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Broward County Coastal Ocean Water Quality Study, 2010-2012

Atlantic Oceanographic and Meteorological Laboratory
Miami, Florida

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Disclaimer

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Acronyms

ADCP	Acoustic Doppler current profiler
BLAST	Basic local alignment search tool
CDOM	Chromophoric dissolved organic matter
CFU	Colony forming units
CS	Chromogenic substrate assay
CTD	Conductivity-temperature-depth
DIN	Dissolved inorganic nitrogen
DIP	Dissolved inorganic phosphorus
DO	Dissolved oxygen
DOC	Dissolved organic carbon
DOP	Dissolved organic phosphorus
FACE	Florida Area Coastal Environment program
FDEP	Florida Department of Environmental Protection
FIB	Fecal indicator bacteria
GEU	Genome equivalent units
HAB	Harmful algal bloom
H&S	Hazen and Sawyer
MPN	Most probable number
MST	Microbial source tracking
N+N	Nitrite + nitrate
NGS	Next-generation-sequencing
NH_4	Ammonium
NO_2	Nitrite
NO_3	Nitrate
NTU	Nephelometric turbidity units
ORP	Oxidation-reduction potential
OTU	Operational taxonomic unit
PC	Particulate carbon
PCoA	Principal coordinates of analysis
PIP	Particulate inorganic phosphorus
PN	Particulate nitrogen
PO_4	Orthophosphate
POM	Particulate organic matter
POP	Particulate organic phosphorus
PP	Particulate phosphorus
QIIME	Quantitative insights into microbial ecology
qPCR	Quantitative polymerase chain reaction
RD	Rhodamine dye
SFWMD	South Florida Water Management District
Si	Silicate
SIPP	Source Identification Protocol Project
SPC	Sample processing control
SGD	Submarine groundwater discharge
TDN	Total dissolved nitrogen
TDP	Total dissolved phosphorus
TN	Total nitrogen
TOC	Total organic carbon
TON	Total organic nitrogen
TP	Total phosphorus
TSS	Total suspended solids

Abstract

Researchers with the Ocean Chemistry and Ecosystems Division of NOAA's Atlantic Oceanographic and Meteorological Laboratory conducted 12 monthly cruises in two separate track lines off of Broward County, Florida, from November 2010 through January 2012. The cruise tracks were designed to provide information on three categories of the coastal ocean: (1) the vicinity of the Broward and Hollywood treated-wastewater outfalls; (2) the vicinity of the Hillsboro and Port Everglades inlets; and (3) the interstitial areas in between.

Sampling took place from aboard the NOAA R/V *Hildebrand* using a conductivity-temperature-depth (CTD)/rosette for water samples and water column profiles and appropriately located acoustic Doppler current profiler (ADCP) instruments for ocean current information. Measured discrete parameters included location, depth, salinity, temperature, pH, oxygen saturation (dissolved oxygen, DO), oxidation-reduction (redox) potential (ORP), chlorophyll-a, phaeopigments, total suspended solids (TSS), nitrate (NO_3), nitrite (NO_2), ammonium (NH_4), silicate (Si), orthophosphate (PO_4), total dissolved nitrogen (TDN), total dissolved phosphorus (TDP), particulate carbon (PC), particulate phosphorus (PP), particulate nitrogen (PN), and dissolved organic carbon (DOC). CTD profile data included depth, turbidity, ORP, DO, pH, chlorophyll-a, salinity, temperature, and density. A variety of microbiological entities were measured, including fecal indicator bacteria (FIB), selected waterborne pathogens, and molecular microbial source tracking (MST) markers. Community bacterial metagenomic profiles were also generated for selected sample sites. Quality controls of nutrient sample analyses were obtained following National Environmental Laboratory Accreditation Conference (NELAC)-certified procedures.

The data obtained present a view of the coastal ocean as having a low "background" concentration of most analytes, interrupted by elevated concentrations near the outfalls and inlets whose excess concentrations decreased rapidly away from the point sources. The waters were found to be oligotrophic, with no evidence of bloom events. A major upwelling event was observed on August 11, 2011, where a ~10°C temperature drop was observed near the southernmost portion of the sampled area.

1. Introduction

The southeast Florida coast includes the counties of Miami-Dade, Broward, and Palm Beach (~25.6–26.9°N latitude), consisting of about 142 km of coastline extending approximately parallel to the flow of the Florida Current to the east. The region contains three non-continuous reef tracts[1] with ecosystems of significant economic,[2] ecological, and aesthetic value to the 5.5 million residents therein.[3] In association with two wastewater treatment plants in Broward County,[4] NOAA researchers undertook a major investigation of the chemical, oceanographic, and microbiological characteristics of the coastal waters off of Broward County from November 2010 to January 2012; this document is a report on that activity. To provide a context for the scientific results of the study, a brief overview of the oceanographic, ecological, and chemical characteristics of the area is presented.

1.1 Land Forms and Surface Water

The region of South Florida is an increasingly developed area with essentially contiguous urbanization along the coast. The area contains two significant ports (Port Everglades, Port of Miami) and three major airports (Miami International, Fort Lauderdale-Hollywood International, Palm Beach International). Tourism is Florida's top industry, drawing about 81 million visitors a year, employing more than 1 million people, and accounting for 21 percent of sales tax revenues.[5] The population originally settled on two slightly elevated ridges (Pine Island Ridge and the Atlantic Coastal Ridge);[6] subsequent wetland drainage[7] allowed further westward expansion to the present limits. Drainage canals were created by the U.S. Army Corps of Engineers for this purpose, resulting in substantial changes in surface and groundwater flow[8] that remain a major conduit for agricultural and urban runoff.[9] These conduits may contain chemical fertilizers, pesticides, suspended solids and highly colored organic materials, elevated nutrients, high natural iron concentrations, and contaminants from septic tanks and landfills.[10] A list of the major canals in Palm Beach, Broward, and Miami-Dade counties is given in Table 1; a map of the canals in Broward County[11] is given in Figure 1.

Table 1. Major canals in southeast Florida.

Number	Name	County
C51	West Palm Beach Canal	Palm Beach
C18	Hillsboro Canal	Palm Beach
C17		Palm Beach
C14		Broward
C13		Broward
C12		Broward
NNR	New North River Canal	Broward
C11	South New River (Dania Cutoff)	Broward
C9	Snake Creek Canal	Broward
C8		Miami-Dade
C6	Miami Canal (Miami River)	Miami-Dade
C4	Tamiami Canal	Miami-Dade
C3		Miami-Dade
C2	Snapper Creek Canal	Miami-Dade
C100		Miami-Dade
C1		Miami-Dade
C102		Miami-Dade

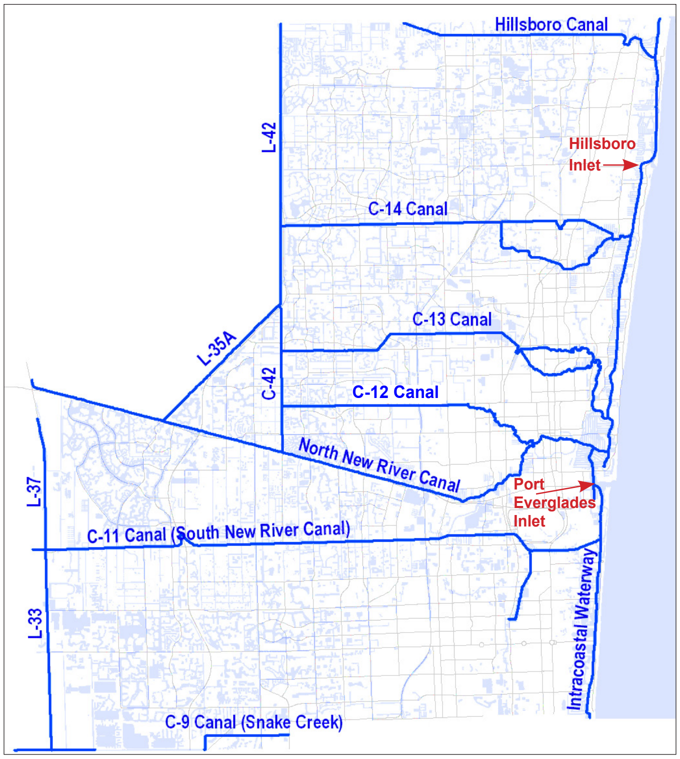

Figure 1. Major canals of Broward County, Florida (from Broward County Environmental Protection Department, 2007).[11]

The Intracoastal Waterway extends 374 miles along the coast, from Fernandina Harbor to Miami Harbor, requiring periodic dredging maintenance.[12] Because of the large

Table 2. Inlets in southeast Florida.[1]

Inlet	Latitude (ºN)	Longitude (ºW)	Distance to Next Inlet South (km)	Width (m)	Depth (m)
Boynton Inlet	26.55	-80.04	23.5	30	3
Boca Raton Inlet	26.34	-80.07	8.7	50	3
Hillsboro Inlet	26.26	-80.08	18.4	94	3
Port Everglades Inlet	26.09	-80.10	21.67	137	12.8
Bakers Haulover Inlet	25.90	-80.12	13.0	61	3.4
Government Cut	25.76	-80.13	---	122	11

[1] Widths and depths are approximate. Data are from various sources.

volume of boat traffic in the waterway, it is a potentially significant source of non-point pollution. For northern Miami-Dade, Broward, and Palm Beach counties, surface waters, including canal flow and Intracoastal Waterway water flow to the ocean, are predominantly constrained to a series of inlets: Norris Cut, Bear Cut, Government Cut, Haulover Inlet, Port Everglades Inlet, Hillsboro Inlet, Boca Raton Inlet, Boynton Inlet, and Palm Beach Inlet (North Lake Worth). There are three inlets within the area studied in this project: Hillsboro Inlet, Port Everglades Inlet, and Haulover Inlet; some characteristics of these and other inlets are provided in Table 2. As the final venue for surface waters flowing into the Atlantic, inlets have been noted as major point sources of pollution into the coastal ocean.[13,14] In a 1998 study of water quality in South Florida,[15] the U.S. Geological Survey listed domestic wastewater facility discharges (1500 facilities), industrial wastewater discharges (including leachate and runoff from contaminated land), septic tank discharges (nearly a half million), agricultural wastewater runoff including pesticides and fertilizers (citrus farming, dairy, and beef operations), runoff from landfills (40 active landfills), and urban wastewater (stormwater) runoff as the leading categories of land-based pollution.

1.2 Meteorology

South Florida receives 40-65 inches (102-165 cm) of rainfall annually (Table 3), much of it in the southeastern coastal regions (Figure 2). The rainy season extends from June to November; the dry season from December to May. The rainy season is characterized by frequent afternoon thunderstorms, resulting in significant freshwater runoff into the coastal ocean.

Table 3. Rainfall over southeast Florida, 1915-1985.

Time Period	Mean (cm)	Maximum (cm)	Minimum (cm)
Annual	132	197	93
Wet season	88	136	59
Dry season	44	79	19

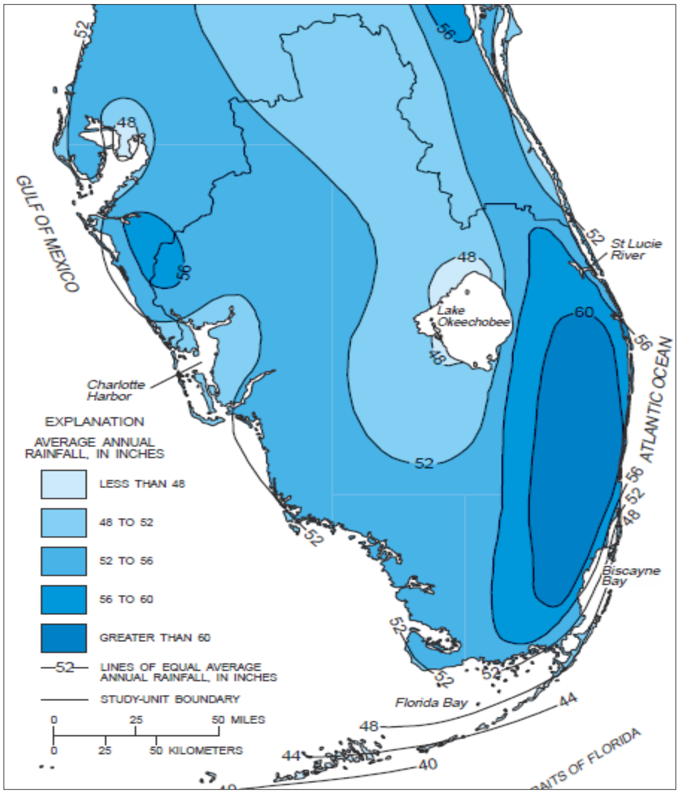

Figure 2. Average rainfall for South Florida, 1951-1980. From Fernald and Patton, Water Resources Atlas of Florida (1984), as cited in McPherson and Halley (1996).[16]

Increased rainfall causes increased turbidity and reduced salinity in the coastal ocean, as well as an increase in the transport of pollutants. Because of leaks in the sewage transport piping, increased rainfall also results in an increase in the flow of water at treated-wastewater plants and, subsequently, transport to the coastal ocean through ocean outfalls. Table 3 provides a summary of rainfall statistics.[16] It is important to note that individual years may differ substantially from these averages.

A significant variable is the El Niño-Southern Oscillation cycle: a La Niña condition is characterized by a cooling of waters in the central and eastern equatorial Pacific Ocean. The La Niña that was observed during this study developed in the summer of 2010. The effect in Florida is typically a very dry and less stormy winter and spring. Other multi-year signals also affect global weather patterns, e.g., the Pacific North American Pattern and the North Atlantic Oscillation.[17,18] A plot of the rainfall data[19] from Palm Beach, Broward, and Miami-Dade counties is given in Figure 3. Note that the data for 2011 (red dashed line) indicates significantly reduced rainfall for all three counties through September. This data will be discussed further in section 4.2.3.

Meteorological data were collected from NOAA buoy PVGF1 at Port Everglades Inlet during the period of this study (http://www.ndbc.noaa.gov/station_page.php?station=pvgfl). Figure 4 presents histograms of the wind direction and wind speed from PVGF1 data for 2011 separated into summer and winter months. Overall, the histograms from the two time regimes are quite similar.

In general, wind speeds are somewhat higher in the winter (average of 4.3 m/s) than summer (3.5 m/s). Both time regimes saw winds primarily from the northeast, east, and southeast, with much less frequency from the north, west, or south (Figure 4).

1.3 Groundwater

The groundwater hydrology of the Florida coast is complex, due to the interplay of the stratified subsurface water flowing seaward (due to the hydraulic pressure from land) and the inflow of saline water from the ocean into freshwater aquifers (Figure 5).[20] In this area, the predominant geological strata consist of karst limestone that is hydraulically conductive, allowing groundwater to flow rapidly down hydraulic

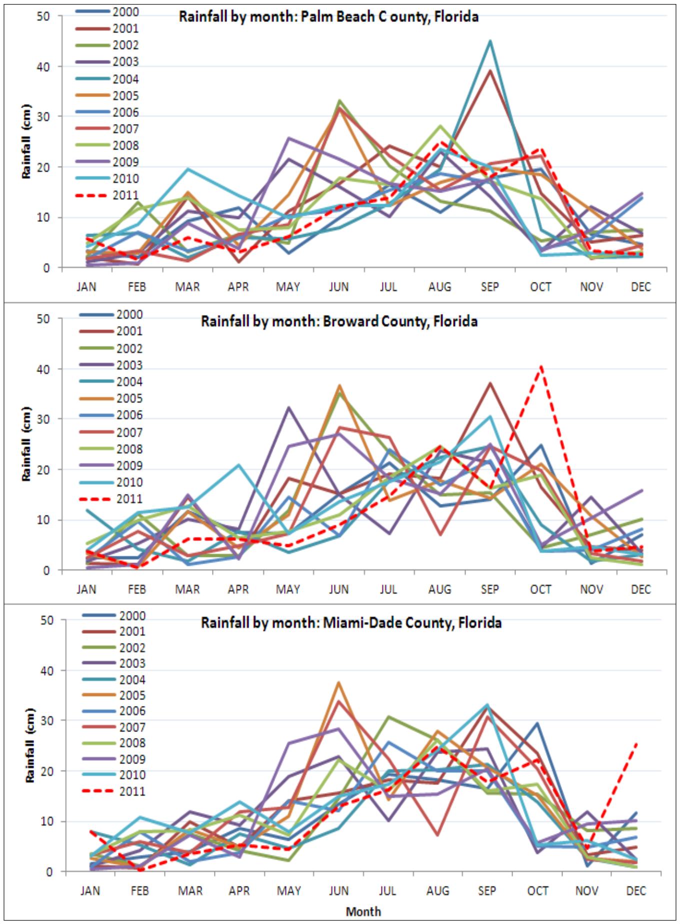

Figure 3. Rainfall by month for Palm Beach (upper), Broward (middle), and Miami-Dade (lower) counties for the years 2000-2011 (SFWMD).[19] Data for 2011 are given by the red dashed line; note the low rainfall from January to September.

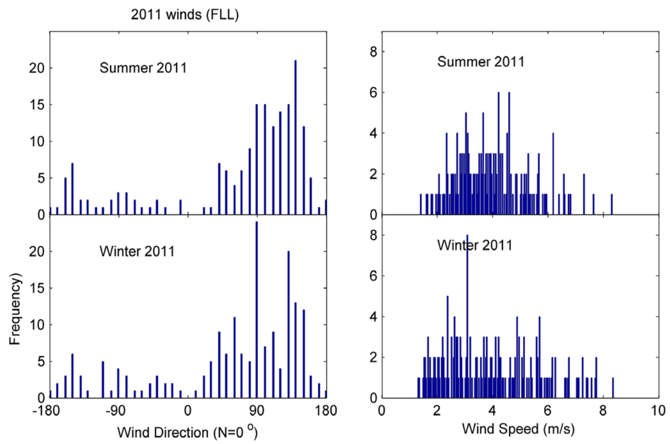

Figure 4. Histograms of wind from the Fort Lauderdale International Airport in summer (April-September 2011) and winter (October-March 2011). Left: wind direction; right: wind speeds. Units are indicated.

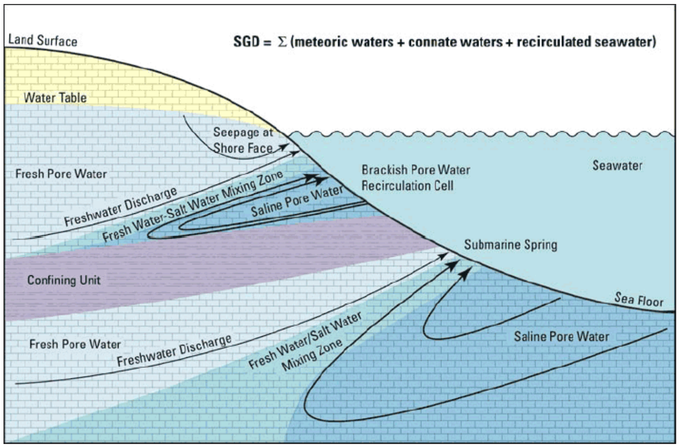

Figure 5. Illustration of groundwater/seawater interactions on an idealized coast. From Swarzenski *et al.* (2004).[20]

gradients. The groundwater being delivered to the coastal ocean (submarine groundwater discharge, SGD)[21] may be significantly enhanced in the concentration of natural materials such as nutrients (e.g., nitrate, nitrite, phosphate, silicate) and may also contain metals, pharmaceuticals, and pesticides. The impact of groundwater discharge on coastal ecosystems has recently become recognized as a major vector of water transport and thus an area of growing interest and concern.[22,23] Nutrient enrichment of coastal groundwater occurs as a consequence of activities such as wastewater disposal from septic systems and agricultural and urban uses of fertilizers.[24,25] Excessive nutrients (especially phosphates and nitrates) in an ecosystem may lead to a condition known as eutrophication, an excessive production of algal biomass that leads to changes in habitats such as seagrass beds and coral reefs, changes in marine biodiversity and distribution of species, and depletion of dissolved oxygen and associated die-offs of marine life.[26] SGD is an efficient transport of nutrients; it has been estimated that nitrates from SGD sources in west-central Florida may exceed that of rivers and atmospheric deposition.[27] Finkl and Krupa[28] estimated that ground fluxes of nutrients to Palm Beach County averaged 15,690 kgN/d and 1134 kgP/d, more than double that of surface water fluxes (6775 kgN/d and 540 kgP/d). SGD has also been implicated in the transport of nitrogen to the reefs of northern Palm Beach County.[13]

Groundwater flow off the coast of Broward County has been recently studied by a variety of techniques.[29] In this region, the saltwater interface is located 2-5 km inland. Reich *et al.* (2009)[29] found that the presence of brackish groundwater with high radon (^{222}Rn) suggested groundwater was being discharged via tidal pumping. Acoustic data revealed features on land indicative of karstic and sandy soils consistent with efficient SGD. It was clear from this study that more work detailing the geological and hydrological features of the area would be required before an adequate understanding of the SGD in this region could be obtained.

1.4 Coastal Ocean Circulation

The Southeast Florida Shelf in this region is quite narrow and shallow, varying in width from 1-3 km and only about 30 m deep at the shelf break (Figure 6).[30] The west side is the Florida shoreline; east of the shelf break is the main body of the north-flowing Florida Current, a major component of the Gulf Stream. These waters are derived from the Caribbean (Cayman Current) and the Loop Current of the southern Gulf of Mexico. In the shelf, the current is generally northerly due to the proximity of the Florida Current.

1.4.1 Nearshore Currents

The nearshore coastal waters tend to be well mixed throughout the year with little evidence of seasonal stratification. Tidal currents are primarily in the alongshore direction, except for areas immediately adjacent to inlets. Tidal influence rapidly decreases away from shore; its overall contribution in Florida's coastal waters is small.[31] Wind forcing from local alongshore winds is also important. Because of the north-south oriented coastline, the current response is in the same direction as the wind (north or south) with a lag of less than 6 hours. Prolonged north wind events in the autumn result in southward mean flows at the coast.[32] Winter and spring cold front passages cause variable alongshore flows without a preferred mean direction. Magnitudes of seasonally-averaged flows tend to be quite weak in the shallow nearshore region, typically on the order of 1 cm/s. This work provides additional information on the nearshore currents off of Broward County, which are described in section 4.1.1.

1.4.2 Current Reversals

Current reversals are common and may extend from the Florida coast across to the north-flowing Florida Current. Two related but distinct mechanisms have been described. The western edge of the Florida Current is not fixed; it is known to "meander."

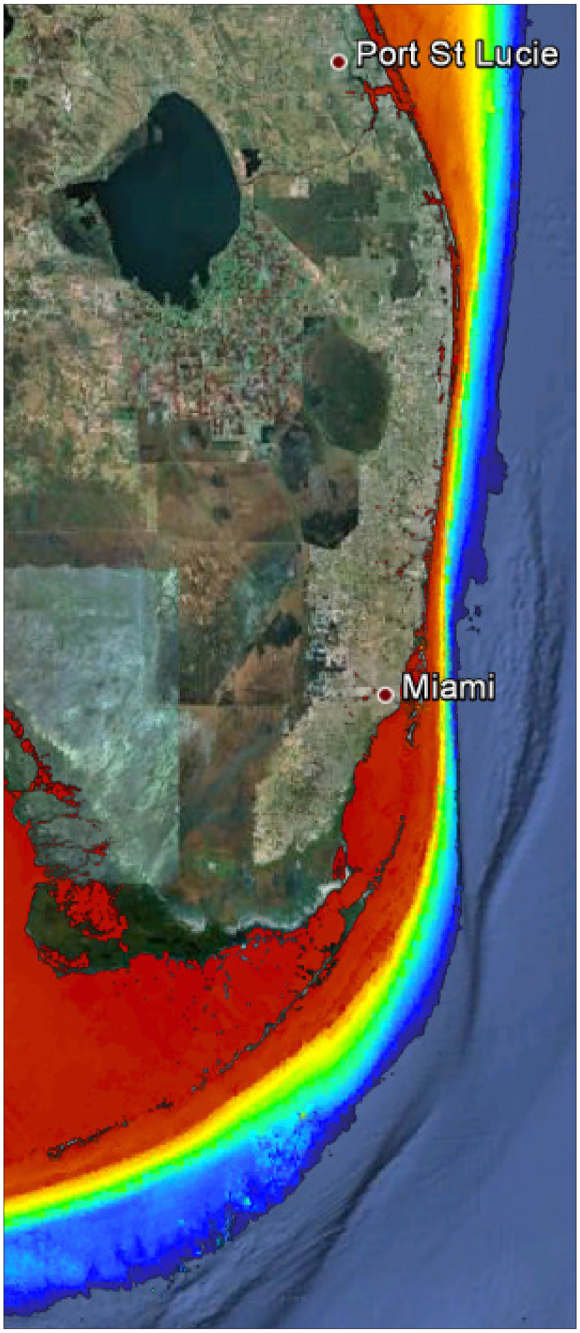

Figure 6. Bathymetry off the southeast Florida coast (Google Earth, NOAA bathymetry). The 30-m edge of the shelf is approximately denoted by the edge of the red contour.

Meanders are a northward-moving displacement wave of the mean profile of the Florida Current, with periods ranging from a few days to two weeks.[33] In some cases, meanders are correlated with onshore winds.[34] Meanders can result in counterclockwise-rotating fronts that cause upwelling of deeper, nutrient-rich waters of the Florida Current into the shelf. Eddy diameters range from 5-30 km and may take 1-2 days to pass. They appear to occur about once per week throughout the year.[35]

While meanders may result in current direction changes and temperature and salinity fluctuations via upwelled water, there is no exchange of water mass across a meander front. A related phenomenon is that of a frontal eddy, which conveys Florida Current water into the coastal region via northward transport of upstream eddies.[36] Eddies can be detected as strong current reversals accompanied by an advection of cooler, saline, low-turbidity waters.[37] Meander and eddy structure are depicted in Figure 7.[38]

1.5 Water Column and Ecosystem Characteristics

The water column can be viewed as the chemical, physical, and biological characteristics of an area of the ocean from surface to seafloor. This may include particulates such as suspended sediments, phytoplankton and zooplankton, chemical characteristics such as salinity or nutrient concentrations, and physical characteristics such as temperature, currents, and density stratifications.

On the southeast Florida coast, the water column is characterized by persistent, widespread oligotrophic (i.e., low nutrient concentrations) conditions[39] which result in low phytoplankton and organic matter concentrations, high water clarity, and high dissolved oxygen concentrations. These conditions are impacted by near-field and far-field processes: near-field processes include point sources of

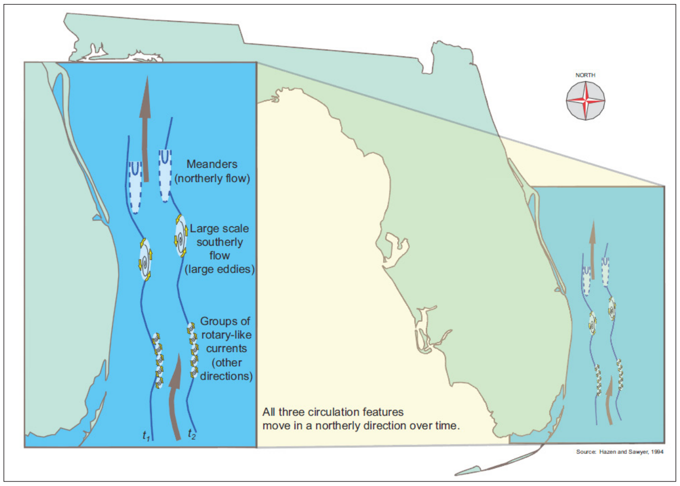

Figure 7. Schematic image of Gulf Stream frontal eddies as envisioned for coastal Florida (image taken from EPA, 2003).[38]

continental materials (inlets and treated-wastewater outfalls) and groundwater seepage; far-field processes include atmospheric deposition, ocean upwelling, and transport of impacted waters (e.g., from the Mississippi River or Southwest Florida Shelf).[40] The near-field impact is serious because of the presence of an ever-expanding population with all its attendant pressures on the coast (Figure 8).

The underlying bottom contains a variety of features: a nearshore ridge complex (3-5 m depth) containing scleractinian and octocorals, macroalgae, and sponges; the inner reef, a non-continuous middle reef at ~15 m depth; an outer reef, a relatively continuous reef at ~16 m depth; a deep hardbottom ridge (~25 m depth), sparsely settled; and lastly, various patch reefs isolated from other formations, each separated by sand or hardbottom.[1] There are distinct differences between the communities on the three reef tracts; for example, the outer reef tract lacks frame-building corals that characterize nearshore coral communities.[41] Significant latitudinal changes have also been described.[42]

If nutrient concentrations increase, it is likely that phytoplankton,[43] benthic macroalgae,[44] and harmful algal bloom frequency will increase.[45] It is desirable that the southeast Florida marine ecosystem remains oligotrophic, thus maintaining the economically valuable and ecologically significant benthic habitats that support the various types of fish, coral reefs, seagrasses, and sponges that thrive there. This is particularly significant at this time of rapid change in coastal ecosystems,[46] as some species are already stressed.[47] Some discussion of the nutrients and related species studied in this work is given in the following sections.

1.5.1 Nutrients

Nutrients are chemical species that are essential requirements for the maintenance of life. Generally, "nutrients" refer to the biologically-available species of nitrogen, phosphorus, and silicon.[48] While these elements are found in many chemical forms, the forms most readily available to living organisms are the simple ions in solution (dissolved), viz., nitrite (NO_2^-), nitrate (NO_3^-), ammonium (NH_4^+), phosphate (PO_4^{-3}), and silicate ($Si(OH)_4^{-4}$). These are commonly denoted in nutrient literature without charge designations and subscripts (e.g., nitrite is NO_2); this nomenclature will be employed in this report. Other forms of these compounds exist, for example, as components of a particle (e.g., particulate nitrogen); these are much less readily used by living organisms. These elements may also be included in organic molecules (e.g., nitrogen in urea, amino acids, proteins, and humic substances), either dissolved or

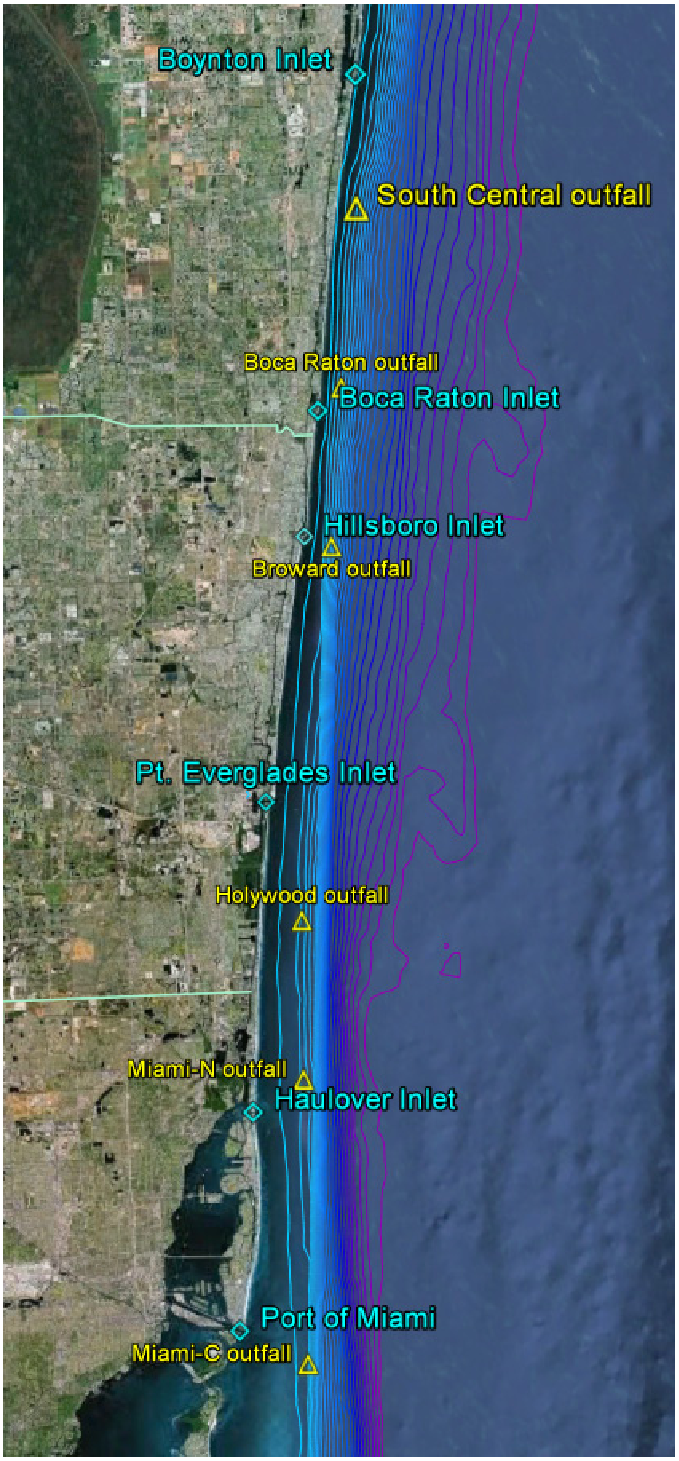

Figure 8. Map showing the location of southeast Florida inlets (blue) and treated-wastewater outfalls (yellow) (Google Earth).

in particles, again not as readily available. A major concern in recent decades for both nitrogen and phosphorus in the coastal environment is the increased use of fertilizers.[49]

Nitrogen—Nitrogen species have a variety of sources and sinks in the coastal environment (Figure 9). Of course, nitrogen (N_2) is the major atmospheric gas (~78%), but is not biologically available in this form or in the other trace atmospheric N species (viz., NO, N_2O, NO_2). It can be converted to ammonium (NH_4^+) by certain plants (e.g., legumes) and by nitrogen-fixing bacteria and macroalgal species.[50,51] Because nitrogen species interconvert rapidly, it is geochemically sound to sum nitrite and nitrate concentrations; this is denoted as N+N. Another grouping, which includes the very relevant species ammonium, is dissolved inorganic nitrogen (DIN), equal to the sum of the concentrations of nitrite+nitrate+ammonium. The quantity of nitrogen found in organic materials is denoted as total organic nitrogen (TON). Total nitrogen (TN) is the sum concentration of all the various nitrogen species, dissolved and particulate.

The measurement units used are commonly milligrams per liter (mg/L) or micromolar (μM). "Molar" means moles per liter. The units can be easily converted, i.e.,

$$C(\text{mg/L}) * (1000/MW) = C(\mu M)$$

where C denotes concentration and MW is the molecular weight of the species. Care must be taken because sometimes the weight refers to the weight of the principal element (e.g., nitrogen, N), but it may also refer to the weight of the molecule (e.g., NO_3, MW = 62 g/mole, versus N, MW = 14 g/mole). This is clarified as, for example, C (mg/L as N). The use of molar units avoids this source of confusion.

