TAMPA BAY ENVIRONMENTAL RESTORATION FUND
Final Report

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PROJECT TITLE: The use of *Staphylococcus aureus* and MRSA as an indicator of human pollution in Tampa Bay

Introduction:

Indicator bacteria/groups such as fecal coliforms, *Escherichia coli* and *Enterococcus*, are routinely used to provide a measure of water quality. The presence of these bacteria, which originate from gastro-intestinal tracts of warm blooded animals, indicate fecal contamination and/or the presence of other pathogenic organisms such as *Salmonella* and *Shigella* (U.S. EPA, 1986). Prior to 1986, the EPA recommended indicator organisms for recreational water assessment were fecal coliforms. Data on water quality gathered prior to this time is usually in terms of levels of fecal coliform bacteria. However, with an increase in infections from non- fecal coliforms worldwide, there are concerns that monitoring only fecal coliforms overlooks pathogens that are not primarily associated with feces (Goodwin et al., 2012). A potential alternative to the aforementioned indicator bacteria is *Staphylococcus aureus* and Methicillin-Resistant *S. aureus* (MRSA).

Staphylococcus aureus is an opportunistic pathogen found on skin that is considerably resistant to changes in the environment (i.e. antibiotics) and is carried by 20 – 40% of people (Al-Zu"Bi et al. 2004; Kuehnert et al. 2006; Goodwin et al., 2012). The incidence of infection from community onset *S. aureus* and MRSA are increasing worldwide (Chambers 2001, Zetola et al. 2005, Goodwin et al. 2012). A major issue with community onset *S. aureus* and MRSA is that the bacteria can cause infections in healthy people with no traditional risk factors for infections (Mulvey et al. 2005, Gorwitz 2008). Furthermore, the number of skin infections from MRSA has increased both locally and worldwide (Jarvis et al. 2007; Goodwin et al. 2012; CDC, 2018). The human impact of MRSA in the community is increasing, thus, new resistant strains pose emerging public health threats. MRSA can cause a multitude of syndromes, including bloodstream infection, pneumonia, osteomyelitis, endocarditis, cellulitis, and wounds (Centers for Disease Control and Prevention, 2018). The community acquired (CA) incidence rate of MRSA infections is 4.7 per 100,000 for non-dialysis patients; while hospital-acquired MRSA is decreasing, community-acquired incidence rose in 2016. (Centers for Disease Control and Prevention, 2018).

The main sources of *S. aureus* and MRSA in waterbodies is from human activity (El-Shenawy, 2005), storm water (Selvakumar and Borst, 2006), coastal streams that drain to the coast (Viau et al., 2011), and wastewater (Goodwin et al., 2012; Goldstein et al. 2012). It is crucial to examine the amount of *S. aureus* and MRSA in Tampa Bay waterbodies in order to reduce human exposure to microbial contaminants, assist in cleaning up local waterbodies, implement preventative initiatives statewide, and to treat patients more effectively. The overall goal of the proposed project is to evaluate the use of *S. aureus* and MRSA as an indicator of human pollution. This study can aid beach-goers to make informed decisions, help beach managers take actions to ensure health of recreational water, and can help communities to evaluate the quality of recreational water and risk of infection. Furthermore, the screening-level microbial risk assessment of *S. aureus* and MRSA is extremely limited in the literature due to a paucity of dose-response information; however this study will provide additional data to refine this process and better inform communities of human health risk. Specifically, this study addressed the following objectives: Assess the viability of *Staphylococcus aureus* as an indicator of human pollution in high and low human use areas in Tampa Bay; Quantify the spatio-temporal distribution of *Staphylococcus aureus* and MRSA. Model species distributions to determine risk of exposure to *Staphylococcus aureus* and MRSA in Tampa Bay.

This proposal directly addressed the priority of, "advance new analytical techniques to identify sources and assess the human and environmental health risks of waterborne fecal pathogens." Furthermore, the proposed project addresses multiple research and monitoring topics discussed in the CCMP Research and Monitoring Programs: 1) continue to assess the water quality, sediment quality, and habitat of tidal tributaries in Tampa Bay; 2) build a database on information for smaller tributaries to support existing management strategies; and 3) continue assessments of human and environmental health indicators suitable for Tampa Bay beaches and other recreational waters. And specific objectives of 1) Support and monitor research into microbial indicators of waterborne pathogens harmful to human and environmental health; and 2) support and monitor advancements in analytical techniques to directly detect, identify and track waterborne microbial pathogens.

Methods:

Staphylococcus aureus collections:

To assess the viability of *S. aureus* as an indicator of human pollution in high and low human use in Tampa Bay, water was collected at seven sites (Redneck Riviera, Ben T. Davis, Cypress Pt. Park, Picnic Island, Davis Island, Bahia Beach and Simmons Park Beach; Figure 1; Study Map) monthly from June 2019 to May 2021. Site specific monthly sampling events occured twice per site (pre and post weekend) to examine the effects of human usage on the quantity of *S. aureus* and MRSA. All water samples were collected and processed following methods described in the book "*Standard Methods for the Examination of Water and Wastewater.*" Filtration was completed using a vacuum operated manifold that captures the bacteria on membrane filters (0.45 µm pore size). Membrane filters were placed onto selective and differential Mannitol Salt Agar (MSA) and incubated at 37 °C for 24 hours. After incubation, all yellow colonies were counted as *S. aureus*. For each site and every sampling event, ten random samples were transferred (n= 70 per sampling event) and stored for testing antibiotic susceptibility to methicillin.

Genetic Confirmation:

Microbial colony isolates that showed growth and fermentation on Mannitol Salt Agar (MSA) were further tested for hemolysis and coagulase activity prior to being subjected to molecular verification using PCR. Samples picked at random from MSA plates were further subjected to Kirby Bauer tests to determine susceptibility or resistance to methicillin. Samples that tested as resistant to methicillin were further subjected to molecular verification by amplification of the nuc gene to determine presence of S. aureus and next by amplification of the mecA gene Methicillin Resistant S. aureus (MRSA). Standard PCR techniques were used as follows: nuc gene- 94°C for 10 mins followed by *32 cycles of 94°C for 60 sec 51°C for 60 sec* and *72° for 120 sec with a final extension of* 72°C for 10 mins to amplify a target of 279 bp., mecA gene- 94°C for 10 mins followed by *32 cycles of 94°C for 60 sec 50°C for 60 sec* and *72° for 60 sec with a final extension of* 72°C for 10 mins to amplify a target of 230 bp. N315 clinical sample was used as a clinical positive control for both genes (Katayama and Hiramatsu 1999) and 16SrRNA target amplicon was used to verify negative amplifications. Primers used to amplify target genes are listed in Table 1 (Fang and Hedin 2003; Goldstein et al., 2012).

Table 1. Primers used for amplification of target genes from eDNA.

Primer sequence 5'--> 3'	Gene	
	Primer target	Amplicon size in base pairs (bp)
GCGATTGATGGTGATACGGTT AGCCAAGCCTTGACGAACTAAAGC	nuc forward nuc reverse	279 bp
GCAATCGCTAAAGAACTAAG GGGACCAACATAACCTAATA	mecA forward mecA reverse	230 bp
GGGACCAACATAACCTAATA GGG CGG WGT GTA CAA GGC	16S forward 16S reverse	791 bp

To further validate mecA sample positive PCR amplification select samples where sequenced using a 16srRNA gene product. Briefly, the amplified PCR product was subjected to Exosap PCR clean up, Cycle sequencing reaction using BigDye, Ethanol precipitation and directional sequencing using an in-house ABI sequencer. Sequence chromatograms were analyzed using MEGAX and blasted against the NCBI nucleotide BLAST database.

