

Microclimatic changes occurring in tide pools over time



By Megan Savage and Larisa Melbarde

Introduction

- Tide pools are the shallow pools on the boundary of land and sea that are uncovered as the tide goes out. These areas, and their inhabitants, have to adapt to changing conditions throughout the day.
- Temperature “change(s) rates of photosynthesis and respiration. For every 10 C, photosynthesis increases by one and a half times and respiration by two and a half to three times.”
- “Photosynthesis... cause oxygen concentrations to peak in the afternoon”
- “Sun and wind evaporate water from the surface of pools... this causes an increase in salinity.”

Introduction

- The purpose of this study was to observe the changes and variations in the tide pool ecosystems over a certain time span beginning at low tide.
- Hypothesis:
 - As temperature of the tide pool decreases, the pool will become more acidic
 - As time progresses, the level of dissolved oxygen will increase
- Null:
 - Temperature will have no effect on the acidity of the tide pool
 - Time progression will have no correlation with the level of dissolved oxygen

Materials and Methods

- Selected and marked off 5 tide pools varying in overall size elevation that were located about the same distance from the low tide line



1



2



3



4



5

Materials and Methods

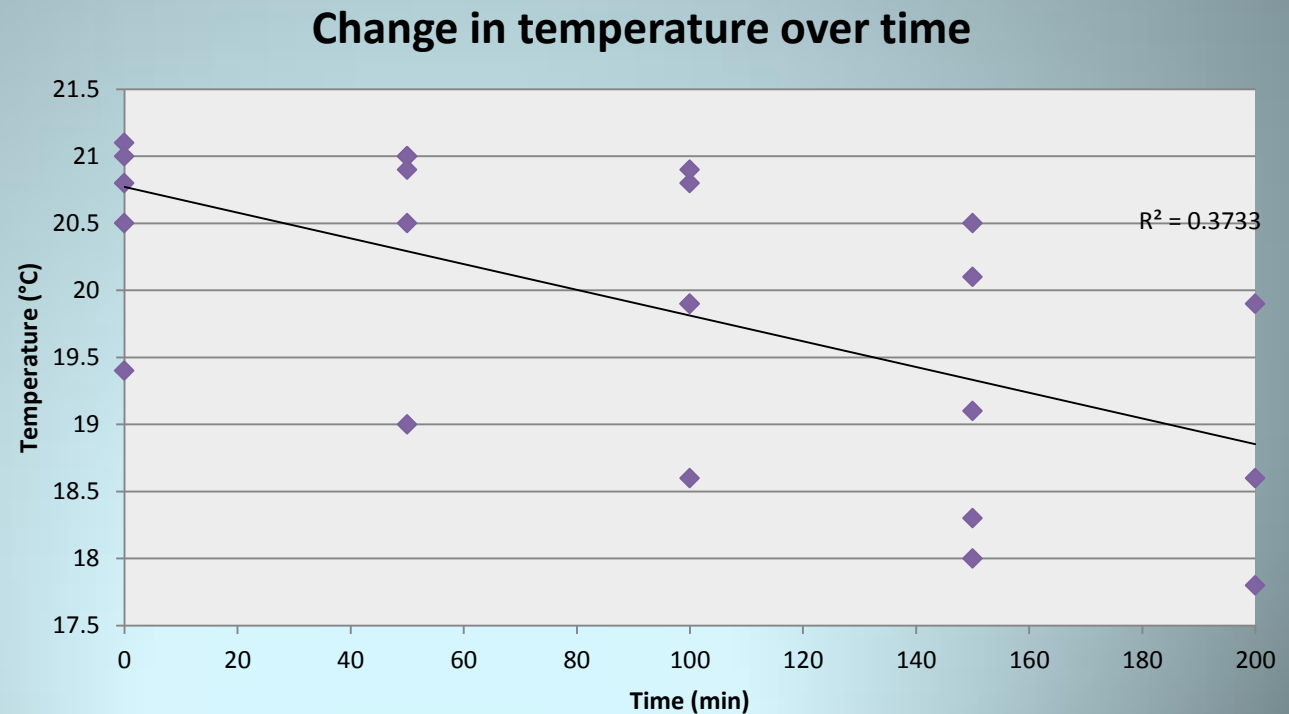
- Used the LabQuest handhelds to find the following variables for all 5 pools once every 50 minutes
- Example:

	pH	Temperature (°C)	Volume (m ³)	Salinity (ppm)	Dissolved O ₂ (mg/L)	Time
Trial area 1	8.8	21.1	0.140	34200	13.4	0
	8.84	21	0.172	34343	25.1	50
	9	19.9	0.113	34671	28.6	100
	9.07	18.3	0.042	35050	28.5	150
	9.14	17.8	0.043	35523	24.8	200