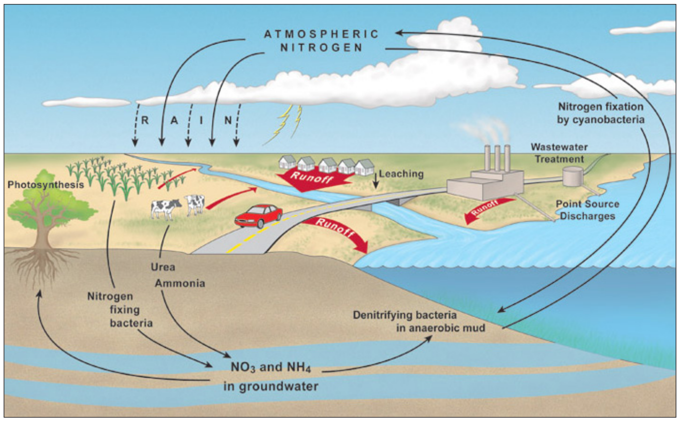

Figure 9. Nitrogen cycle in Florida coastal areas. From Florida Sea Grant (archived at http://www.webcitation.org/5ZhWSaa3M).

Ammonia (NH_3) and ammonium (NH_4^+) exist in equilibrium in aqueous solutions, including the coastal ocean:[52]

$$NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$$

The equilibrium is clearly dependent on the acidity of the water (pH),[53] as shown in Figure 10. Measurements of pH obtained during the cruises found pH values of 7.65-8.25, with a median value of 8.1 (95% of the measurements were between 7.9 and 8.2). Thus, most of the total ammonia is in the form of NH_4^+. We denote total ammonium as NH_4.

Phosphorus—Phosphorus is an essential element for life, playing a critical role in the storage and transfer of energy in the cell. Major natural sources include bird droppings (guano) and the weathering or leaching of rocks. A major anthropogenic source is fertilizer application in agriculture. Phosphorus occurs in the environment in several forms: (1) orthophosphate (PO_4), also called soluble reactive phosphorus, includes the species $H_2PO_4^-$, HPO_4^{-2}, and PO_4^{-3}; (2) particulate organic phosphorus (POP), including living or decaying plants, animals, and bacteria; (3) particulate inorganic phosphorus (PIP), derived from minerals; and (4) dissolved organic phosphorus (DOP), generally derived from organisms but also from anthropogenic sources such as detergents. Total phosphorus (TP) is the sum of all of the above.

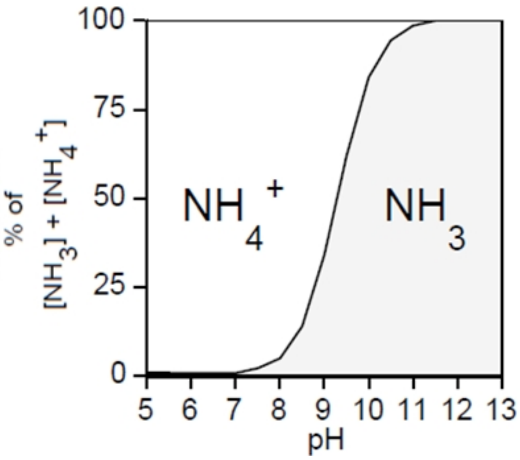

Figure 10. Relationship of ammonium (NH_4^+) and ammonia (NH_3) as a function of pH (from Scranton, 1983).[52]

Nitrogen and phosphorus are often in limited supply for the maintenance of life in an ecosystem. This was noted by Liebig, who proposed his Law of the Minimum.[54] This law states that the nutrient available in the least quantity relative to the needs of the organism is the growth-limiting nutrient. Different plants and animals have different requirements for nutrients; thus, we use fertilizers with different relative amounts of nutrients for different garden requirements. It turns out that the dry weight composition of aquatic plants can be approximated by the following ratio:[55]

$$106CO_2 + 16NH_4^+ + HPO_4^{-2} + 108H_2O \leftrightarrow$$

$$C_{106}H_{263}O_{110}N_{16}P_1 + 107O_2 + 14H^+$$

from which we see the molar ratio of the significant nutrients C:N:P is then 106:16:1 (the "Redfield ratio").[56] Using the relevant molecular weights, this ratio can be written in terms of weight: (106×12):(16×14):(1×31) = 40:7.2:1. Thus, the ideal ratio of nitrogen to phosphorus is ~7.2 to 1 (TN/TP = 7.2 by weight). If, for example, a water mass has insufficient TN, TN/TP will be <7.2, and the water mass primary production will be nitrogen limited; if TN/TP = 20, the primary production will be phosphorus limited.

Silicon—Dissolved silicate does not have a direct anthropogenic source; it is a product of weathering and the erosion of rocks. Silicon is important in ecosystems because it is used as a major structural element in the cells. Diatoms use dissolved reactive silicon (mainly $Si(OH)_4$) to build their cell walls. Silicate may be a limiting nutrient if sufficient nitrogen and phosphorus are available (similarly with iron).[48]

Nutrients in coastal waters tend to increase in concentration with depth, as is observed in the deeper ocean. Figure 11 shows some concentration profiles from the Gulf of Mexico and East Coast Cruise (GOMECC-1)[57] taken near the Florida coast. Nutrient concentrations are low near the surface due to uptake by phytoplankton, whose photosynthesis activities are supported by the presence of sunlight.

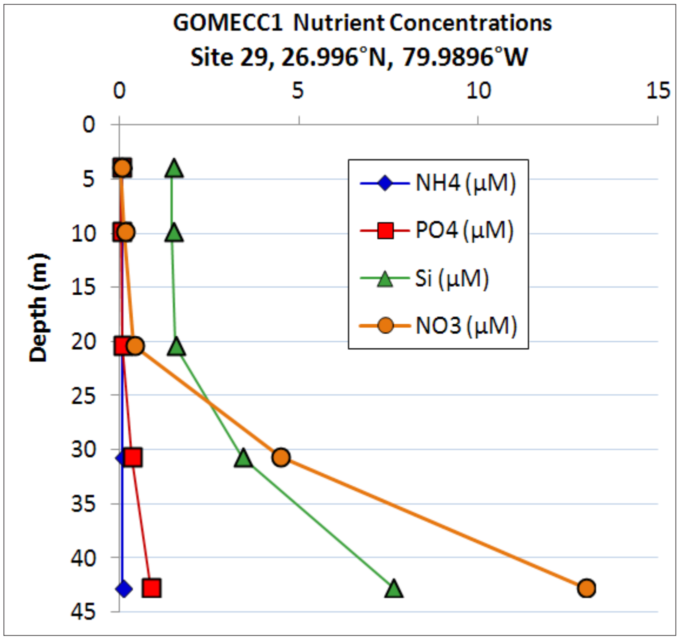

Figure 11. Profiles of coastal seawater nutrients from GOMECC-1.

Chromophoric Dissolved Organic Matter—Light is fundamental to the health of southeast Florida ecosystems: corals, phytoplankton, and seagrasses need light for photosynthesis.[58,59] Light in the sea is affected by absorption, scatter, and refraction.[60] Absorption is chiefly the result of chromophoric dissolved organic matter (CDOM). CDOM in South Florida is primarily derived from the decomposition of organic material such as seagrass, phytoplankton, and mangroves.[61,62] CDOM has the important function of shading the benthic ecosystem from harmful ultraviolet rays,[63] while excessive light attenuation can limit photosynthesis.

1.6 The Food Web

The food web is the array of feeding patterns by which energy and nutrients are transferred from one species to another. At the base of the food web are marine plants (phytoplankton, a.k.a. microalgae) and benthic vegetation (seagrasses and macroalgae), which employ energy from the sun and available nutrients to grow and provide food for grazing species such as zooplankton and filter feeders such as sponges. In southeast Florida, these patterns have changed significantly in recent times, e.g., large animals like manatees, sawfish, sharks, and sea turtles are nearly extinct from the region,[64] in large part due to overfishing.[65] Another type of perturbation of the food web is from algal blooms (discussed in section 1.7). Some components of the food web in the southeast Florida water column have been and are currently being monitored by several groups, in particular, the Southeast Florida Coral Reef Evaluation and Monitoring Project (SECREMP)[66] has maintained long-term monitoring of coral ecosystems at 17 sites off of Martin, Palm Beach, Broward, and Miami-Dade counties. In addition, a number of stakeholder organizations provide field observations of fishing and reef conditions (e.g., REEF, Reef Rescue).[67]

1.7 Harmful Algal Blooms

A bloom occurs when an alga rapidly increases in numbers to the extent that it dominates the local planktonic or benthic community.[68,69] These blooms can cause human, fish, or manatee poisoning, economic losses, and disruptions to the ecosystem.[70] When the bloom organisms die and decompose, they may consume so much oxygen that other species may not be able to survive (anoxia).[71] Of particular concern are harmful algal blooms (HABs) associated with the dinoflagellate, *Karenia brevis*. *K. brevis* contains a brevetoxin compound that can aerate and cause respiratory distress. It can also cause paralytic shellfish poisoning via consumption of contaminated shellfish from an area with a recent *K. brevis* bloom.[43] Large blooms of *K. brevis* may result in hypoxic conditions (low dissolved oxygen) fatal to many species.[27]

Macroalgal blooms are a related problem. The macroalgae in southeast Florida waters include *Dictyota* ssp. and *Halimeda* ssp. Macroalgal blooms are usually associated with non-indigenous species such as *Lyngbya*, *Caulerpa*, and *Codium* ssp. These blooms are harmful not through chemical toxicity but through disturbance of the ecosystem,[39] crowding out other species. Blooms may be related to a variety of causes including increased nutrient availability or removal of macroalgal grazers ("bottom up" versus "top down" control).[44]

1.8 Treated-Wastewater Outfalls in Southeast Florida

There are five operational open ocean sewage outfalls in southeast Florida, located off of Miami-Dade, Broward, and Palm Beach counties (see Figure 8). A listing of outfall characteristics is given in Table 4. All of the outfall sites have terminations at water depths of about 28 m, near the western boundary of the Florida Current, and at or beyond the third reef line (for bathymetry, see Banks *et al.,* 2008).[1] The number of outfalls has changed dramatically over the years; there were ten operating in 1972.[31]

In the last decade, there has been an effort to reduce the amount of ocean discharge, resulting in notable decreases in the amount of water released into the coastal ocean. In April 2009, the South Central (Boynton-Delray) outfall ceased routine discharge through the outfall; the Boca Raton facility also has plans to cease outfall operations.[72] Effluent that had been disposed of via the ocean outfall is being disposed of through deep well (Class 1) injection or by re-use.[38,73] A summary of outfall characteristics from Koopman *et al.* (2006)[74] is given in Table 4; quite similar data can be found in FDEP (2010).[72] The results in Table 4 do not explore a number of subtleties. As mentioned previously, the effluent flow through the outfall varies considerably from day to day and is strongly dependent on the local rainfall. This is evident in Figure 12, where the daily flow rates from the Miami-North and Miami-Central outfalls, and the daily rainfall, are plotted together. Similar data from the other outfalls are shown in Figure 13. Because the increase in flow

Table 4. Treated-wastewater outfalls in southeast Florida.

Name	Latitude (°N)	Longitude (°W)	Length (m)	Depth (m)	Number of Ports	Annual Average Flow (MGD) (2006)	Annual Average Flow (MGD) (2011)[1]
South Central	26°27.715	80°2.525	1.6	27.4	1	12.9	0
Boca Raton	26°21.016	80°3.243	1.6	27.4	1	10.3	7.3
Broward	26°15.083	80°3.724	2.2	32.6	1	37.4	22.0
Hollywood	26°1.147	80°5.156	3.0	28.3	1	40.1	12.4
Miami-North	25°55.384	80°5.370	3.6	32.9	12	81.0	45.8
Miami-Central	25°44.569	80°5.158	5.7	30.5	15	114.8	111.5
Totals						**296.5**	**199.0**

[1] 2011 flow data as reported to the principal author by the utilities.

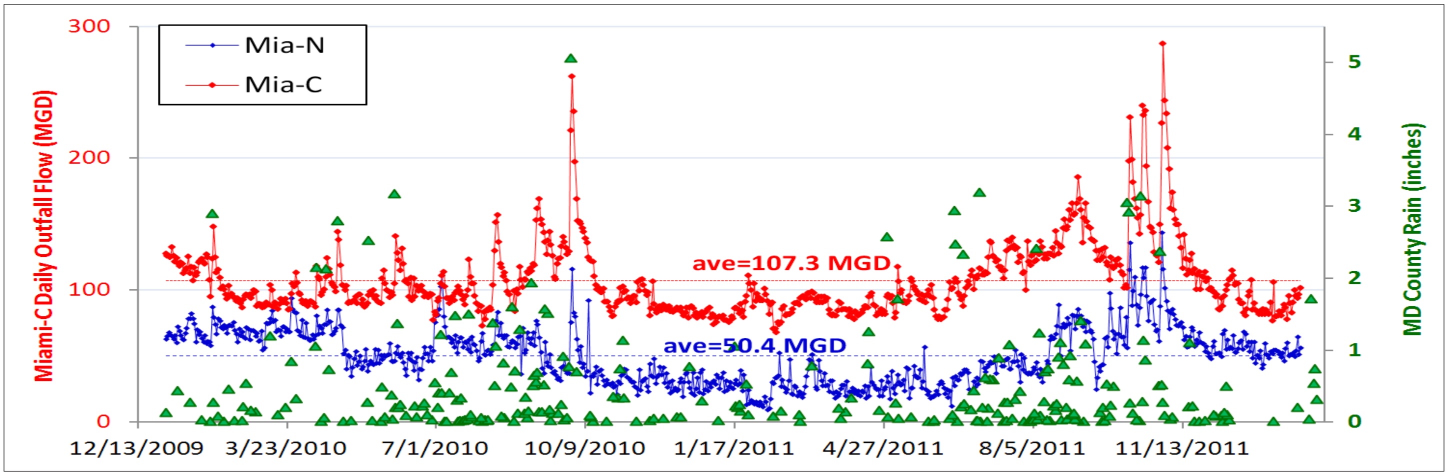

Figure 12. Flow from the Miami-North (blue) and Miami-Central (red) outfalls (R. O'Rourke, personal communication, April 11, 2012). Daily rain data for Miami-Dade County are shown in green (from www.nws.noaa.gov/climate).

due to rain would be low in nutrients, the flux of nutrients to the ocean is not proportionally increased during these high-flow episodes.

What is the nutrient flux from the outfalls, and how does it compare to other sources of nutrients to the coastal ocean? Chemical analyses are performed at each wastewater treatment plant on a regular basis. Data for TN and TP for the time period of this report (November 2010-January 2012) are summarized in Table 5 and shown in Figure 14. It is of note that the various outfalls differ considerably with respect to TN and TP flux, both between the different outfalls and with a single outfall through the year. There were no clear seasonal trends.

How do these values compare with other sources of nutrients to the coastal ocean? As noted in section 1.5, the generally acknowledged list of nutrient sources include point sources (inlets and outfalls), near-field non-point sources (groundwater discharge), and far-field sources (atmospheric deposition, advection from the Gulf of Mexico, and ocean upwelling). Except for the outfalls, where the concentrations and flow are carefully monitored, none of these nutrient sources have been adequately quantified. The far-field sources are episodic and unpredictable. There have been some tentative investigations of the flux through the inlets for Boynton Inlet[75] and for Port Everglades.[76] As noted in section 1.3, Finkl and Krupa (2003)[28] gave some estimates for SGD in Palm Beach County, and these results are summarized in Table 6. Of the known nutrient sources, the Miami wastewater outfalls are clearly dominant. The paucity of data is evident.

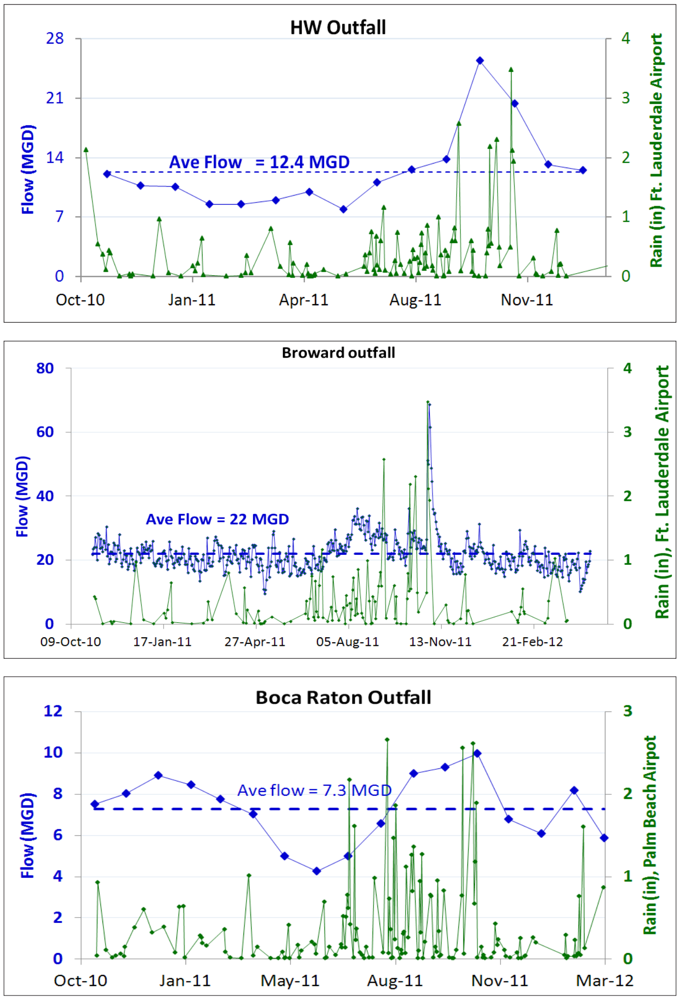

Figure 13. Average outfall flow (blue diamonds) from the Hollywood (upper panel), Broward (middle panel), and Boca Raton (lower panel) outfalls, and rainfall (green lines), versus time. Average flows are denoted by dashed blue lines. Daily rain data are from NOAA (www.sfwmd.gov).

Table 5. Total nitrogen and total phosphorus flux (kg/d) from treated-wastewater outfalls in southeast Florida, 2011.

	Total Nitrogen					Total Phosphorus				
Month	**Boca**	**BR**	**HW**	**MN**	**MC**	**Boca**	**BR**	**HW**	**MN**	**MC**
Jan	380	2,329	522	2,474	9,889	77	65	40	199	509
Feb	374	1,473	402	2,061	9,342	63	109	29	158	580
Mar	308	1,274	454	2,990	10,413	45	112	35	425	780
Apr	263	1,568	392	1,543	8,648	40	154	37	134	513
May	142	1,300	492	1,912	10,097	37	91	45	200	659
Jun	127	1,252	440	1,941	10,591	39	76	30	296	952
Jul	161	1,789	592	2,275	11,211	41	450	34	269	1,046
Aug	281	1,924	506	2,453	12,065	43	188	62	332	1,079
Sep	480	1,410	580	2,993	11,436	56	137	73	343	1,043
Oct	391	1,277	884	4,872	12,332	68	158	96	375	1,066
Nov	518	1,826	741	5,986	10,522	84	224	77	343	694
Dec	356	862	550	5,252	11,975	44	122	45	340	881

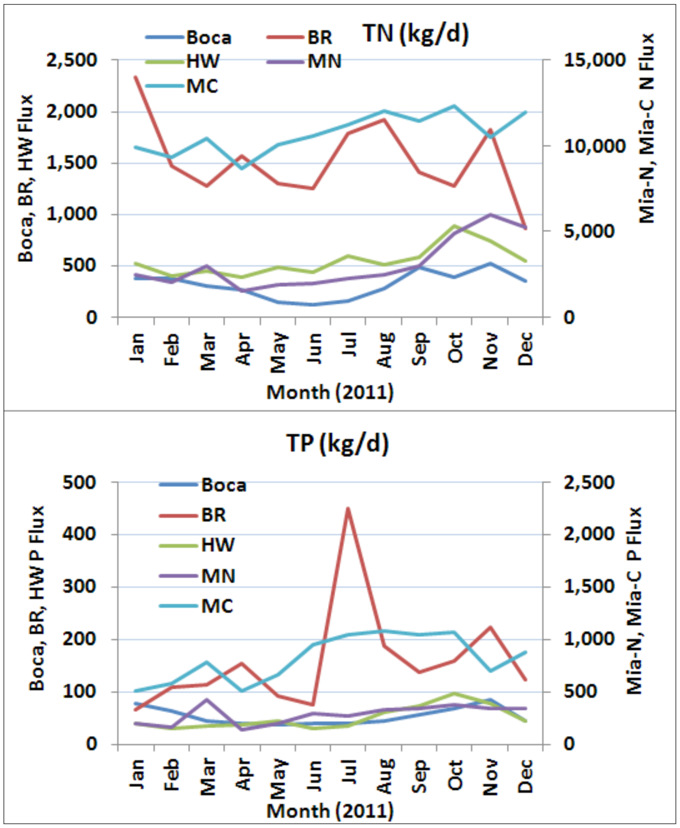

Figure 14. Flux (kg/d) of total nitrogen (upper panel) and total phosphorus (lower panel) at the five south Florida outfalls for 2011. Data provided by the utilities to the principal author.

Table 6. Nutrient fluxes (kg/d) from point and non-point sources in southeast Florida.[1]

Source	TN	TP	N+N	NH$_4$	Ortho-P
Boca Raton outfall (2011)	315	53	76	195	45
Broward outfall (2011)	1,524	157	--	--	--
Hollywood outfall (2011)	546	50	210	248	--
Miami-North outfall (2011)	3,063	285	--	--	--
Miami-Central outfall (2011)	10,710	817	--	--	--
Boynton Inlet (2007)[2]	616	--	378	356	309
Boca Raton Inlet[3]	2,027	104	--	--	--
Hillsboro Inlet	--	--	--	--	--
Port Everglades Inlet[4]	1,830	53	--	--	--
Haulover Inlet	--	--	--	--	--
Upwelling	--	--	--	--	--
Groundwater discharge[5]	15,690	1,134	--	--	--
Atmospheric deposition	--	--	--	--	--
Gulf of Mexico advection	--	--	--	--	--

[1] Inlet values assume two ebb tide pulses per day. Empty cells indicate no data for this category.

[2] From Carsey *et al.* (2012),[75] net (ebb minus flood) fluxes. TN is from one intensive (June 2007); NH$_4$ is the average of June and September 2007 intensives.

[3] Stamates and Carsey, preliminary data obtained October 15, 2012.

[4] Boyer *et al.* (2011)[76] SEFCRI talk, May 5-6 2011. Values shown are the average of two sampling events (www.dep.state.fl.us/coastal/programs/coral/meeting_archive_2011.htm).

[5] Palm Beach County only (Finkl and Krupa, 2003).[28]

2. Field Sample Collection Methods

2.1 Water Sampling

All sampling for the study took place from aboard the NOAA R/V *Hildebrand*. The *Hildebrand* is a 41 ft. former U.S. Coast Guard utility boat outfitted with an A-frame (1000-pound capacity), a winch with 180 ft. of ⅛-inch wire rope, and a Seabird ECO 55 Rosette water sampler with a SBE 19*plus* V2 CTD (conductivity-temperature-density) instrument that holds six 4-L bottles. The ship and CTD unit are shown in Figure 15. The Seabird 19plus V2 CTD/ECO 55 Rosette sampler has a variety of probes that generate measurements during each cast, producing a profile of the water column with depth. These measurements are summarized in Table 7.

Nutrient samples were filtered through 0.45-µm membrane filters using a 50-ml syringe and collected in 50-ml, pre-acid washed polyethylene test tubes. Each filter was washed before use by passing 25 ml of sample water through it. Sample tubes were rinsed three times with sample water, shaking with the cap in place after each rinse. Finally, the tubes were filled with sample water and preserved. Samples were preserved by the addition of 0.1 mL of chloroform. The samples were placed upright in a test tube rack in the designated sample cooler on ice (4°C). Samples were transported to AOML and frozen until analyzed.

TP, TN, and DOC samples were collected in two 1-L, acid-cleaned brown polyethylene bottles, stored on ice, and filtered in the lab at AOML the day after collection.

Water samples for TSS analysis were collected in pre-cleaned, 1-L white polyethylene bottles and stored on ice. The samples were filtered in the lab at AOML the day after collection.

Chlorophyll samples were collected in 500-mL polyethylene brown bottles and filtered on board the ship, placed in labeled vials, and preserved in a 20-L Dewar of liquid nitrogen. Samples were transported to AOML for extraction and analysis.

Samples gathered for pH analysis were collected in pre-cleaned, 500-mL polyethylene brown bottles. Samples were analyzed immediately after collection on board the ship using a Beckman hand-held pH meter.

Figure 15. Top: R/V *Hildebrand* forward view. Middle: R/V *Hildebrand* aft view showing A-frame. Bottom: Seabird Rosette/CTD instrument being deployed from the R/V *Hildebrand* by NOAA scientists LT R. Kotkowski and C. Featherstone.

Table 7. Parameters measured by the SBE 19*plus* V2 CTD during each cast.

Parameter	Probe	Specifications
Depth	CTD profile	
Temperature	CTD profile (SBE 3)	Accuracy ±0.001°C
Conductivity	CTD profile (SBE 4)	Accuracy 0.00003 S/m
pH	CTD profile (SBE 27)	Accuracy ±0.1 pH
Redox potential	CTD profile (SBE 27)	Accuracy ±1.0 mV
Dissolved oxygen	CTD profile (SBE 43)	Accuracy 2% of sat
Chlorophyll-a	CTD profile (Seapoint)	DL 0.02 µg/L
Turbidity	CTD profile (Seapoint)	Accuracy 2% of sat

Water samples for microbiological analysis were collected in pre-cleaned, autoclaved 2-L bottles. Sample bottles were held on ice until their return to AOML, then immediately filtered, preserved, and processed as described in section 3.4.

Additional observations that were recorded included general weather conditions, ambient air temperature, tidal conditions, previous rainfall, approximate channel depth, and current direction and strength.

Analytical procedures for the various discrete sample analyses are given in section 3.

2.2 Flow Measurements

Accurate measurements of ocean currents have been made possible by the use of acoustic Doppler current profiling (ADCP) instrumentation.[77] For this work, AOML installed two ADCP units near shore, while two additional instruments had been previously installed near the Hollywood (HW) and Broward (BR) outfalls by Hazen and Sawyer (H&S); these data have been made available. Details of the instruments are given in Table 8; locations are mapped in Figure 16.

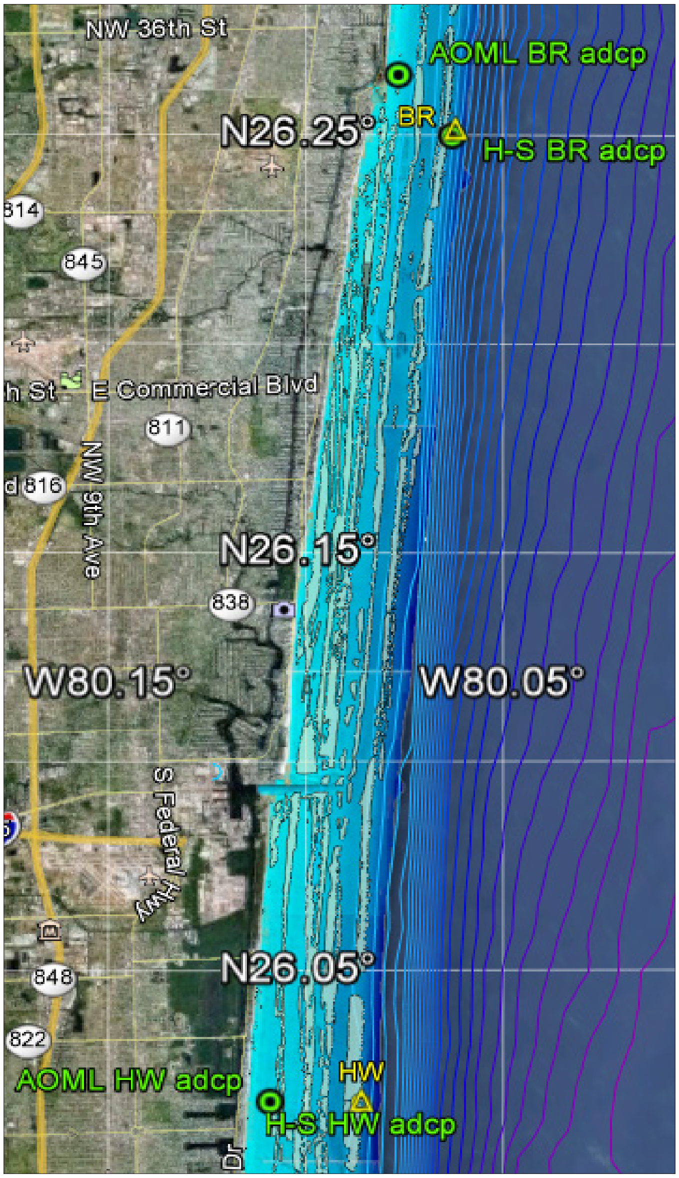

Figure 16. Map showing the location of AOML and Hazen and Sawyer ADCPs (green circles), and the Hollywood (HW) and Broward (BR) outfalls (yellow triangles). Map from Google Earth.

Table 8. Acoustic Doppler current profiling instruments used in this study.

	AOML HW	H&S HW	AOML BR	H&S BR
Depth (m)	7.3	26.2	8.2	32.4
Offshore distance (km)	0.59	2.87	0.37	2.18
Latitude	26°1.149'N	26°1.1075'N	26°15.887'N	26°15.00'N
Longitude	80°6.518'W	80°5.1716'W	80°4.568'W	80°3.752'W
Bin size (m)	0.5	2	0.5	2
Sampling Interval (min)	20	30	20	30
Start / End Dates	14-Oct-10 / 4-Apr-11	17-Aug-10 / 14-Nov-10	14-Oct-10 / 5-Jan-12	17-Aug-10 / 6-Dec-10
Start / End Dates	8-Apr-11 / 2-Apr-13	30-Nov-11 / 1-Jul-12	11-May-12 / 2-Apr-13	21-Apr-11 / 20-Oct-11
Start / End Dates	-----	6-Sep-12 / 7-Feb-13	-----	30-Nov-11 / 14-May-12
Start / End Dates	-----	-----	-----	14-Jun-12 / 18-Dec-12

Note that the times of overlap were limited. At the Hollywood outfall, overlaps from the two instruments occurred from October 14-December 6, 2010; at the Broward outfall, overlap occurred from October 14-December 6, 2010 and from April 21-October 20, 2011 (the H&S Broward ADCP was operational for two separate time intervals). As a component of the current measurements, these instruments also measure and record seawater temperature and sea level height. ADCP data are described in section 4.1.

3. Analytical Methods

3.1 Analytical Parameters

Analytical characteristics are given in Table 9. Nutrient analyses (ammonia, nitrite, nitrite+nitrate, orthophosphate, silicate, total phosphorus, total nitrogen, and dissolved organic carbon) were all performed to accommodate the Florida Department of Health's Non-Potable Water certification criteria (recognized by the National Environmental Laboratory Accreditation Program)[78] at either AOML or at Florida International University's Southeast Environmental Research Center.[79]

Accuracy is the measure of the agreement between an observed value and an accepted reference value or true value.

Laboratory Accuracy—Laboratory accuracy was assessed through the analysis of matrix spikes and/or laboratory control samples and, if required by the analytical methods, was used to determine percent recoveries (%R). The %R utilizing matrix spikes are calculated as follows:

$$\%R = \frac{(CS - CU) \times 100}{CA}$$

where CS is the measured concentration of the spiked sample, CU is the measured concentration of the unspiked sample, and CA is the actual concentration of the spike added.

The %R utilizing laboratory control samples are calculated as follows:

$$\%R = \frac{(CM) \times 100}{CA}$$

where CM is the measured concentration of the control sample and CA is the actual concentration of the control sample.

Dilution blank samples and method blank samples were generated by the laboratory, as required by the analytical method, and used to assess contamination resulting from laboratory practices.

Field Accuracy—Field accuracy was assessed through the use of field blanks. For the accuracy assessment to be relevant, protocols concerning sample collection, handling, preservation, and holding times were maintained. This included the analysis of field blanks, consisting of reagent grade deionized water. Field blanks provide a method to check for procedural contamination at the laboratory that may have caused sample contamination.

Laboratory Precision—Precision is a measure of the variability in the results of replicate measurements due to random error.[80] Random errors are always present

Table 9. Characteristics of analytical measurements.

Measurement	Accuracy	Precision	Completeness	MDL	Stability / Holding Time
Ammonia	10%	10%	95%	0.4 µg N/L	Freezing / 2 weeks
Nitrate + nitrite	10%	10%	95%	0.3 µg N/L	Freezing / 1 month
Nitrite	10%	10%	95%	0.1 µg N/L	Freezing / 1 month
Orthophosphate	10%	10%	95%	0.4 µg P/L	Freezing / 2 months
Silicate	10%	10%	95%	2.3 µg Si/L	Freezing / 2 months
Total phosphorus	10%	10%	95%	0.05 µg P/L	Freezing / 2 months
Dissolved organic carbon	10%	10%	95%	4 µg C/L	28 days
Total nitrogen	10%	10%	95%	10.5 µg N/L	Freezing / 2 months
Chlorophyll	20%	20%	95%	0.05 µg/L	28 days deep frozen
Total suspended solids	20%	20%	95%	0.1 mg/L	7 days

due to normal variability in the many factors affecting the measurement results. The precision of the laboratory analysis is assessed by a comparison of matrix spikes (MS) and matrix spike duplicates (MSD), if required by the analytical method. The relative percent difference (RPD) between the analyte levels measured in the MS sample and the MSD sample is calculated as follows:

$$\mathrm{RPD} = \frac{|\mathrm{CMS} - \mathrm{CMSD}| \times 100}{0.5(\mathrm{CMS} + \mathrm{CMSD})}$$

where RPD is the relative percent difference, CMS is the measured concentration of the matrix spike, and CMSD is the measured concentration of the matrix spike duplicate.

Field Precision—Field precision tests were conducted for grab samples and physical parameter readings. The precision of grab samples was assessed by the comparison of field duplicates. The RPD between the analyte levels measured in the field duplicates is calculated as follows:

$$\mathrm{RPD} = \frac{|\mathrm{CA} - \mathrm{CB}| \times 100}{0.5(\mathrm{CA} + \mathrm{CB})}$$

where CA is the measured concentration of the sample and CB is the measured concentration of the duplicate sample.

Completeness—Completeness is a measure of the amount of valid data obtained from a monitoring program compared to the expected amount of data. Events that may contribute to a reduction in measurement completeness include sample container breakage, inaccessibility to proposed sampling locations, automatic sampler failure, and laboratory equipment failures. The percent completeness (%C) is determined as follows:

$$\%\mathrm{C} = \frac{(\mathrm{MV}) \times 100}{(\mathrm{MP})}$$

where MV is the number of valid measurements and MP is the number of planned measurements.

Laboratory completeness is a measure of the amount of valid measurements obtained from all samples submitted for each sampling activity. The completeness criterion for all measurements is 95%.

Field completeness is determined by the number of measurements collected versus the number of measurements planned for collection. The details concerning the actual number of field samples collected are discussed in section 4.2. The completeness criterion for all measurements and sample collection is 90%, but would be influenced by environmental situations that may alter monitoring schedules.