Health Risk:

In this study, a Quantitative Microbial Risk Assessment (QRMA) was conducted to determine the annual probability of illness from exposure to methicillin-resistant *Staphylococcus aureus* (MRSA). The initial grant proposal specified a model to determine the risk of gastrointestinal illness (GI) for *Enterococcus* due to the lack of dose-response relationship for *Staphylococcus aureus* (SA) in the literature. In the interim, an updated skin model for *Staphylococcus aureus* was published and this will be used for the risk assessment. This will be a static model whereas the risk of secondary infection will not be considered. The initial grant proposal identified several scenarios that would be completed (swimmer, boater, and jet skier); the completed risk analysis assumes swimming with full-body immersion as the most conservative estimate. Last, it was assumed that all interactions with MRSA can potentially result in an infection.

Methodology

The risk assessment framework is based on the Environmental Protection Agency document, *Microbial Risk Assessment (MRA) Tools, Methods, and Approaches for Water Media* and consists of four steps: hazard identification, dose-response, exposure assessment, and risk characterization (U.S. Environmental Protection Agency, 2014).

Planning and scoping inform the hazard identification stage and are represented by a review of the literature. Several recent studies have completed QRMAs for SA in the last few years and can serve as a model for analysis and improvement. Schoen et al (2021) used a QRMA model to assess levels of SA in reclaimed wastewater to determine the ideal treatment level to adequately reduce risk to the general public. This study assumed conservative exposure of daily immersion in water. In addition, horizontal gene transfer was incorporated into the model, but had little impact on risk levels; thus, this study did not consider it.

An updated dose-response model for acute skin infection elucidated the bacterial kinetics needed to predict the dose of organisms post-exposure that results in a skin infection (Esfahanian, Adhikari, Dolan & Mitchell, 2019). This model highlighted an optimized k parameter, 8.05 x 10-8, using an exponential model. These studies were used as the basis for this QRMA.

Hazard identification was completed by collecting samples at the identified sites in Tampa Bay to determine levels of *S. aureus* in recreational water. This sampling provided the parameters of the actual concentration of SA in Tampa Bay. The dose is calculated as a function of pathogen density in an exposure medium and the volume of that medium that is in contact with the body.

$$Dose = C_{SA} \times SAB \times Film \quad \text{(Eq. 1)}$$

Such that C_{SA} is the log10 concentration of SA measured during monitoring of Tampa Bay times 0.3, the approximate proportion of methicillin-resistant SA found during the monitoring phase. The surface area of the body (SAB) represents the surface area of the body assuming full immersion in seawater. Body surface area was derived from the EPA Exposure Factors Handbook (EPA, 2021). A simulated variable was created using these parameters from EPA: maximum was the male mean surface area plus three standard deviations (2.54 m^3) and the minimum was defined as the female mean surface area minus three standard deviations (1.1 m^3). The film refers to the layer of water that remains on the skin after immersion (EPA, 2021). These parameters (C_{SA} and SAB) were then used to simulate 100,000 data points according to the assumptions provided in Table 1 using IBM SPSS Statistics version 27. The simulation feature of SPSS was used to fit the parameter distributions. The full set of input assumptions is found in Table 1.

Table 1. Input Assumptions

Input	Description	Unit	Value	Reference
C_{SA}	*S. aureus* concentration in water	cfu/ml	Gamma (shape=6.317, scale=2.284) x 0.3[a]	Simulated based on measured data
SAB	Surface area of the body	cm^2	Uniform (min=55.55, max = 126.55)	Simulated based on EPA, 2021
Film	Film of water adhering to body	cm	4.99×10^{-3}	EPA, 2021
Volume	Volume of water contact with body	cm^3	SAB*Film	Calculated
Dose	C_{SA} contacting body	CFU	Volume*C_{SA}	Calculated

a: Approximately 30% of collected samples tested positive for MRSA. This was used to restrict to only the most pathogenic *Staphylococcus aureus*.

Exposure assessment is the qualitative or quantitative consideration of combined risks of concern, exposure pathways, and associated uncertainties. In this model, the quantitative risk was determined – specifically the annual probability of risk.

An exponential model based on an updated k value, 8.05×10^{-8} (Esfahanian et al, 2019) was used to compute the probability of infection (Pinf), equation 2. Stopping criteria of the model included adequate sampling of the tails (95% uncertainty intervals), and there was a maximum number of 100,000 iterations of the Monte Carlo simulation.

The probability of infection from SA:

$$P_{inf} = 1 - exp^{-k*Dose} \qquad \text{(Eq. 2)}$$

In order to determine the annual probability of infection, it was estimated that individuals took 2 beach trips per month, totaling 24 per year. Based on the P_{inf} model parameters (mean= $2.018*10^{-5}$, sd = $9.281*10^{-6}$) 24 data points were randomly chosen to collect daily P_{inf} in order to determine $A.P_{inf}$.

The equation for the annual probability of infection was modified from the “gold standard” as identified by Karavarsamis & Hamilton (2010):

$$A.P_{inf} = 1 - \prod_{day=1}^{24} 1 - P_{inf} \qquad \text{(Eq. 3)}$$

Last the $A.P_{inf}$ was compared to EPA acceptable risk levels.

Results

The daily P_{inf} was simulated 9033 times until the stopping criteria (adequate sampling of tails) was met, resulting in a mean of 2.018×10^{-5} with a standard deviation of 9.281 x 10-5. The daily P_{inf} is demonstrated in Table 1 (percentiles) and Figure 1.

Table 1. Percentiles of daily probability of infection.

Percentiles	5%	25%	50%	75%	95%
	8.086×10^{-6}	1.339×10^{-5}	1.865×10^{-5}	2.517×10^{-5}	3.716×10^{-5}

The predicted annual probability of developing a skin infection via contact with methicillin-resistant *Staphylococcus aureus,* assuming 24 beach visits per year, is 4.66×10^{-4}.