- Did linear regressions tests with all the data collected

Results

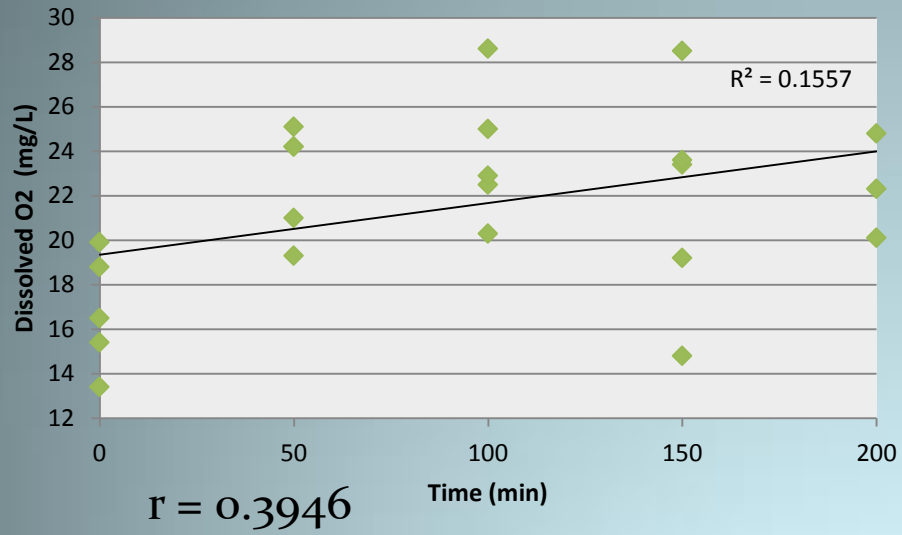
- We created graphs including: time, temperature, dissolved oxygen, salinity, Ph, and volume