3.2 Particulates

3.2.1 Total Suspended Solids

Total suspended solids (TSS) were determined gravimetrically for each station following Young *et al.* (1981)[81] and Kelble *et al.* (2005).[59] As large a volume of the sample as possible (max 1-L), with a minimum of 200 mL, was filtered onto pre-weighed, 0.4 µm, 47-mm polycarbonate filters that were dried at 60°C and stored in a pre-labeled Petri dish. The filter and filtrate were reweighed after drying on a Perkin-Elmer AD6 auto balance with an accuracy of 0.2 µg. The following equation was used to calculate TSS:

$$\mathrm{TSS} = (W_{\mathrm{post}} - W_{\mathrm{pre}}) \,/\, V_{\mathrm{filtered}}$$

where W_{pre} is the prefiltration weight, W_{post} is the post-filtration weight, and V_{filtered} is the volume filtered.

3.2.2 Turbidity

A Seapoint turbidity meter was installed as part of the instrumentation on the R/V Hildebrand's CTD unit (see Table 7). The instrument was calibrated by the manufacturer in February 2012.

3.2.3 Chlorophyll-a

Chlorophyll-a concentrations were determined via a standardized filtration-extraction method using a 60:40 mixture of acetone and dimethyl sulfoxide.[59,82] The fluorescence of each sample was measured before and after acidification on a Turner Designs model TD-700 fluorometer to correct for phaeophytin. The fluorescence values were calibrated using known concentrations of chlorophyll-a to yield chlorophyll-a concentrations in $\mathrm{mg/m^3}$.

3.3 Dissolved Nutrients and Organics

Nutrient analysis was conducted using the following methods of the Environmental Protection Agency (EPA).

3.3.1 Ammonium

EPA method 349.0 was used to determine the concentration of ammonia (NH_4) for each station.[83] This method uses automated gas segmented continuous flow colorimetry for the analysis of ammonia. Ammonia in solution reacts with alkaline phenol and NaDTT at 60°C to form indophenol blue in the presence of sodium nitroferricyanide as a catalyst. The absorbance of indophenol blue at 640 nm is linearly proportional to the concentration of ammonia in the sample.

3.3.2 Nitrite + Nitrate

EPA method 353.4 was used to determine the concentration of nitrite and nitrate (N+N) for each station.[84] This method uses automated gas segmented continuous flow colorimetry for the analysis of nitrite and nitrate. Samples were passed through a copper-coated cadmium reduction column. Nitrate is reduced to nitrite in a buffer solution. The nitrite is then determined by diazotizing with sulfanilamide and coupling with N-1-naphthylethylenediamine dihydrochloride to form a color azo dye. The absorbance measured at 540 nm is linearly proportional to the concentration of nitrite + nitrate in the sample. Nitrate concentrations were obtained by subtracting nitrite values, which were separately determined without the cadmium reduction procedure from the nitrite + nitrate values.

3.3.3 Silicate

EPA method 366.0 was used to determine the concentration of silicate (Si) for each station.[85] This method uses automated gas segmented continuous flow colorimetry for the analysis of dissolved silicate concentration. Silicate contained in the sample reacts with molybdate in acidic solution to form β-molybdosilicic acid. The β-molybdosilicic acid is then reduced by ascorbic acid to form molybdenum blue. The absorbance of the molybdenum blue, measured at 660 nm, is linearly proportional to the concentration of silicate in the samples.

3.3.4 Orthophosphate

EPA method 365.5 was used to determine the concentration of orthophosphate (PO_4) for each station.[86,87] This method uses automated colorimetric and continuous flow analysis for the determination of low-level orthophosphate concentrations. Ammonium molybdate and antimony potassium tartrate react in an acidic medium with dilute solutions of phosphate to form an antimony-phosphomolybdate complex. This complex is reduced to an intensely blue-colored complex by ascorbic acid. The absorbance measured at 800 nm is proportional to the phosphate concentration in the sample.

3.3.5 Total Dissolved Phosphorus

Total dissolved phosphorus (TDP) concentration was determined by wet persulfate oxidation of organically-bound phosphorus to phosphate, followed by a gas segmented continuous flow colorimetric analysis of digested samples.[88] In this method, dissolved organic phosphorus (DOP) in the water reacts with persulfate in acidic media at a temperature of 95°C for 16 hours. These digested samples are then analyzed for phosphate concentration by the molybdenum blue colorimetric method using gas segmented continuous flow analysis. Dissolved organic phosphorus (DOP) was calculated as the difference between total dissolved phosphorus and dissolved inorganic phosphorus (DOP = TDP – DIP).

3.3.6 Total Nitrogen

Total nitrogen (TN) was measured using the thermal decomposition/NO detection chemiluminescence method in a Teledyne/Tekmar Apollo 9000 total organic carbon analyzer with total nitrogen module. When a sample is introduced into the combustion tube (furnace temperature 720°C), the TN in the sample decomposes to nitrogen monoxide. However, nitrogen gas does not become nitrogen monoxide under these circumstances. The carrier gas (pure oxygen), which contains the nitrogen monoxide, is cooled and dehumidified by an electronic dehumidifier. The gas then enters a chemiluminescence gas analyzer where the nitrogen monoxide is detected. The detection signal from the chemiluminescence gas analyzer generates a peak, and the TN concentration in the sample is measured against a five-point standard curve.

3.3.7 Total Organic Carbon

Total organic carbon (TOC) samples were placed in a pre-cleaned, 40-ml glass vial and then placed in the auto-sampler of the Teledyne/Tekmar Apollo 9000 total organic carbon analyzer. This method determines the organic content of a sample after the removal of inorganic carbon. Samples are acidified to a pH of 2-3, and carbon dioxide derived from inorganic carbon in the sample is removed by purging. The remaining organic carbon in the sample is introduced into a combustion tube filled with a platinum oxidation catalyst and heated to 680°C. The sample is oxidized in the combustion tube, and the contents converted to carbon dioxide. Carrier gas, which flows at a rate of 150 mL/min to the combustion tube, carries the sample combustion products from the combustion tube to an electronic dehumidifier where the gas is cooled and dehydrated. The gas then carries the sample combustion products through a halogen scrubber to remove chlorine and other halogens. Finally, the carrier gas delivers the sample to the detector where it is measured against a five-point standard curve to determine the total organic carbon content.

3.3.8 Particulate Organic Matter

Particulate organic matter (POM) filters were freeze dried prior to analysis. The area of the filter containing filtrate was removed, split in half, and placed in 5 × 3.5 mm tin capsules for dual analysis of $\delta^{15}N$ and $\delta^{13}C$ on a Europa Scientific ANCA GSL prep device interfaced with a 20/20 continuous flow stable isotope ratio mass spectrometer.

3.3.9 pH

Samples gathered for pH analysis were analyzed immediately after collection aboard the R/V *Hildebrand* using a hand-held Beckman 200 series pH meter. The pH meter was calibrated before each sampling cruise using 4.01, 7.00, and 10.01 Oakton pH standard solutions according to the the National Bureau of Standards pH scale.

3.4 Microbiology

3.4.1 Viable Bacterial Indicators

For the monthly Hollywood and Broward sampling cruises, viable enterococci fecal indicator bacteria (FIB) were enumerated by the EPA-approved Chromogenic Substrate Most Probable Number (CS MPN) method[89] using the commercial assay kit for this test known as the IDEXX EnteroLert® test (IDEXX Laboratories, Inc.). Water samples were collected during the monthly cruises as described above, and bacteriological samples were analyzed aboard ship during the actual sampling cruise by the IDEXX EnteroLert® test to measure the abundance of viable enterococci fecal indicator bacteria within 6 hours of their collection. Sample processing and analysis for viable enterococci by this CS MPN method using IDEXX EnteroLert® followed the procedures outlined in the *Standard Methods for the Examination of Water and Wastewater*.[90] All samples were diluted to a 1:10 ratio with sterilized reagent water to reduce the ionic strength of the marine water matrix (as recommended by the manufacturer to avoid potential false-positive Vibrio effects). Field duplicates and sample processing control replicates were analyzed for approximately 10% of the samples.

For the Hollywood and Broward dye tracer cruises (HYTEX, BOTEX1, and BOTEX2 cruises on July 9, 2012, November 7, 2012, and November 28, 2012, respectively), viable enterococci were measured in the laboratory using EPA method 1600 (membrane filtration mEI agar plate count method, MF plate count),[91] instead of aboard ship using the CS MPN method. The format of the dye tracer cruises permitted passing water samples to a shore team which could transport the samples to the laboratory within the 6-hour holding time of EPA guidelines for viable enterococci assessment; thus, shipboard processing of bacteriological samples during the dye tracer cruises was unnecessary.

3.4.2 Protozoan Cysts

A large volume of water samples (100+ liters) was collected and filtered aboard ship by hi-speed peristaltic pump and sterile tubing with EnviroCheck HV filter capsules (Pall Corporation). Filter capsules were stored on ice until their return to the laboratory. Protozoan cysts were eluted from the filter cartridges and analyzed within 72 hours of collection. Elution from the filter cartridges and enumeration of protozoan *Cryptosporidium* oocysts and *Giardia* cysts in the eluate were conducted by immunomagnetic separation and immunofluorescent microscopy according to EPA standard method 1623.[92]

3.4.3 Environmental DNA Extracts from Total Community Bacterial Populations

Total community bacterial populations were harvested from water samples by the filtration of replicate 1-L water samples onto cellulose nitrate membrane filters (0.45 µm pore size), followed by extraction of total genomic DNA from the filters using a FastPrep™ DNA Spin Kit (MP Biomedicals/ Qbiogene) according to the manufacturer's instructions. Cell lysates were spiked prior to DNA purification steps with an extraction Sample Processing Control (SPC), consisting of 0.2 ng/mL of commercially purified salmon sperm DNA (Life Technologies, Invitrogen, Inc.). The purified environmental community DNA from the water samples was stored frozen for later analysis of specific bacterial fecal indicators and pathogens by real-time quantitative polymerase chain reaction (qPCR) as discussed in section 3.4.5 and for bacterial community metagenomic sequence profiling as discussed in section 3.4.6. Calibration control samples were extracted using salmon sperm DNA at a final concentration of 0.2 ng/mL and using pre-enumerated enterococci 550 Bioballs® (bioMerieux, Inc.), as described in EPA method 1611 for qPCR of enterococci.[93]

3.4.4 Molecular Microbial Source Tracking by Quantitative PCR

Real-time qPCR was used to enumerate bacterial fecal indicator populations of total enterococci, total Bacteroidales, human-host-specific Bacteroidales (to assess impacts from human sewage/septic tanks), and dog-host-specific Bacteroidales (to assess impacts from urban stormwater and terrestrial runoff). All versions of qPCR assays used in this study were based on Taqman™-type 5'-exonuclease fluorogenic hydrolysis probe chemistry.[94] Total enterococci were enumerated using the EPA "Entero1A" qPCR assay,[95] as per U.S. EPA method 1611.[93] Enumeration was based on both standard curves using known concentrations of purified *Enterococcus faecalis* DNA, and by the EPA delta-delta CT (ddCT) method, using salmon sperm DNA as the sample processing control reference spike (0.2 ng/mL), and *Enterococcus faecalis* single shot 550 BioBalls® (bioMerieux, Inc.) as calibrator cell controls. Total Bacteroidales were enumerated with the EPA GenBac3 qPCR assay,[96] again using salmon sperm DNA as the SPC spike and using Bacteroides thetaomicron singe shot 10K BioBalls® (custom ordered by U.S. EPA from bioMerieux, Inc.) as calibrator cell controls, as per EPA publication EPA-822-R-10-003.[97]

Two different human-host-source Bacteriodales qPCR assays were used to independently enumerate human-source fecal markers: (1) the BacHum-UCD qPCR assay;[98] and (2) the U.S. EPA HF183-Taqman assay.[99] Dog-host-specific Bacteroidales were enumerated using the AOML DogBact qPCR assay.[100] Salmon DNA Sample Processing Controls were enumerated with the U.S. EPA Sketa22 qPCR assay.[96] All reactions were carried out with the Qiagen QuantiTect Probe PCR Kit mastermix (Qiagen, Inc.) using an ABI StepOnePlus real-time PCR System (Applied Biosystems).

Enumeration for each assay was determined by replicate 6-point standard curves of 1:10 dilutions of positive control DNA for measured Ct values versus known target concentrations of the positive control DNA in units of genome equivalent units (GEU) ranging from 1,000,000 GEU to 1 GEU. Positive control DNA for the Entero1A assay was from *Enterococcus faecalis* (strain ATCC 29212); the general Bacteroidales GenBac3 assay was from *Bacteroides thetaiotaomicron* (strain ATCC 29741); the human-host-specific BacHum-UCD and EPA HF183 assays were from *Bacteroides dorei* (strain DSM 17855); the salmon Sketa22 assay was from UltraPure™ salmon sperm DNA solution (Catalog No. 15632-011, Life Technologies, Invitrogen, Inc.); and the canine AOML DogBact assay was from the purified DogBact plasmid control (a cloned positive control sequence from dog), constructed and prepared as described in Sinigalliano *et al.* (2010).[100] Note that since this dog assay used a cloned plasmid control for standard curves rather than a genomic DNA control, the units associated with this assay were in target sequence copies rather than GEU.

Positive and negative controls, extraction/inhibition controls, calibrators, standard curves, and reaction conditions are as previously described in the respective references. The qPCR reactions were run in triplicate and, as an independent inhibition assessment control, the third well of each triplicate set for enterococci and calibrators was run with a spike of the 1000 cell standard (same as used for the 1000 cell point in the standard curve). Any such third well spike of an environmental sample whose amplification was delayed by more than a 1.5 Ct value from the 1000 cell standard was deemed "inhibited" and subsequently diluted and re-analyzed until a clean uninhibited signal could be attained. Sample extraction and amplification efficiency was measured by the recovery of the salmon DNA with SPC, and the final results were normalized for SPC recovery efficiency.

3.4.5 Primer and Probe Sequences/Thermocycling Conditions for Quantitative PCR Procedures

General enterococci 23S rRNA gene—EPA Entero1A (i.e., EPA Method 1611):[93]

- Forward primer: 5’-AGAAATTCCAAACGAACTTG-3’
- Reverse primer: 5’-CAGTGCTCTACCTCCATCATT-3’
- Probe: 5’-6FAM-TGGTTCTCTCCGAAATAGCTTTAGGGCTA-BHQ-3’
- Rxn conditions: final volume of 25 µL in 1X QuantiTect Probe Mastermix, with 900 nM forward primer, 300 nM reverse primer, 100 nM probe, and 2 µL sample target DNA.
- Cycling conditions: Denature 50°C for 2 min and 95°C for 10 min; followed by 40 cycles of: 95°C for 15 sec; 60°C for 1 min; Plate read.

General Bacteroidales 16S rRNA gene—EPA GenBac3 assay:[96]

- Forward primer: 5’- GGGGTTCTGAGAGGAAGGT -3’
- Reverse primer: 5’- CCGTCATCCTTCACGCTACT -3’
- Probe: 5’-6FAM- CAATATTCCTCACTGCTGCCTCCCGTA -BHQ-3’
- Rxn conditions: final volume of 25 µL in 1X QuantiTect Probe Mastermix, with 3.5 µL of primer/probe mix (consisting of 10 µL of each primer from 500 µM stock and 4 µL probe from 100 µM stock in 576 µL of H_2O), 2.5 µL of BSA (from 2 mg/mL stock), and 2 µL sample target DNA.
- Cycling conditions: Denature 50°C for 2 min and 95°C for 10 min; followed by 40 cycles of: 95°C for 15 sec; 60°C for 1 min; Plate read.

Salmon DNA SPC—EPA Sketa 22 assay (i.e., EPA Method 1611):[93]

- Forward primer: 5’- GGTTTCCGCAGCTGGG -3’
- Reverse primer: 5’- CCGAGCCGTCCTGGTC -3’
- Probe: 5’-6FAM- AGTCGCAGGCGGCCACCGT -BHQ-3’
- Rxn conditions: final volume of 25 µL in 1X QuantiTect Probe Mastermix, with 3.5 µL of primer/probe mix (consisting of 10 µL of each primer from 500 µM stock and 4 µL probe from 100 µM stock in 576 µL of H_2O), 2.5 µL of BSA (from 2 mg/mL stock), and 2 µL sample target DNA.
- Cycling conditions: Denature 50°C for 2 min and 95°C for 10 min; followed by 40 cycles of: 95°C for 15 sec; 60°C for 1 min; Plate read.

Human-source Bacteroidales V2 region of 16S rRNA—EPA HF183 Taqman assay:[99]

- Forward primer: 5’- ATCATGAGTTCACATGTCCG -3’
- Reverse primer: 5’- CGTAGGAGTTTGGACCGTGT -3’
- Probe: 5’-6FAM - CTGAGAGGAAGGTCCCCCACATTGGA -BHQ-3’
- Rxn conditions: final volume of 25 µL in 1X QuantiTect Probe Mastermix, with 3.5 µL of primer/probe mix (consisting of 10 µL of each primer from 500 µM stock and 4 µL probe from 100 µM stock in 576 µL of H_2O), 2.5 µL of BSA (from 2 mg/mL stock), and 2 µL sample target DNA.
- Cycling conditions: Denature 50°C for 2 min and 95°C for 10 min; followed by 40 cycles of: 95°C for 15 sec; 60°C for 1 min; Plate read.

Human-source Bacteroidales 16S rRNA gene marker—Kildare BacHum-UCD assay: [98]

- Forward primer: 5’- TGAGTTCACATGTCCGCATGA -3’
- Reverse primer: 5’- CGTTACCCCGCCTACTATCTAATG -3’
- Probe: 5’-6FAM- TCCGGTAGACGATGGGGATGCGTT -BHQ-3’
- Rxn conditions: final volume of 25 µL in 1X QuantiTect Probe Mastermix, with 400 nM forward primer, 400 nM reverse primer, 80 nM probe, 0.05 mg/mL BSA, and 2 µL sample target DNA.
- Cycling conditions: Denature 50°C for 2 min and 95°C for 10 min; followed by 40 cycles of: 95°C for 15 sec; 60°C for 1 min; Plate read.

Canine-source Bacteroidales 16S rRNA gene marker—AOML DogBact assay:[100]

- Forward primer: 5’- CGCTTGTATGTACCGGTACG -3’
- Reverse primer: 5’- CAATCGGAGTTCTTCGTG -3’
- Probe: 5’-6FAM- ATTCGTGGTGTAGC GGTGAAATGCTTAG -BHQ-3’
- Rxn conditions: final volume of 25 µL in 1X QuantiTect Probe Mastermix, with 900 nM forward primer, 900 nM reverse primer, 300 nM probe, and 2 µL sample target DNA.
- Cycling conditions: Denature 50°C for 2 min and 95°C for 10 min; followed by 40 cycles of: 95°C for 15 sec; 60°C for 30 sec; Plate read.

3.4.6 Bacterial Community Next-Generation-Sequencing and Community Metagenomic Analysis

Bacterial community DNA extracts (prepared from filters as described in section 3.4.3) were chosen from selected outfall, coastal inlet, and reef tract sites and subjected to next-generation-sequencing by the 454 pyrosequencing technique and community metagenomic analysis to compare the relative similarities and differences in bacterial community structure and diversity from these habitats in relation to site type and season. AOML researchers collected water samples and prepared the DNA extracts during the regular monthly Hollywood and Broward cruises as described previously. Pyrosequencing and primary bacterial community genomic analysis were conducted as a value-added benefit to this study by our collaborators with the laboratory of Dr. Jose Lopez at Nova Southeastern University's Oceanographic Center in Dania Beach, Florida, as part of their own ongoing metagenomic research related to microbial diversity in corals and sponges in the southeast Florida coastal environment and with the Earth Microbiome Project. The AOML-Florida Area Coastal Environmental (FACE) program study sites selected for this community genomic pyrosequencing investigation were: (1) the outfall sites BR10 (Broward) and HW4 (Hollywood); (2) the coastal inlet sites BR14 (Hillsboro Inlet) and HW14 (Port Everglades Inlet); and (3) the reef tract sites HW9 (roughly 5 km north or typically downcurrent from the Hollywood outfall HW4 site) and reef tract site BR7 (roughly 5 km south or typically upcurrent from the Broward outfall BR10 site and more than 20 km north or typically downcurrent of the Hollywood outfall HW4 site).

The V4 hypervariable region of the 16S rRNA was amplified using primers 515f/806r[101] with 10 base pair multiplex identifiers and sent for 454 pyrosequencing. The resulting sequences were analyzed using Quantitative Insights into Microbial Ecology (QIIME).[102] This experiment used high throughput next-generation-sequencing of 28 16S rRNA amplicon libraries to understand the microbial community dynamics at these different habitats during different seasons. The 454 pyrosequencing of these samples generated 91,081 individual sequences, and QIIME was used to initially analyze the sequence data. The mean number of sequences was about 3252/library with 6051 operational taxonomic units (OTU) detected. Rarefaction plots of OTU sampling depth were created using the Cloud Virtual Resource (CloVR).[103] Taxa generated from QIIME were found using the Greengenes and Ribosomal Database Project databases. Resolution of community structure from this initial analysis by QIIME was primarily at the level of Order/Family and at the level of Genus. Further analysis of this bacterial community genomic data is still ongoing with other metagenomic analysis methods such as MG-RAST to generate additional resolution of community structure to the Genus/Species level.

Additional analysis of similarities and differences in bacterial community composition, structure, and abundance were elucidated by the use of principal coordinates of analysis (PCoA) with UniFrac, and further visualized by Bray-Curtis dissimilarity analysis. The sequences generated were also screened for known pathogen target sequences using the Basic Local Alignment Search Tool (BLAST). Although limited in geographic and temporal scope, the data collected from this bacterial community genomic pilot study of the Florida coastal area can be expanded by continued analysis of the generated sequences with different metagenomic analysis tools and algorithms and incorporated as a part of the Earth Microbiome Project, which is aimed at characterizing prokaryotic communities in various environments and establishing a gene atlas of each environment.

3.4.7 Sucralose as a Chemical-Based Human Fecal Excretion Marker in Coastal Waters

As another value-added analysis for this study, AOML collaborators at the Tallahassee Environmental Laboratory of the Florida Department of Environmental Protection (FDEP) provided measurements on the concentration of Sucralose artificial sweetener (known in the U.S. primarily as the commercial product Splenda®) in coastal water samples collected during the two Broward dye tracer experiment cruises of November 7 and 28, 2012. The FDEP provided AOML with prepared sample bottles specifically for the collection of water samples for Sucralose analysis, and replicate 500 mL water samples for Sucralose analysis were collected by AOML personnel during the cruises according to specific FDEP instructions from selected dye tracer sample sites as described in section 6.2. Sucralose water sample bottles were shipped overnight in cool-gel ice packs to the FDEP laboratory in Tallahassee, Florida, where Sucralose concentrations in water matrices were measured according to FDEP SOP LC-001-2, based upon EPA method 8321B.[104]

4. Data Summary and Discussion

4.1 Acoustic Doppler Current Profiler Results

4.1.1 Current Measurements

The ADCP technique arbitrarily divides the water column above the bottom-mounted instrument into equally-spaced vertical "bins." Within each bin, three-dimensional movement is calculated by interpreting acoustic signals backscattered by the water in that bin. The different instruments used in this study used different bins of data that were sampled at different time intervals as described in Table 8. The end result, however, is a useful elucidation of the currents at that location. The data are conveniently viewed as stick diagrams, wherein the length and direction of each stick indicates the velocity and direction of the water at that time and depth.

We begin with the Hazen and Sawyer offshore instruments located near the Hollywood and Broward wastewater-treated outfalls. Figure 17 presents the Hollywood and Broward data sets. Although the current was commonly considered to be northward (because of the proximity of the north-flowing Florida current), there was a substantial amount of time with the current in the opposite direction and very little time spent in transition. In addition, the current was not north/south; there was a distinct northwest/southeast direction. The current directions were invariably consistent from surface to depth, with the highest velocities at the surface and decreasing velocity with increasing depth (because of the drag caused by contact with the seafloor). There was no evidence of a reversal of direction with depth. The range of velocities rarely exceeded 80 cm/s. Roughly, the current flowed north ~75% of the time at Broward and ~66% of the time at Hollywood (H&S data, Table 10). Nearer shore, the flow was northerly about 60% of the time at Broward but not quite 50% of the time at Hollywood. The dominance of northerly flow was less at Hollywood compared to Broward, and less inshore than offshore. These characteristics are summarized in Table 10; a more detailed discussion of currents is provided in section 1.4.

Current measurements from the nearshore instruments operated by AOML near the Broward and Hollywood outfalls are shown in Figures 18 and 19. Generally, data from the Broward ADCP were similar to those from the Hollywood instrument. Current speeds were higher at Broward than at Hollywood; on several occasions the speed exceeded 120 cm/s (2.3 kts). Here, the nominal north/south current direction appeared to be veering to the north-northeast/south-southwest (in contrast to the Hollywood data), especially during the latter part of 2011. In this more northerly location, the current was more predominantly north/south, with fewer occasions of southerly current. Additional information derived from the Hollywood and Broward ADCPs can be found in Appendix 1.

4.1.2 Temperature Measurements

An extensive temperature data set was gathered by the four ADCP instruments described in Table 8. These data indicate important differences between inshore (AOML instruments) and offshore (H&S) measurements, as well as latitudinal differences (Broward to the north, Hollywood to the south), for ocean current characteristics and temperature. As already noted, each instrument measures pressure (primarily due to sea-level height) and temperature at the depth of the instrument (near the ocean floor). These data are depicted in Figure 20, which shows the temperature record for all four ADCPs across the entire time interval

Table 10. Northern component of water column average velocities (cm/s).

	BR–AOML	BR–H&S	HW–AOML	HW–H&S
All flow				
Mean	2.01	18.68	-1.3	7.8
Median	4.73	20.75	-0.82	8.69
Standard dev.	15.8	28	11.77	19.09
Minimum	-60.49	-95.93	-47.81	-72.24
Maximum	49.17	109.26	31.14	76.64
N	1442.2	1442.2	1769.4	1769.4
North flow only				
Mean	12.55	30.69	8.69	18.04
Median	12.1	29.15	7.93	15.94
Standard dev.	7.64	18.79	5.76	12.43
Minimum	0.01	0.01	0.01	0
Maximum	49.17	109.26	31.14	76.64
N	869.3	1093.1	841.3	1196.7
South flow only				
Mean	-14	-18.92	-10.35	-13.58
Median	-11.9	-14.33	-8.73	-10.55
Standard dev.	10.72	16.35	7.86	11.26
Minimum	-60.49	-95.93	-47.81	-72.24
Maximum	-0.01	-0.01	-0.01	-0.01
N	572.9	349.1	928.1	572.7
Percent S flow[1]	39.7	24.2	52.5	32.4
Percent S flow[2]	40.2	27.1	51.7	33.7

[1] Percent using data when both AOML and H&S data were available.

[2] Percent using entire data set from each unit.

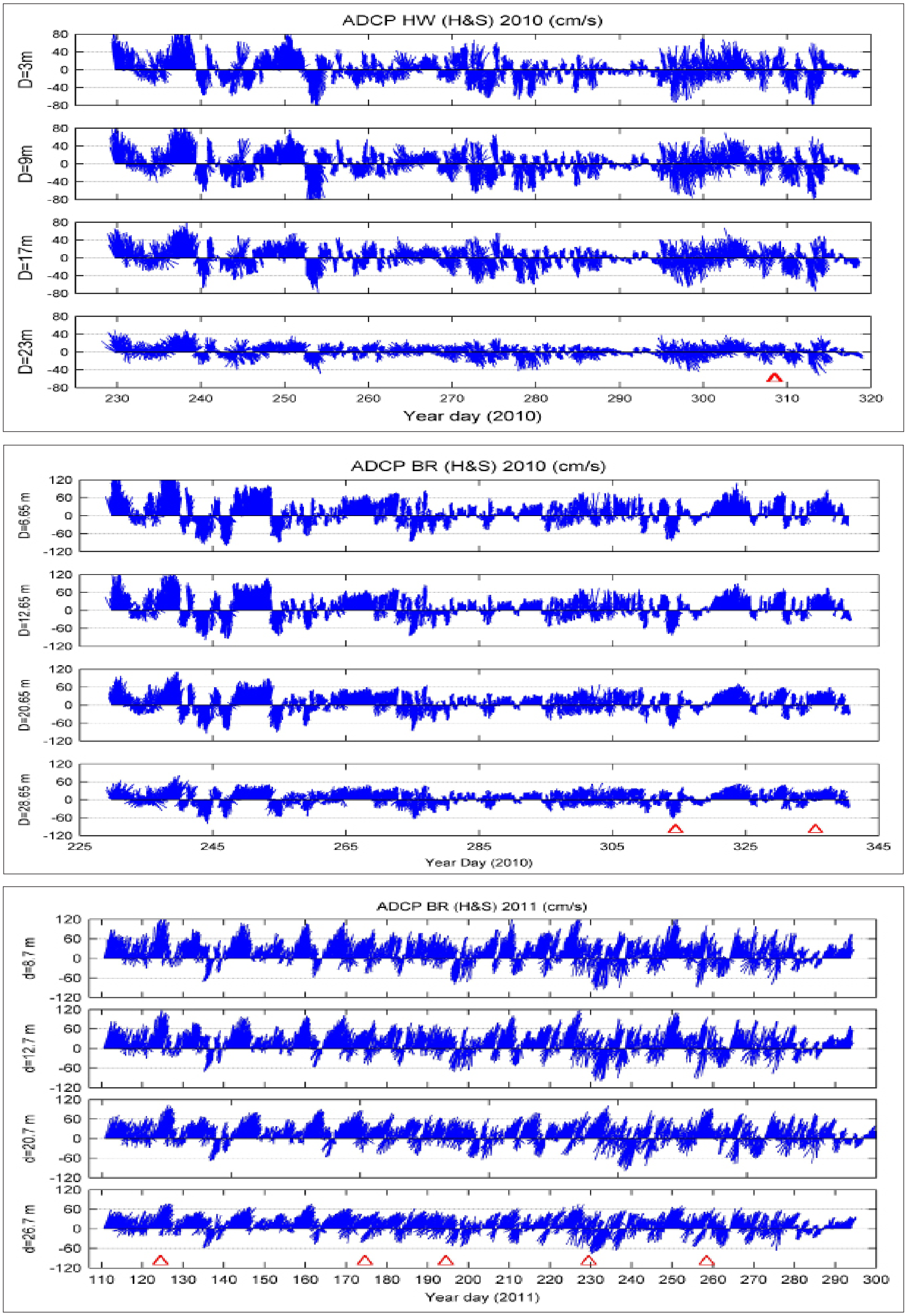

Figure 17. ***Top***: **Stick plots of currents at four depths measured by the Hollywood H&S ADCP during 2010 (D=3 m is the surface measurement, etc.). Length and direction of each stick denotes the speed (according to the y-axis units) and direction (north is up). Red triangle in the lowest panel denotes the time of the Hollywood FACE sampling cruise (CTD drop times) during this time interval.** ***Middle***: **Stick plots of currents at four depths measured by the Broward H&S ADCP during 2010.** ***Bottom***: **Stick plots of currents at four depths measured by the Broward H&S ADCP during 2011.**

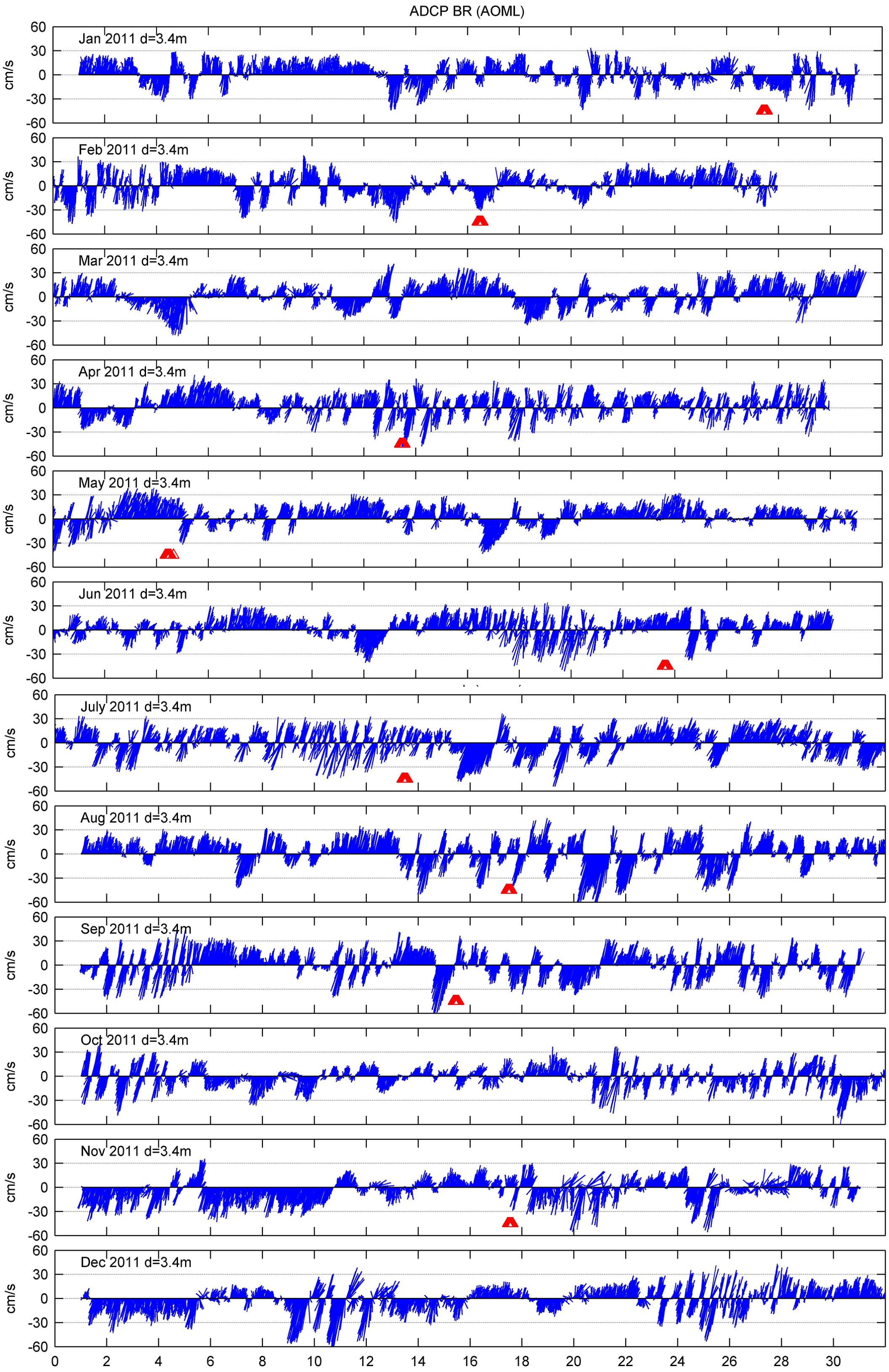

Figure 18. Stick plot of currents at a depth of 3.4 m measured by the AOML Broward ADCP during 2011. Format is similar to Figure 17.

