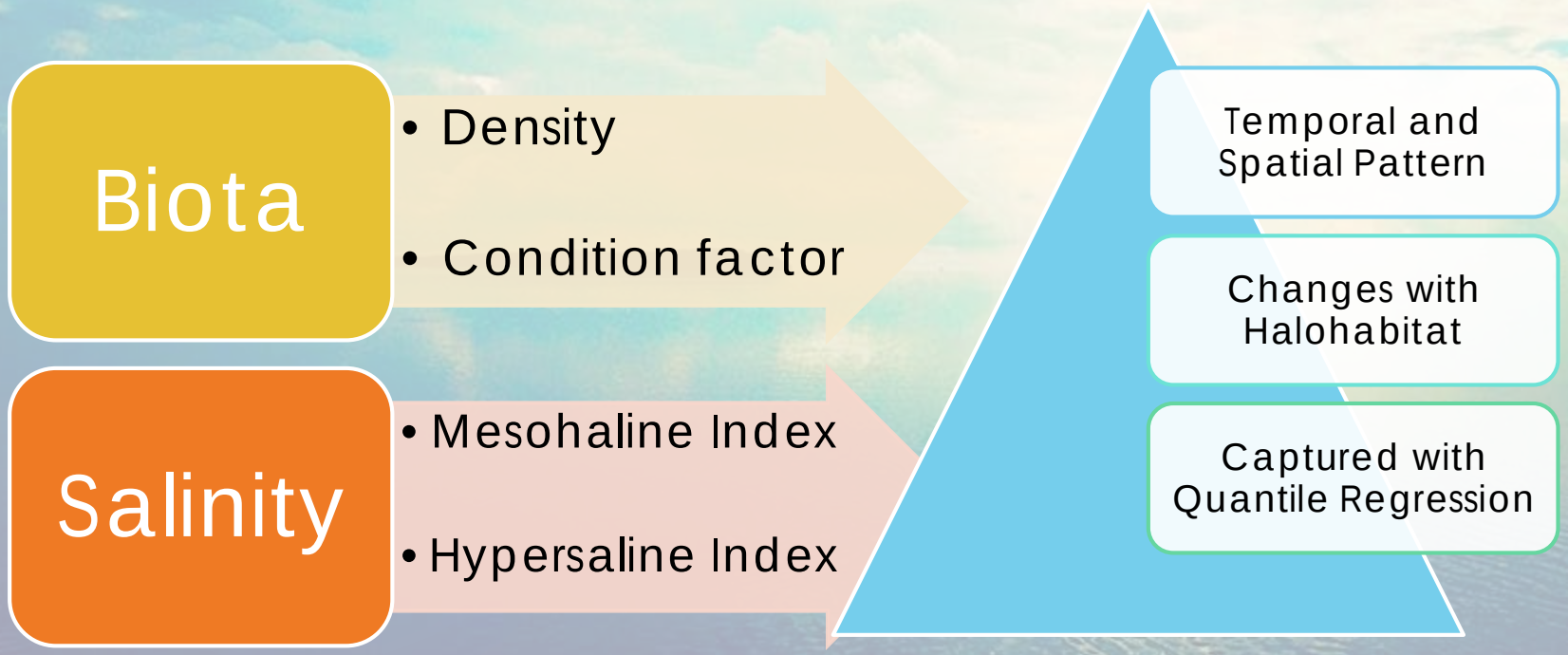
➢ Rainwater killifish – *Lucania parva*

- ❖ Most numerically-dominant fish species in nearshore Biscayne Bay.
- ❖ Stress specialist:
  Highly tolerant of hypoxia, high temperature, high salinity and rapid salinity changes.