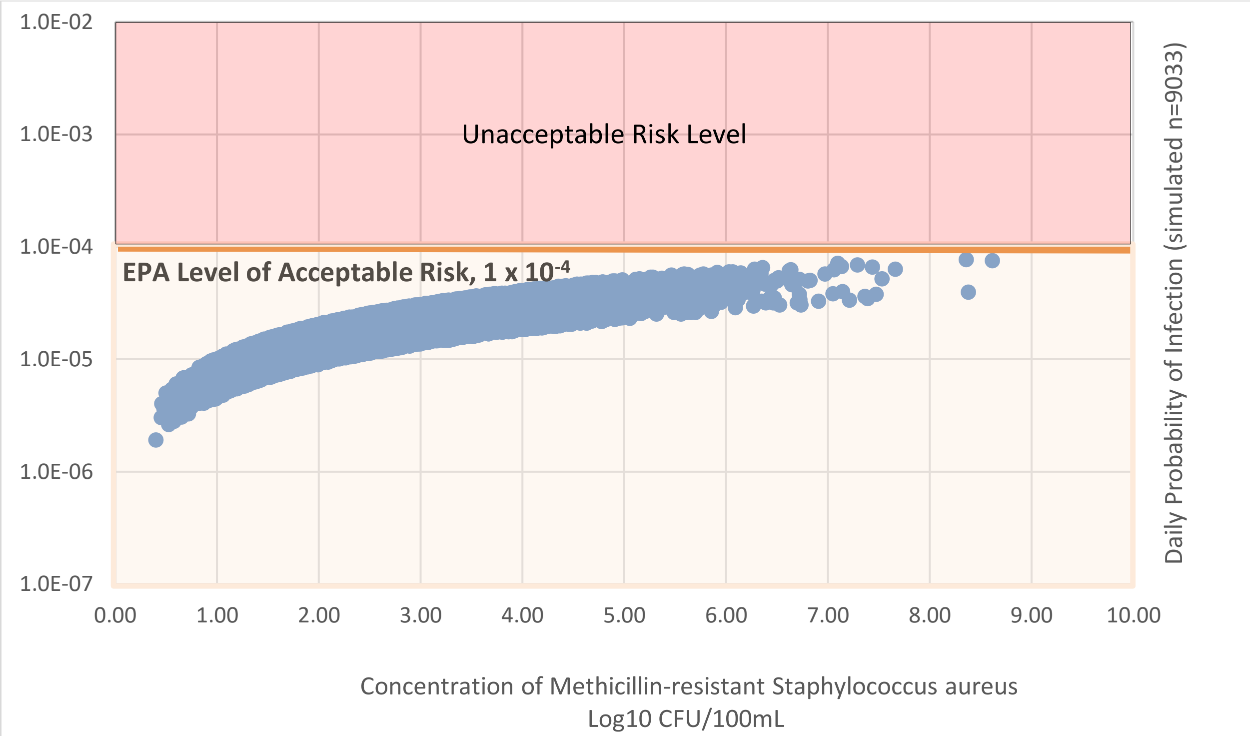

Figure 1. Concentration of MRSA and daily probability of infection superimposed with EPA acceptable risk levels.

The green line in Figure 1 represents the upper end of EPA's generally acceptable risk range of 10^{-4} to 10^{-6} as outlined as part of the National Contingency Plan (40 CFR 300.430).

Results and Discussion

In the 24 month sampling period a total of n=586 samples tested as resistant to methicillin using microbial Kirby Bauer test. All methicillin resistant samples were subjected to molecular verification using nuc PCR for *S. aureus* (MSSA) and mecA PCR for MRSA. Of the 586 samples 45.90% (n=269) tested positive for *S. aureus*, 42.15% (n=247) tested negative and 11.94% (n=70) had inconclusive results for nuc. Of the positive *S. aureus* samples, n=142/269 were positive for mecA and therefore validated as MRSA and n=30/269 tested negative for mecA. Of the 11% that tested positive for mecA but negative for *S. aureus* we anticipate to plan to on using 16srRNA to characterize these potential antibiotic resistant microbes that are not MRSA. Due to in consistencies in PCR amplification, n= 97/269 remain to be tested for mecA or require further validation by sequencing of the mecA gene product. We are currently developing additional primer sets based on publication from Soge et al, 2009 and Milheirico et al., 2007 which utilized amplification of the staphylococcal cassette chromosome Mec (SCCmec) and sequencing to verify mecA genotypes and Goodwin et al., 2012. Initial in-house sequence reactions where preformed on MRSA verified samples as proof of concept for sequence characterization of samples yielding data on three samples showing 100% similarity to *S. aureus* and S. argenteus strains in the NCBI database. We plan to continue to characterization of the methicillin resistant samples to determine what type of resistant microbe in being found in the Bay.

One illness/infection per 10,000 is the upper end of the EPA acceptable risk level based on exposure to chemicals at Superfund sites. This level is generally used when comparing risk. The *daily probabilities of infection* are all below the acceptable EPA risk level. As Figure 1 denotes, as the concentration increases, the probability of risk approaches the transition from acceptable risk to unacceptable risk. Daily probabilities were then used to calculate an annual probability, 4.66×10^{-4}, based on 24 beach visits per year. This number is a limitation of the study as we are unsure of actual beach loading or the annual number of visits to the beach, which can vary widely between locals, part-time residents, and tourists. Future studies may want to include sampling methodology similar to Christensen & King (2017) where research assistants administered surveys on the beach to better understand demographics, visits, and other items related to access. In addition, Tomenchok et al (2020), considered the abrasions of children 6 years old and younger to better understand exposure to environmental contaminants. They found 58.2% of children had an existing abrasion before playing on the beach and another 8.2% of children acquired a new abrasion while playing on the beach. CDC and the Florida Healthy Beaches Program both encourage those with open wounds to avoid swimming; however, whether this guidance is followed is unknown. This assessment did not model the impact on children or other potentially sensitive populations (e.g., immunocompromised).

This leads to the last step of the QMRA, risk characterization. The risk characterization is only as strong as the assumptions used to model the probabilities. The dose-response model is the most critical step in this process, and there is a paucity of data in the literature; in addition, for best modeling a strain-specific model is ideal. A more accurate dose-response model requires human testing, whether part of a clinical trial or due to an outbreak.
In addition, there were limitations in the sampling strategy. The water quality sampling took place from September 2019 to July 2021 and was impacted significantly by COVID in multiple ways. First, the water sampling was halted in spring 2020 when COVID emerged until adequate safety measures were developed and the University of Tampa approved updated protocols. Second, water samples were taken early in the morning on Mondays and Fridays. SA concentration is affected by bather loads. It was estimated that the amount of *S. aureus* shed per 15-minutes bathing period is 10^5 to 10^6 CFU/per person, with 15-20% positive for MRSA (Plano, Garza, Shibata, et al, 2011). SA concentrations may be higher later in the afternoon, especially on high beach activity days. Since the majority of the data was collected during the COVID pandemic, it is unknown how beach occupancy changed as a result of the pandemic, social distancing, and local public health regulations. Further, as there are other sources of SA in the environment (wastewater spillage, stormwater, animals, septic tank intrusion), these systems may also have been operating at different capacities than when the initial COVID pandemic began,

and people did not venture out in the community at the same rates. Further, the release of phosphate mining wastewater into Tampa Bay, Red Tide in the area, and implications of climate change all further challenge us to understand how the water of Tampa Bay is changing.

Risk in the Community

Based on the current annual probability of risk, which is entering the area of unacceptable risk, it is prudent to plan future studies to address study limitations, while considering the overall implications of the risk level and community. Risk assessment and risk management decisions begin with a scientific assessment; however, subsequent actions should be should also consider economic factors, laws and legal decisions, social factors, technological feasibility, politics related to issue and intervention, and public values. Four of the sampling points (Ben T. Davis, Cypress Point Park, Davis Islands, and Picnic Island) are managed by the City of Tampa, Parks, and Recreation. The Florida Healthy Beaches Program encourages visitors to check the local city or country webpage to determine if the beach is closed due to water quality issues. In terms of defining community values, there are many stakeholders from both economic (tourism) and conservation perspective (Tampa Bay Environmental Restoration Fund). One challenge of community intervention is the lack of a coordinating entity that impacts all beach access sites. One way to decrease the risk of skin infections is to encourage people to shower off after swimming in the ocean, and also to ensure that there are places to rinse off at each beach access location. Kelly et al (2018) considered the effect of beach management policies on recreational water quality and found that when there was public shower or rinsing facilities at the beach, there was a lower exceedance of Enterococci indicator (3.13%) than those without (5.83%, $p<0.02$). An advantage of this strategy is that it may remove all potential pathogens (avoiding community alarm regarding communication of MRSA alone).