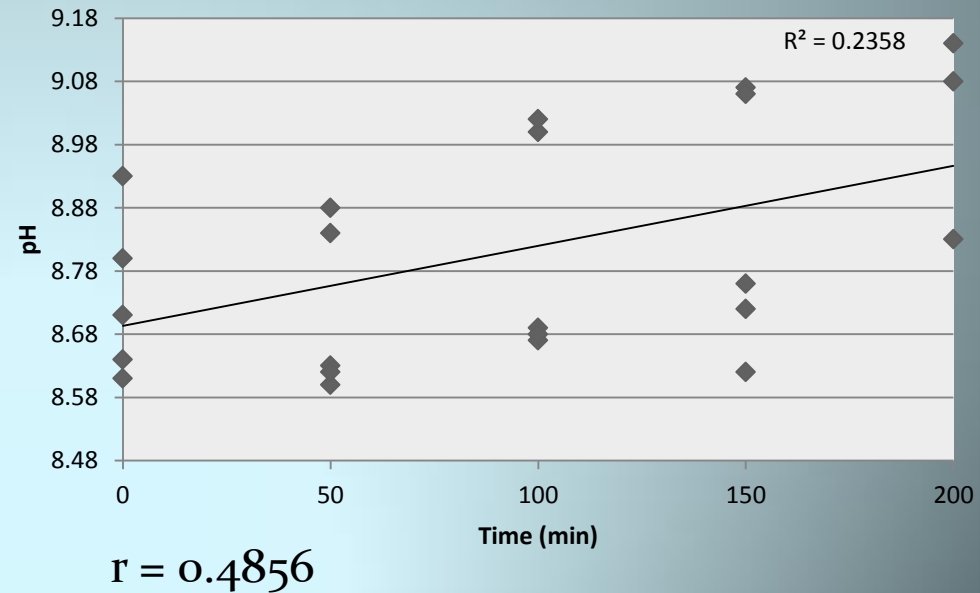
$$r = 0.6110$$

Results

Dissolved Oxygen over time

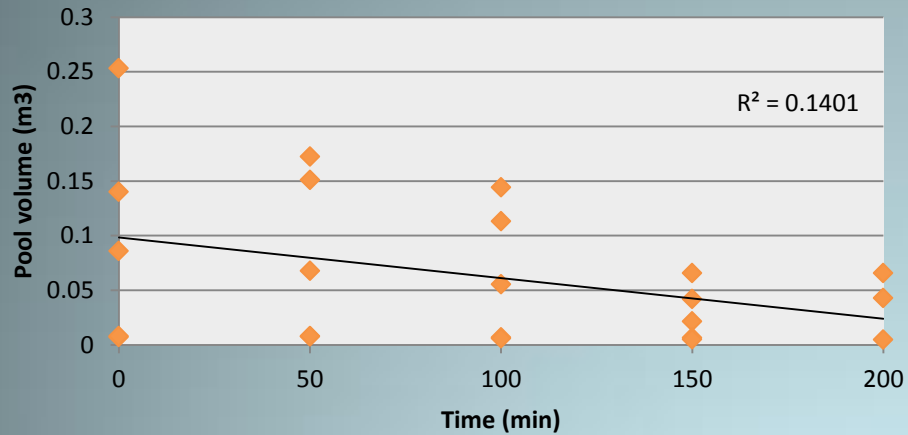


pH over time



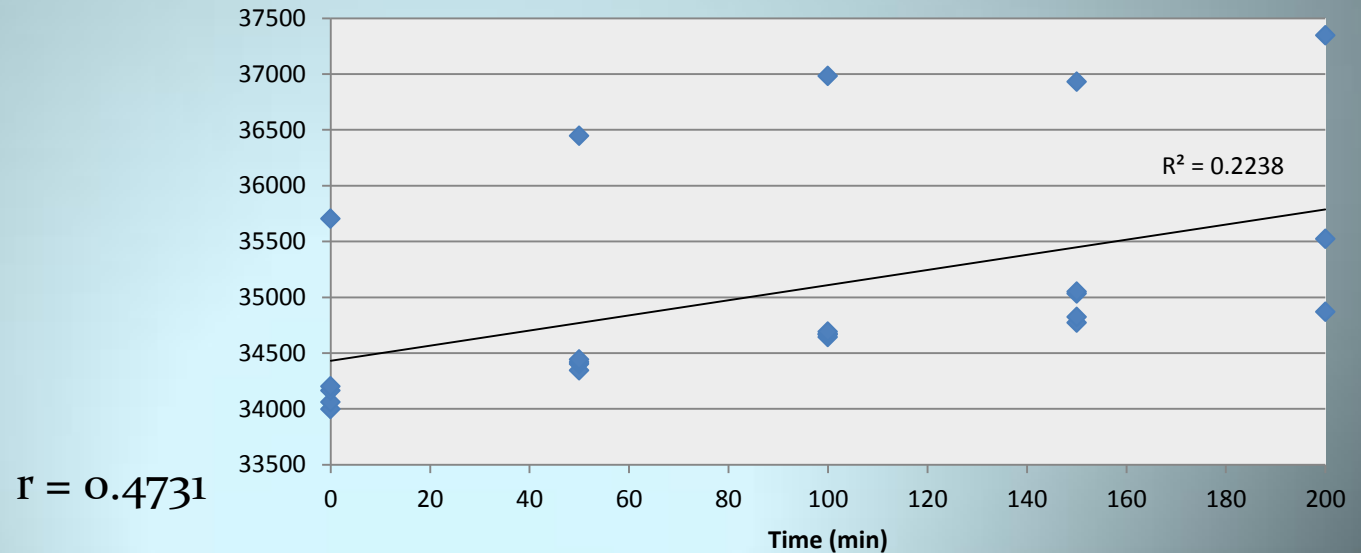
Results

Change in Pool Volume over Time



$$\Gamma = 0.3743$$

Change in Salinity over Time



$$\Gamma = 0.4731$$

Discussion

- Tide pools 2 and 3 were inundated with water by the time we took the 5th measurements
- All correlation values were found to be significant *except* between pool volume and time
- We had to accept the first null hypothesis that temperature will had no effect on the acidity of the tide pool
- We were able to accept our hypothesis that the level of dissolved oxygen would increase as time progressed

Discussion Continued

- Possible explanations for results:
 - Acidity: it is winter, so water cooled down instead of warmed up, causing the water to become more basic
 - Dissolved Oxygen levels: photosynthetic processes of organisms inside the pools, and other biotic processes
 - Salinity levels: as the pools started to decrease in size, salinity increased because there was less water and more salt as the water evaporated
 - Note: all variables were dependent on each other to some extent, explaining some results overall.

Discussion Continued

- Potential errors with this study:
 - Calibration of equipment
 - Taking volume of tide pools (irregular shape)
 - Did not include the effect of living organisms in each pool, only noted existence
- Ways to further the study:
 - More data points of each size pool
 - Cold vs. Warm day
 - Winter vs. Summer
 - More applicable statistical testing

Works Cited

- Bigelow Laboratory for Ocean Sciences. *Tide Pool Physical Factors*. Maine InterTidal Zone Investigation.
- *Tide Pools: Intertidal Ecology*. SeaWorld Parks and Entertainment. 2014.
- *What is a Tide Pool?* SeaWorld Parks and Entertainment. 2014.