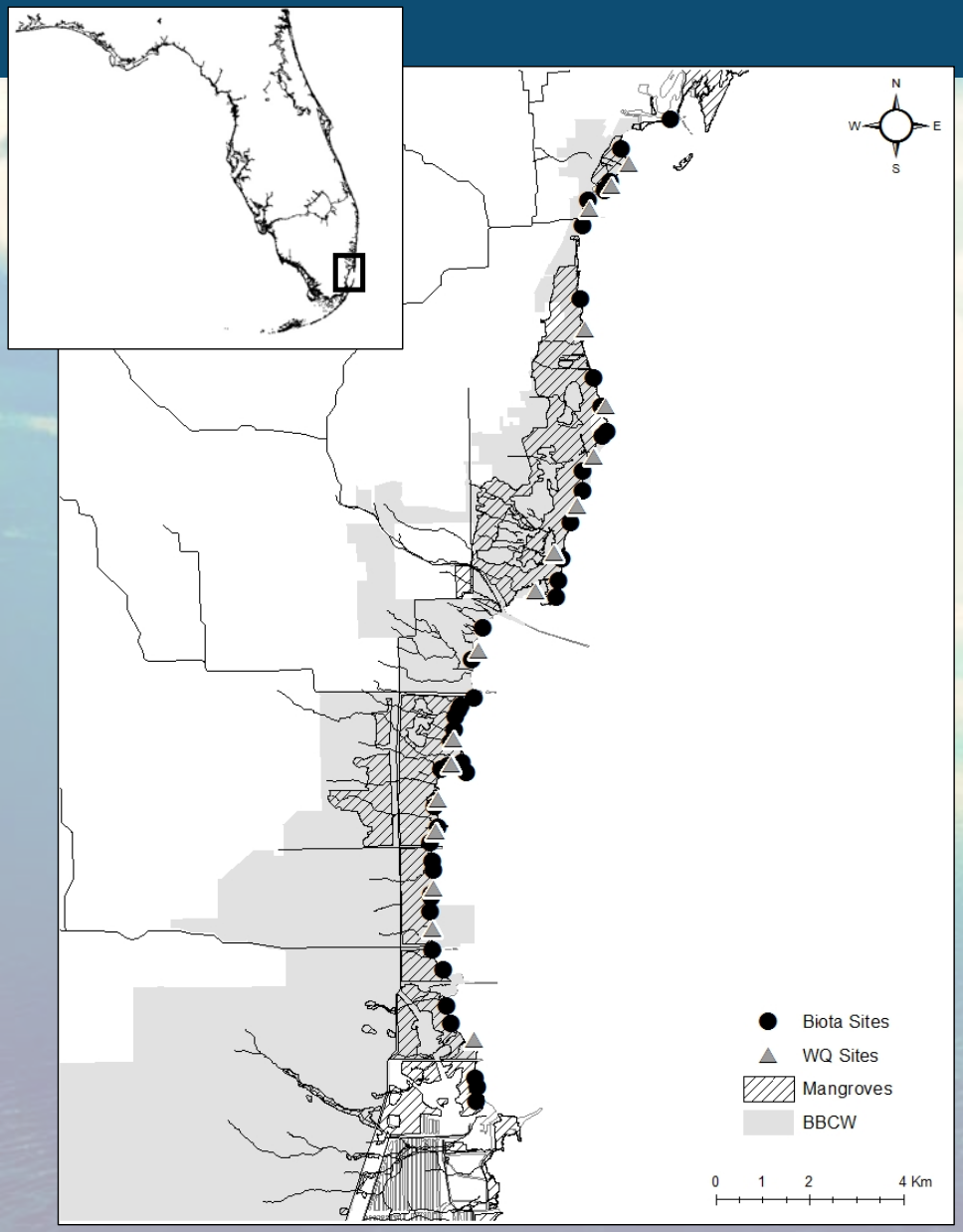
- ❖ Important prey to economically valuable species such as spotted seatrout and gray snapper.
- ❖ Potential indicator species?

➢ Objective

❖ **Examine rainwater killifish abundance and condition in relation to salinity indices.**