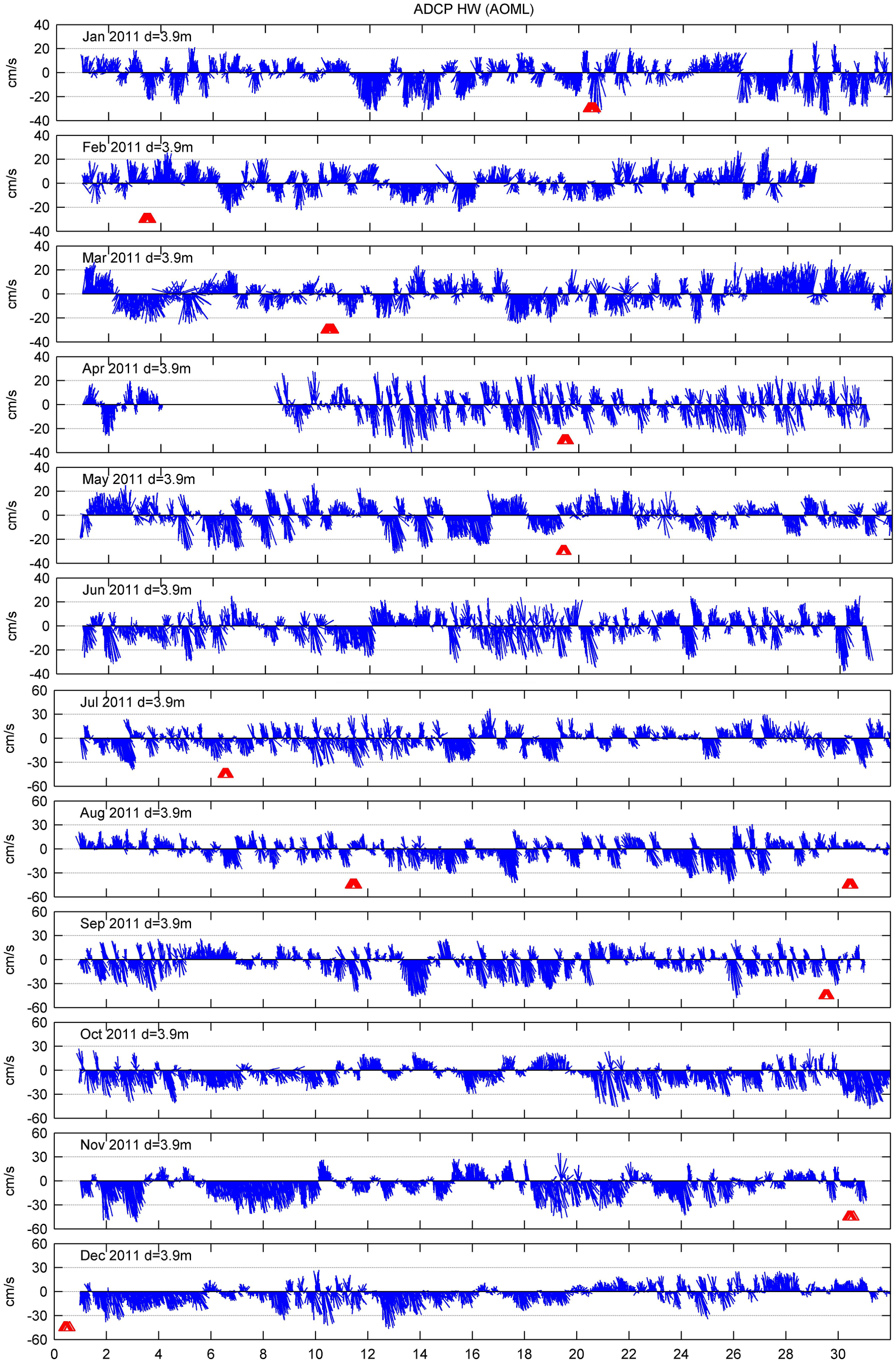

Figure 19. Stick plot of currents at a depth of 3.9 m measured by the AOML Hollywood ADCP during 2011. Format is similar to Figure 17.

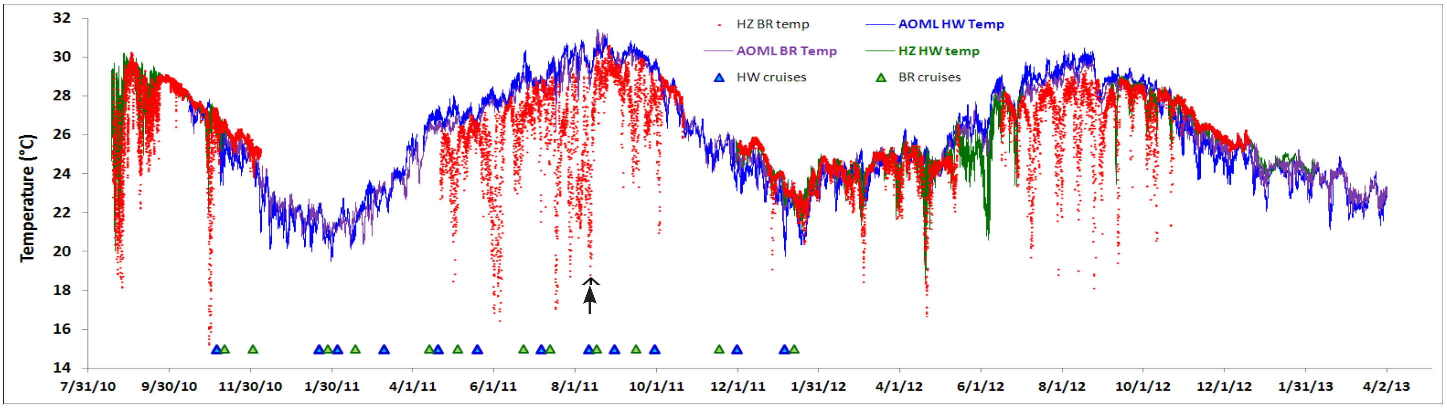

Figure 20. Temperature data over 31 months from the ADCP instruments. Triangles near the bottom indicate times of the Hollywood (blue) and Broward (green) cruises. Arrow shows one of many probable upwelling events. There were gaps in the data from some instruments.

(there are significant gaps in some data sets). The offshore (H&S) instruments recorded sizable and frequent drops in temperature compared to the inshore instruments. This difference has been interpreted as a manifestation of Gulf Stream eddies (section 1.4), such as noted by the arrow in Figure 20 (fortuitously sampled by the August 11, 2011 Hollywood cruise and described in section 4.2.6).

4.2 Water Sample Measurements

4.2.1 Sampling Site Locations

A total of 1,164 cast samples were obtained and analyzed for up to 27 different parameters, although not all parameters were measured for every sample. A total of 24,123 analyses were performed. These samples were obtained at sites indicated in Table 11 and mapped in Figure 21. Sites were chosen to result in sampling of (1) the vicinity of the ocean outfalls, (2) the vicinity of the major inlets, and (3) sites away from these point sources. Wherever possible, sites were co-located with sites monitored by Broward County. Where depths were sufficient, three depths were sampled (bottom, middle, and surface); shallower sites were sampled at fewer (one or two) depths. An explanation of the site selection for all Hollywood and Broward sites follows. While every effort was made to sample at the prescribed location, ship drift resulted in a degree of clustering of the actual cast sites near the goal locations. Table 11 indicates both the target locations and the average of all the actual cast locations, along with distances of the sites to the appropriate outfalls, inlets, and to shore. Figure 21 and Table 12 also show the classification of the sites into regions.

Broward Sites:

Station BR1: Positioned at the PE1 site for Broward County's Water Quality Monitoring Program[105] and located at the harmful algal bloom (HAB, 2005-2006) study site JLU7, within the Port Everglades Inlet entrance.

Station BR2: Positioned at the OS2 site for Broward County's Water Quality Monitoring Program, 1.6 km northeast of the entrance to Port Everglades Inlet to determine inlet water quality on the receiving environment.

Station BR3: Positioned at the OS3 site for Broward County's Water Quality Monitoring Program, 5.3 km northeast of Port Everglades Inlet to determine water quality of the plume exiting the inlet.

Station BR4: Positioned approximately 5 km north of Port Everglades Inlet over the reef system to determine water quality of the downcurrent inlet plume.

Station BR5: Positioned at the OS3 site for Broward County's Water Quality Monitoring Program, adjacent to the Southeast Florida Coral Reef Evaluation and Monitoring Project site BC-2.

Station BR6: Positioned approximately 5.5 km south of the Broward outfall to determine background upcurrent water quality over the reef.

Station BR7: Positioned at HAB study site HO (Hillsboro offshore) approximately 2.3 km south of the Broward outfall to measure the background on the upcurrent reef.

Station BR8: Positioned approximately 1.7 km south of the Broward outfall to determine near-field water quality upcurrent of the boil.

Station BR9: Positioned 0.5 km south of the Hillsboro Inlet to determine the water quality of the inlet plume on the

Table 11. Sampling site locations for the Broward and Hollywood cruises.

Station Name	Target Latitude (°N)	Target Longitude (°W)	Actual Latitude (°N)	Actual Longitude (°N)	Sample Depths (m)	Distance to Inlet (km)	Distance to Outfall (km)	Distance to Shore (km)[1]
BR1[2]	26.0936	-80.1039	26.0936	-80.1052	3	0.10	8.54	IN
BR2[2]	26.1026	-80.0929	26.1024	-80.0938	2	1.54	9.30	1.1
BR3	26.1367	-80.0914	26.1380	-80.0905	3	13.35	12.92	1.2
BR4	26.1590	-80.0765	26.1599	-80.0761	3	10.89	10.27	2.3
BR5	26.1595	-80.0889	26.1594	-80.0885	3	10.97	10.56	1.0
BR6	26.1900	-80.0847	26.1896	-80.0846	3	7.59	7.23	1.0
BR7	26.2027	-80.0684	26.2050	-80.0680	3	6.01	5.19	2.5
BR8	26.2378	-80.0685	26.2379	-80.0683	3	2.54	1.62	1.9
BR9	26.2479	-80.0627	26.2476	-80.0630	3	2.11	0.43	2.2
BR10	26.2516	-80.0620	26.2520	-80.0624	3	1.95	0.08	2.2
BR11	26.2550	-80.0625	26.2556	-80.0621	3	1.89	0.47	2.2
BR12	26.2490	-80.0806	26.2495	-80.0795	2	0.93	1.75	0.5
BR13	26.2597	-80.0832	26.2595	-80.0832	1	0.30	2.29	L
BR14	26.2618	-80.0855	26.2618	-80.0853	1	0.63	2.59	IC
BR15	26.2634	-80.0833	26.2632	-80.0834	1	0.65	2.50	IC
BR16	26.2612	-80.0746	26.2611	-80.0735	3	0.82	1.57	0.7
BR17	26.2764	-80.0649	26.2756	-80.0642	3	2.59	2.70	1.5
BR18	26.2981	-80.0685	26.2976	-80.0681	3	4.60	5.17	0.9
HW1	25.9955	-80.0892	25.996	-80.0957	3	6.53	2.07	2.7
HW2	26.0149	-80.0861	26.0504	-80.0891	3	5.06	3.49	2.9
HW3	26.0148	-80.0949	26.0148	-80.0949	3	8.82	1.02	2.0
HW4	26.0193	-80.0860	26.0193	-80.0860	3	8.47	0.02	2.9
HW5	26.0247	-80.0868	26.0247	-80.0868	3	7.87	0.63	2.8
HW6	26.0246	-80.0946	26.0246	-80.0946	3	7.74	1.06	2.0
HW7	26.0453	-80.0946	26.0453	-80.0946	3	5.47	3.03	1.8
HW8	26.0450	-80.1062	26.0450	-80.1062	2	5.41	3.51	0.7
HW9	26.0680	-80.0853	26.0680	-80.0853	3	3.44	5.44	2.6
HW10	26.0830	-80.0848	26.0830	-80.0848	3	2.31	7.11	2.5
HW11	26.0827	-80.0957	26.0827	-80.0957	3	1.51	7.14	1.4
HW12	26.0938	-80.0950	26.0938	-80.0950	3	0.97	8.36	1.0
HW13	26.0946	-80.0841	26.0946	-80.0841	3	2.06	8.40	2.1
HW14	26.0943	-80.1152	26.0943	-80.1152	1	1.05	8.85	L
HW15	26.1024	-80.0825	26.1024	-80.0825	3	2.42	9.27	2.2

[1] Distance measured along east-west axis. IC refers to the Intracoastal, L refers to lagoon, and IN denotes a sample obtained from within the Port Everglades Inlet.

[2] BR1 and BR2 were associated with the Port Everglades and Hollywood outfalls.

receiving environment. Located just to the west of HAB site HI (Hillsboro inshore).

Station BR10: Positioned at the Broward outfall to determine the water quality of the boil.

Station BR11: Positioned approximately 0.5 km north of the Broward outfall to determine the near-field water quality downcurrent of the boil.

Station BR12: Positioned 1 km southeast of Hillsboro Inlet to determine the water quality of the water exiting the inlet.

Station BR13: Positioned within the Hillsboro Inlet to determine the influence of the inlet plume on the receiving environment.

Station BR14: Positioned inside the Hillsboro Inlet to determine inlet water quality of the southern Intracoastal Canal.

Station BR15: Positioned inside the Hillsboro Inlet to determine inlet water quality of the northern Intracoastal Canal.

Station BR16: Positioned approximately 0.8 km northeast of the Hillsboro Inlet to determine the downcurrent water quality exiting the inlet.

Station BR17: Positioned approximately 2.7 km north of the Broward outfall and 2.67 km northeast of the Hillsboro Inlet to determine the downcurrent water quality over the reef.

Station BR18: Positioned approximately 5 km north of the Broward outfall to determine the downcurrent water quality over the reef.

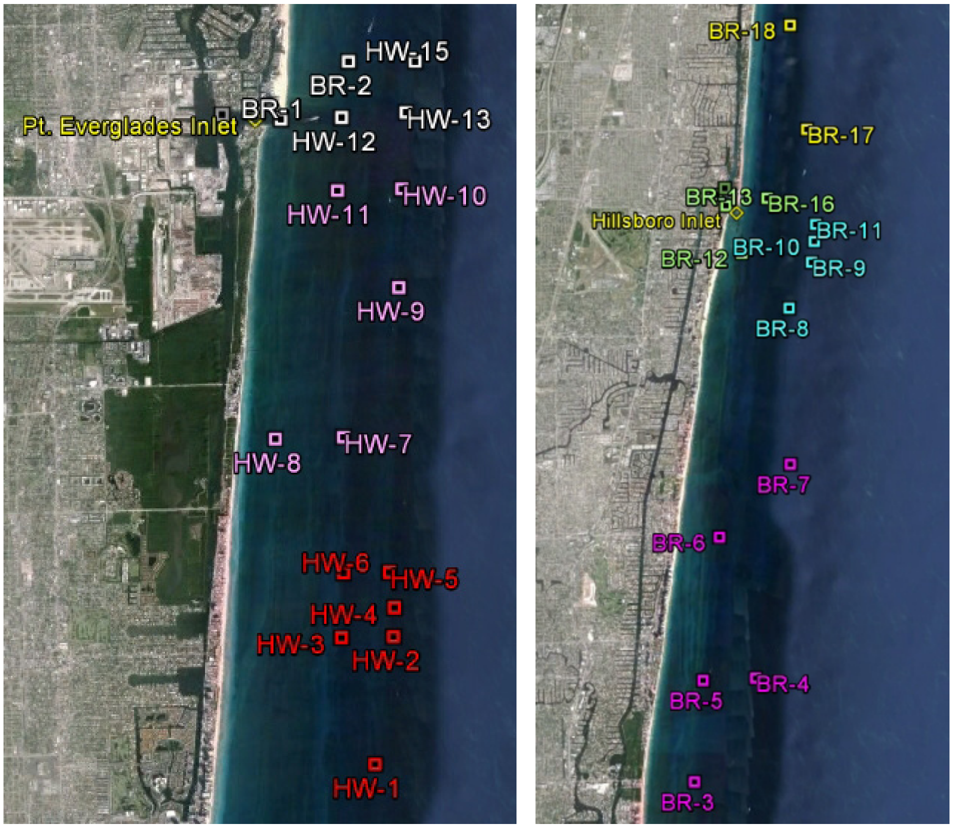

Figure 21. Maps of the Broward (left) and Hollywood (right) sampling sites. Sample regions are denoted by color. Starting at the top of the left-hand map. Region 1 (BR17, 18): yellow. Region 2 (BR12, 13, 14, 15, 16): light green. Region 3: (BR8, 9, 10, 11): blue. Region 4 (BR3, 4, 5, 6, 7): magenta. Region 5 (BR1, 2, HW12, 13, 14, 15): white. Region 6 (HW7, 8, 9, 10, 11): light magenta. Region 7 (HW1, 2, 3, 4, 5, 6,): red. Inlets are indicated by yellow text and diamond symbols.

Table 12. Designation of samples into geographic regions.

Number	Region Name	South Latitude	North Latitude	Sample Numbers
1	North of Hillsboro	26.27	26.30	BR17, 18
2	Hillsboro Inlet	26.24	26.27	BR12, 13, 14, 15, 16
3	Broward Outfall	26.23	26.26	BR8, 9, 10, 11
4	North Reef Tract	26.13	26.21	BR3, 4, 5, 6, 7
5	Port Everglades Inlet	26.08	26.11	BR1, 2; HW12, 13, 14, 15
6	South Reef Tract	26.04	26.09	HW7, 8, 9, 10, 11
7	Hollywood Outfall	26.00	26.03	HW1, 2, 3, 4, 5, 6

Hollywood Sites:

Station HW1: Positioned approximately 2.6 km south of the Hollywood outfall to determine background water quality upcurrent of the outfall.

Station HW2: Positioned at HAB study site BR22 at approximately 0.5 km south of the Hollywood outfall to determine background water quality upcurrent of the outfall.

Station HW3: Positioned approximately 1 km southwest of the Hollywood outfall to determine near-field water quality upcurrent of the boil and over the second reef track.

Station HW4: Positioned at the Hollywood outfall to determine the water quality of the boil.

Station HW5: Positioned approximately 0.5 km north of the Hollywood outfall to determine the near-field water quality downcurrent of the boil.

Station HW6: Positioned approximately 1 km northwest of the Hollywood outfall to determine the near-field water quality inland on the second reef track.

Station HW7: Positioned approximately 3 km northwest of the Hollywood outfall to determine the near-field water quality inland and northwest of the boil.

Station HW8: Positioned approximately 3.4 km northwest of the Hollywood outfall to determine the downcurrent inshore water quality.

Station HW9: Positioned approximately 3.5 km south of the Port Everglades Inlet and 5.5 km north of the Hollywood outfall to determine the downcurrent water quality closer to the inlet.

Station HW10: Positioned at the OS1 site for Broward County's Water Quality Monitoring Program and located at HAB study site JLU7, 2.7 km southeast of the Port Everglades Inlet entrance.

Station HW11: Positioned at the OS1 site for Broward County's Water Quality Monitoring Program, 1.7 km southeast of the entrance to Port Everglades Inlet to determine water quality of the plume exiting the inlet.

Station HW12: Positioned ~1 km east of Port Everglades Inlet to determine water quality of the plume exiting the inlet.

Station HW13: Positioned 2.7 km east of the entrance of Port Everglades Inlet to determine inlet water quality exiting the inlet.

Station HW14: Within the mouth of the Port Everglades Inlet to determine water quality within the inlet.

Station HW15: Positioned 2.8 km northwest of the Port Everglades Inlet to determine water quality of the inlet plume.

At each site, a CTD cast was performed, with bottles opened at the appropriate depths. Photographs of the Broward and Hollywood plume boils as observed from aboard the R/V *Hildebrand* are shown in Figures 22 and 23.

4.2.2 Data Overview

The data set generated in this study covered more than a year of time and a wide study area. The study area ranged from latitude 25°59′37.4″ to 26°17′55.97″ and from longitude 80°3′37.37″ to 80°6′58.54″, equivalent to ~33 km (north/south) by 4.3 km (east/west). Sampling sites included the Intracoastal Waterway to ~2.9 km offshore, two inlets, two outfalls, and the three reef tract lines. The region is the heart of the southeast Florida coast. Because of the exceptional geographic range, we found it instructive to group the samples into regions (Figure 21 and Table 12).

We may thus examine various latitudinal, longitudinal, and seasonal trends in the data. The second major distinction is the cruise date. A total of 24 cruises were completed (Appendix 2), generally monthly, but some months were missed due to weather or equipment issues. The cruise list is given in Table 13; a month number ("No." columns) was assigned to each cruise and employed in the figures that follow.

Figure 22. The Broward plume boil as observed from aboard the R/V *Hildebrand* on November 17, 2011.

Figure 23. The Hollywood effluent boil as observed from aboard the R/V *Hildebrand* on May 19, 2011.

Table 13. Cruise schedule.

Date	Hollywood	No.		Broward	No.
Nov 2010	11/2/2010	1		11/10/2010	2
Dec 2010	-----	-----		12/01/2010	3
Jan 2011	01/20/2011	4		01/27/2011	5
Feb 2011	02/03/2011	6		02/16/2011	7
Mar 2011	03/10/2011	8		-----	-----
Apr 2011	04/19/2011	10		04/13/2011	9
May 2011	05/19/2011	12		05/04/2011	11
Jun 2011	-----	-----		06/23/2011	13
Jul 2011	07/06/2011	14		07/13/2011	15
Aug 2011	08/11/2011	16		08/17/2011	17
Aug 2011	08/30/2011	18		-----	-----
Sep 2011	09/29/2011	20		09/15/2011	19
Nov 2011	11/30/2011	22		11/17/2011	21
Dec 2011	-----	-----		-----	-----
Jan 2012	01/12/2012	24		01/05/2012	23

Table 14 presents the minimum, average, and maximum values from all cruises, separated into surface, middle, and deep samples. While not every analyte was measured in each sample, most analytes were measured at each sampling site, which totals 1,114 samples (444 surface, 322 middle, and 348 deep samples). Note that the average concentration of dissolved oxygen was found to be high and does not comprise a threat to ecosystem health.[106] Minimum values of zero reflect measurements below the detection limit of the analysis. Note also that ammonium (NH_4) was found to be the dominant form of inorganic nitrogen. These data are much more informative when parsed into time, location, depth, and in relation to other variables; this will be shown in subsequent sections. The entire data set is shown in Figures 24 and 25 (Matlab® box plots). These may be compared to the 2011 Southeast Florida Coral Reef Initiative (SEFCRI) data.[107] The complete data set is presented in Appendix 3.

Over the seven regions shown in Table 12, ammonium was the major component of dissolved inorganic nitrogen (Figure 26). Looking at total dissolved nitrogen, dissolved organic nitrogen concentrations exceeded that of DIN (DON = TDN–DIN). A similar result was obtained in the Florida Keys.[108] The lowest DIN and DON concentrations are seen in regions 1 and 4.

Looking at phosphorus (Figure 27, left panel), we observed that dissolved phosphorus greatly exceeded particulate phosphorus; similarly for carbon (Figure 27, right panel). The latter did not include dissolved inorganic carbon (e.g., carbonates, CO_2, CO_3, HCO_3, H_2CO_3).

In the case of particulates, TSS, and turbidity, these were somewhat correlated (Figure 28, left panel) with minimum values away from the inlets. The outfalls were not significant sources of either. Turning to chlorophyll-a and phaeopigments (a measure of the grazing of phytoplankton), we observed that both were correlated across the regions, at a ratio of about 3 to 1, with the inlets again showing the highest concentrations of both (Figure 28, right panel).

4.2.3 Seasonal Trends

Our study resulted in over a year's worth of data. This means we may investigate seasonal trends in some detail. We begin with seawater temperature (Figure 29, left panel). The northernmost sites (uppermost panels) showed a remarkable lack of temperature change from surface to deep samples, regardless of the time of year. As one moved south (lower panels), there was an increasing occurrence of deep samples that were much cooler than the surface samples, especially in March, April, and August. This is interpreted as upwelling and is discussed in section 4.2.6.

Another informative measurement was that of salinity (Figure 29, right panel). Freshening of surface samples was reasonable for the Hillsboro and Port Everglades inlet regions, with greater freshening during the high precipitation months (August through December 2011, see Figure 3). Remarkably, most of the middle and deep sample salinities in Figure 29 are marine (≥36 psu), except for these same high precipitation months, even those remote from point or non-point sources (i.e., South Reef Tract, North Reef Tract, north of Hillsboro). This freshening must have been derived from surface water (i.e., from terrestrial rain and/or canal flow), or from marine rain.

Figure 30 compares the salinity data with rainfall rates measured at Port Everglades Inlet; it appears that the lower salinities were correlated with the higher rainfall during those months (see section 1.2).

Another period of lower salinity was November 2010, where salinities were markedly lower in the more southern regions (Port Everglades Inlet; Hollywood outfall; Figure 29). From Figure 30 (lower panel), the most significant preceding

Table 14. Minimum, average, and maximum values of measured analytes (all sites).

		SURFACE			MIDDLE			DEEP		
Analyte	**Unit**	**Minimum**	**Average**	**Maximum**	**Minimum**	**Average**	**Maximum**	**Minimum**	**Average**	**Maximum**
Depth	m	0.651	1.463	13.800	3.393	9.132	18.311	3.691	16.157	37.675
Salinity	psu	25.845	35.689	36.514	34.926	36.007	36.511	34.928	36.064	36.509
Temp	°C	20.314	26.342	31.329	20.781	26.157	30.895	19.587	25.829	35.512
DIN	µM	0.000	2.074	30.753	0.000	1.463	24.172	0.000	1.513	26.593
pH	Units	7.730	8.060	8.250	7.790	8.104	8.220	7.650	8.095	8.230
ORP	mV	70.18	179.40	262.7	6.25	179.7	264.6	86.28	180.9	268.6
Chlor-a	µg/L	0.099	0.650	4.206	0.175	0.522	1.480	0.152	0.492	1.170
Phaeo	µg/L	0.024	0.205	1.318	0.041	0.155	0.468	0.052	0.169	0.404
TSS	mg/L	0.010	0.383	1.960	0.020	0.287	1.570	0.000	0.286	1.790
Turbidity	FTU	0.681	1.733	7.199	0.899	1.743	3.622	0.977	1.758	4.805
N+N	µM	0.000	0.577	12.924	0.000	0.347	4.370	0.000	0.504	11.791
NO_2	µM	0.000	0.152	3.044	0.000	0.092	2.235	0.000	0.101	2.852
NO_3	µM	0.000	0.402	5.732	0.000	0.246	3.808	0.000	0.374	8.939
NH_4	µM	0.000	1.526	24.486	0.000	1.124	23.833	0.000	1.047	14.802
PO_4	µM	0.000	0.044	0.696	0.000	0.023	0.381	0.000	0.029	0.654
Si	µM	0.000	1.932	19.960	0.000	1.019	4.952	0.000	1.060	10.242
TDN	µM	0.154	7.898	37.058	0.142	6.629	12.653	0.140	6.431	14.099
TDP	µM	0.020	0.459	10.883	0.025	0.383	8.512	0.031	0.381	9.655
PC	µM	1.926	9.174	60.079	1.828	6.202	26.567	2.449	6.107	48.756
PP	µM	0.005	0.027	0.267	0.005	0.016	0.083	0.004	0.014	0.061
PN	µM	0.256	0.965	2.239	0.215	0.732	1.633	0.128	0.593	1.457
DOC	µM	36.11	80.82	162.83	36.63	73.87	115.75	27.24	71.69	117.92
NO_2	mg/L	0.000	0.0012	0.0426	0.000	0.0008	0.0313	0.000	0.0009	0.0399
NO_3	mg/L	0.000	0.0030	0.0802	0.000	0.0015	0.0184	0.000	0.0026	0.1251
NH_4	mg/L	0.000	0.0113	0.3413	0.000	0.0081	0.3337	0.000	0.0076	0.2072
PO_4	mg/L	0.000	0.0007	0.0216	0.000	0.0003	0.0032	0.000	0.0005	0.0203
Si	mg/L	0.000	0.0266	0.5589	0.000	0.0135	0.1008	0.000	0.0154	0.2868
TDN	mg/L	0.000	0.0264	0.5188	0.000	0.0221	0.1771	0.000	0.0214	0.1505
TDP	mg/L	0.000	0.0017	0.0902	0.000	0.0013	0.0270	0.000	0.0010	0.0215
TP	µM	0.032	0.486	10.920	0.031	0.398	8.522	0.038	0.395	9.671
TN	µM	0.422	8.666	39.297	0.658	7.211	13.334	0.663	6.899	14.431
TC	µM	46.88	89.99	180.80	44.43	80.07	124.90	32.92	77.79	124.05
DO	% sat.	70.44	81.55	84.31	79.17	81.42	82.49	78.51	81.36	90.05

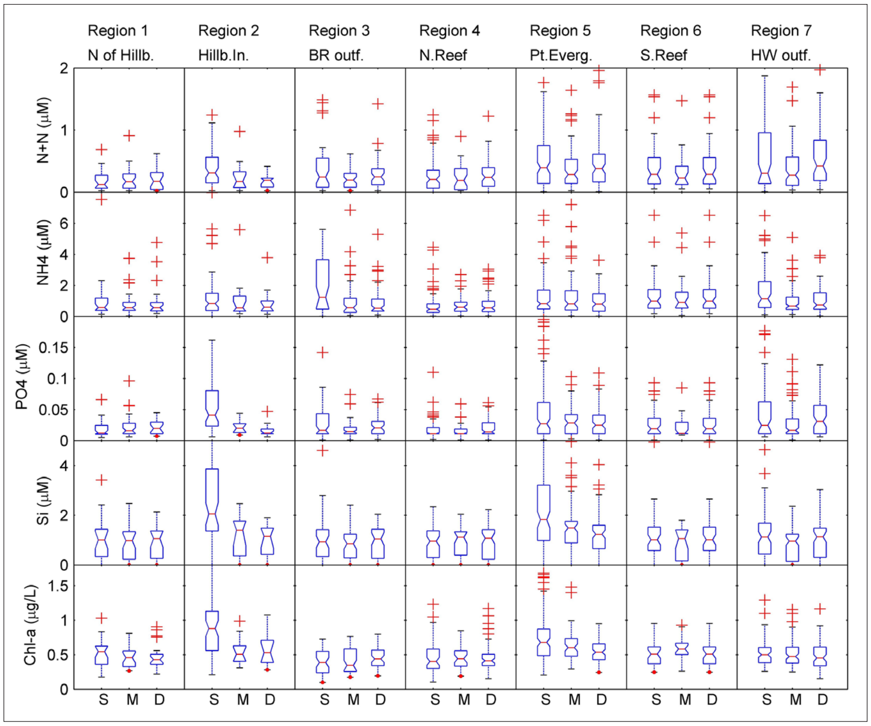

Figure 24. Box plots of five key analytes, grouped by depth (surface, middle, deep) and by region. On each box, the central mark is the median, the edges of the box are the 25th and 75th percentiles, the whiskers extend to the most extreme data points not considered outliers, and outliers are plotted individually in red. The notch is constructed so that two box plots whose notches do not overlap have different medians at the 5% significance level. Vertical scale chosen to best represent data; some data are not shown.

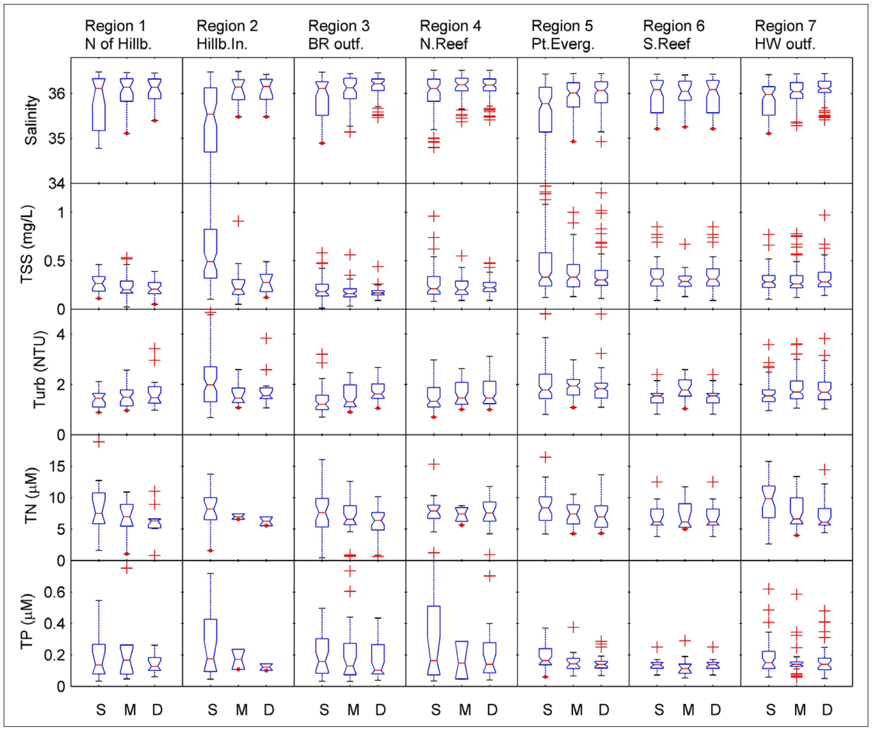

Figure 25. Box plots of five additional analytes, grouped by depth and by region. The format is similar to that of Figure 24.

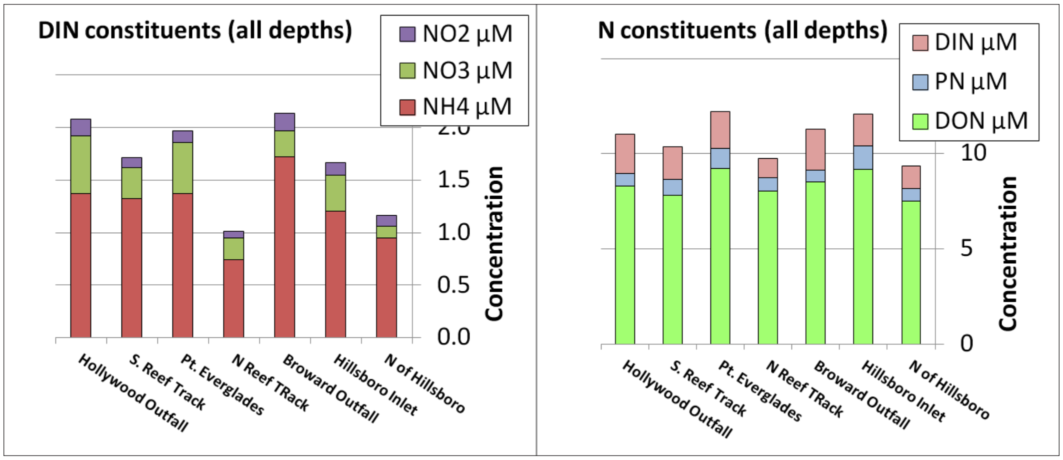

Figure 26. Left: Constituents of dissolved inorganic nitrogen. Right: Comparison of dissolved inorganic, particulate, and dissolved organic nitrogen concentrations, averaged over depths for each region.