The Florida Department of Health currently uses multiple ways to interact with the public regarding beach safety: regular monitoring in indicator organisms and reporting on the Healthy Beaches webpage, Facebook, Twitter, billboards in the community, and others. One limitation of their strategy is that local information can be difficult to access, other than beach water quality monitoring data; the Hillsborough County Healthy Beaches webpage was last updated in 2016, Pinellas county last updated in 2018. Health Departments must prioritize many community health initiatives, from providing clinical services to evaluating septic systems, and COVID placed a high burden on already limited resources. One improvement to reduce the risk of skin infections from beach use is to ensure that there are showers at each beach access location – this would serve to *prevent* infections from many organisms. This would first entail an examination of beach access in Tampa Bay, documentation of distance to shower/rinse-off facilities, and later a policy brief that could be used to gain awareness of the issue for community discussion and action.

Conclusion:

The annual risk of acquiring an infection from methicillin-resistant *Staphylococcus aureus* is 4.66×10^{-4}, based on 24 beach visits per year. This is approaching a level of unacceptable risk; additional study is needed to better understand how *Staphylococcus aureus* concentrations are changing, their relationship to the standard *Enterococcus* indicator organism, local beach conditions/management practices and beach visitor habits.

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Metadata:

Column	**Description**
Sampling	The number refers to the sampling event number associated with the day of sampling. F =
	BB = Bahia Beach,BD = Ben T. Davis, CP = Cypress Point, DI = Davis Island, EG = E.G.
Site	Simmons, PI = Picnic Island, RR = Redneck Riviera/ Gandy Beach,
Date	Sampling date
Month	Month of sampling event
Year	Year of sampling event from 2019 to 2021
Weekday	F = Friday, M = Monday
Time	Time of water collection (am)
Latitude	In decimal degrees
Longitude	In decimal degrees
Weather	Weather during time of water collection
people	Number of people in the water
Temperatu	Water temperature during time of water collection in °C
Salinity	Salinity of water during water collection in ppt (parts per thousand)
Precipitatic	Total rainfall in the last 24 hours before sampling
CFU/100ml	Colony forming units of Staphylococcu aureus per 100mL of water per site per sampling

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
1F	BB	9/20/2019	September	2019	F	5:10	27.72894	-82.47657	windy	0	27.62	20.93	0.4	17
1F	BD	9/20/2019	September	2019	F	6.57	27.97045	-82.57884	windy	2	27.00	21.00	0.4	1,296
1F	CP	9/20/2019	September	2019	F	7:23	27.95016	-82.54697	clear	2	27.50	20.50	0.4	1,863
1F	DI	9/20/2019	September	2019	F	8:45	27.90972	-82.44721	sunny	1	27.50	21.00	0.4	21
1F	EG	9/20/2019	September	2019	F	5:30	27.74772	-82.47278	windy	0	27.50	20.90	0.4	2,754
1F	PI	9/20/2019	September	2019	F	8:13	27.85183	-82.55415	clear	2	27.00	20.00	0.4	2,997
1F	RR	9/20/2019	September	2019	F	7:51	27.87459	-82.59566	clear	1	26.00	21.00	0.4	1,337
1M	BB	9/23/2019	September	2019	M	4:50	27.72894	-82.47655	clear	0	26.25	22.17	-	12
1M	BD	9/23/2019	September	2019	M	6:35	27.97048	-82.57885	clear	0	25.77	16.38	-	14
1M	CP	9/23/2019	September	2019	M	7:02	27.95018	-82.54608	clear	0	25.72	17.27	-	8
1M	DI	9/23/2019	September	2019	M	8:37	27.90978	-82.44716	sunny	1	26.97	21.28	-	15
1M	EG	9/23/2019	September	2019	M	5:25	27.74772	-82.47272	windy	0	25.83	21.02	-	745
1M	PI	9/23/2019	September	2019	M	8:01	27.85161	-82.55462	sunny	0	25.51	20.42	-	9,275
1M	RR	9/23/2019	September	2019	M	7:31	27.87494	-82.5958	sunny	1	28.87	18.90	-	12
2F	BB	10/25/2019	October	2019	F	4:35	27.72897	-82.47657	windy	0	26.77	25.17	-	18
2F	BD	10/25/2019	October	2019	F	6:29	27.97048	-82.57885	windy	0	26.75	25.00	-	99
2F	CP	10/25/2019	October	2019	F	7:00	27.95013	-82.54613	clear	1	25.08	18.88	-	2,362
2F	DI	10/25/2019	October	2019	F	8:35	27.90977	-82.44723	clear	1	26.32	22.87	-	15
2F	EG	10/25/2019	October	2019	F	5:14	27.7478	-82.47279	windy	0	25.95	22.55	-	19
2F	PI	10/25/2019	October	2019	F	8:00	27.85171	-82.55468	clear	0	25.75	23.38	-	3,090
2F	RR	10/25/2019	October	2019	F	7:35	27.87498	-82.59563	windy	6	25.37	20.51	-	1,066
2M	BB	10/28/2019	October	2019	M	4:34	27.72896	-82.47656	calm	0	27.27	24.97	0.2	117
2M	BD	10/28/2019	October	2019	M	6:24	27.97044	-82.57883	clear	0	27.04	18.73	0.2	94
2M	CP	10/28/2019	October	2019	M	6:48	27.95016	-82.54607	clear	0	26.93	19.32	0.2	5,073
2M	DI	10/28/2019	October	2019	M	8:20	27.90981	-82.44726	fair	0	25.00	18.00	0.2	3,393
2M	EG	10/28/2019	October	2019	M	5:15	27.74772	-82.47281	calm	0	27.11	23.28	0.2	68
2M	PI	10/28/2019	October	2019	M	7:45	27.85181	-82.55458	fair	0	28.00	22.00	0.2	7,358
2M	RR	10/28/2019	October	2019	M	7:20	27.87499	-82.5956	fair	0	24.00	18.00	0.2	88,661
3F	BB	11/22/2019	November	2019	F	4:30	27.72897	-82.47657	clear	0	24.00	27.00	-	32
3F	BD	11/22/2019	November	2019	F	6:26	27.9704	-82.57889	clear	0	26.00	25.00	-	9,265
3F	CP	11/22/2019	November	2019	F	6:45	27.95012	-82.54623	clear	0	26.00	25.00	-	6,907