➢ IBBEAM Material & Methods

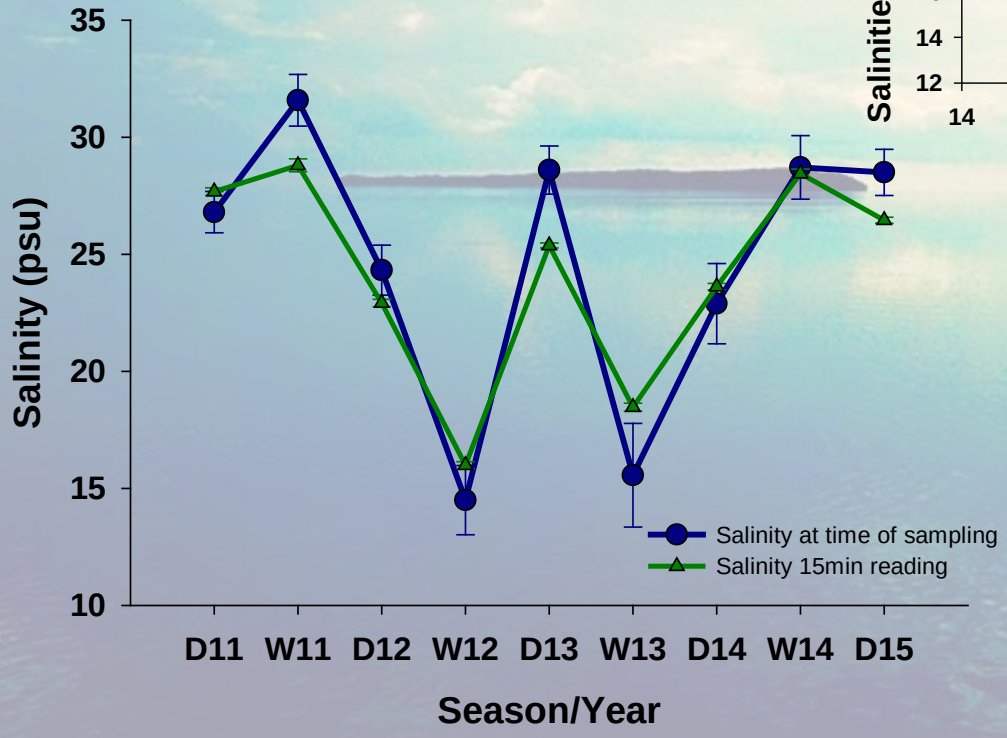


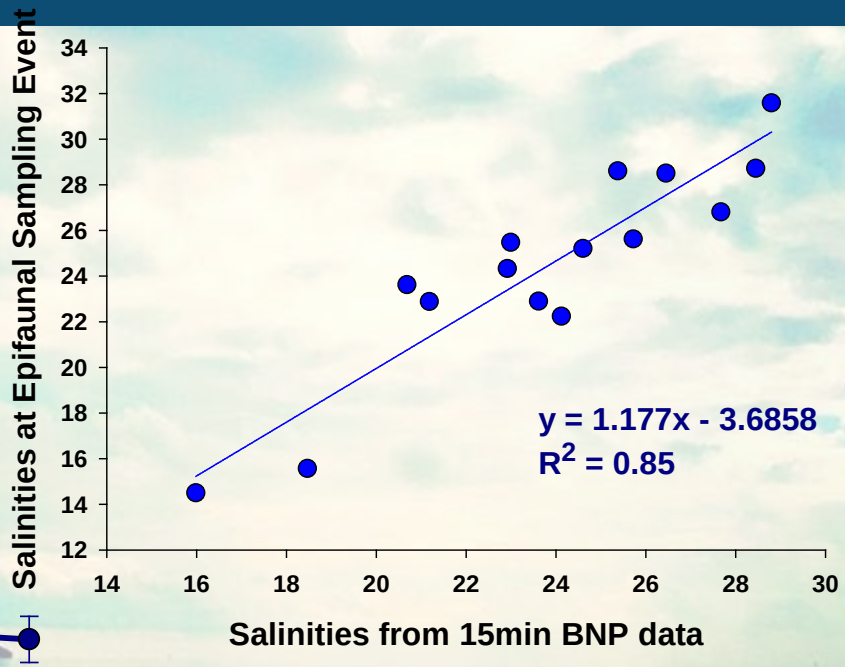
- Samples dry and wet season, Dry 2008-Dry 2015 at 44 sites.
- Salinity, temperature, DO, pH, and depth recorded.
- Fish collected with 1 m^2 throw-trap, thrown 3-times per site, 4 sweeps.
- Samples identified, measured, and weighed.
- Salinity data recorded at 15-min intervals 365 days/yr, 24/7, at 17 nearby sites.

➢ IBBEAM Sampling Effort

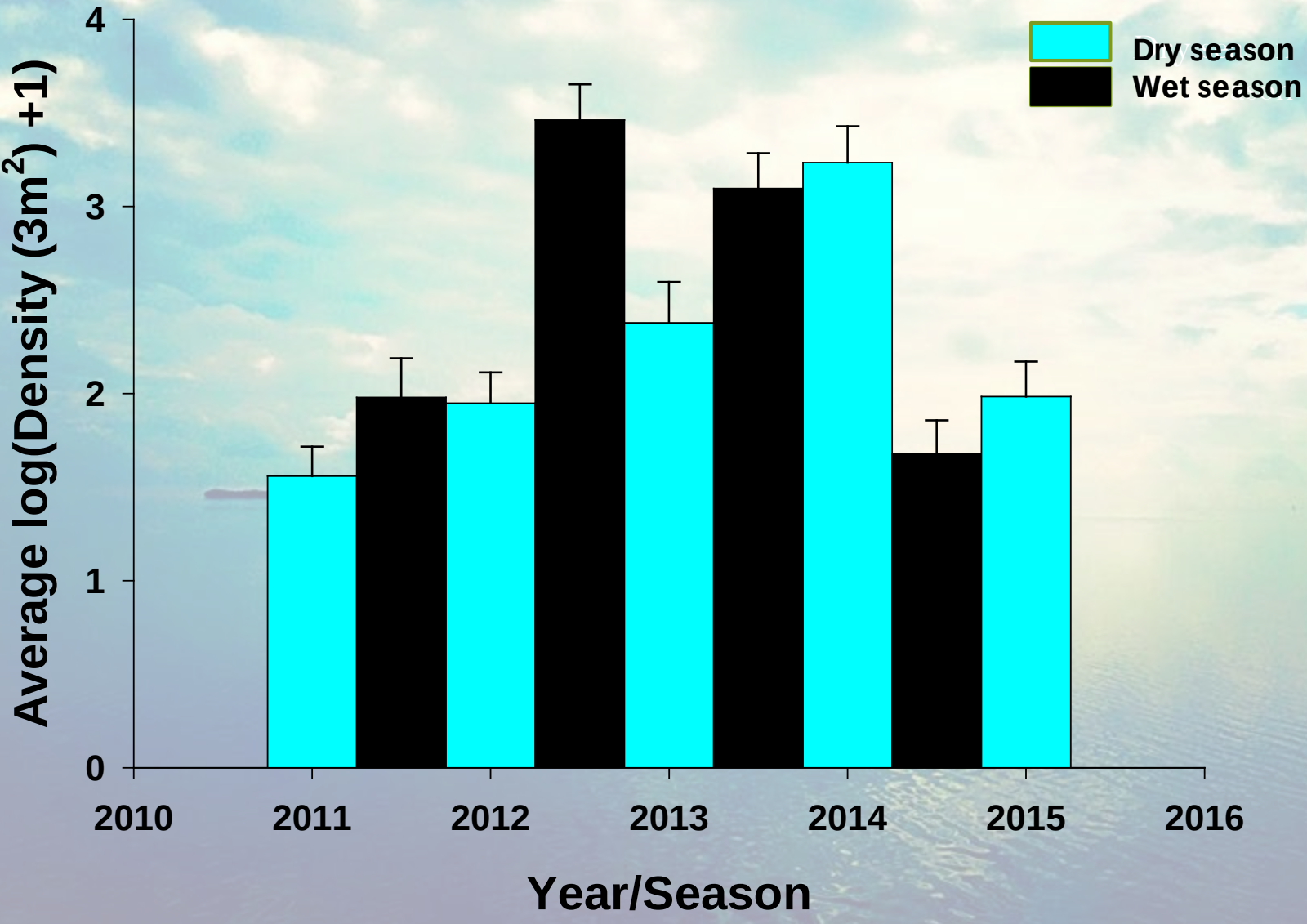
Area	WQ			Faunal Sampling (3m2)		
	Site ID	Dry	Wet	*Site ID*	Dry	Wet
1	*D6*	86976	70651	*1-2*	10	8
2	*D2*	86975	70656	*3-4*	10	8
3	*62*	86247	70547	*5-6*	10	8
4	*C8*	70930	70655	*7-8*	10	8
5	*C6*	70944	70501	*9-10*	10	8
6	*56*	70648	70656	*11-12*	10	8
7	*C4*	70944	70654	*13-14*	10	8
8	*C2*	70944	66342	*15*	5	4
9	*B8*	87263	69885	*16-17*	10	8
10	*B6*	87264	70656	*18-19*	10	8
11	*B4*	86352	70656	*20-26*	35	28
12	*40*	86976	66022	*27-29*	15	12
13	*28*	86976	70656	*30*	5	4
14	*22*	84463	70656	*31-32*	10	8
15	*A8*	87262	68097	*33-37*	25	20
16	*14*	76256	67379	*38-39*	10	8
17	*A6*	85961	70656	*40-44*	25	20