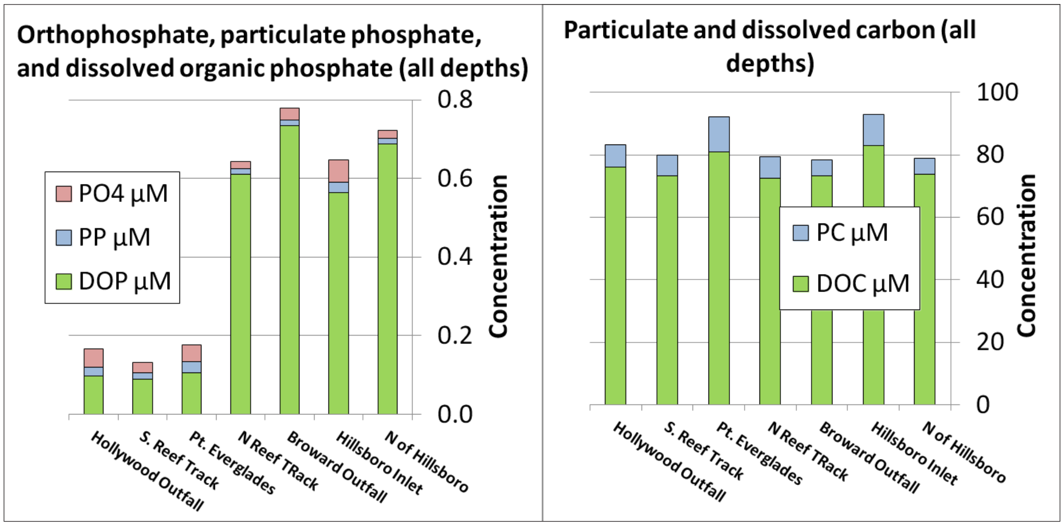

Figure 27. Left: Ortho-, particulate, and dissolved organic phosphorus. Right: Particulate and dissolved organic carbon. Dissolved inorganic carbon is not included. Units are denoted in the legend.

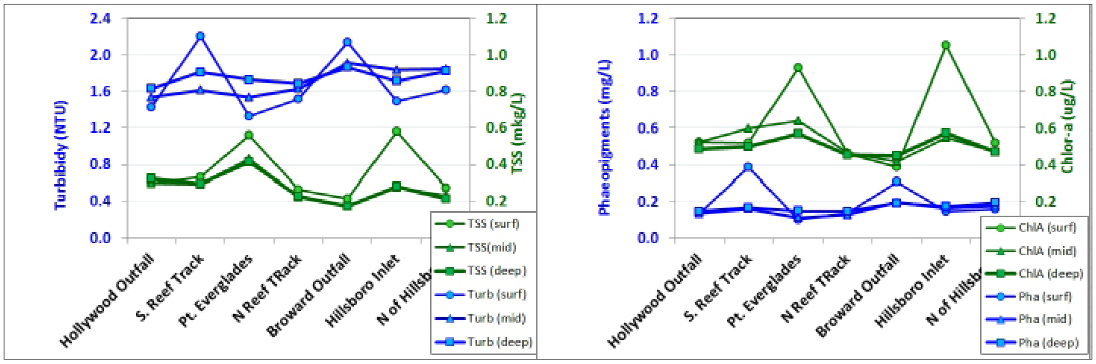

Figure 28. Left: Average total suspended solids and turbidity values. Right: Average chlorophyll-a and phaeopigment concentrations.

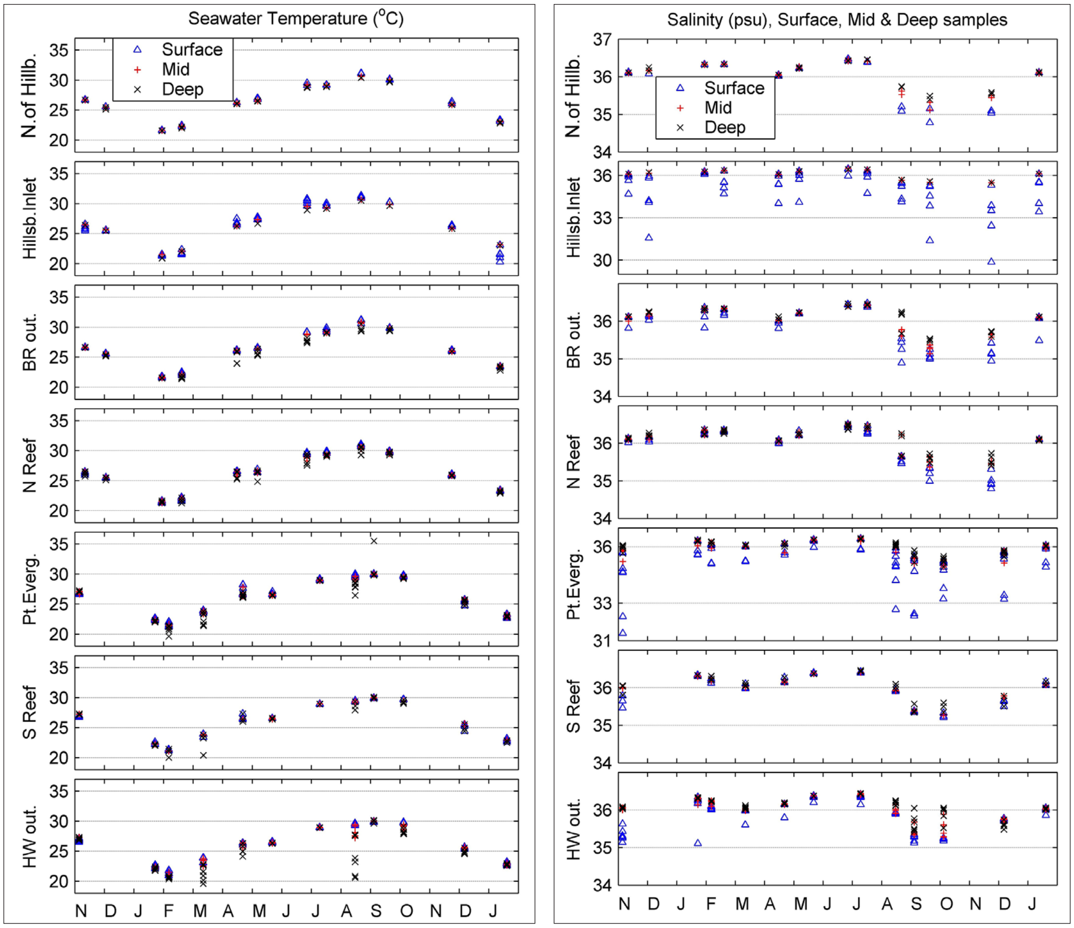

Figure 29. Temperature (left) and salinity (right) measurements from the surface (Δ), middle (+), and deep (x) samples for the seven regions denoted in Table 12. Horizontal axis denotes the month of the cruise. On the uppermost salinity plot ("N. of Hillsb."), rainfall (from the SFWMD) is also shown (magenta circles).

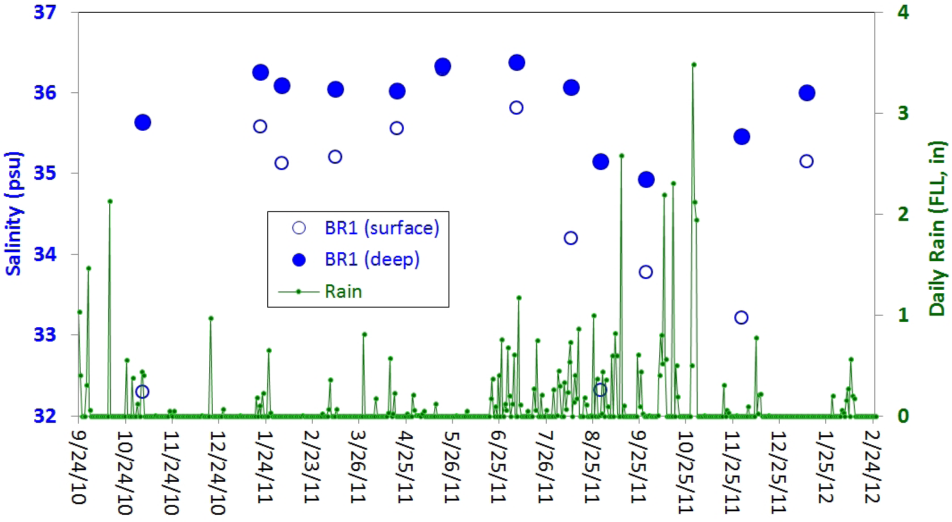

Figure 30. Salinity measurements from BR1 (Port Everglades Channel), surface (open circles) and deep (filled circles) samples, and Broward County daily rainfall (SFWMD), green line. Note elevated rainfall and decreased salinities during August through November 2011.

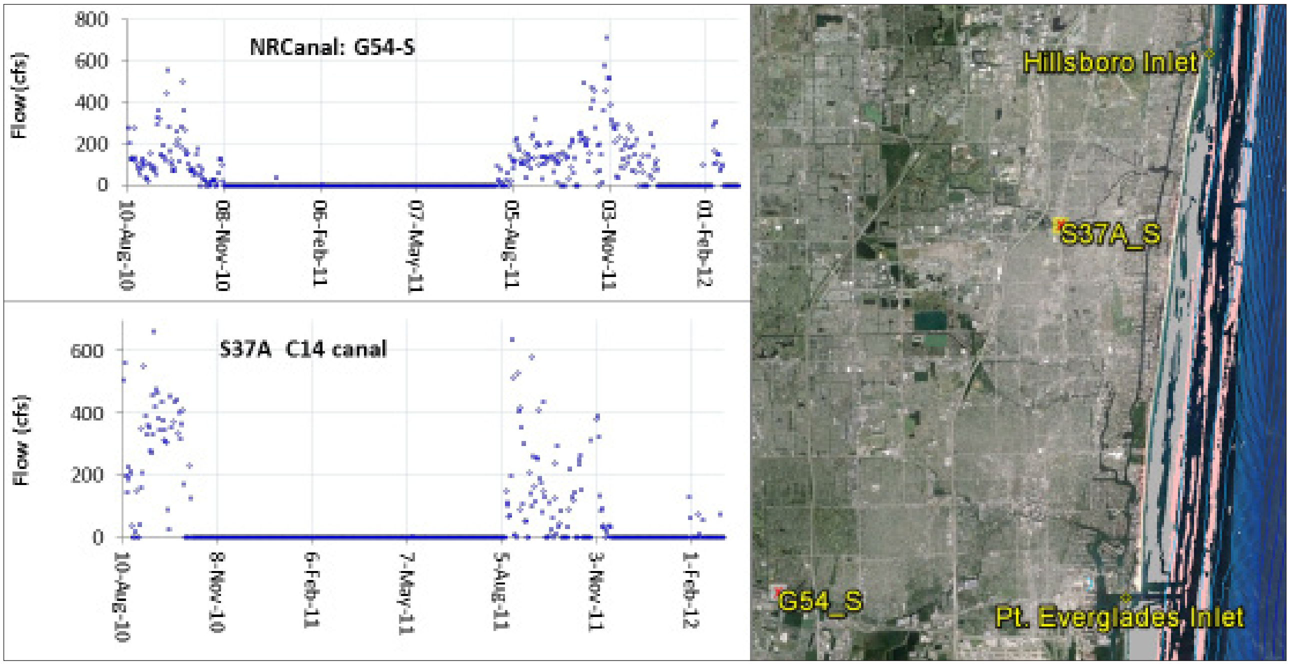

Figure 31. Upper Left: Flow through G54-S (North New River Canal (DB station G54-S); lower left: Flow through the C14 Canal (DB station S37A). Data from DBHYDRO. Right: Google Earth map of Broward County showing the location of the two canal flow measurement sites.

rainfall was several weeks earlier (October 13, 2011, 5.3 cm of rain); however, the decrease in salinity may be better correlated with canal flow than with rain. To examine the impact of canal flow, the flow rates from the South Florida Water Management District's (SFWMD) G54 station on the North New River Canal (see Figure 1), which empties (via the Intracoastal Waterway) into Lake Mabel (Port Everglades Inlet) and the C14 Canal (S37A), which also flows into the Intracoastal Waterway, were obtained from the DBHYDRO database. These data (Figure 31) indicated a general correlation with canal flow and the lower salinity of the Port Everglades Inlet and Hollywood outfall sample regions. While the flow data are from sites considerably upstream from the coastal inlets (and the more useful Intracoastal Waterway flows were apparently not measured), these data clearly imply that surface water flow (including canal flow) in Broward County had an important impact on the entire water column of the coastal waters of southeast Florida, even at the depth of the reef tract. A very approximate estimate of the magnitude of that impact can be made, based on the salinity drop of ~1 psu (out of ~36); viz., about 3% of the water at depth at the reef tract is continental by this method.

Turbidity and TSS are both due to particulates suspended in the water; turbidity is a measure of the light scattering by the particles, while TSS is a measure of the filterable particulates (by weight) in water samples. Although both TSS and turbidity arise from suspended particles, the relationship between them is not simple, because they refer to quite different characteristics of the ensemble of particles.[109] Turbidity is not a function of particle density; TSS will be unaffected by incident light wavelength, particle shape or size, optical reflectivity, or the number of particles. A plot of TSS versus turbidity over the entire collected data set shows weak correlation ($R^2 = 0.31$) (Figure 32).

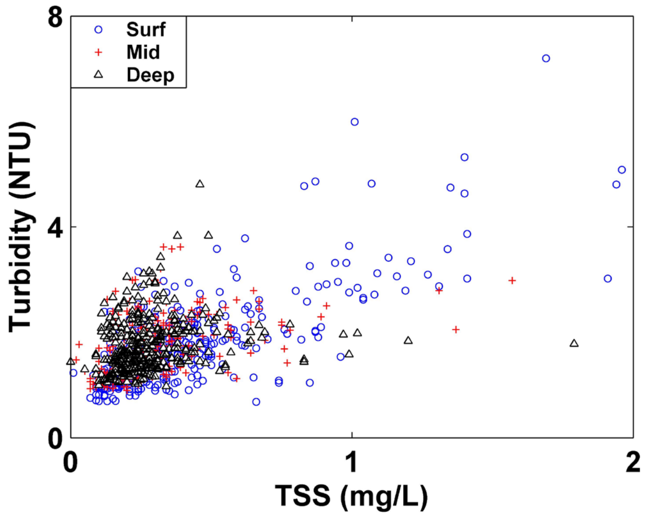

Figure 32. Turbidity measurements (vertical axis) plotted against total suspended solids (horizontal axis); data segregated by depth.

Plots of turbidity and TSS similar to Figure 29 for the cruises listed in Table 13, categorized into regions, are shown in Figure 33. As with salinity, turbidity and TSS showed the most change (increases) at the inlets (opposite to salinity, as proximity to freshwater reduces salinity but increases turbidity and TSS). There appeared to be less seasonal change here (compared to salinities) that was generally confined to the surface samples. Away from the inlets, the observed turbidities indicated the expected clarity of these waters, with turbidities >4 NTU only observed at the inlets. Outfalls were not a source of excess turbidity or TSS. Both are low over the reef tracts, indicative of high water clarity appropriate for healthy reef ecosystems.[110]

There has been an ongoing effort to determine surrogate TSS via turbidity measurements, due to the rapidity and simplicity of the latter measurement relative to the former.[111] When systems are simple and with appropriate turbidity standards, this can be accomplished.[112] Clearly, environmental conditions in the present study precluded such a straightforward relationship; thus, we cannot approximate TSS values using turbidity values.

Results for the key available nitrogen species N+N (left panel) and NH_4 (right panel) are plotted in Figure 34. The most striking feature is the dominance of ammonium over N+N in every region. These nutrients were not well correlated (Figure 35), indicating dissimilar sources and sinks.

PO_4 and Si are plotted in Figure 36. The vertical axis has been adjusted in each region for maximum display. The highest concentrations were found in the vicinity of the wastewater treatment plant outfalls. Elevated concentrations at the inlets during the rainy season were sometimes observed but not in all cases. High ammonium results were obtained in month 6 (May 2011), and were obtained in a single cast (HW12, May 19, all four bottles). The sampling location was just outside the Port Everglades Inlet. It may be real, or it may be an outlier due to contamination.

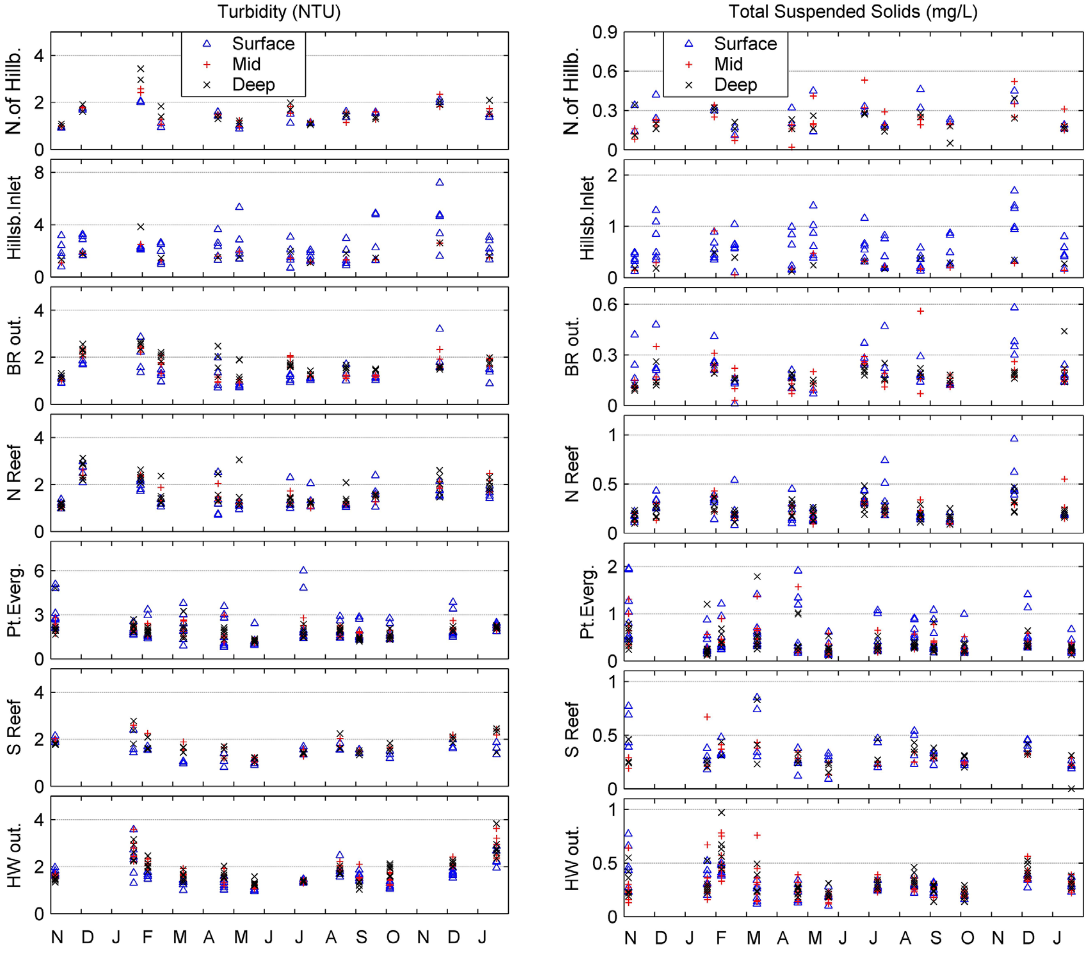

Figure 33. Left: Plots of turbidity. Right: Plots of total suspended solids. Format is the same as Figure 29.

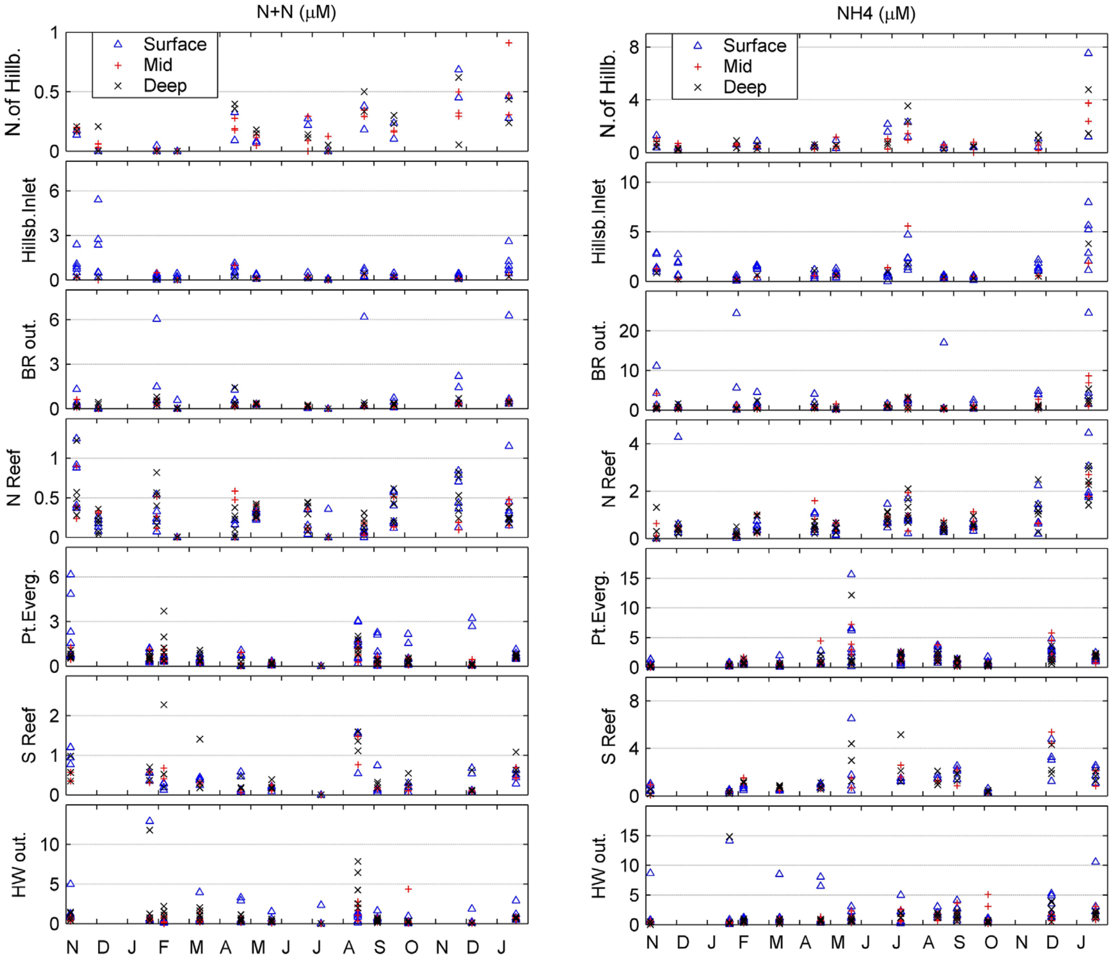

Figure 34. Left: Plots of nitrite+nitrate. Right: Plots of ammonium. Format is the same as Figure 29.

For the nutrients orthophosphate and silicate (Figure 36), there were seasonal differences primarily in the inlet regions which correlated with times of rain. No relationship with temperature was noted.

In summary, the following points can be made concerning seasonal changes in concentration:

1. Elevated nutrient concentrations were primarily confined to surface samples.
2. Continental impact at depth was not absent; however, salinity decreases throughout the region (including at depth), indicated impact from terrestrial waters.
3. Elevated nutrient concentrations generally occurred during the rainy months.
4. Locations more distant from the inlets and outfalls had significantly lower concentrations for most nutrients.

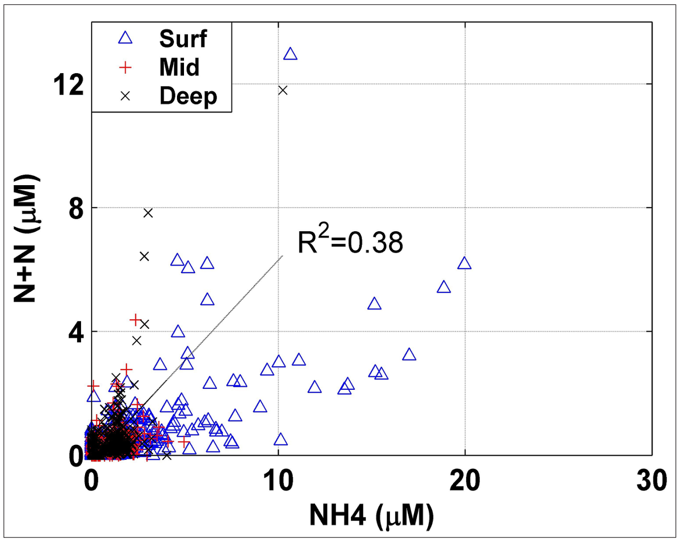

Figure 35. Nitrite+nitrate and ammonium concentrations for different depths. Only the surface values are somewhat correlated: $R^2 = 0.38$ (surface), 0.00 (middle), and 0.13 (deep).

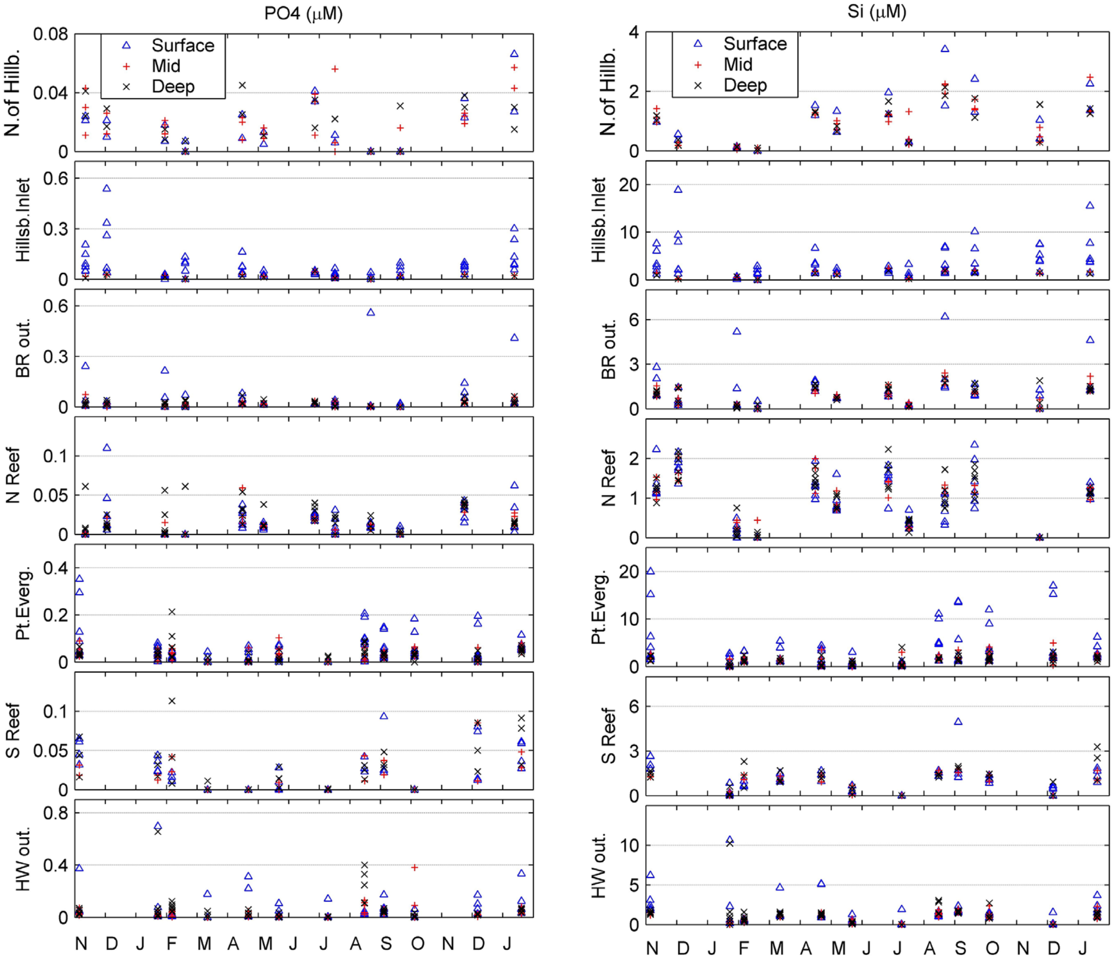

Figure 36. Left: Plots of orthophosphate. Right: Plots of silicate. Format is the same as Figure 29.

4.2.4 Latitudinal Trends

The range of sample locations spanned approximately 26.0-26.4° of latitude, or ~33.5 km. This can be compared to the largest distance from shore to sample site (HW2) of only ~2.8 km, resulting in a height to width ratio of nearly 12 to 1. Recall that while the coastline appears nearly north-south, it actually tracks at approximately 4.5° east of north in this region. Do some characteristics of these measurements change regularly with latitude?

To study latitudinal trends, we first removed sample locations from the data set that were known to be strongly influenced by the four known point sources of pollution (the two inlets and two outfalls; note that the Broward outfall has nearly the same latitude as the Hillsboro Inlet). We further separated the remaining sites into two categories: nearshore (shallow) and distant from shore (deep), see Figure 37. The designations are shown in Table 15.

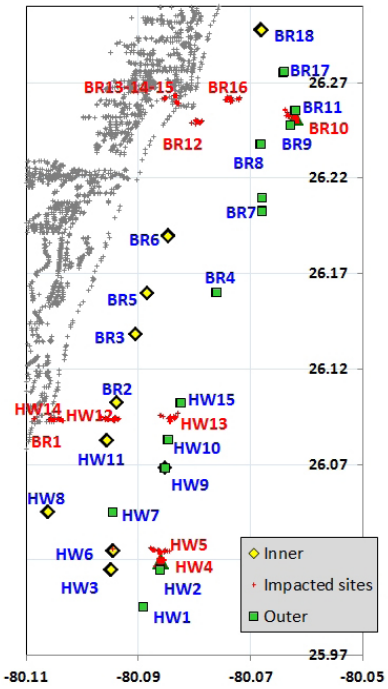

Table 15. Same site designations.

Inner	Impacted	Outer
BR2	BR1	BR4
BR3	BR10	BR7
BR5	BR12	BR8
BR6	BR13	BR9
BR18	BR14	BR11
HW3	BR15	BR17
HW6	BR16	HW1
HW8	HW4	HW2
HW11	HW5	HW7
	HW12	HW9
	HW13	HW10
	HW14	HW15

Figure 37. Sample locations separated into inner (yellow, ◊), impacted (red, +), and outer (green, □) sites. Coastline is denoted by grey dots.

We begin with temperature and salinity. Results for surface, mid-depth, and deep sites are shown for both inner and outer locations in Figure 38. As expected, temperatures increased going north for both inner and outer sites. Salinity also increased but only inner sites (middle and deep samples) had significant correlation. TSS showed a surprising decrease with latitude for both inner and outer sites at all depths, as did chlorophyll-a (but with weaker correlation with latitude).

Reviewing other measurements using this same method of analysis, we present data for selected nutrients in Figure 39. Correlations for TN and DIN that were significant showed decreases with latitude and a similarity between inner and outer sites. The same observations were obtained with PO_4 and PN; in fact, the highest correlation was with surface PN (inner sites), R^2 = 0.93 but with only four data points.

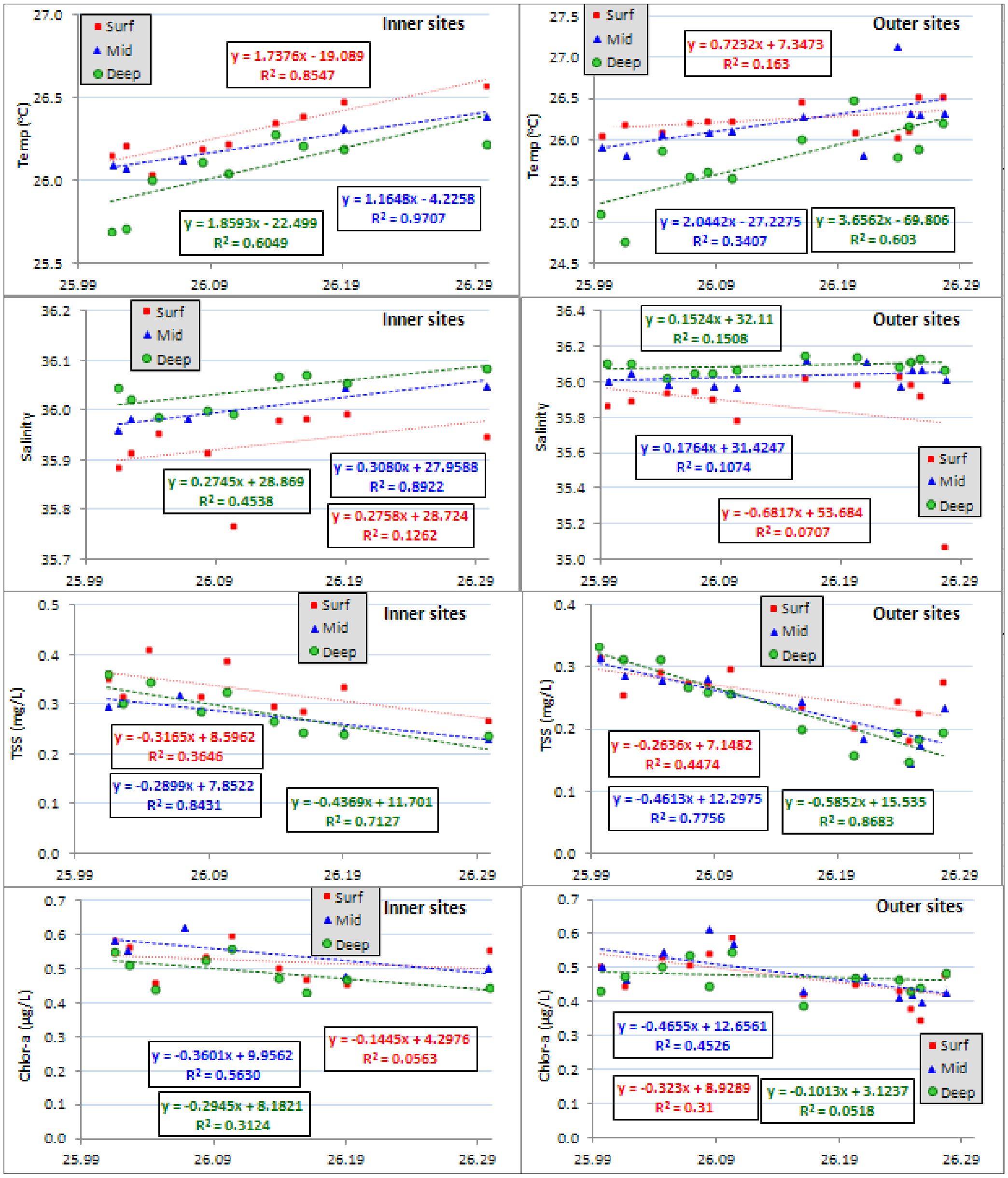

Figure 38. Analytical results (vertical axis) plotted versus latitude (horizontal axis) for temperature (top panels), salinity (second from top), total suspended solids (third from top), and chlorophyll-a (bottom panels). Each symbol denotes the average result over all the cruises at that location. Inner sites are plotted in the left-side panels; outer sites in the right-side panels. Separate symbols and colors denote surface (red), middle (blue), and deep (green) results; corresponding regression statistics use the same colors.