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
3F	DI	11/22/2019	November	2019	F	8:17	27.9098	-82.4462	clear	2	18.00	25.00	-	175
3F	EG	11/22/2019	November	2019	F	5:00	27.7478	-82.47279	clear	0	23.00	25.00	-	7,905
3F	PI	11/22/2019	November	2019	F	7:36	27.85175	-82.55459	clear	0	17.00	22.00	-	3,544
3F	RR	11/22/2019	November	2019	F	7:14	27.87498	-82.59566	clear	1	17.00	21.00	-	92
3M	BB	11/25/2019	November	2019	M	4:15	27.72897	-82.47657	clear	0	18.00	23.00	0.3	721
3M	BD	11/25/2019	November	2019	M	6:30	27.9704	-82.57889	windy	0	15.00	24.00	0.3	24
3M	CP	11/25/2019	November	2019	M	6:40	27.95012	-82.54623	windy	0	13.00	24.00	0.3	53
3M	DI	11/25/2019	November	2019	M	8:07	27.90977	-82.44727	windy	0	16.00	26.00	0.3	627
3M	EG	11/25/2019	November	2019	M	4:45	27.7478	-82.47279	clear	0	18.00	24.00	0.3	68
3M	PI	11/25/2019	November	2019	M	7:33	27.85174	-82.55468	clear	0	17.00	26.00	0.3	666
3M	RR	11/25/2019	November	2019	M	7:15	27.87494	-82.59568	windy	1	15.00	25.00	0.3	706
4F	BB	1/17/2020	January	2020	F	5:31	27.72897	-82.47657	clear	0	15.00	25.00	-	164
4F	BD	1/17/2020	January	2020	F	7:23	29.97041	-82.57883	windy	0	16.00	24.00	-	127
4F	CP	1/17/2020	January	2020	F	7:40	27.95013	-82.54613	windy	2	17.00	23.00	-	110
4F	DI	1/17/2020	January	2020	F	9:05	27.90977	-82.44723	windy	0	17.00	25.00	-	74
4F	EG	1/17/2020	January	2020	F	5:54	27.7478	-82.47279	clear	0	16.00	25.00	-	2,785
4F	PI	1/17/2020	January	2020	F	8:30	27.85171	-82.55468	windy	1	16.00	25.00	-	151
4F	RR	1/17/2020	January	2020	F	8:06	27.87498	-82.59563	windy	0	16.00	24.00	-	77
4M	BB	1/20/2020	January	2020	M	5:33	27.72897	-82.47657	windy/cold	0	16.00	28.00	-	157
4M	BD	1/20/2020	January	2020	M	7:35	29.97041	-82.57883	windy/cold	0	12.00	28.00	-	93
4M	CP	1/20/2020	January	2020	M	7:51	27.95013	-82.54613	windy/cold	0	12.00	30.00	-	3,656
4M	DI	1/20/2020	January	2020	M	9:12	27.90977	-82.44723	windy/cold	0	13.00	26.00	-	132
4M	EG	1/20/2020	January	2020	M	5:56	27.7478	-82.47279	windy/cold	0	16.00	27.00	-	222
4M	PI	1/20/2020	January	2020	M	8:55	27.85171	-82.55468	windy/cold	0	14.00	26.00	-	166

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
4M	RR	1/20/2020	January	2020	M	8:17	27.87498	-82.59563	windy/cold	2	16.00	25.00	-	119
5F	BB	2/7/2020	February	2020	F	4:40	27.72897	-82.47657	windy/cold	0	16.00	25.00	0.0	30,294
5F	BD	2/7/2020	February	2020	F	6:30	29.97041	-82.57883	windy/cold	0	16.00	25.00	0.0	1,611
5F	CP	2/7/2020	February	2020	F	6:45	27.95013	-82.54613	windy/cold	0	16.00	25.00	0.0	9,358
5F	DI	2/7/2020	February	2020	F	8:11	27.90977	-82.44723	windy/cold	0	16.00	26.00	0.0	13,214
5F	EG	2/7/2020	February	2020	F	5:00	27.7478	-82.47279	windy/cold	0	16.00	26.00	0.0	31,185
5F	PI	2/7/2020	February	2020	F	7:35	27.85171	-82.55468	windy/cold	0	16.00	28.00	0.0	40,095
5F	RR	2/7/2020	February	2020	F	7:11	27.87498	-82.59563	windy/cold	0	16.00	29.00	0.0	39,798
5M	BB	2/10/2020	February	2020	M	4:43	27.72897	-82.47657	calm	0	16.00	30.00	-	125
5M	BD	2/10/2020	February	2020	M	6:23	29.97041	-82.57883	calm	0	15.00	26.00	-	257
5M	CP	2/10/2020	February	2020	M	6:43	27.95013	-82.54613	calm	0	14.00	26.00	-	257
5M	DI	2/10/2020	February	2020	M	8:07	27.90977	-82.44723	calm	0	16.00	25.00	-	132
5M	EG	2/10/2020	February	2020	M	5:03	27.7478	-82.47279	calm	0	15.00	29.00	-	5,200
5M	PI	2/10/2020	February	2020	M	7:35	27.85171	-82.55468	calm	0	15.00	26.00	-	25,384
5M	RR	2/10/2020	February	2020	M	7:11	27.87498	-82.59563	calm	0	17.00	24.00	-	219
6F	BB	3/6/2020	March	2020	F	4:40	27.72897	-82.47657	windy/sprinkle	0	20.00	28.00	-	6,039
6F	BD	3/6/2020	March	2020	F	6:24	29.97041	-82.57883	windy/cloudy	0	19.00	25.00	-	7,726
6F	CP	3/6/2020	March	2020	F	6:40	27.95013	-82.54613	windy/cloudy	0	19.00	26.00	-	338
6F	DI	3/6/2020	March	2020	F	8:07	27.90977	-82.44723	windy/cloudy	0	22.00	30.00	-	8,306

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
6F	EG	3/6/2020	March	2020	F	4:59	27.7478	-82.47279	windy	0	20.00	28.00	-	403
6F	PI	3/6/2020	March	2020	F	7:29	27.85171	-82.55468	windy/cloudy/sprinkle	0	21.00	30.00	-	201
6F	RR	3/6/2020	March	2020	F	7:04	27.87498	-82.59563	windy/cloudy	2	23.00	25.00	-	97
6M	BB	3/9/2020	March	2020	M	4:37	27.72897	-82.47657	calm	0	18.00	30.00	-	632
6M	BD	3/9/2020	March	2020	M	6:26	29.97041	-82.57883	calm	1	17.00	30.00	-	47,789
6M	CP	3/9/2020	March	2020	M	6:33	27.95013	-82.54613	calm	0	18.00	26.00	-	######
6M	DI	3/9/2020	March	2020	M	8:04	27.90977	-82.44723	calm	0	19.00	29.00	-	6,253
6M	EG	3/9/2020	March	2020	M	4:57	27.7478	-82.47279	calm	0	18.00	29.00	-	19,248
6M	PI	3/9/2020	March	2020	M	7:30	27.85171	-82.55468	calm	0	18.00	29.00	-	50,729
6M	RR	3/9/2020	March	2020	M	7:06	27.87498	-82.59563	calm	0	17.00	29.00	-	12,168
7F	BB	6/26/2020	June	2020	F	5:49	27.72897	-82.47657	calm	0	32.50	24.50	-	357
7F	BD	6/26/2020	June	2020	F	7:24	29.97041	-82.57883	calm	0	31.00	24.00	-	263
7F	CP	6/26/2020	June	2020	F	7:50	27.95013	-82.54613	calm	2	32.50	23.00	-	391
7F	DI	6/26/2020	June	2020	F	9:29	27.90977	-82.44723	calm	2	32.00	21.00	-	212
7F	EG	6/26/2020	June	2020	F	6:30	27.7478	-82.47279	calm	0	31.00	22.00	-	357
7F	PI	6/26/2020	June	2020	F	8:55	27.85171	-82.55468	calm	2	31.00	22.00	-	55,460
7F	RR	6/26/2020	June	2020	F	8:32	27.87498	-82.59563	calm	2	35.50	23.00	-	331
7M	BB	6/29/2020	June	2020	M	5:49	27.72897	-82.47657	calm	0	32.00	24.00	-	226
7M	BD	6/29/2020	June	2020	M	7:07	29.97041	-82.57883	clear	0	31.50	23.00	-	231
7M	CP	6/29/2020	June	2020	M	7:18	27.95013	-82.54613	clear	11	32.00	22.00	-	72
7M	DI	6/29/2020	June	2020	M	9:00	27.90977	-82.44723	sunny/hot	4	32.00	23.00	-	56
7M	EG	6/29/2020	June	2020	M	6:04	27.7478	-82.47279	clear/hot	2	32.00	24.00	-	7,315
7M	PI	6/29/2020	June	2020	M	8:24	27.85171	-82.55468	clear/sunny/hot	1	32.00	24.00	-	3,978
7M	RR	6/29/2020	June	2020	M	7:59	27.87498	-82.59563	calm	2	37.00	22.00	-	36
8F	BB	7/24/2020	July	2020	F	5:55	27.72897	-82.47657	calm	0	29.00	30.00	0.1	713
8F	BD	7/24/2020	July	2020	F	8:58	29.97041	-82.57883	calm	0	28.00	23.00	0.1	206