➢ Comparison of Salinities Measured

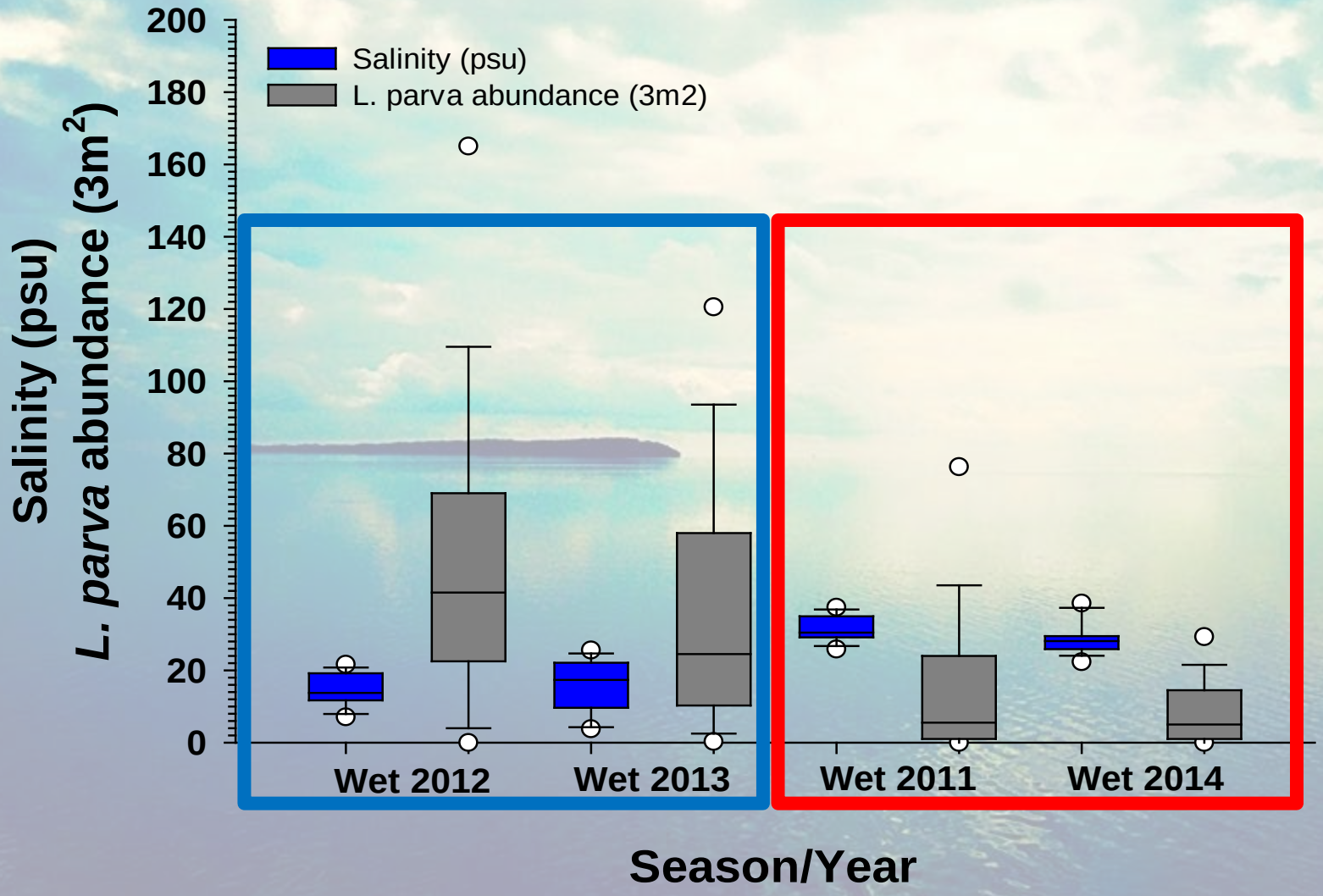




➢ Rainwater killifish density per season/year



➢ Rainwater killifish density and salinity of selected season/years:



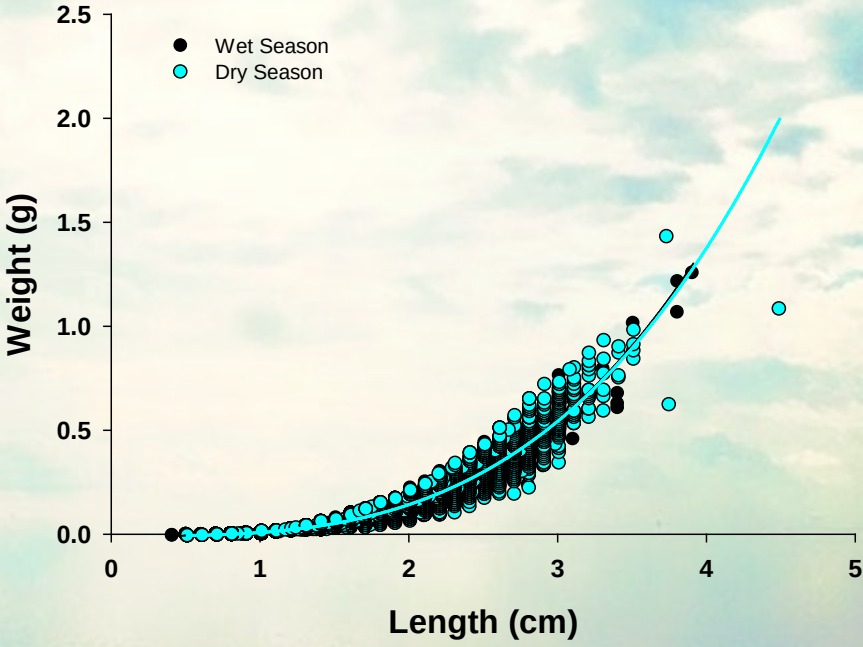
➢ Rainwater killifish Length-Weight relationship:

Relative Condition:

$$Kn = \frac{W}{W'} \quad \Rightarrow \quad W' = a * L^{b} \quad \Leftarrow$$

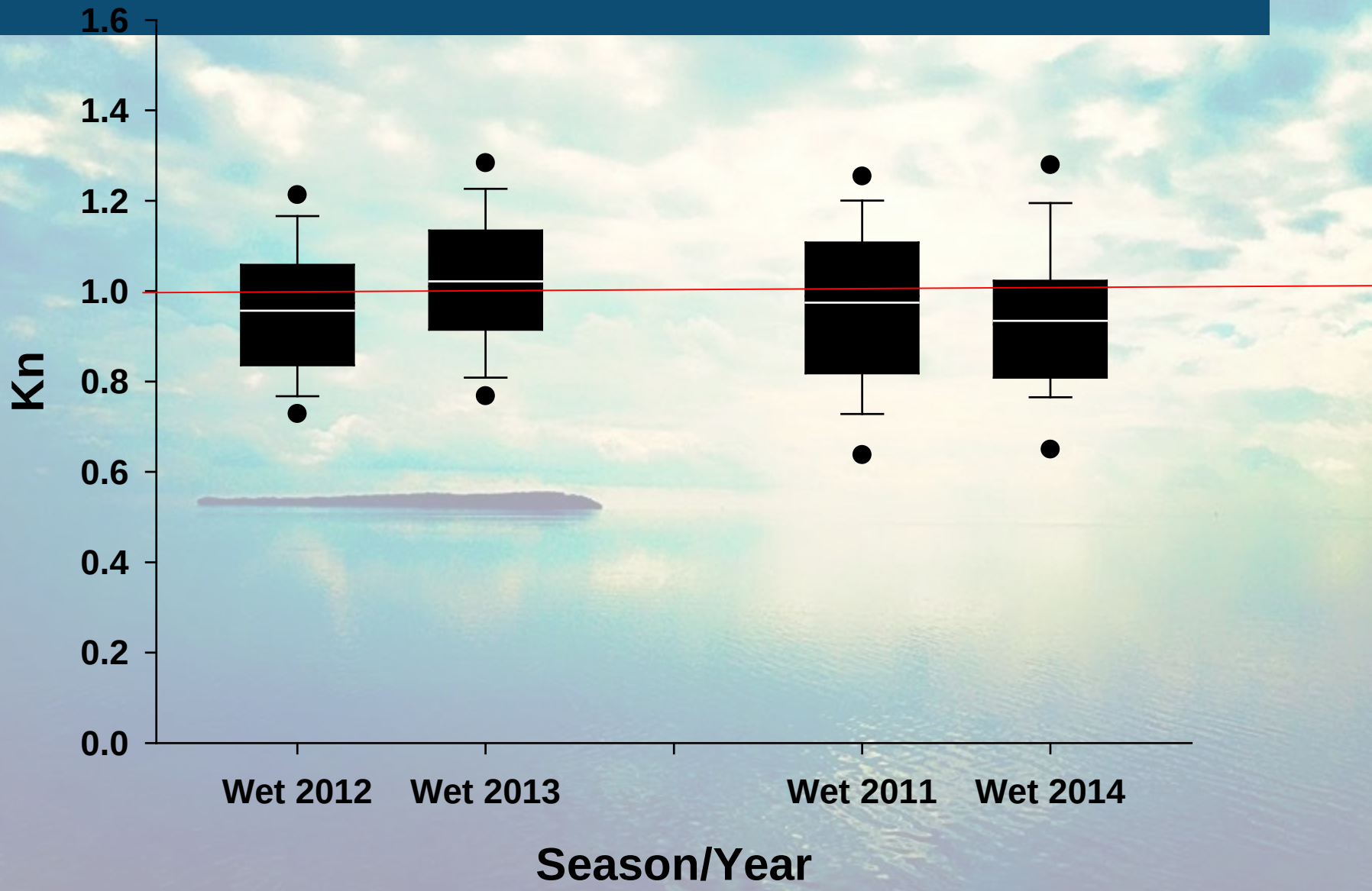
Growth of the fish:

$$b = \frac{(\log(W) - \log(a)}{\log(L)}$$

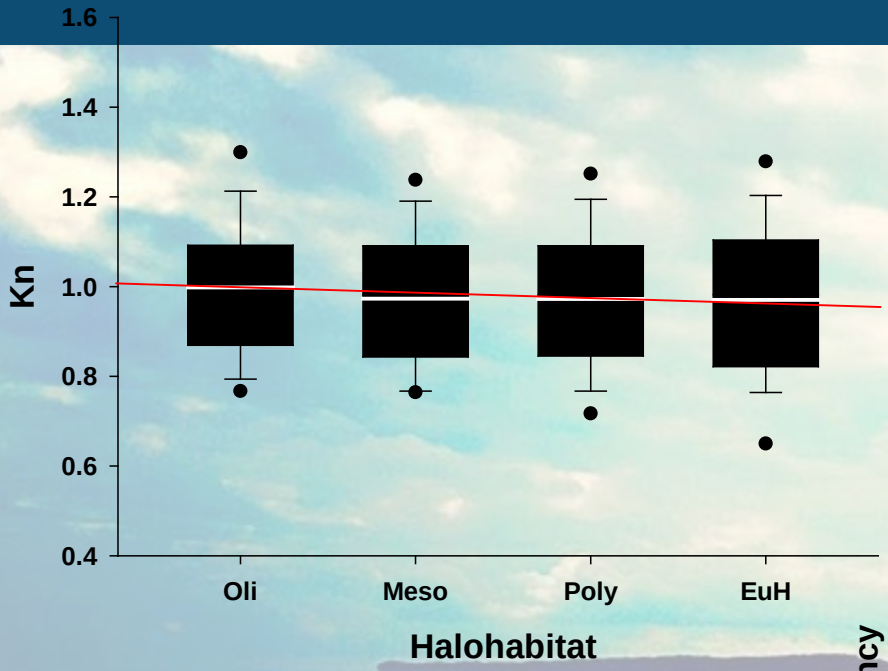


****theoretical ideal growth results in b=3*

➢ Rainwater Killifish Condition Factor



➢ Rainwater Killifish Condition vs Halohabitat:



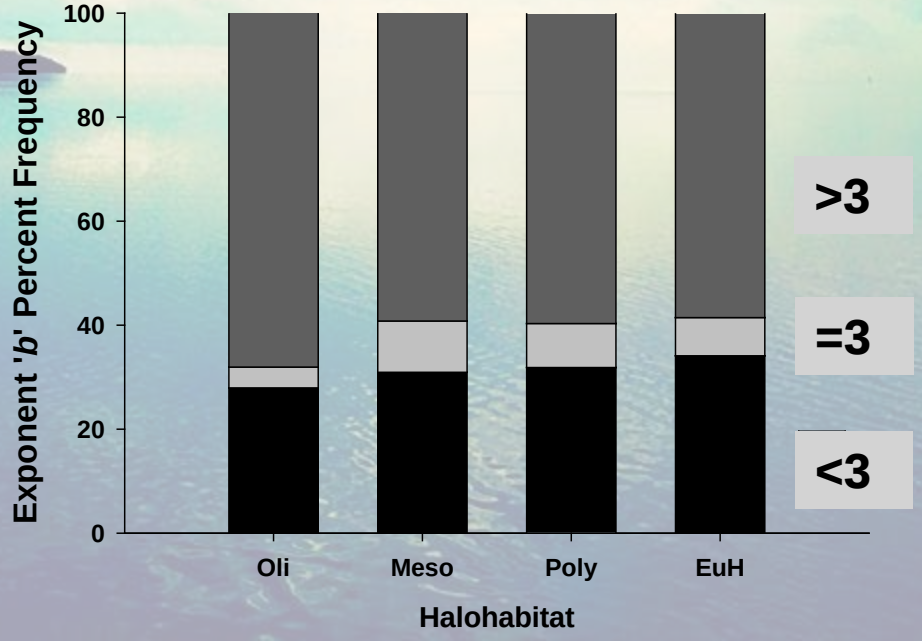
Normality Test (Kolmogorov-Smirnov)
Failed (P < 0.050)

Kruskal-Wallis One Way Analysis of Variance on Ranks
p = 0.047

Normality Test (Shapiro-Wilk)
Passed (P = 0.332)

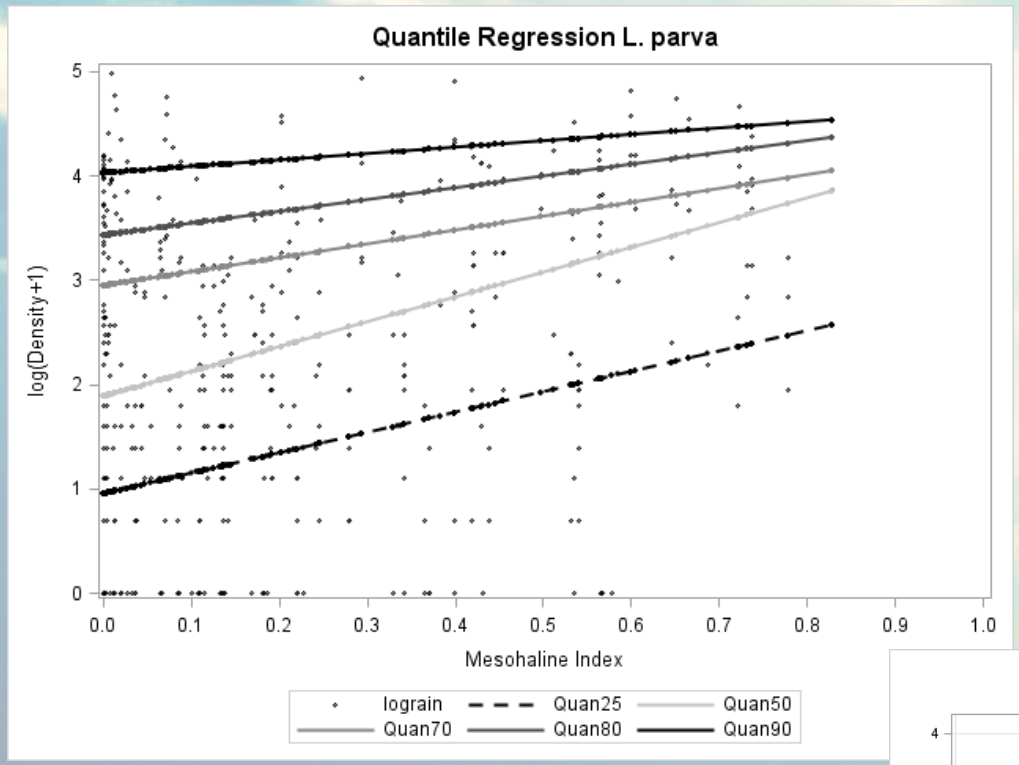
Equal Variance Test:
Passed (P = 0.906)

One Way Analysis of Variance
P < 0.001



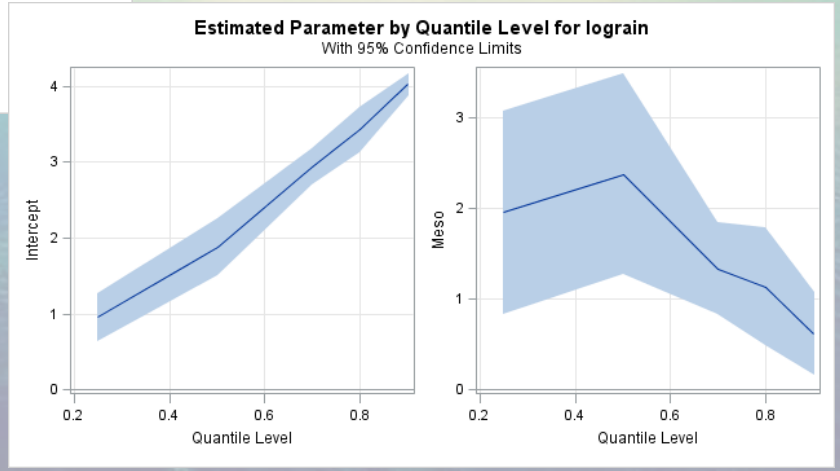
➢ Quantile Regression

Density vs. Mesohaline Salinity Index Condition:



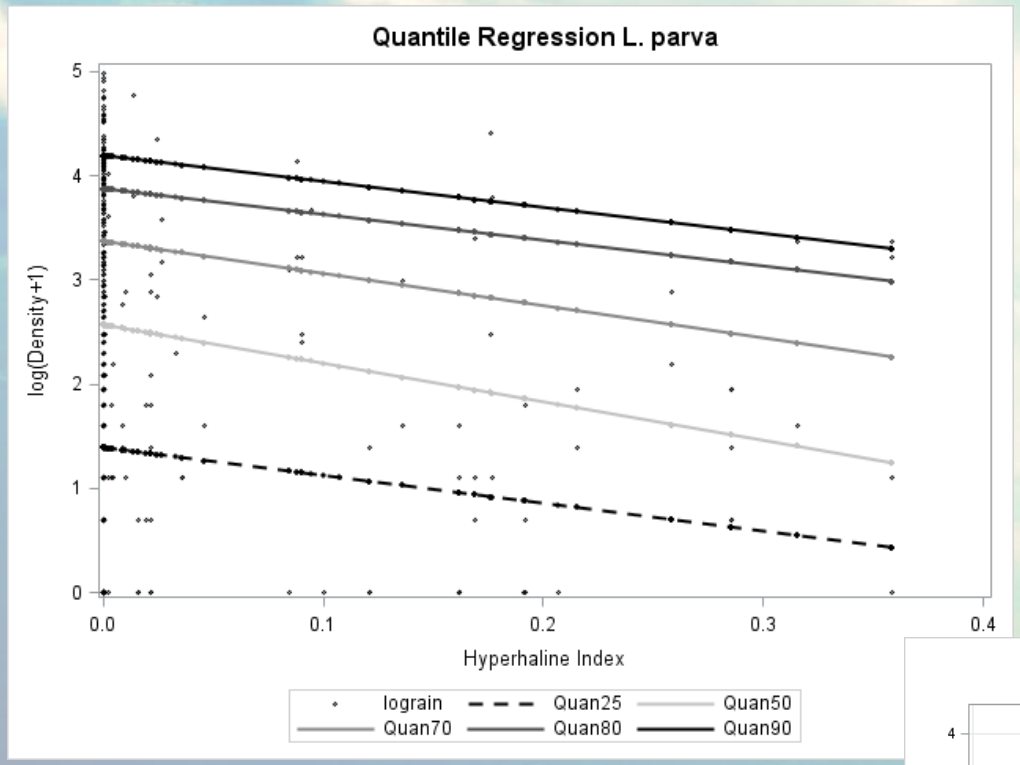
Quantile	p
0.7	<0.0001
0.8	0.0006
0.9	0.0082

Mesohaline Index: Proportion of time with salinity in range 5 -18.

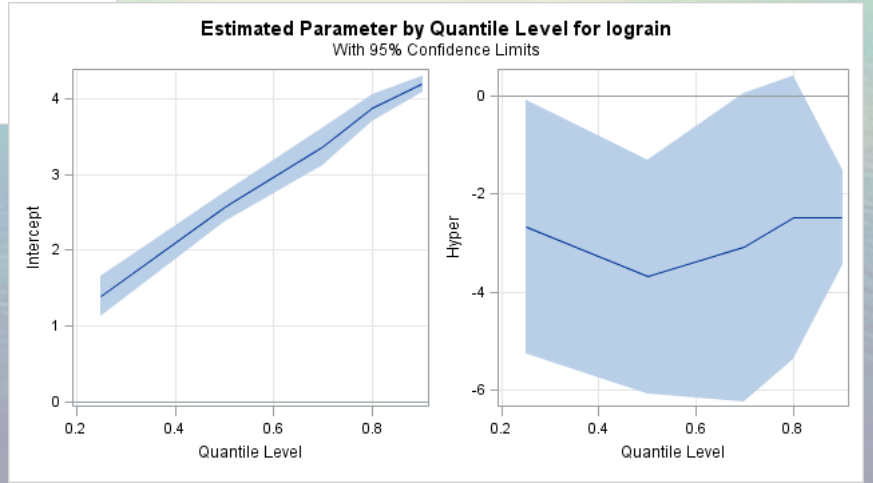


➢ Quantile Regression

Density vs. Hyperhaline Salinity Index Condition



Quantile	p
0.7	0.00551
0.8	0.09363
0.9	<0.001



Hyperhaline Index: 1 – Proportiono of time when when salinity was greater than 38 ppt.

➢ Conclusions

- ❖ Abundance and condition factor, a function of weight to length that reflects fish health, is influenced by salinity in the rainwater killifish.
- ❖ Quantile regression is an appropriate method to estimate functional relationships for all parts of a probability distribution.
- ❖ Rainwater killifish is a potential indicator of salinity change in Biscayne Bay.

➢ Acknowledgment – *Special Thanks*

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