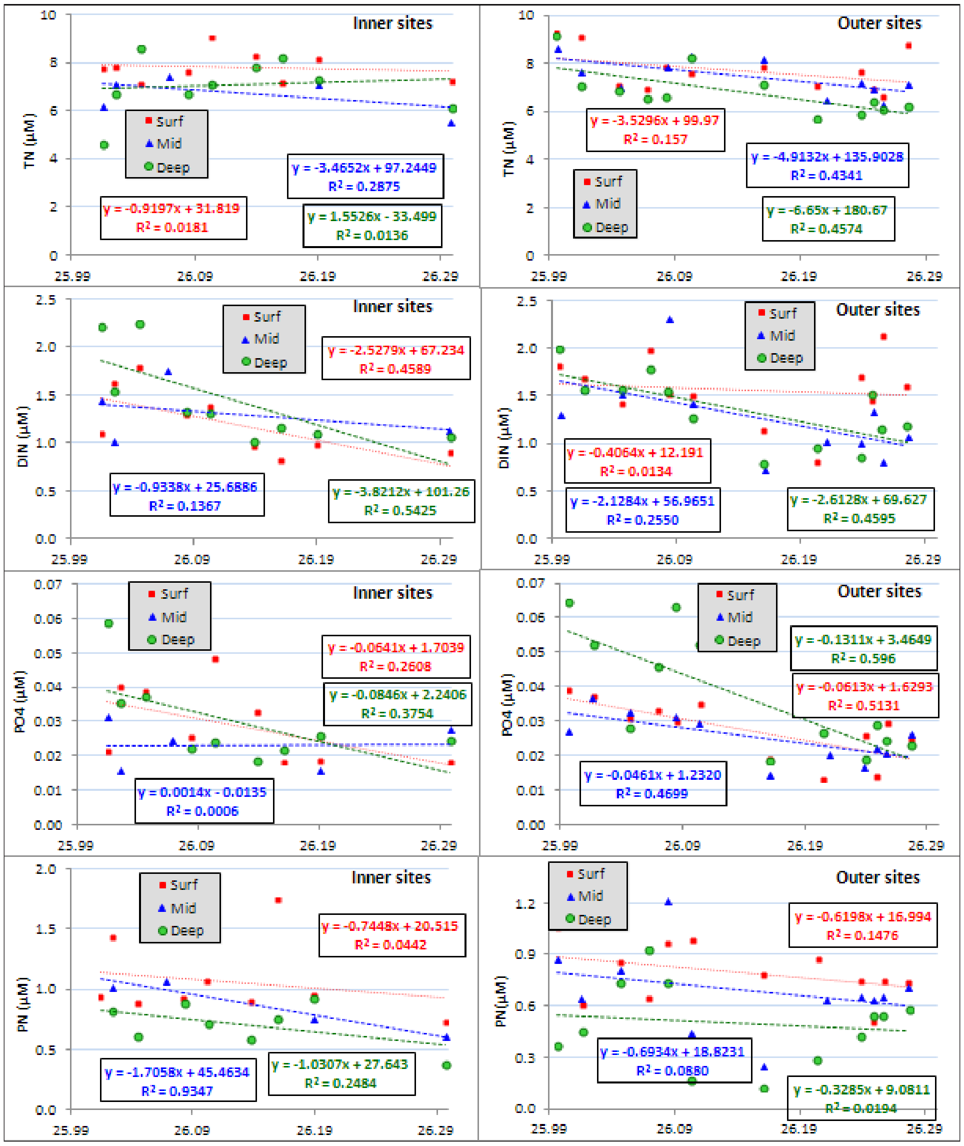

Figure 39. Data for total nitrogen (top panels), dissolved inorganic nitrogen (second from top), orthophosphate (third from top), and particulate nitrogen (bottom panels) versus latitude; format is the same as Figure 38.

For essentially every nutrient data set examined, similar trends (e.g., decreasing concentrations with latitude) were observed at all three depths. For many analytes, the strongest correlations existed with the deep samples, possibly because of the presence of the Gulf Stream or possibly because the surface samples were more influenced by highly irregular anthropogenic sources. Markers of anthropogenic input (e.g., DIN, TN, PO_4, and TSS) generally decreased with increasing latitude (i.e., negative slopes), especially for surface samples, thus being unsupportive of the view that anthropogenic loading into the coastal waters increased as one tracks from south to north due to the presence of point and non-point sources along the coast.

4.2.5 *Changes with Depth*

Changes in concentrations and physical parameters with depth can illuminate several interesting characteristics of the coastal ocean, such as the degree of stratification across a year, the presence of upwelling, and the degree of penetration of surface water downward onto reef habitats. Figures 24 and 25 present box-plots of the surface, middle, and deep sample results of important measurements. A summary of these results is shown in Table 16, where differences (surface minus deep) are indicated when statistically significant (Kruskal-Wallis test, $p < 0.10$).[113]

In Table 16, inlets and outfalls tended to have higher nutrients, as expected, but not as universally as might be expected. Salinities were higher at depth, as expected with fresh continental water and/or rain contributing more to the surface samples. Turbidities were generally higher at depth due to resuspension of shallow bottom sediments. Perhaps the most remarkable reading from the table is the lack of differences observed over the entire region.

In Figure 40 are plotted the seawater density (σ_T, kg/m³) of cruises from regions 1, 4, and 6 (not closely associated with inlets or outfalls) and region 7 because it contains the southernmost locations. The density of seawater was computed from temperature and salinity.[114,115] The figure shows large variations in density profiles from cruise to cruise, compared to the changes in density during a particular cruise (a single low-salinity data point from region 1 [December 1, 2010] may have been an instrument error).

Temperature is primarily a function of the time of the year, and salinity is driven by continental fresh water. We can remove these seasonal differences by looking at a "relative

Table 16. Changes in concentration with depth (averaged surface concentrations minus deep concentration differences).

Region	TP µM	TN µM	NH$_4$ µM	N+N µM	PO$_4$ µM	Si µM	TSS mg/L	Turb NTU	Chl-a µg/L	Sal psu	DO % sat
North of Hillsboro	-	-	-	-	-	-	0.05	-	-	-	-
Hillsboro Inlet	-	-	-	0.06	0.01	0.17	0.01	-	-0.05	-0.13	0.12
Broward Outfall	-	2.40	2.20	-	-	-	-	-0.40	-0.06	-0.20	-
North Reef Tract	-	-	-	-	-	-	-	-0.19	-	-	-
Port Everglades Inlet	0.03	0.62	-	-	-	1.19	-	-	0.18	-0.38	0.16
South Reef Tract	-	-	-	-	-	-	-	-0.21	-	-	-
Hollywood Outfall	-	3.56	0.84	-	-	-	-	-0.21	-	-0.22	0.09

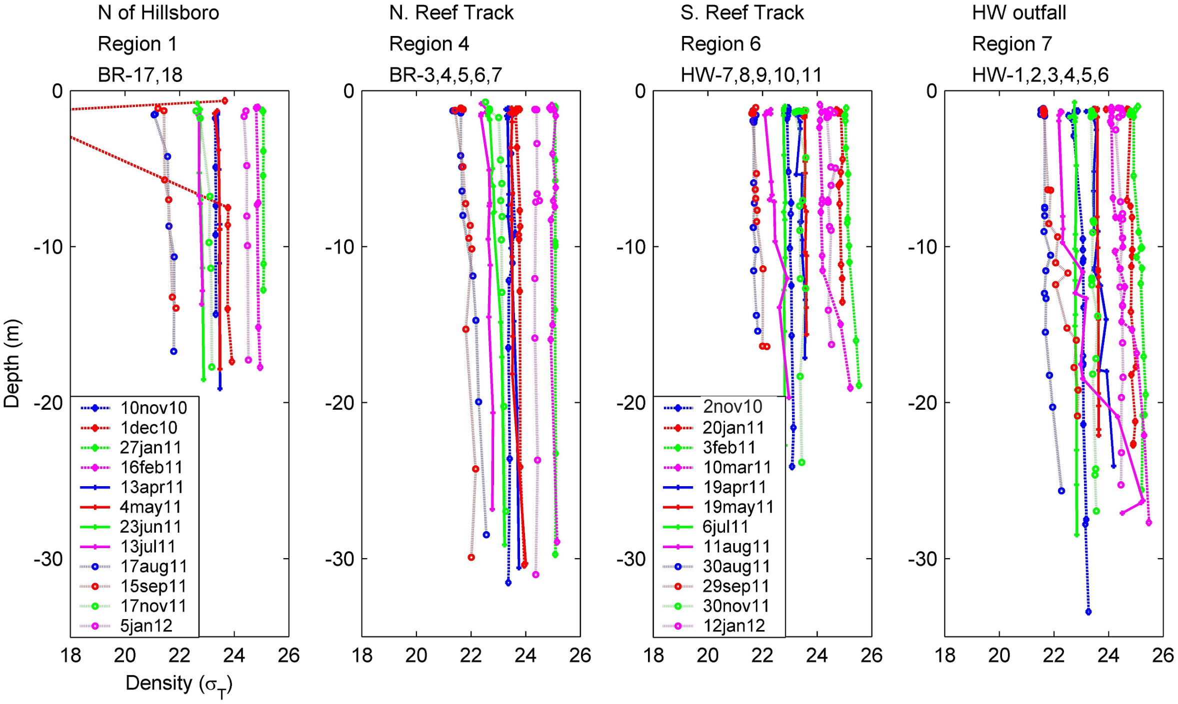

Figure 40. Plots of density measurements from water quality samples taken in regions 1, 4, 6, and 7, versus depth. A separate line is plotted for each cruise, but all indicated samples are grouped together and sorted by depth; cruise dates are shown in the legends. The legend for region 4 is the same as for region 1; similarly, the legend for region 7 is the same as for region 6. Each data point is the density versus water depth for one of the sample locations in that region. Density (kg/m³) was computed from salinity and temperature according El-Dessouky and Ettouney (2002);[115] σ_T was then computed as σ_T = density–1000.

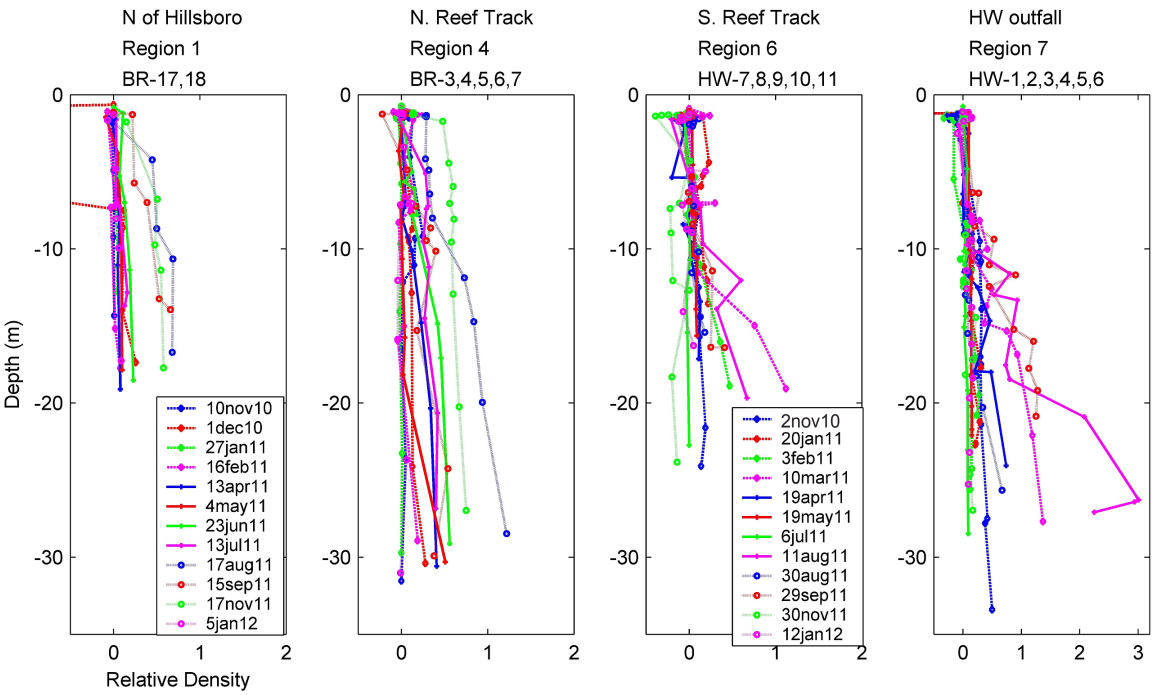

Figure 41. Relative density versus depth for regions 1, 4, 6, and 7. Note the change in density axis scale for region 7. Format is the same as Figure 40.

density," computed by subtracting the density of the surface sample from the rest of the density data from that cruise (Figure 41).

Looking at differences in the four regions in Figure 40, we note region 1 locations were in shallower water compared to the other regions; however, if we compare the three regions at ~18 m there still is a greater spread of relative densities as one goes south (regions 1 to 7).

The largest deviations were observed in region 7 (August 11, 2011). We examined the seasonality of these differences by plotting, in Figure 42, the difference in seawater density between the surface and the deepest sample (denoted "Δ-Density"). The late summer months (July through October) saw higher Δ-Density values (more stratification), but February also exhibited high Δ-Density in regions 6 and 7. While these differences do exist, a generalization that winter months are always characterized by a well-mixed (unstratified) water column does not seem to be justified by these data.

4.2.6 An Upwelling Event

We now examine nitrate and temperature data with depth in Figures 43 and 44. Note the data in region 7 on August 11, 2011: the nitrate concentration is elevated, while the temperature is decreased. Ammonium does not show an increase at depth. This cruise (August 11, 2011) is indicated in Figure 20 as a fortuitous sampling of a low-temperature event. Because deeper water was characterized by increased nitrate concentration, little or no change in ammonium, and decreased temperature (as we saw in Figure 11), we interpreted the data for August 11, 2011 as an example of upwelling of deep water (Gulf Stream water) into the coastal ocean (see section 1.4.2 and Figure 20). This is of significance because this mechanism appears to be capable of exposing benthic habitats to elevated nutrients. Recall that the area covered by region 7 includes the second and third reef tracts.

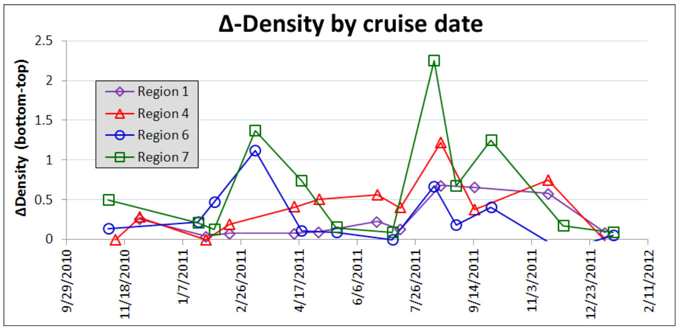

Figure 42. Density differences (bottom–top) for four regions, versus cruise date. Sample locations most affected by inlets and outfalls.

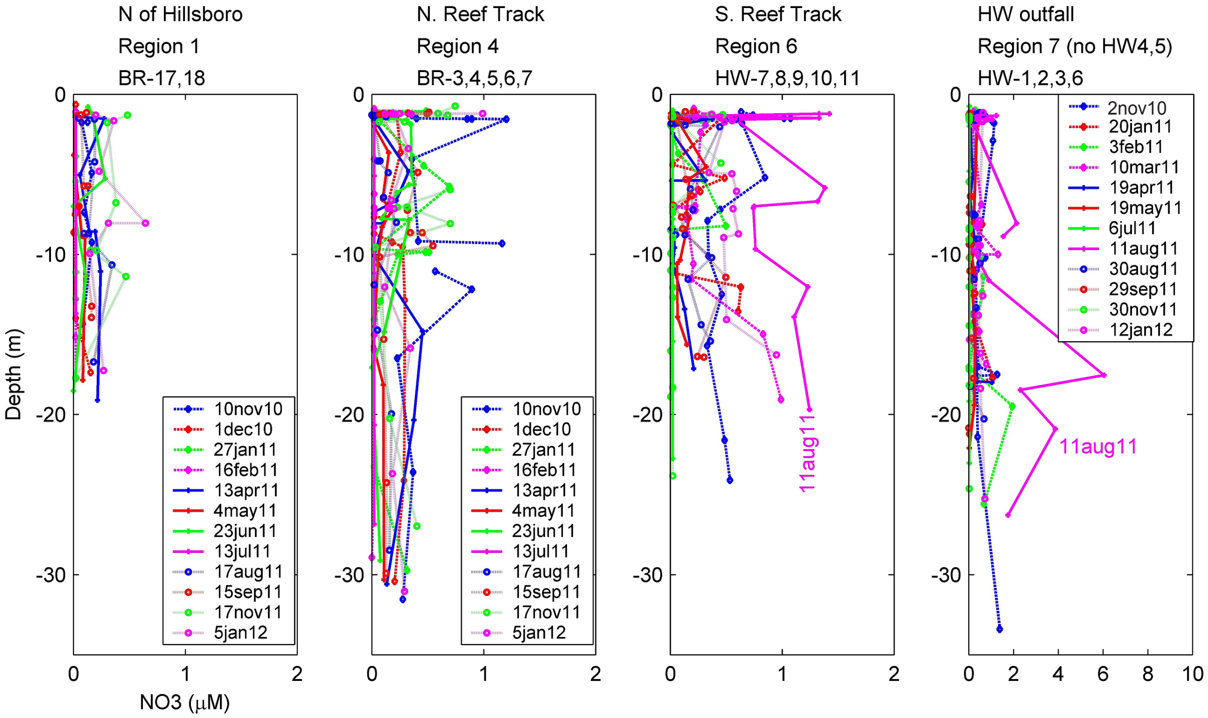

Figure 43. Profiles of nitrate concentrations from regions 1, 4, 6, and 7. Data from sites impacted by the Hollywood outfall (HW4 and HW5) have been removed from region 7. Format and cast designations are the same as in Figure 40.

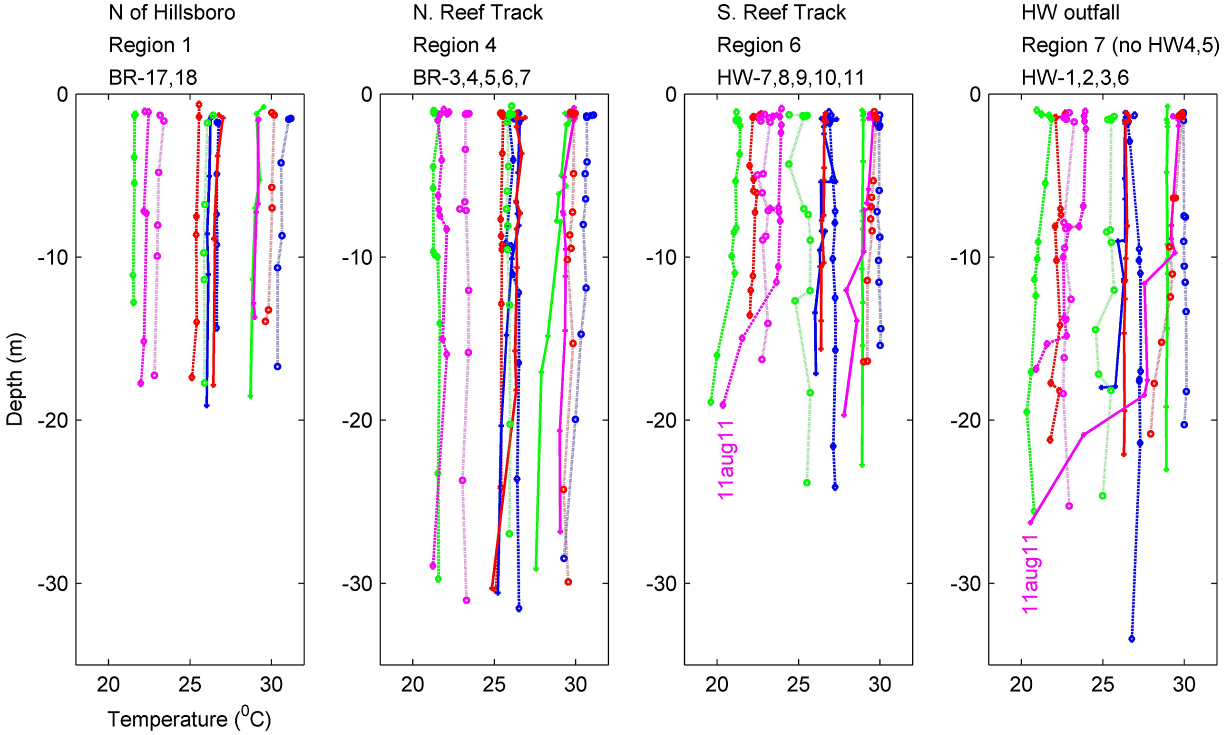

Figure 44. Temperature profiles from regions 1, 4, 6, and 7. Format and cast designations are the same as in Figure 40. Note the nearly 10° drop in the August 11, 2011 data.

The upwelling signal occurred in the southernmost Hollywood sampling sites, which include the outfall (HW4). Contour plots are deceiving unless a carefully gridded (geographically) data set is obtained; however, in Figure 45 we observe a contour plot of the temperature data of the deep samples from the August 11, 2011 cruise; the contour provides a reasonable view of the plume, showing the lowest temperatures at sites HW2, HW4, and HW5.

The mechanism of upwelling is described in Figure 46. It is well known that deep water has higher concentrations of nutrients (Figure 11). Meanders of the Gulf Stream move deeper water into the shoaling coastal seashore, bringing these excess nutrients into the Florida reef tract.

What kind of materials does the upwelling mechanism bring to the reef tract? Table 17 shows the average of all HW1, HW2, HW3, HW4, and HW5 samples minus the average of all samples (separated into surface, middle, and deep

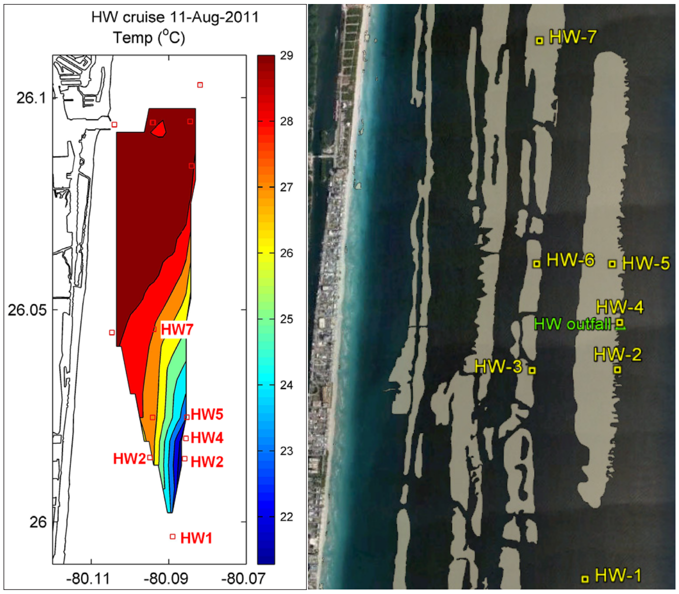

Figure 45. Left: Contour of temperature data from the deep samples, August 11, 2011 cruise. Right: Location of sites over a rendering of the reefs (Broward County LADS [Laser Airborne Depth Sounder] bathymetry).

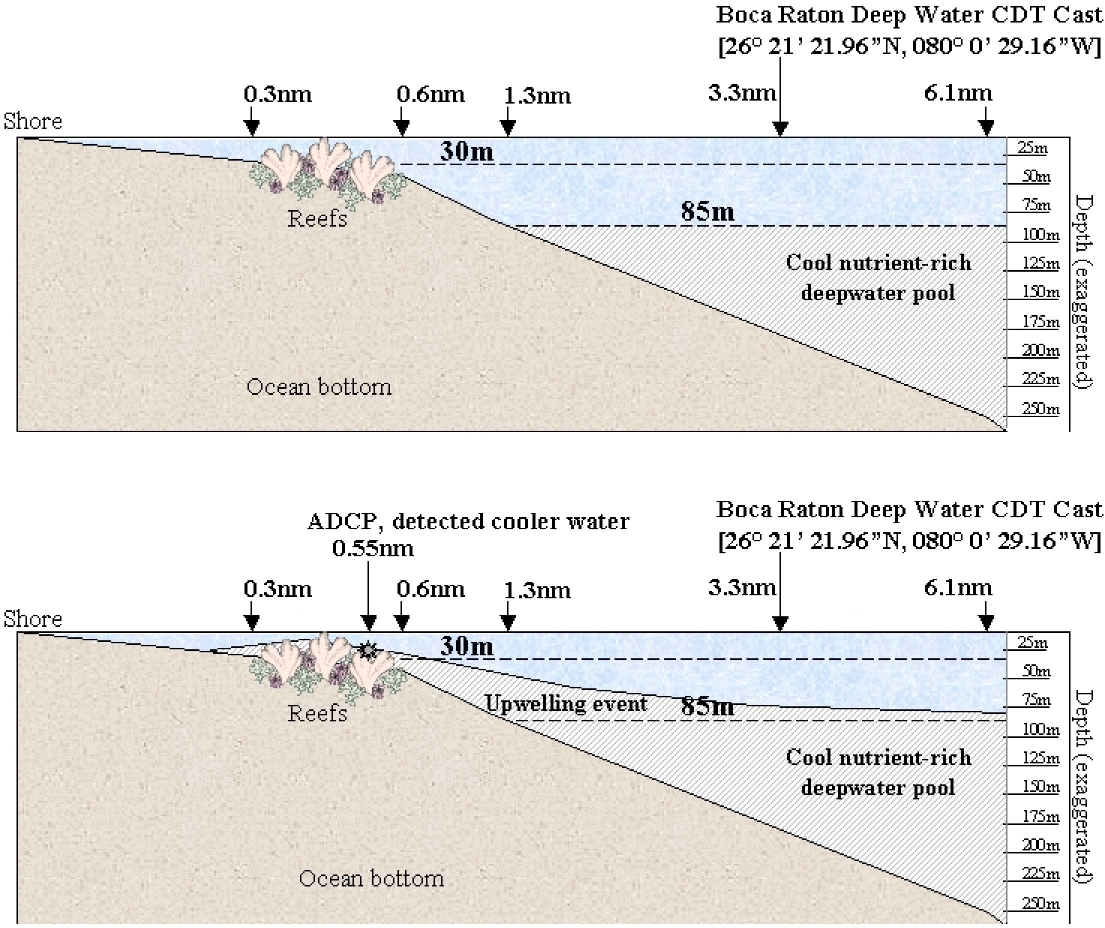

Figure 46. Graphic depiction of upwelling (lower panel) compared to typical conditions (upper panel) in the coastal ocean.

samples) for 13 different analytes. We note the upwelled concentrations of DIN (5.4 µM) and PO_4 (0.27 µM) exceed LaPointe's nutrient thresholds[116] (~1.0 µM and 0.1 µM respectively).

The duration of the event could not be precisely determined by the data as gathered, as no long-term monitoring instrument was installed in the area of the event. We did, however, examine the temperature traces of installed ADCP units (Figure 47); in particular, the ADCP operated by Hazen and Sawyer at the Broward outfall (see Table 10). The event was estimated at about 6 day's duration (green line, Figure 47). Four other similar-looking events were not sampled. Currents during the upwelling event were northerly (Figure 48).

Did the outfall plume confound the unambiguous observation of the upwelling? We examined this point in Figure 49, in which any temperature anomaly due to the outfall plume should be evident: the difference in temperature (deep samples only) from the annual average was plotted for the five southern Hollywood sites. The drop in temperature on August 11, 2011 was unmistakable and occurred at all five sites. Except for that date, however, the outfall measurements (HW4) were not noticeably cooler or warmer than the other sites across the year, and we concluded that the outfall plume did not measurably affect the temperature of the measurement at depth, even measurements as near as we could manage to be in the plume.

Table 17. Nutrient concentrations from the August 11, 2011 upwelling event.

Sample	Salinity psu	Temp °C	Density kg/m³	O_2 sat mg/L	ChlorA µg/L	TSS mg/L	Turb NTU	NO_2 µM	NO_3 µM	NH_4 µM	DIN µM	PO_4 µM	Si µM
S-ave (non-UW)	35.93	29.47	22.25	6.24	0.70	0.39	1.58	0.11	0.96	1.49	2.56	0.03	1.48
S-ave (UW)	35.92	29.51	22.23	6.24	0.61	0.30	1.85	0.09	0.61	1.70	2.41	0.03	1.23
S-excess	-0.01	0.04	-0.02	0.00	-0.09	-0.10	0.26	-0.02	-0.35	0.22	-0.15	0.00	-0.26
M-ave (non-UW)	35.95	29.21	22.36	6.27	0.79	0.32	1.98	0.06	0.94	2.08	3.08	0.03	1.60
M-ave (UW)	36.03	28.49	22.66	6.34	0.53	0.29	1.96	0.16	1.34	1.28	2.79	0.07	1.39
M-excess	0.08	-0.72	0.30	0.07	-0.26	-0.03	-0.02	0.10	0.40	-0.80	-0.29	0.04	-0.22
D-ave (non-UW)	36.04	28.40	22.70	6.35	0.62	0.38	1.87	0.09	1.25	1.62	2.95	0.03	1.36
D-ave (UW)	36.19	23.23	24.44	6.93	0.35	0.36	1.80	0.33	4.78	1.64	5.40	0.27	2.53
D-excess	0.15	-5.17	1.74	0.58	-0.27	-0.02	-0.07	0.25	3.54	0.02	2.45	0.24	1.18

S, M, and D refer to surface, mid, and deep samples. S-ave(all) denotes the average of all surface samples during the entire experiment; S-ave(upw) denotes the average of HW1, HW2, HW3, HW4, and HW5 samples; S-excess is the difference (S-ave(upw) minus S-ave(all)).

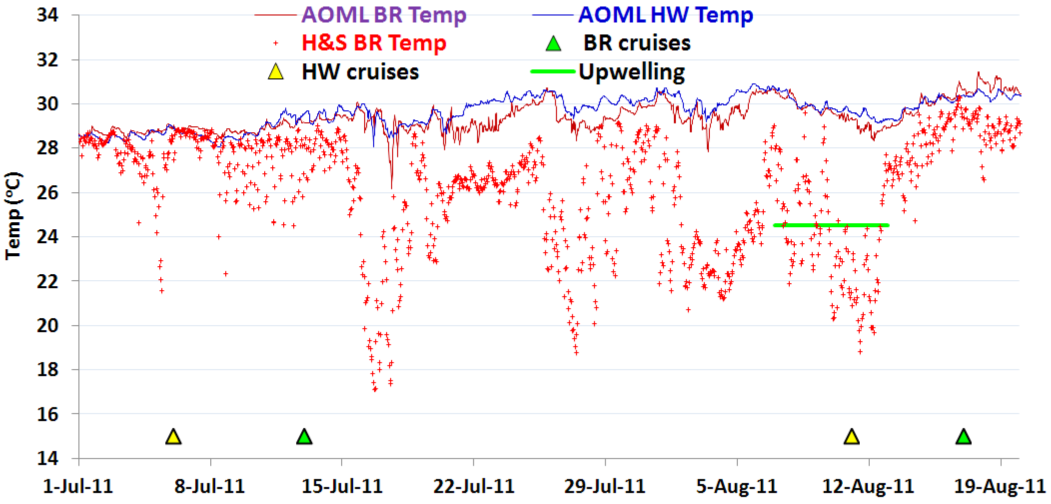

Figure 47. ADCP temperature traces, July 1-August 19, 2011. Green line denotes the width of the low-temperature event as measured by the Hazen and Sawyer ADCP at the Broward outfall. Triangles denote times of the FACE cruises.

4.2.7. "Background" Concentrations

Regions 1, 4, and 6 were designed to characterize areas distant from point sources of pollution. We may then posit that the average of those concentrations define a kind of coastal waters "background," and are the receiving waters for point sources such as inlets and outfalls. These concentrations are shown in Table 18 for key analytes at the three depths.

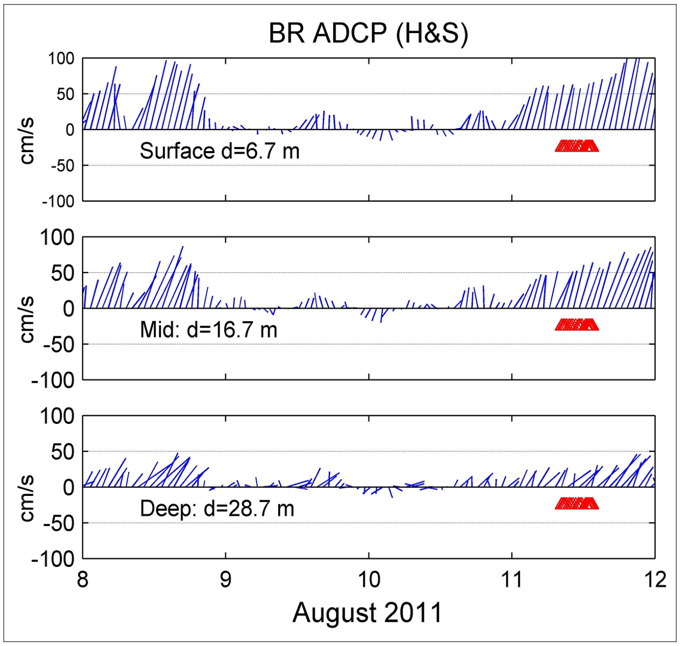

Figure 48. ADCP current measurements from the Hazen and Sawyer Broward instrument. The three panels show current arrows (showing direction current was moving towards) from surface, middle, and deep locations in the water column. Red symbols denote time of casts.

4.2.8 Influence of Ocean Outfalls

What effects on the coastal ocean can we ascribe to the Broward and Hollywood ocean outfalls? The Broward outfall is quite close to the Hillsboro Inlet, while the Hollywood outfall is some 8.5 km south-southeast of the Port Everglades Inlet (Figure 16). Both are located at ~30 m depth (Table 8) just east of the third reef tract.

Because the current is primarily northerly or southerly, the effluent plume will be advected primarily in those directions. To sample the plume, a subset of the sampling sites was selected with sites south, at, and north of the outfalls, as shown in Figure 50. We examined how the concentrations measured in those samples may have been influenced by the outfall plumes.

Figures 51 and 52 plot the concentrations of some useful analytes versus distance from the outfall. The linear axis implies a linear north-south sequence which includes the boil, which is only true for the three points around the x = 0 axis. Other than those three points, some locations are nearer shore (and thus in shallower water, e.g., BR8) than the outfall. They may not be located in the midpoint of an effluent plume, and the influence of the inlet (on BR17) can be important. Nevertheless, the data provide unique insights into plume behavior.

Salinity. In coastal seawater, salinity increases with depth due to the mixing of fresh continental water into the surface waters. The outfall plume is fresh at the pipe terminus and will mix with seawater as it rises. Thus, nearly all the traces

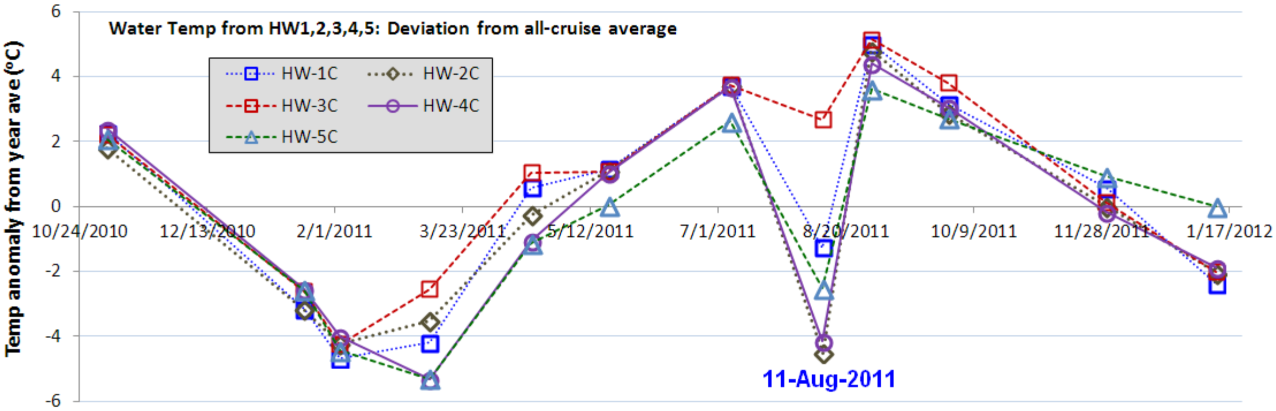

Figure 49. Temperature anomalies of deep samples from HW1, HW2, HW3, HW4, and HW5. Each point represents the difference between the sample temperature and the annual average temperature from all five sites. HW4 (purple circle, solid purple line) is the outfall.