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
8F	CP	7/24/2020	July	2020	F	9:12	27.95013	-82.54613	calm	4	29.00	23.00	0.1	214
8F	DI	7/24/2020	July	2020	F	8:25	27.90977	-82.44723	calm	0	29.00	22.00	0.1	404
8F	EG	7/24/2020	July	2020	F	6:18	27.7478	-82.47279	calm	0	26.00	25.00	0.1	372
8F	PI	7/24/2020	July	2020	F	7:55	27.85171	-82.55468	calm	1	27.00	25.00	0.1	1,980
8F	RR	7/24/2020	July	2020	F	7:33	27.87498	-82.59563	windy/choppy	2	28.00	25.00	0.1	499
8M	BB	7/27/2020	July	2020	M	6:01	27.72897	-82.47657	calm	0	28.00	30.00	0.1	1,151
8M	BD	7/27/2020	July	2020	M	7:11	29.97041	-82.57883	windy	0	29.00	26.00	0.1	670
8M	CP	7/27/2020	July	2020	M	7:27	27.95013	-82.54613	calm	6	31.00	23.00	0.1	388
8M	DI	7/27/2020	July	2020	M	9:05	27.90977	-82.44723	calm	1	32.00	25.00	0.1	11,796
8M	EG	7/27/2020	July	2020	M	6:22	27.7478	-82.47279	clear	0	28.00	30.00	0.1	236
8M	PI	7/27/2020	July	2020	M	8:31	27.85171	-82.55468	calm	0	29.00	25.00	0.1	50
8M	RR	7/27/2020	July	2020	M	8:03	27.87498	-82.59563	windy	0	32.00	25.00	0.1	66,824
9F	BB	8/28/2020	August	2020	F	6:24	27.72897	-82.47657	clear	0	30.00	na	-	1,763
9F	BD	8/28/2020	August	2020	F	5:56	29.97041	-82.57883	clear	0	30.00	24.00	-	2,395
9F	CP	8/28/2020	August	2020	F	8:16	27.95013	-82.54613	clear/sunny	3	30.00	21.00	-	138
9F	DI	8/28/2020	August	2020	F	7:32	27.90977	-82.44723	clear	6	29.00	na	-	3,022
9F	EG	8/28/2020	August	2020	F	6:41	27.7478	-82.47279	clear	0	31.00	na	-	141
9F	PI	8/28/2020	August	2020	F	7:45	27.85171	-82.55468	clear	0	30.00	23.00	-	9,021
9F	RR	8/28/2020	August	2020	F	6:54	27.87498	-82.59563	clear	4	32.00	23.00	-	1,994
9M	BB	8/31/2020	August	2020	M	6:10	27.72897	-82.47657	clear	0	30.00	24.00	0.9	8,731
9M	BD	8/31/2020	August	2020	M	7:30	29.97041	-82.57883	clear	0	28.00	20.00	0.9	73,197
9M	CP	8/31/2020	August	2020	M	7:46	27.95013	-82.54613	clear	2	29.00	na	0.9	7,818
9M	DI	8/31/2020	August	2020	M	7:54	27.90977	-82.44723	clear	0	28.00	15.00	0.9	7,423
9M	EG	8/31/2020	August	2020	M	6:30	27.7478	-82.47279	clear	0	28.00	23.00	0.9	145
9M	PI	8/31/2020	August	2020	M	7:09	27.85171	-82.55468	clear, sunrise	0	29.00	na	0.9	370
9M	RR	8/31/2020	August	2020	M	5:48	27.87498	-82.59563	clear	0	30.00	na	0.9	62,751
10F	BB	9/18/2020	September	2020	F	4:40	27.72897	-82.47657	raining	0	29.00	30.00	0.0	77
10F	BD	9/18/2020	September	2020	F	6:10	29.97041	-82.57883	cloudy	2	29.00	25.00	0.0	43

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
10F	CP	9/18/2020	September	2020	F	6:31	27.95013	-82.54613	cloudy	0	29.00	27.00	0.0	15
10F	DI	9/18/2020	September	2020	F	8:25	27.90977	-82.44723	clear	0	28.00	11.00	0.0	1,714
10F	EG	9/18/2020	September	2020	F	5:05	27.7478	-82.47279	raining	0	29.00	28.00	0.0	77
10F	PI	9/18/2020	September	2020	F	7:42	27.85171	-82.55468	clear	0	28.00	23.00	0.0	43
10F	RR	9/18/2020	September	2020	F	7:06	27.87498	-82.59563	windy	5	28.00	23.00	0.0	1,371
10M	BB	9/21/2020	September	2020	M	5:15	27.72897	-82.47657	clear	0	28.00	22.00	-	264
10M	BD	9/21/2020	September	2020	M	6:16	29.97041	-82.57883	clear	0	27.00	20.00	-	57
10M	CP	9/21/2020	September	2020	M	6:28	27.95013	-82.54613	clear	0	27.00	20.00	-	51
10M	DI	9/21/2020	September	2020	M	8:02	27.90977	-82.44723	calm	2	28.00	20.00	-	105
10M	EG	9/21/2020	September	2020	M	4:51	27.7478	-82.47279	windy	0	28.00	22.00	-	287
10M	PI	9/21/2020	September	2020	M	7:26	27.85171	-82.55468	clear	1	28.00	21.00	-	230
10M	RR	9/21/2020	September	2020	M	6:51	27.87498	-82.59563	windy	1	30.00	22.00	-	287
11F	BB	11/6/2020	November	2020	F	4:45	27.72897	-82.47657	windy	0	22.00	30.00	-	50,246
11F	BD	11/6/2020	November	2020	F	6:21	29.97041	-82.57883	clear	0	22.50	21.00	-	5,064
11F	CP	11/6/2020	November	2020	F	6:38	27.95013	-82.54613	calm	0	22.00	27.00	-	8,921
11F	DI	11/6/2020	November	2020	F	8:13	27.90977	-82.44723	windy	0	24.00	25.00	-	9,106
11F	EG	11/6/2020	November	2020	F	5:00	27.7478	-82.47279	windy	0	22.00	30.00	-	87,808
11F	PI	11/6/2020	November	2020	F	7:46	27.85171	-82.55468	windy	0	23.00	25.00	-	11,383
11F	RR	11/6/2020	November	2020	F	7:12	27.87498	-82.59563	windy	1	23.00	25.00	-	111
11M	BB	11/9/2020	November	2020	M	4:51	27.72897	-82.47657	windy	0	22.00	30.00	-	4,791
11M	BD	11/9/2020	November	2020	M	6:23	29.97041	-82.57883	cloudy, windy	0	25.00	23.00	-	2,053
11M	CP	11/9/2020	November	2020	M	6:40	27.95013	-82.54613	cloudy, windy	1	25.00	22.00	-	4,449
11M	DI	11/9/2020	November	2020	M	8:12	27.90977	-82.44723	rain, cloudy	0	25.00	25.00	-	7,187
11M	EG	11/9/2020	November	2020	M	5:10	27.7478	-82.47279	windy, rain	0	21.00	25.00	-	31,827
11M	PI	11/9/2020	November	2020	M	7:40	27.85171	-82.55468	windy, cloudy	0	24.00	25.00	-	5,818

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
11M	RR	11/9/2020	November	2020	M	7:15	27.87498	-82.59563	cloudy, windy	5	25.00	25.00	-	2,053
12F	BB	1/15/2021	January	2021	F	5:50	27.72897	-82.47657	cold, calm	0	12.00	29.00	0.0	442
12F	BD	1/15/2021	January	2021	F	7:14	29.97041	-82.57883	windy	0	13.00	30.00	0.0	23
12F	CP	1/15/2021	January	2021	F	7:34	27.95013	-82.54613	windy	0	11.00	27.00	0.0	940
12F	DI	1/15/2021	January	2021	F	8:17	27.90977	-82.44723	clear, cold	0	17.00	26.00	0.0	58
12F	EG	1/15/2021	January	2021	F	6:13	27.7478	-82.47279	cold, calm	0	12.00	29.00	0.0	311
12F	PI	1/15/2021	January	2021	F	7:50	27.85171	-82.55468	clear, cold	0	15.00	31.00	0.0	30
12F	RR	1/15/2021	January	2021	F	7:02	27.87498	-82.59563	calm, clear	2	16.00	30.00	0.0	22
12M	BB	1/18/2021	January	2021	M	6:15	27.72897	-82.47657	clear	0	13.00	32.00	-	1,332
12M	BD	1/18/2021	January	2021	M	7:25	29.97041	-82.57883	clear	0	14.00	27.00	-	1,776
12M	CP	1/18/2021	January	2021	M	7:42	27.95013	-82.54613	clear	5	14.00	29.00	-	27
12M	DI	1/18/2021	January	2021	M	8:32	27.90977	-82.44723	calm, clear	0	16.00	24.00	-	213
12M	EG	1/18/2021	January	2021	M	6:35	27.7478	-82.47279	clear	0	13.00	30.00	-	107
12M	PI	1/18/2021	January	2021	M	7:28	27.85171	-82.55468	calm, clear	0	15.00	25.00	-	653
12M	RR	1/18/2021	January	2021	M	6:51	27.87498	-82.59563	calm, clear	0	16.00	28.00	-	12,340
13F	BB	2/19/2021	February	2021	F	5:40	27.72897	-82.47657	windy, cloudy	0	23.00	21.00	0.0	306
13F	BD	2/19/2021	February	2021	F	7:00	29.97041	-82.57883	windy	0	23.00	24.00	0.0	6,322
13F	CP	2/19/2021	February	2021	F	7:26	27.95013	-82.54613	windy	1	23.00	23.00	0.0	3,197
13F	DI	2/19/2021	February	2021	F	8:15	27.90979	-82.4472	clear	0	20.00	22.00	0.0	120
13F	EG	2/19/2021	February	2021	F	5:56	27.7478	-82.47279	windy, cloudy	0	23.00	20.00	0.0	175

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
13F	PI	2/19/2021	February	2021	F	7:39	27.85187	-82.55447	clear	0	20.00	23.00	0.0	13,519
13F	RR	2/19/2021	February	2021	F	7:00	27.8749095	-82.5958408	Windy, choppy	1	21.00	25.00	0.0	50
13M	BB	2/22/2021	February	2021	M	5:28	27.72897	-82.47657	clear	0	19.00	25.00	-	226
13M	BD	2/22/2021	February	2021	M	6:49	29.97041	-82.57883	clear	0	19.00	25.00	-	194
13M	CP	2/22/2021	February	2021	M	7:10	27.95013	-82.54613	clear	0	20.00	24.00	-	172
13M	DI	2/22/2021	February	2021	M	8:15	27.90979	-82.44726	Clear	0	18.00	21.00	-	99
13M	EG	2/22/2021	February	2021	M	5:45	27.7478	-82.47279	clear	0	20.00	24.00	-	150
13M	PI	2/22/2021	February	2021	M	7:40	27.85184	-82.55463	Clear	0	15.00	26.00	-	163
13M	RR	2/22/2021	February	2021	M	6:56	27.87486	-82.59582	Fair, cloudy	1	17.00	25.00	-	123
14F	BB	3/19/2021	March	2021	F	5:40	27.72897	-82.47657	Windy	0	20.00	28.00	0.4	3,018
14F	BD	3/19/2021	March	2021	F	6:51	29.97041	-82.57883	Windy	0	21.00	29.00	0.4	6,005
14F	CP	3/19/2021	March	2021	F	7:10	27.95013	-82.54613	Windy	5	21.00	28.00	0.4	533
14F	DI	3/19/2021	March	2021	F	7:40	27.90979	-82.44726	Windy	0	22.00	25.00	0.4	120
14F	EG	3/19/2021	March	2021	F	5:55	27.7478	-82.47279	Windy	0	20.00	28.00	0.4	988
14F	PI	3/19/2021	March	2021	F	7:50	27.85184	-82.55463	Windy	0	19.00	28.00	0.4	576
14F	RR	3/19/2021	March	2021	F	7:20	27.87486	-82.59582	Windy	0	27.00	29.00	0.4	175
14M	BB	3/22/2021	March	2021	M	5:35	27.72897	-82.47657	windy, raining	0	19.00	25.00	0.4	8
14M	BD	3/22/2021	March	2021	M	6:50	29.97041	-82.57883	Windy	0	19.00	30.00	0.4	12
14M	CP	3/22/2021	March	2021	M	7:19	27.95013	-82.54613	Calm	0	18.00	29.00	0.4	7
14M	DI	3/22/2021	March	2021	M	7:05	27.90979	-82.44726	Fair, overcast	0	17.00	16.00	0.4	42
14M	EG	3/22/2021	March	2021	M	5:55	27.7478	-82.47279	Windy, rain	0	18.00	25.00	0.4	85
14M	PI	3/22/2021	March	2021	M	8:13	27.87486	-82.59582	Overcast	0	16.00	25.00	0.4	24
14M	RR	3/22/2021	March	2021	M	7:35	27.85184	-82.55463	Fair, overcast	1	19.00	25.00	0.4	2,447
15F	BB	4/23/2021	April	2021	F	6:20	27.72897	-82.47657	Calm	0	23.00	20.00	-	7,858