Table 18. "Background" concentrations for key analytes at three depths.

		SURFACE		MIDDLE		DEEP	
Analyte	**Unit**	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
Salinity	psu	35.90	36.10	36.04	36.11	36.07	36.13
Temp	°C	26.34	26.52	26.25	26.37	26.04	26.34
DIN	µM	1.31	0.91	1.31	0.87	1.30	0.94
O_2 sat	mg/L	6.58	6.54	6.59	6.55	6.61	6.56
pH	Units	8.08	8.09	8.11	8.13	8.10	8.12
ORP	mV	181.2	179.2	183.7	182.6	183.2	181.7
Chlor-a	µg/L	0.50	0.49	0.51	0.51	0.47	0.44
Phaeo	µg/L	0.14	0.13	0.14	0.13	0.16	0.15
TSS	mg/L	0.29	0.26	0.25	0.24	0.25	0.24
Turbidity	NTU	1.49	1.46	1.67	1.57	1.69	1.55
N+N	µM	0.31	0.21	0.27	0.19	0.33	0.24
NO_2	µM	0.08	0.08	0.09	0.06	0.08	0.07
NO_3	µM	0.23	0.13	0.18	0.10	0.25	0.16
NH_4	µM	1.00	0.63	1.05	0.65	0.98	0.61
PO_4	µM	0.02	0.01	0.02	0.01	0.02	0.02
Si	µM	1.02	1.05	0.95	1.10	0.98	1.10
TDN	µM	7.17	6.77	6.54	6.44	6.58	6.27
TDP	µM	0.53	0.12	0.32	0.11	0.48	0.12
PC	µM	7.18	6.87	5.71	5.66	5.61	5.41
PP	µM	0.02	0.01	0.01	0.01	0.01	0.01
PN	µM	0.86	0.81	0.76	0.78	0.63	0.63
DOC	µM	75.36	76.37	70.15	65.83	73.17	71.42
TP	µM	0.55	0.14	0.34	0.14	0.49	0.14
TN	µM	7.79	7.65	7.10	6.88	7.04	6.67
TC	µM	82.53	83.62	75.85	72.59	78.78	78.69

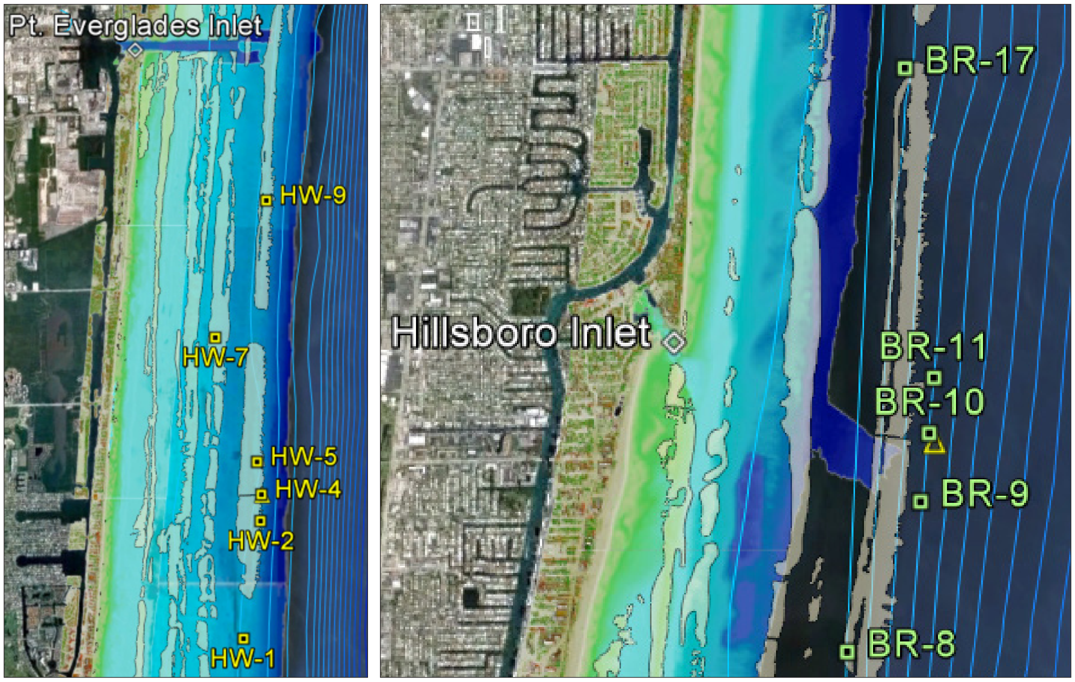

Figure 50. Sampling sites around the Hollywood (left) and Broward (right) outfalls (Google Earth). The Hollywood outfall is at location HW4.

showed a decrease in salinity near the outfall. The deep/winter spike at the outfall is counter-intuitive, but it is possible the sample bottle may have missed the outfall pipe. In Figure 52, the most distant Broward site (BR17) shows reduced salinity due to a single winter/surface measurement of 25.8 psu, possibly an instrument error. Without that measurement, the salinity deficit essentially disappears at <1 km, consistent with other salinity averages.

Temperature. The effect of the outfall plume on water temperature is small and generally negative, larger in summer and at depth, which is reasonable. The effluent must travel several kilometers through a pipe where it can equalize its temperature with the surrounding ocean.

pH. The effluent plume was found to be slightly acidic (lower pH) compared to the ambient coastal waters, with considerable scatter in the data, increasing with depth, but within the normal range of seawater (7.5-8.5). The acidity of effluent plumes can vary significantly; the Miami-Central effluent pH ranged from 6.2-9 in 1977.[117] The acidity of seawater, primarily controlled by equilibria with atmospheric CO$_2$, has significant implications for the biogeochemical capacity of the oceans in the support of life

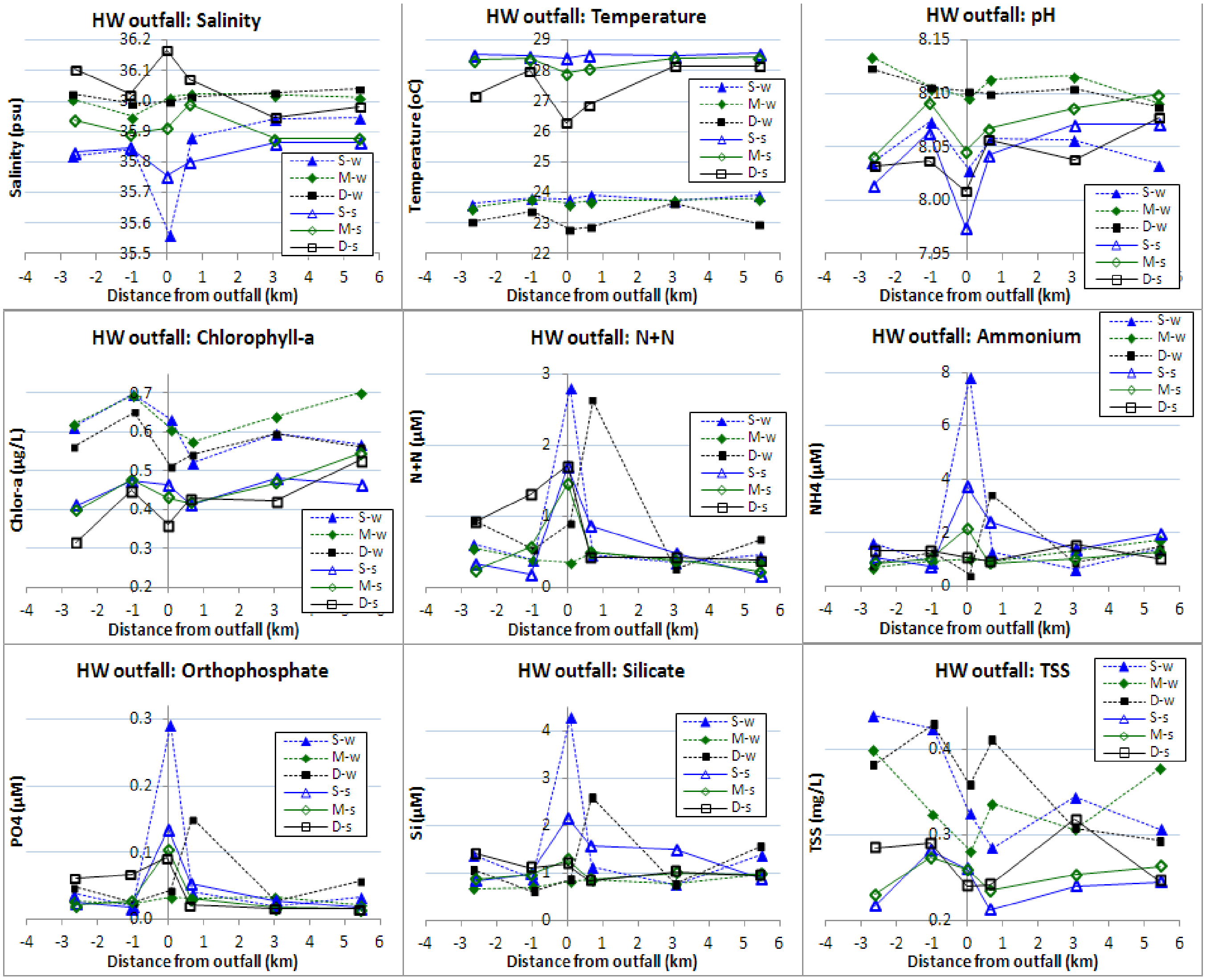

Figure 51. Concentrations of selected analytes around the Hollywood outfall for winter (dotted lines and open symbols) and summer (solid lines, filled symbols). Locations north of the outfall are plotted as positive distances.

(ocean acidification).[118] The outfall plumes did not appear to be problematic with respect to ocean acidity.

Chlorophyll-a. Chlorophyll-a is an indicator of photosynthesis and biomass production and is a key indicator of eutrophic response in EPA's numeric nutrient criteria approach. It is an approximate method because the many different phytoplankton species do not have the same fluorescence characteristics as does the calibration standard.[119] However, it is a widely used and informative measurement; the values listed here are typical of South Florida waters (the median concentration in the surface waters of the Florida Keys was 0.261 µg/L).[120] These results indicate a minimal effect of the plume on chlorophyll-a measurements above normal environmental variance.

Nutrients. Nutrients refer to the nitrate (NO_3^-), nitrite (NO_2^-), ammonium (NH_4^+), orthophosphate (PO_4^{-3}), and silicate ($Si(OH)_4$) in seawater.[48] These compounds are readily absorbed by phytoplankton and are thus a vital nutrient; excess nutrients may lead to eutrophication.[121] Elevated nutrients were observed at the outfall, especially at the surface, and decreased to a coastal "background" value, usually within 1 km.

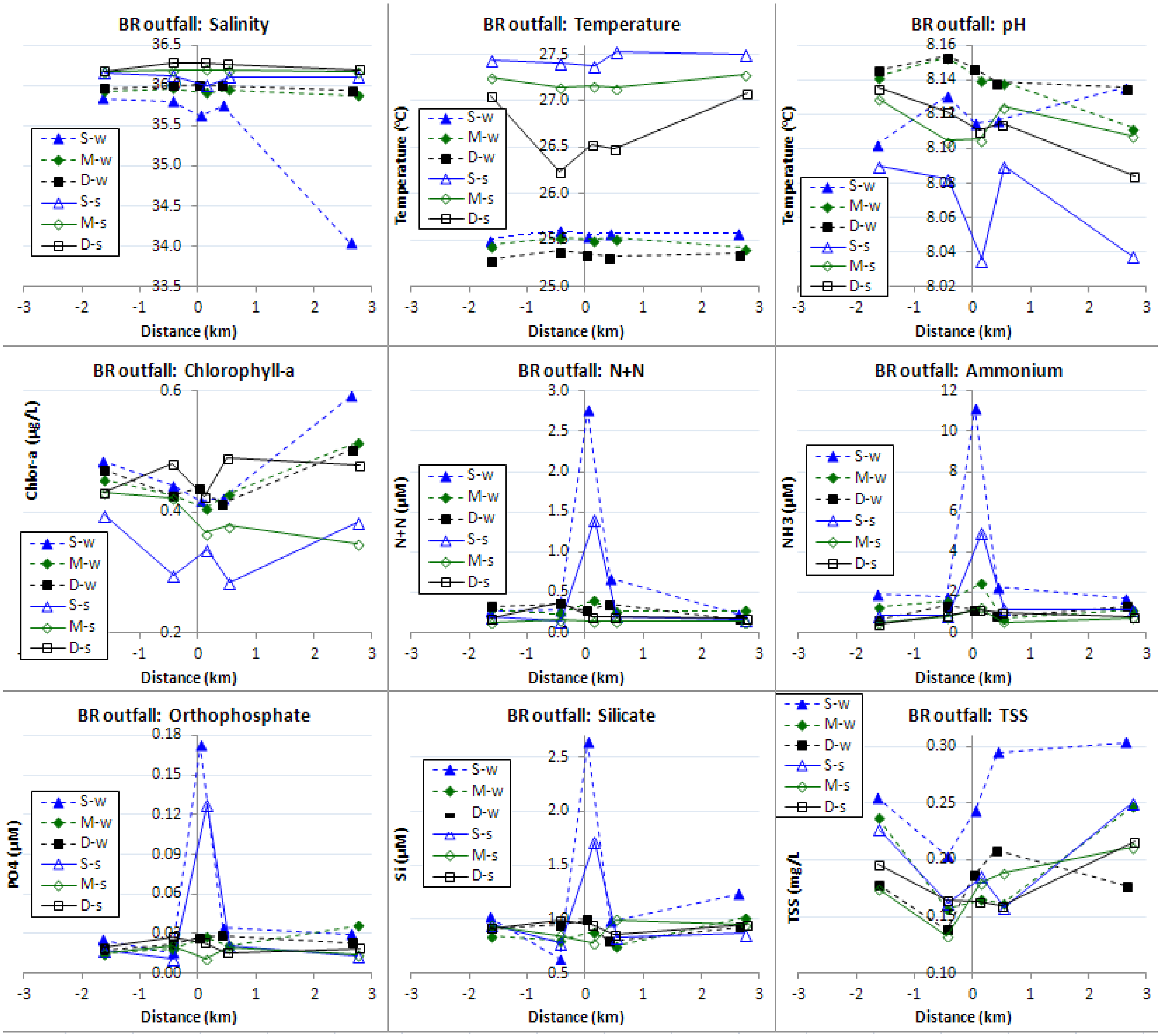

Figure 52. Concentrations of selected analytes around the Broward outfall. Format is similar to Figure 51.

Turbidity and TSS. Treated wastewater processing is a secondary treatment, which includes screening, grit removal, secondary clarification, and chlorine contact tanks prior to ocean disposal at both plants.[74] Reported TSS removal rates and concentrations in ocean-disposed effluent were 94%/136 mg/L at Hollywood and 97%/217 mg/L at Broward (turbidity values were not reported).[122] These steps were apparently effective; turbidity and TSS concentrations were not elevated near the outfalls (turbidity measurements are not shown).

Another approach to the data, which examines the downward movement of the effluent following its initial rise to the surface, is shown in Figure 53. In this figure, we plot the concentration versus depth to elicit evidence of the plume moving downward as it moves downcurrent. The Hollywood results were compromised by a single egregious data point from January 11, 2011 (resulting in the dotted green line, Figure 51); without that point, data consistent with the other sets of Hollywood data qualitatively gave the same result: while surface concentrations decreased within a kilometer or two of the boil, this occurred without increasing the concentration of the middle or deep samples.

These results (Figure 53), in both outfalls, showed a pattern in which elevated nutrient concentrations downcurrent from the boil were observed primarily at the surface near the outfall terminus, and decreased within ~1 km to concentrations similar to those found upcurrent of the outfall. The outfall plume did not appear to add substantially to the “background” concentrations of chlorophyll-a, TSS, or turbidity.

4.2.9 *Influence of Coastal Inlets*

We have seen that the outfalls strongly effect the measured nutrient concentrations but that these effects are seen to diminish downcurrent to a level corresponding to the concentrations upcurrent. We now examine the effects of the Port Everglades and Hillsboro inlets. The subsets of sampling sites used to characterize the inlets for Port Everglades were HW12, HW13, HW14, HW15, BR1, and BR2. For Hillsboro Inlet, the sampling sites were BR8, BR12, BR13, BR16, and BR17 (avoiding sites BR10 and BR11 that will be strongly influenced by the Broward outfall).

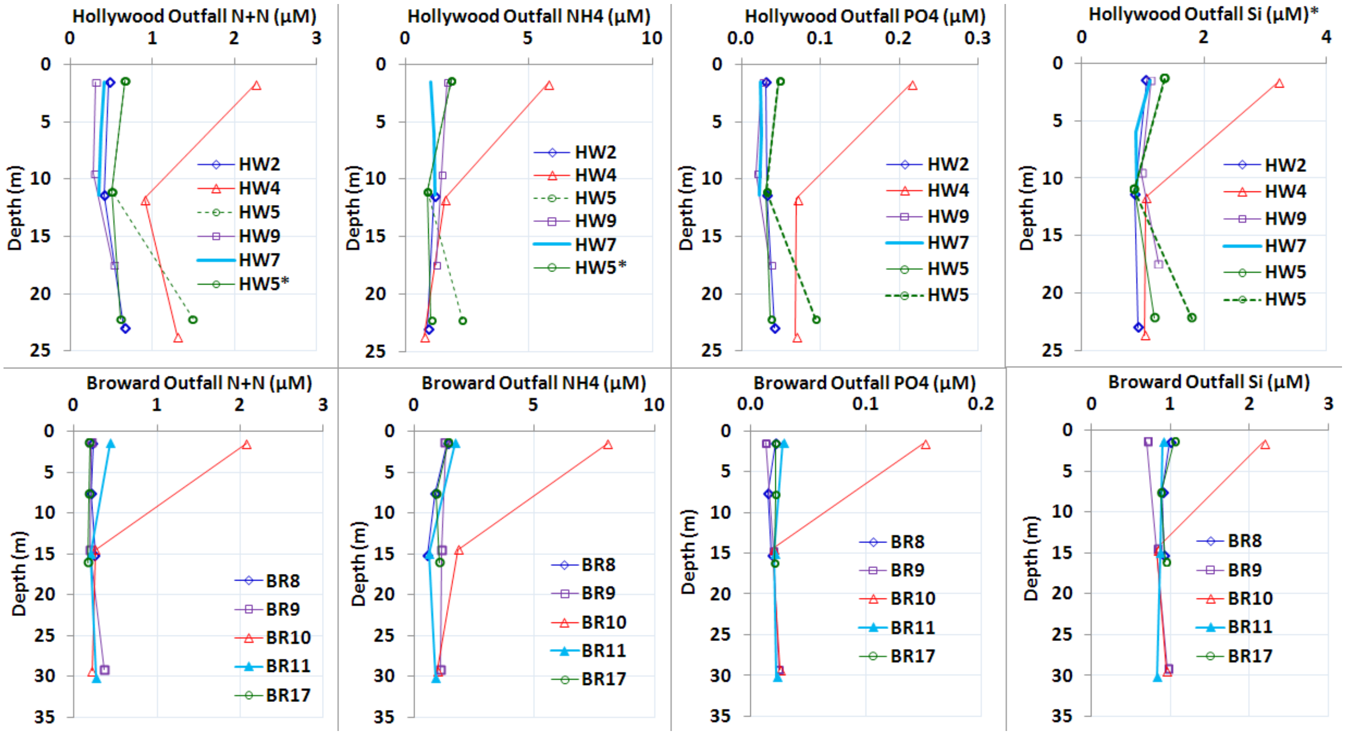

Figure 53. Concentration versus depth for the Hollywood (upper panels) and Broward (lower panels) sample sites around the outfalls (as noted in legend). The HW5 dotted line includes a possible outlier from January 11, 2011; the solid line excludes the possible outlier. The red line represents data from the outfall site.

We wished to characterize the plume and consider its effect on the coastal ocean. While every attempt was made to sample in the vicinity of the inlets during ebb tide flows, that goal could not be met with precision each time. A sample site was chosen for each inlet and the ebb tide water sampled; this site was BR1 for Port Everglades Inlet and BR13 for Hillsboro Inlet. We compared the concentrations of many analytes from those sites in Table 19 and Figure 54; clearly, note that Port Everglades Inlet analyte concentrations exceeded that of Hillsboro Inlet, often substantially and most likely a reflection of the considerable shipping activities that occur in the former compared to the latter. While concentration data are instructive, we cannot provide a flux computation because inlet flow was not being measured at the time of the sampling cruises.

Table 19. Ebb tide concentrations measured at three inlets.

Analyte	Unit	Port Everglades (BR1)	Hillsboro (BR13)	Port Everglades/ Hillsboro
Depth	m	1.36	1.49	91.1%
Salinity	psu	34.54	35.27	98.0%
Temp	°C	26.33	26.47	99.5%
Density	kg/m^3	22.23	22.72	97.9%
pH	Units	7.94	8.03	99.0%
O$_2$ sat	mg/L	6.63	6.60	100.6%
Si	µM	7.07	2.93	241.1%
DIN	µM	3.29	1.73	189.6%
Turbidity	NTU	3.13	2.34	133.9%
NH$_4$	µM	1.67	1.17	142.4%
Chl-a	µg/L	1.45	0.99	146.8%
NO$_3$	µM	1.36	0.43	156.8%
TSS	mg/L	1.03	0.66	
NO$_2$	µM	0.26	0.14	192.1%
PO$_4$	µM	0.11	0.07	151.7%

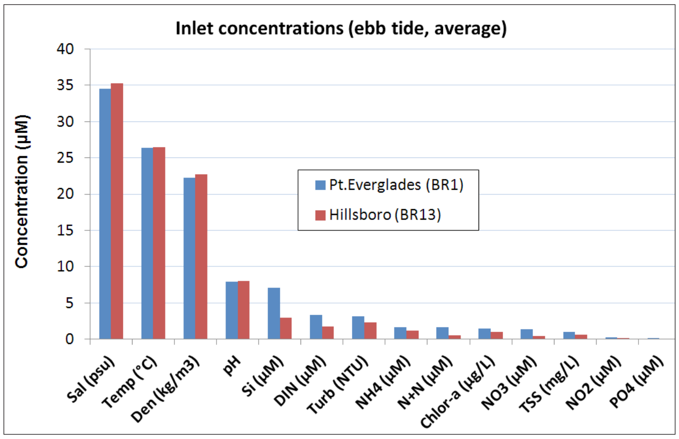

Figure 54. Average concentrations from the Port Everglades and Hillsboro inlets, as measured.

How fast does the dilution decrease away from the inlets? We examined the characteristics of the plume as it entered the coastal ocean. A straightforward approach was to plot the averaged concentrations of various measured analytes versus distance from the mouth of the inlets. The results are shown in Figure 55 for seven selected analytes (surface concentrations). Note that some of the sampling sites were west of the inlets, i.e., within the respective lagoons; these are given negative distances in the following plots. As expected, the high lagoon and inlet concentrations decreased as the plume entered the receiving waters. From Figure 55 it can be seen that perturbations on the coastal ocean environment due to the inlet could not be observed past ~1.5-2 km downcurrent of either inlet (the data density was not sufficient to be more quantitative with respect to distance).

4.2.10 Elemental Ratios

Stoichiometric (elemental) ratios of various chemical species and their role in ecosystem studies were introduced in section 1.5.1. The actual calculation of N:P ratios is simple: if the concentration is given in molar units (e.g., µM), we may compute the molar ratios (e.g., N:P) as µM [N]/µM [P]; if this is >16, we have [N] in excess over P, and the ecosystem is considered to be P-limited. Figure 56 shows some N/P ratios from coastal measurements.[48] If the [N]/[P] ratio is <16, there is insufficient N and the system can be considered N-limited.[123]

Nutrients exist in dissolved inorganic, dissolved organic, and particulate organic forms; conversion between the various forms takes place at varying time scales.[124] Because particulate nutrients are less readily available to phytoplankton, the dissolved ratios better represent what is available biologically. In Figure 57 we observe that for both TN/TP and DIN/PO$_4$ the ratios were >16, indicating that for these samples phosphorus is the limiting nutrient for phytoplankton production. This is in agreement with other studies of fresh and coastal waters in Florida.[125] The question of N or P limitations is quite complex due to the variety of the chemical forms N and P can take and the variety of nutrient sources and sinks in coastal waters. Different approaches to studying N and P limitations have been devised, including dosing experiments and whole-ecosystem historical analyses (for a review, see Howarth and Marino, 2006).[126] The analysis included here is meant to be a contribution to the understanding of N and P limitations in the test area.

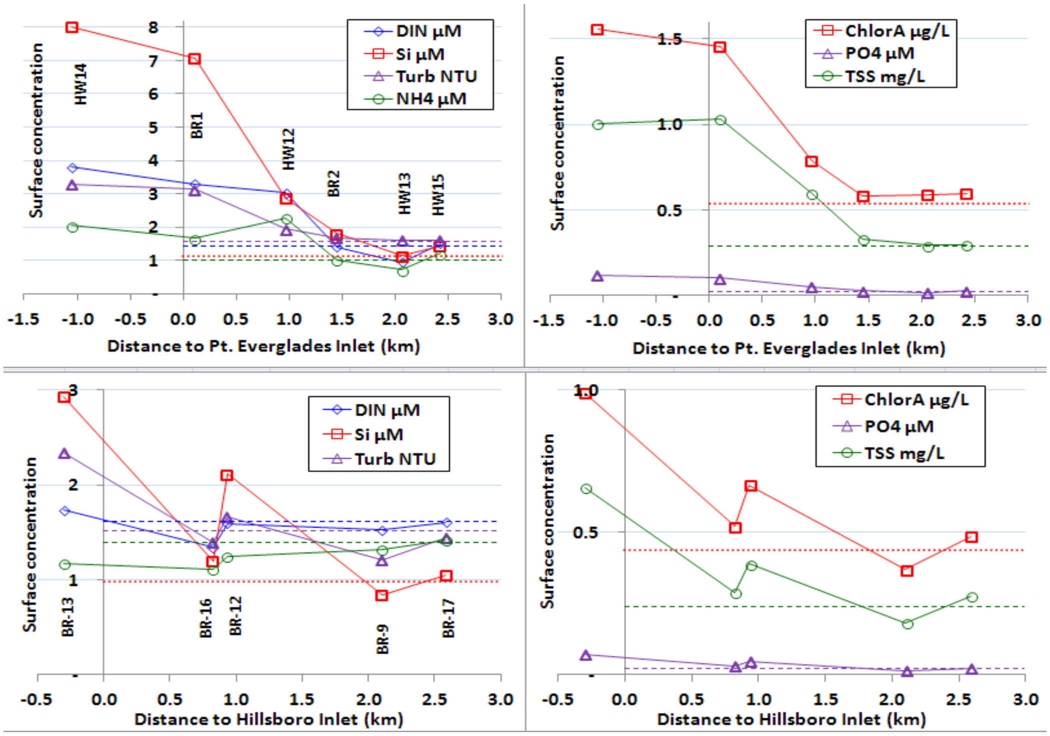

Figure 55. Concentrations of noted analytes versus distance from the mouth of the inlets. Upper: Port Everglades Inlet. Lower: Hillsboro Inlet. Identity of analyte is indicated in the legend. Dotted lines (with appropriate color) indicate the concentration of the upcurrent site (HW7 and BR8, respectively) more distant from the inlet.

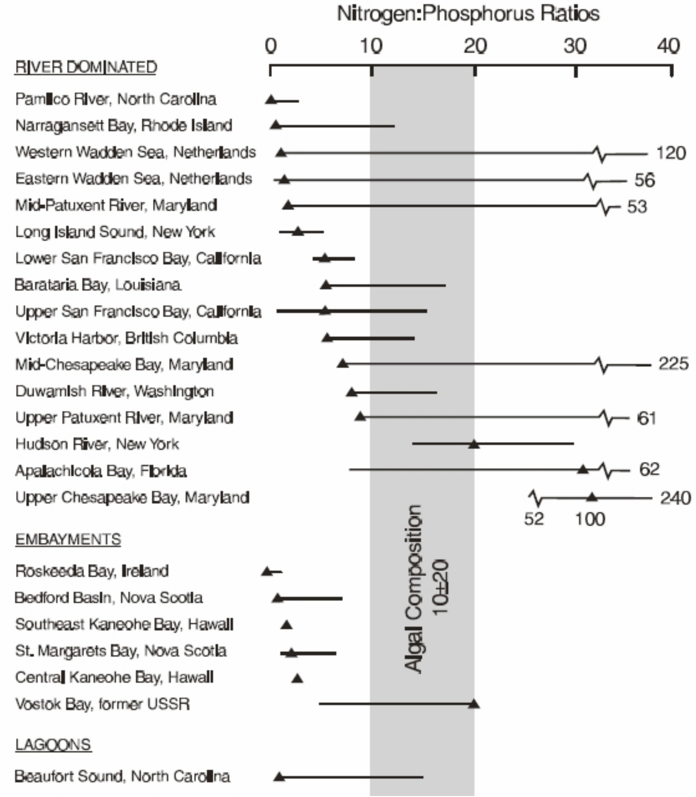

Figure 56. Nitrogen:phosphorus ratios from various coastal ecosystems (from EPA, 2001).[48]

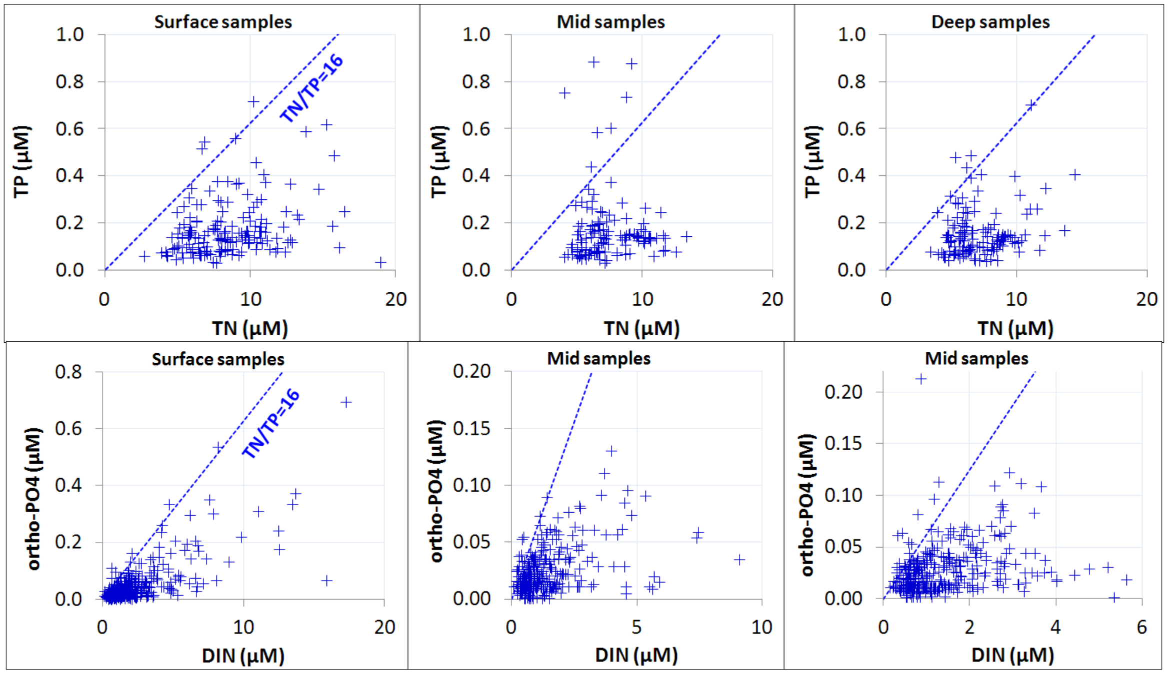

Figure 57. Upper plot: Concentrations of total phosphorus (vertical axis) and total nitrogen (horizontal axis) for surface, middle, and deep water samples. Lower plot: A similar plot for orthophosphate versus dissolved inorganic nitrogen. Blue line denotes the TN/TP = 16 ratio.

We now consider the relationship between salinity and the key nutrients DIN and PO_4 (Figure 58). These waters are generally oligotrophic;[1] this is the optimal condition but may be impacted by terrestrial sources.[123] These sources should correlate positively with salinity. We observe in Figure 58 that most of the measurements of DIN (or PO_4) were not correlated with salinities; the exceptions are marked "A" or "B." For the "A" points, most of these were from the Broward or Hollywood outfall. Although both inlets and outfalls were fresher than seawater, the outfall plumes had ~0 salinity, but this water was rapidly diluted by the receiving waters; the results are the "A" points, with elevated nutrients with, essentially, seawater salinity. The inlets were characterized by reduced salinity due to the addition of fresh terrestrial waters to the tidal flow; the fresh waters were also elevated in nutrients. The results are the "B" points. That these elevated nutrient concentrations in "A" or "B" were not observed in the other regions denoted in Figure 58 is another indication of the rapid dilution of these nutrients (and salinities) within the coastal ocean.

As noted above, chlorophyll-a measurements provide a metric of phytoplankton photosynthesis and biomass production.[48] A related measurement is that of phaeo-pigments, an estimation of grazing (produced by microzooplankton and macrozooplankton grazers).[127] Chlorophyll-a:phaeopigment ratios >1 are typical of coastal Florida non-bloom conditions[128] and are observed in Figure 59 (left panel). No significant relationship was observed between chlorophyll-a and either DIN or PO_4 (Figure 59, center and right panels).

Another sign of eutrophication is oxygen deficiency (hypoxia). A sufficient supply of dissolved oxygen (DO) in water is vital to marine ecosystem health. DO in water is increased by photosynthesis or by mixing with air; a rapidly flowing stream is probably fully saturated. DO is reduced by consumption; for example, waters with excess nutrients may experience algal blooms (eutrophication) which, when consumed by bacteria, lead to hypoxia. DO is measured by titration (Winkler method) or by membrane or optical (optode) sensors. DO can be reported as a concentration (i.e., mg/L) or as a percentage of the saturation at a given temperature and salinity.

Recently, the FDEP has revisited the standards for Florida waters for DO, with separate standards for fresh and marine waters.[106] The proposed standard for the revised DO criteria for Florida's Class II and III marine waters is that the daily average percent DO saturation shall not be below 42% of saturation; the 7- and 30-day average percent DO saturations shall not be below 51 and 56%

saturation, respectively (this is a change from the previous concentration limits).