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
15F	BD	4/23/2021	April	2021	F	8:04	29.97041	-82.57883	Calm, sunny	0	21.00	26.00	-	3,015
15F	CP	4/23/2021	April	2021	F	7:46	27.95013	-82.54613	Fair, overcast	0	24.00	26.00	-	101
15F	DI	4/23/2021	April	2021	F	7:00	27.90979	-82.44726	Fair	0	19.00	28.00	-	115
15F	EG	4/23/2021	April	2021	F	6:42	27.7478	-82.47279	Calm	0	21.00	27.50	-	4,815
15F	PI	4/23/2021	April	2021	F	8:08	27.85184	-82.55463	Fair	0	17.00	30.00	-	34
15F	RR	4/23/2021	April	2021	F	7:30	27.87486	-82.59582	Fair	2	20.00	25.00	-	160
15M	BB	4/26/2021	April	2021	M	6:20	27.72897	-82.47657	clear	0	24.50	26.00	-	161
15M	BD	4/26/2021	April	2021	M	7:47	29.97041	-82.57883	calm	2	24.00	24.00	-	676
15M	CP	4/26/2021	April	2021	M	8:02	27.95013	-82.57883	calm	1	23.90	25.00	-	10,444
15M	DI	4/26/2021	April	2021	M	6:50	27.90979	-82.44726	Fair	0	25.00	28.00	-	11,612
15M	EG	4/26/2021	April	2021	M	6:43	27.7478	-82.47279	windy	0	23.90	28.00	-	4,553
15M	PI	4/26/2021	April	2021	M	8:00	27.85184	-82.55463	Calm	0	23.00	22.00	-	48,649
15M	RR	4/26/2021	April	2021	M	7:18	27.87486	-82.59582	Fair	1	28.00	24.00	-	188
16F	BB	5/21/2021	May	2021	F	5:30	27.72897	-82.47657	calm	0	21.00	30.00	-	182
16F	BD	5/21/2021	May	2021	F	6:35	29.97041	-82.57883	calm	0	22.00	28.00	-	127
16F	CP	5/21/2021	May	2021	F	6:55	27.95013	-82.54613	calm	0	22.00	28.00	-	120
16F	DI	5/21/2021	May	2021	F	6:57	27.90979	-82.44726	calm	0	21.00	27.00	-	133
16F	EG	5/21/2021	May	2021	F	5:50	27.7478	-82.47279	calm	0	21.00	30.00	-	182
16F	PI	5/21/2021	May	2021	F	7:50	27.85184	-82.55463	calm	0	20.00	27.00	-	205
16F	RR	5/21/2021	May	2021	F	7:26	27.87486	-82.59582	choppy	1	21.00	28.00	-	221
16M	BB	5/24/2021	May	2021	M	5:29	27.72897	-82.47657	calm	1	22.00	30.00	-	3,404
16M	BD	5/24/2021	May	2021	M	6:48	29.97041	-82.57883	calm	0	22.00	27.00	-	5,860
16M	CP	5/24/2021	May	2021	M	7:15	27.95013	-82.54613	calm	0	22.00	28.00	-	377
16M	DI	5/24/2021	May	2021	M	6:45	27.90979	-82.44726	calm	0	24.00	30.00	-	195
16M	EG	5/24/2021	May	2021	M	5:46	27.7478	-82.47279	calm	0	22.00	29.00	-	258
16M	PI	5/24/2021	May	2021	M	7:42	27.85184	-82.55463	calm	0	23.00	26.00	-	54
16M	RR	5/24/2021	May	2021	M	7:20	27.87486	-82.59582	calm	1	26.00	25.00	-	75
17F	BB	6/25/2021	June	2021	F	6:54	27.72897	-82.47657	calm	0	30.00	30.00	1.4	38,805
17F	BD	6/25/2021	June	2021	F	8:15	29.97041	-82.57883	calm	0	28.00	25.00	1.4	149

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
17F	CP	6/25/2021	June	2021	F	8:33	27.95013	-82.54613	calm	5	26.00	25.00	1.4	10,432
17F	DI	6/25/2021	June	2021	F	6:59	27.90979	-82.44726	Fair	1	29.00	25.00	1.4	180
17F	EG	6/25/2021	June	2021	F	7:10	27.7478	-82.47279	calm	0	27.00	25.00	1.4	282
17F	PI	6/25/2021	June	2021	F	7:50	27.85184	-82.55463	Fair	0	27.00	25.00	1.4	######
17F	RR	6/25/2021	June	2021	F	7:28	27.87486	-82.59582	Fair	0	28.00	24.00	1.4	######
17M	BB	6/28/2021	June	2021	M	7:01	27.72897	-82.47657	calm, clear	0	28.00	25.00	0.0	409
17M	BD	6/28/2021	June	2021	M	8:36	29.97041	-82.57883	calm, clear	2	27.00	29.00	0.0	5,459
17M	CP	6/28/2021	June	2021	M	8:54	27.95013	-82.54613	calm, clear	1	28.00	25.00	0.0	275
17M	DI	6/28/2021	June	2021	M	6:48	27.90979	-82.44726	calm, clear	0	27.00	23.00	0.0	4,675
17M	EG	6/28/2021	June	2021	M	7:15	27.7478	-82.47279	calm, clear	0	26.00	25.00	0.0	18,430
17M	PI	6/28/2021	June	2021	M	7:33	27.85184	-82.55463	calm, clear	0	28.00	25.00	0.0	7,253
17M	RR	6/28/2021	June	2021	M	7:12	27.87486	-82.59582	calm, clear	0	28.00	24.00	0.0	7,403
18F	BB	7/23/2021	July	2021	F	6:50	27.72897	-82.47657	calm	0	29.00	18.00	0.1	79
18F	BD	7/23/2021	July	2021	F	8:10	29.97041	-82.57883	calm	0	31.00	19.00	0.1	1,017
18F	CP	7/23/2021	July	2021	F	8:34	27.95013	-82.54613	calm	0	29.00	21.00	0.1	1,877
18F	DI	7/23/2021	July	2021	F	7:00	27.90979	-82.44726	fair	0	29.00	16.00	0.1	524
18F	EG	7/23/2021	July	2021	F	7:12	27.7478	-82.47279	calm	0	29.00	19.00	0.1	4,674
18F	PI	7/23/2021	July	2021	F	8:51	27.85184	-82.55463	clear	0	29.00	21.00	0.1	1,481
18F	RR	7/23/2021	July	2021	F	8:25	27.87486	-82.59582	fair	0	32.00	20.00	0.1	36
18M	BB	7/26/2021	July	2021	M	5:45	27.72897	-82.47657	calm	0	29.00	25.00	-	17
18M	BD	7/26/2021	July	2021	M	7:12	29.97041	-82.57883	calm	0	30.00	25.00	-	6
18M	CP	7/26/2021	July	2021	M	7:25	27.95013	-82.54613	calm	0	30.00	20.00	-	21
18M	DI	7/26/2021	July	2021	M	8:56	27.90979	-82.44726	calm	0	30.00	20.00	-	2,028
18M	EG	7/26/2021	July	2021	M	6:15	27.7478	-82.47279	calm	0	30.00	25.00	-	238

Sampling Event	Site	Date	Month	Year	Week-day	Time (am)	Latitude	Longitude	Weather	People	Temp(c)	Salinity (ppt)	Precipi-tation (in)	CFU/ 100mL
18M	PI	7/26/2021	July	2021	M	8:20	27.85184	-82.55463	fair	0	31.00	18.00	-	27
18M	RR	7/26/2021	July	2021	M	7:55	27.87486	-82.59582	calm	0	32.00	20.00	-	392