Although DO has not been flagged as an issue with the region of the coastal ocean investigated in this study, we examined our DO measurements in light of the above discussion from FDEP. We converted the mg/L units to percent saturation for the suite of data using the Benson and Kraus equations (http://water.usgs.gov/admin/memo/QW/qw11.03.pdf). The data are shown in Figure 60. The DO was nearly 100% regardless of depth. The lowest %DO measurements, all greater than 86%, were found in reef samples during the winter (BR4B, 17-Nov-2011; HW15C, 30-Nov-2011; BR17A, 1-Dec-2011; and HW2A, 20-Jan-2011). Thus, these measurements indicate no evidence for hypoxia in these waters.

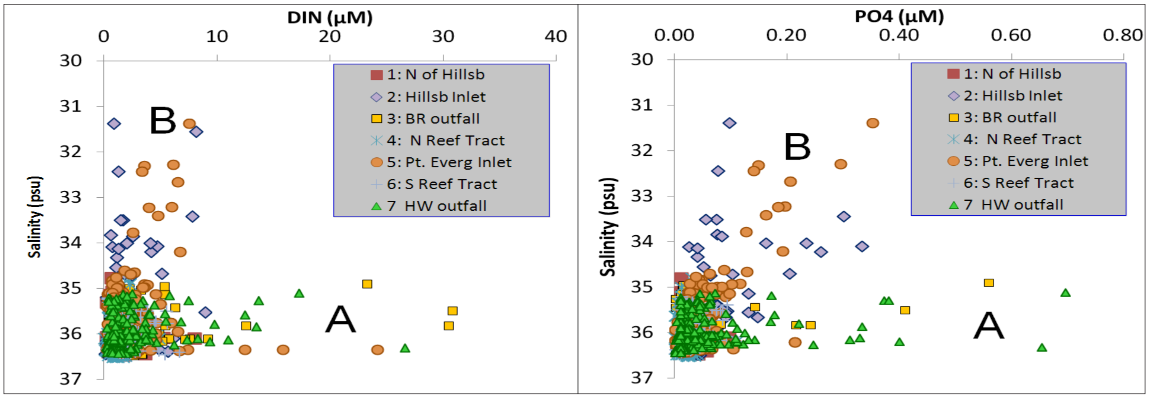

Figure 58. Salinity versus dissolved inorganic nitrogen (left) and salinity versus orthophosphate (right), with separate symbols for samples from the seven regions. Salinity is plotted with reversed axes (fresher water is up). Data points marked “A” are generally from the Broward and Hollywood outfalls, while those marked “B” are generally from the Hillsboro and Port Everglades inlets.

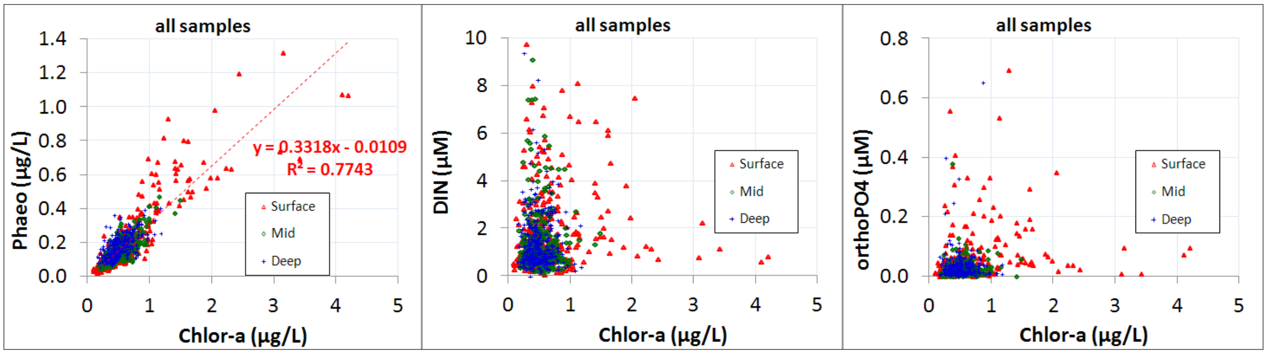

Figure 59. Ratios of phaeopigments (left panel), dissolved inorganic nitrogen (center panel), and orthophosphate (right panel) versus chlorophyll-a concentration, for surface, middle, and deep samples as noted. Red line in left panel is the regression of the surface phaeopigments against chlorophyll-a.

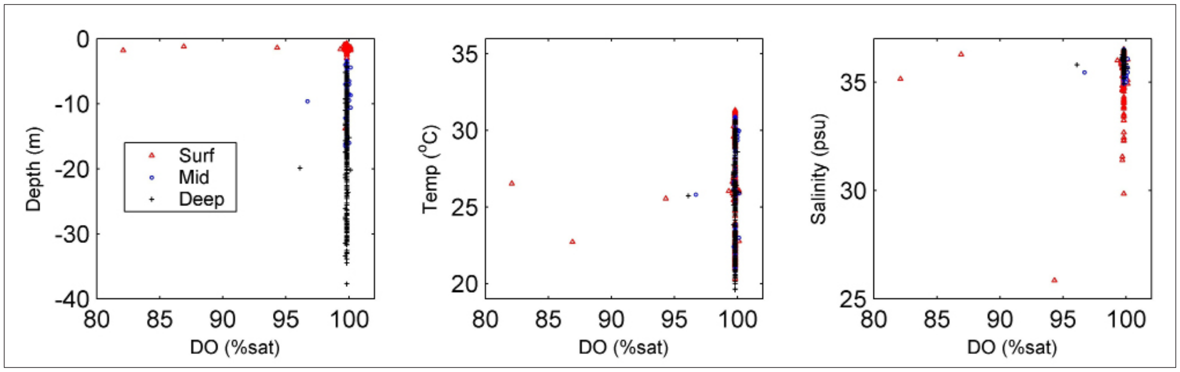

Figure 60. Dissolved oxygen (as percent saturation) data from three depths versus depth, temperature, and salinity.

5. Tracer Studies

Tracer studies were conducted at the two outfall sites to estimate the vertical and horizontal mixing of their respective plumes, especially in relationship to the reef tracts in the plumes' downcurrent extent.

One study was conducted at the Hollywood outfall on July 9, 2012 (a previous study at Hollywood was conducted in 2005),[129] and two studies were conducted at the Broward outfall on November 7 and 28, 2012. In each study, rhodamine-WT dye (RD) was controlled with the goal of providing dye flow at the treated-wastewater plant proportional to the effluent flow out of the plant. The dye was added at the last accessible location in the flow stream prior to its proceeding into the outfall system. The dye was added to the effluent stream for several hours and monitored by two small boats, the R/V *Cable* and R/V *Hildebrand*. The *Cable* was instrumented with a down-looking ADCP instrument for current measurements, as well as for backscatter signals from the plume. The *Hildebrand* obtained discrete water samples from a CTD/rosette system; the boat was also equipped with a flow-through system for continuous measurement of dye as the ship proceeded. The *Hildebrand's* track criss-crossed the plume; the *Cable* performed wide-ranging current and backscatter surveys and performed various logistical duties. In addition, instrumentation for the dye and other measurements were deployed on moorings at selected locations north of the outfalls to record continuous measurements throughout the experiment. An additional mooring outfitted with an ADCP instrument was deployed near each outfall for local current measurements during the experiment.

5.1 Hollywood Tracer Study

Dye dosing equipment was installed on the upper deck of a room in the Southern Regional Wastewater Treatment Plant (1621 N. 14th Avenue, Hollywood Florida) (**Figure 61**). The day of the study (July 9, 2012) was characterized by medium-height tides (Figure 62). The dye (Organic Dyestuffs Corporation, East Providence, RI) was pumped by an Ismatec® MCP-Z pump at a rate noted by the instrument at about 95 ml/min beginning at 3:55 am. Dye was first observed at the boil at 7:45 am, so that the transfer time from the dosing area to the outfall was ~3.8 hours. It became clear that the instrument flow readout was incorrect; dye was flowing faster than the reading and all dye had been pumped out by approximately 9:39 am. Observers on the R/V *Cable* noted that the sea was exceptionally red at the beginning of the surface expression of the plume (i.e., before the *Hildebrand* began sampling). In retrospect, it is clear that the flow of dye was not well controlled, and that most of the dye flowed out at or near the beginning of the dosing (and was thus not sampled by the boats), but remained steady subsequently. We do have measurements of the boil, so that the major unknown introduced by the dosing error is the computation of the initial dilution.

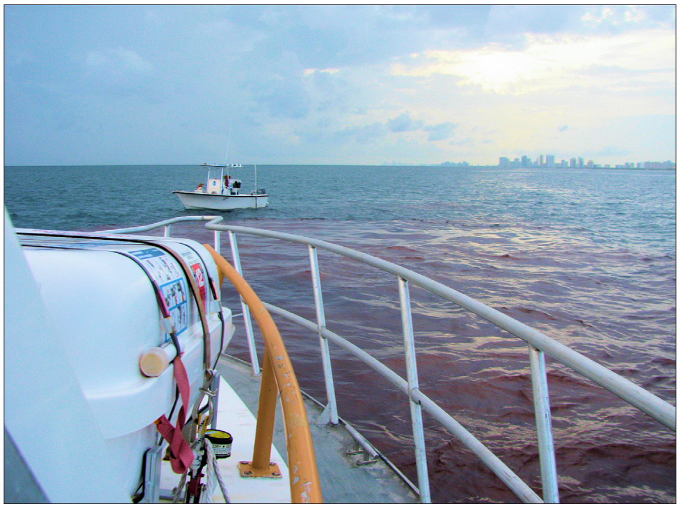

Figure 61. Top: Interior of room showing deck where dosing equipment was installed. Bottom: Dye plume observed from aboard the R/V *Hildebrand* with the R/V *Cable* in view.

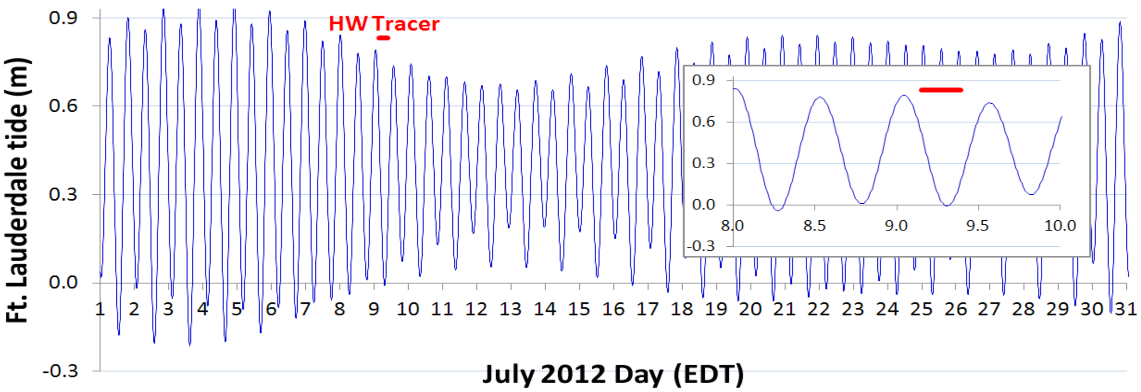

Figure 62. Tides at Fort Lauderdale (WX Tides, http://wxtide.softonic.com/) during July 2012. The time of the Hollywood tracer study is denoted in red. Inset shows detail of July 9, 2012.

On July 9, 2012, the wind was generally from the southeast at ~4.2 m/s (9.3 mph), shifting clockwise (anticyclonic) to give wind from the east during the study (Figure 63). Because the plume was on the surface, the wind moved the surface expression of the plume accordingly (i.e., towards the northwest or west-northwest). Three moorings were deployed as shown in Figure 64 and Table 20. Two types of instruments were deployed, the YSI (Yellow Springs, OH) and Cyclops C-6® (Turner Designs, Sunnyvale, CA). The YSI instrument measured rhodamine dye, turbidity, chlorophyll, DO, pH/oxidation-reduction potential (ORP), conductivity, and temperature; the C-6 measured rhodamine dye, chlorophyll, turbidity, CDOM, and temperature.

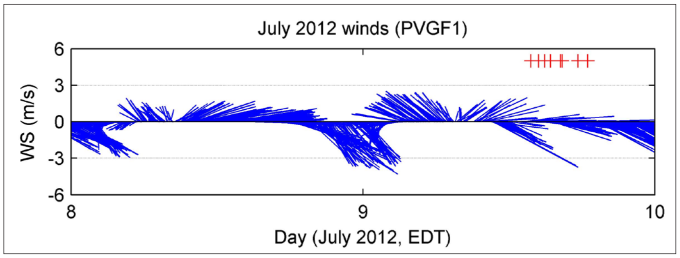

Figure 63. Winds as measured at buoy PVGF1, Port Everglades Inlet (meteorological convention; wind arrows show direction wind is coming from). Red symbols indicate times of CTD casts.

Currents measured at the moored sites were strongly northerly; currents measured by the nearshore ADCP were nearly zero during the experiment, becoming northerly at the end of the experiment (Figure 65).

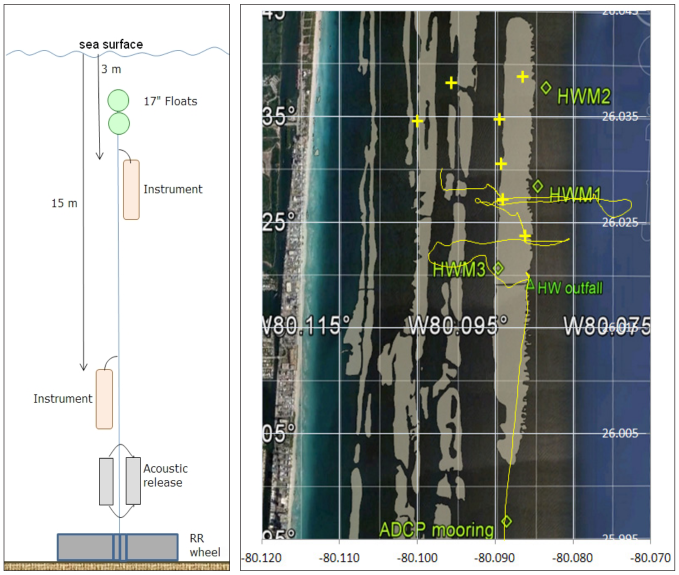

Figure 64. Left: Idealized drawing of mooring. Right: Map showing moorings HWM1, HWM2, and HWM3 (diamonds), CTD casts (+), and ship track (yellow line) during the Hollywood tracer study.

Table 20. Moorings and instrumentation for the Hollywood tracer study.

	HWM1	HWM2	HWM3	Flow-Through
Instrument	YSI	C-6	C-6	C-6
Middle	S/N: 01G0639AD	S/N: 2600204	S/N: 2600207	S/N: 220144
Bottom	S/N: 01G0639AC	S/N: 2600208	S/N: 2600262	--------
Latitude	26°1.6930	26°2.2505	26°2.2291	R/V *Hildebrand*
Longitude	80°5.0981	80°5.0358	80°5.4001	R/V *Hildebrand*
Depth (middle, m)	3.0	5.0	3.1	--------
Depth (deep, m)	13.8	24.6	14.7	--------

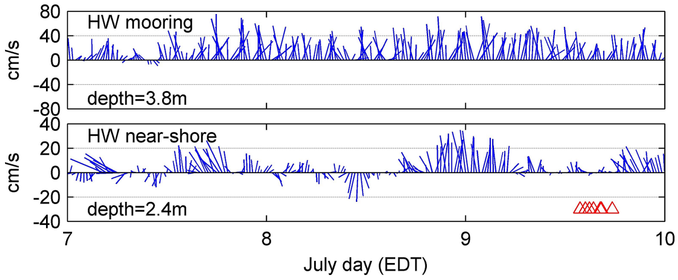

Figure 65. ADCP-derived currents from the moored ADCP (upper panel) and the AOML nearshore ADCP (lower panel). Red symbols denote the time of CTD casts.

Both the RD and CDOM are fluorescence detectors and thus there is the possibility of interference in the measurements. Data from the ship's flow-through system, using the C-6 instrument, provided an opportunity to study this effect. For example, just before the first presentation of RD at the boil, an occurrence of elevated CDOM was noted ("A" in Figure 66). The effect of CDOM on the RD signal was very small. Because no RD was present at that time, the effect could be calculated. With the first observation of dye at the boil ("B" in Figure 66), elevated RD was noted, as well as a substantial elevation in the raw CDOM signal. This provided an opportunity to compute the effect of the RD signal on the CDOM measurement (the natural CDOM concentration during this interval was assumed to be equal to adjacent concentrations). These corrections were applied to the C-6 mooring data. For the YSI instrument (mooring HW1), the effect of CDOM on RD was not detectable, and the effect of RD on CDOM was so small as to be unquantifiable; no correction was deemed necessary.

Mooring data from moorings HWM1, HWM2, and HWM3 are shown in Figures 67-69. The key results can be summarized as follows. The influence of the currents (averaging ~37 cm/s for the day) can be seen in the depth measurements (Figure 68); the current was pushing the instrument downcurrent, forcing the instrument to greater depths beginning in the middle of July 7th and continuing through the mooring deployment. Active seas will break up the plume, contravening the usual view of a plume rising undisturbed to the surface. The effect was much more evident at moorings 1 and 2 compared to the inshore mooring 3, probably due to the larger effect of the Gulf Stream on the first two (outer) moorings.

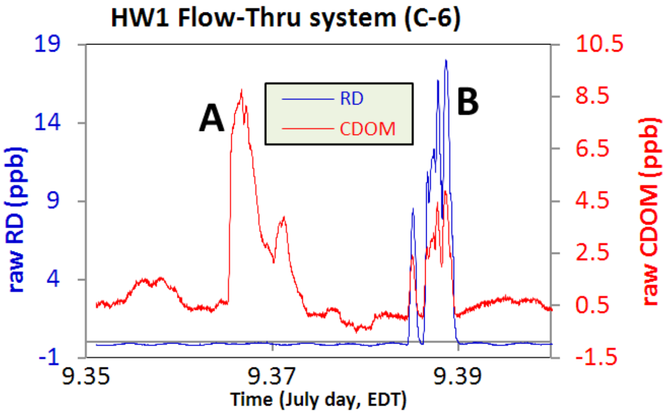

Figure 66. Simultaneous RD and CDOM raw results with the flow-through C-6 system.

HWM3 depths were more controlled by tidal forces than by offshore currents (Figure 69, left panel, purple line). Secondly, the chlorophyll-a signal (Figures 67-69, center plots) was controlled by sunlight, increasing at night and higher at depth at all three moorings. Finally, RD was observed only at the HWM1 and HWM2 mid-depth moorings (Figures 67-69, rightmost plots). The RD was observed in two spikes of higher concentration at HWM1 than HWM2. The RD data from HWM3 (middle or deep instruments) did not provide a RD signal that could be distinguished from the background readings; the dye was not transported to that location (at least at the depths of the moorings). The changes in the two peaks as they passed HWM1 and HWM2 are noted in Figure 70. The decrease in peak concentration was 55% and 50.5%, respectively. An additional finding was that the dye was not observed at HWM3, which was located 0.45 km away to the west-northwest on the eastern edge of the third reef tract.

There were seven casts of the R/V Hildebrand's CTD/rosette system during the experiment. Sample bottles from these casts were analyzed for RD after the cruise via a Turner Designs AU-10 instrument. These data are important because they are a principal means to examine the downward advection of the plume. While every effort was made to drop the CTD into the heart of the boil, this was found to be impossible due to the very active seas (discussed previously); all of these samples had low RD concentrations, indicating that the plume had moved during the cast process and had not been sampled. Casts are listed in Table 21 and depicted in Figure 71.

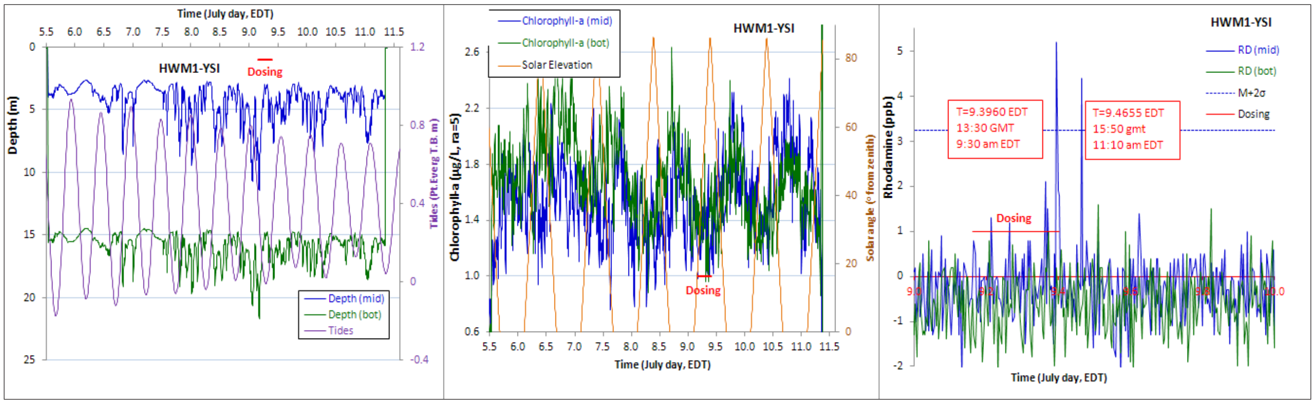

Figure 67. Measurements from Hollywood mooring HWM1. Left: Tidal height (purple line) and depths for the mid-depth (blue) and deep (green) instrument. Center: Chlorophyll-a measurements (blue and green lines, 5-point averages) and solar angle (orange line). Right: RD from middle and deep instruments. Red bar shows RD dosing times; dotted blue line shows RD (mid) averaged concentration +2 standard deviations; red boxes indicate times of two RD peaks. Note different time scale on RD plot.

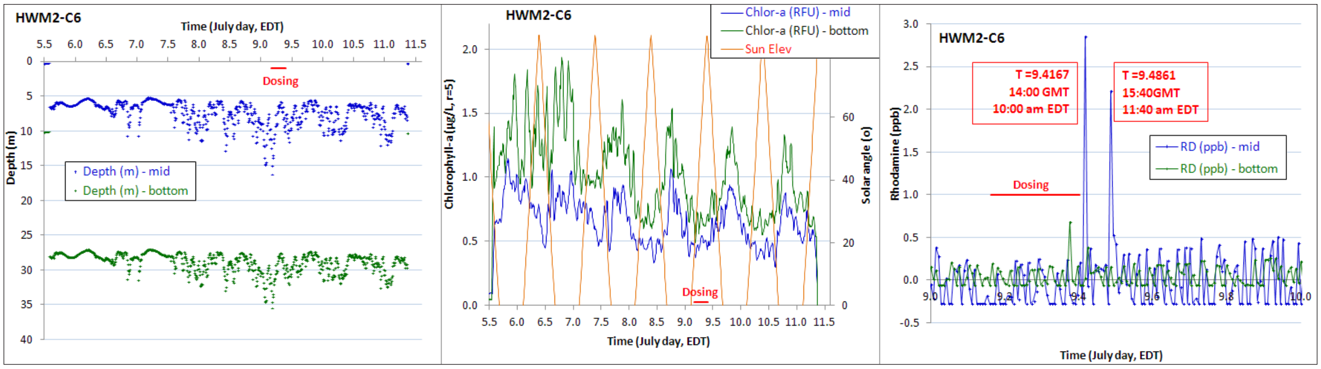

Figure 68. Measurements from Hollywood mooring HWM2. Format is similar to Figure 67.

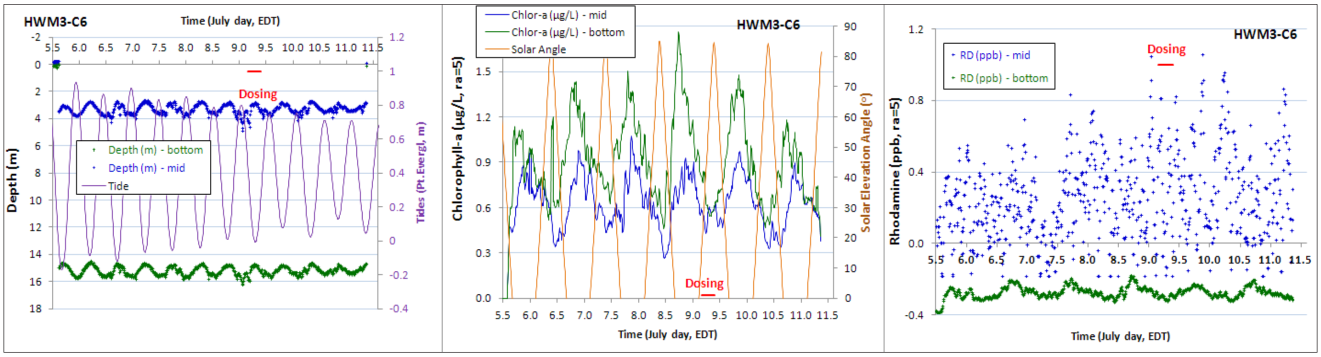

Figure 69. Measurements from Hollywood mooring HWM3. Format is similar to Figure 67.

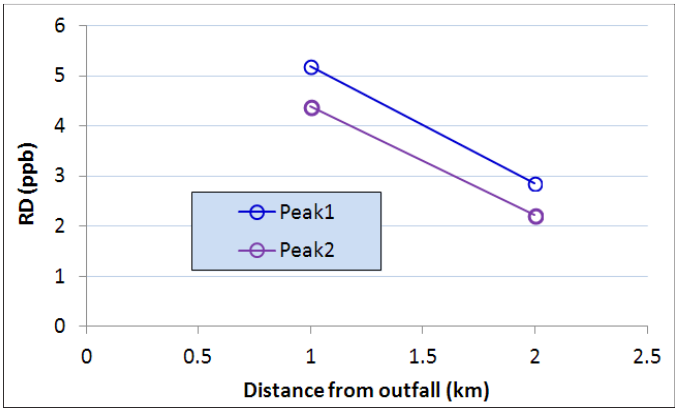

Figure 70. Changes in RD concentration with time for the two peaks measured at HWM1-middle (1 km from outfall) and HWM2-middle (2 km from outfall).

Nevertheless, useful information was obtained. Six of the casts found very little RD; only C1 and C3 found significant concentrations below the surface. Concentrations decreased rapidly with distance, as observed elsewhere. C2 is an anomaly, with low RD concentrations despite being closer to the outfall than C3; this was interpreted as a sign of the very active seas, which dispersed the plume even at this distance (~1 km).

In addition to the data from the moorings, valuable measurements were provided by the flow-through system on the R/V *Hildebrand*. This system consisted of a pump installed in the seawater intake system on the boat which brought seawater to a calibrated Turner Designs C-6 system (unit 5) similar to the instruments on moorings 2 and 3. The flow rate was 5.9 L/min.

In Figure 72 (left) are plotted the locations of the maxima measured by the system, while concentrations versus distance from the outfall are plotted in the center panel. The highest concentration was 18.0 ppb, found at 9:20 am EDT, which we take as the boil concentration. Dilution data versus distance are shown in the right panel of Figure 72. We have arbitrarily separated the dilution into two regions, the near-field and far-field, separated at a distance of ~0.12 km. Regression lines (concentration versus distance) were determined as noted. The far-field dilution indicated by these data was ~100 at 2.5 km. This is roughly equivalent to dilution = distance (km)*20 (in contrast to the SF6-derived dilution of dilution = distance (km)*212 over a much larger distance); however, the exponential fittings in Figure 72 appear to most closely match the data. An initial dilution

Table 21. CTD casts during the Hollywood tracer study.

	C1	C2	C3	C4	C5	C6	C7
Time (July day)	9.575579	9.601713	9.622801	9.642639	9.676991	9.682801	9.736759
Latitude	26.02449	26.02779	26.03076	26.03506	26.03834	26.03946	26.03471
Longitude	-80.0865	-80.0898	-80.0896	-80.0897	-80.0959	-80.0869	-80.1004
RDmax (ppb)	0.76	0.15	0.55	0.23	0.19	0.15	0.14

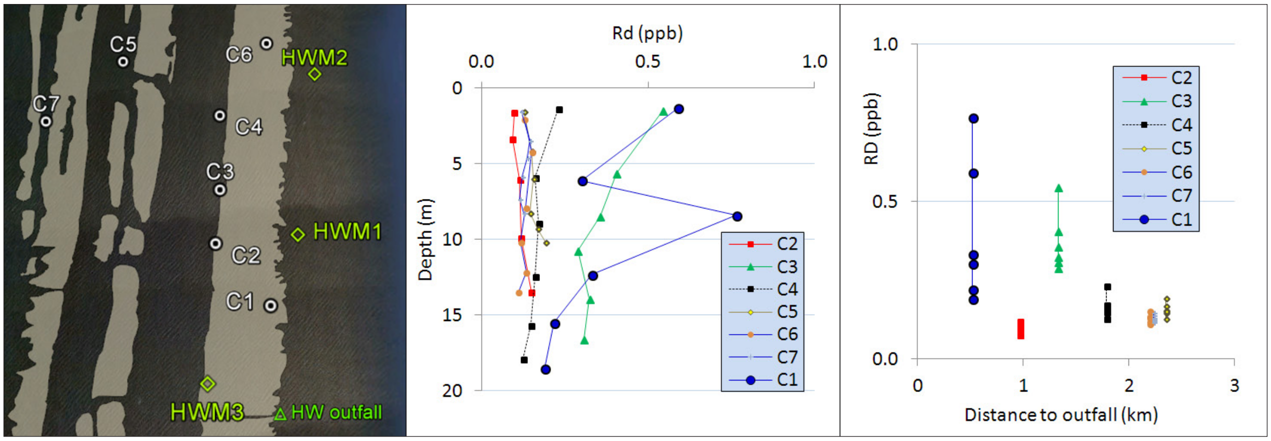

Figure 71. Left: Location of CTD casts (Google Earth). Middle: RD concentration versus depth for the seven casts. Right: RD concentration versus distance from the outfall for the seven casts.

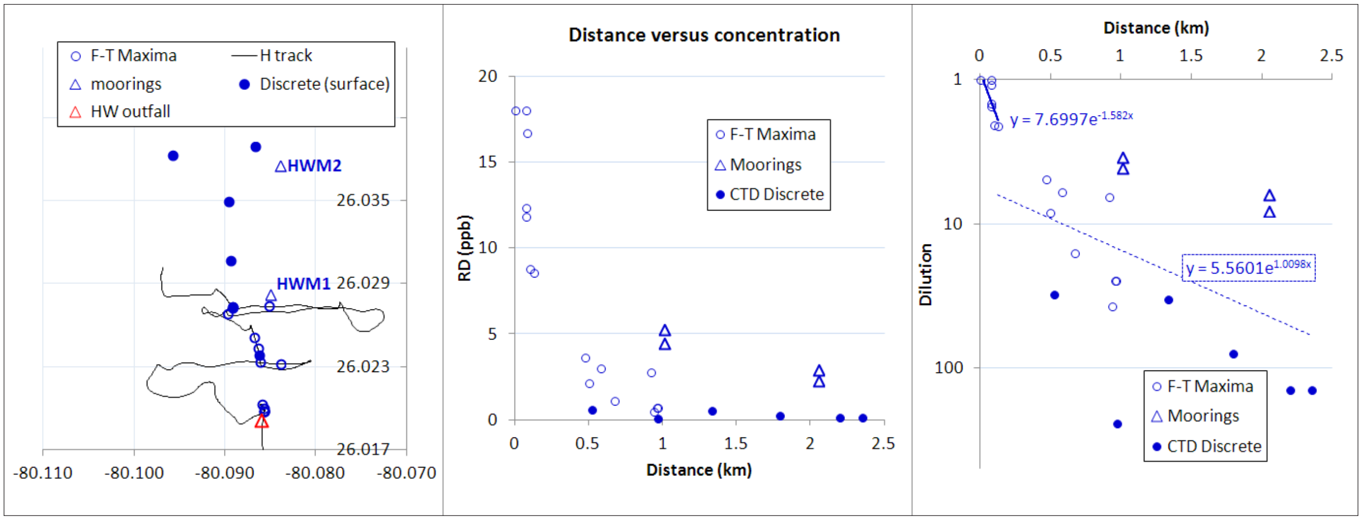

Figure 72. Left: Ship track (line), moorings, and location of RD maxima from the flow-through system. Outfall is indicated in red. Middle: Plot of RD maxima concentrations versus distance from the outfall. Right: Dilution versus distance, arbitrarily separated into an initial dilution and downcurrent dilution, with regression lines.

could not be determined because of difficulties with the dosing described previously. We note that the mooring concentrations were higher than the flow-through system concentrations, and that the two RD peaks (Figures 67-69) occurred early in the experiment. Evidently, those peaks were due to the early excessive dosing previously discussed, which was transported north past the *Hildebrand's* track but was sampled by the moorings. Recall that the ADCP-measured currents were low and southerly; the plume movement here was primarily wind driven.

A view of the plume was obtained via the R/V *Cable's* down-looking ADCP system, which also recorded the acoustic backscatter signal, during a west-to east transect over the plume (Figure 73).

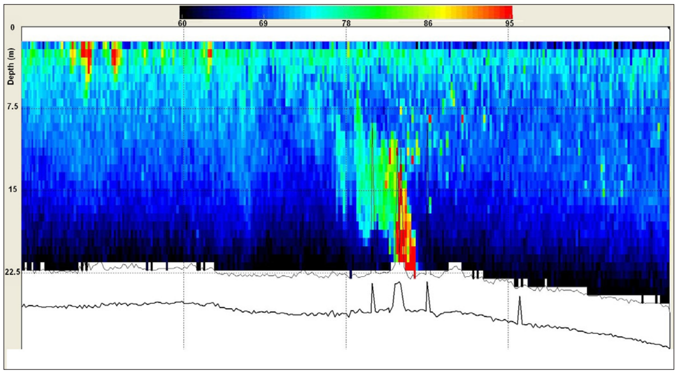

Figure 73. Backscatter view of the Hollywood plume during a west-to-east transect over the plume. Backscatter increases from black to red.

5.2 Broward Tracer Studies

Following the Hollywood tracer study, two similar studies were conducted at the Broward treatment plant on November 7 and 28, 2012 (Broward County North Regional Wastewater Treatment Plant, 2555 West Copans Road, Pompano Beach, FL 33069). The dosing equipment had been improved to insure a steady delivery of dye. For both studies, the equipment was installed outdoors next to the chlorination tank, with a line from the pump passing over the wall into the last section of the tank prior to the effluent flowing into the outfall pipe (Figure 74). Effluent flow data were obtained from the plant so that dye pumping would be proportional to the effluent flow.

The first study was undertaken at a neap tide, while the second was undertaken at a higher tidal period (although not the highest tides for that month) as shown in Figure 75.

Three moorings were deployed under an assumption of northerly current flow (as was done for the Hollywood experiment), mapped in Figure 76. A moored ADCP was also deployed near the Broward outfall (Figure 76, Table 22).

During the first Broward experiment, high tide was at 1:30 am, while low tide was at 8 am (Figure 75). The currents were described as follows: at the start of the study the currents were northerly. The inshore flow began a counterclockwise rotation to the south at about 8:20 am on November 7th, reaching a southerly flow at about

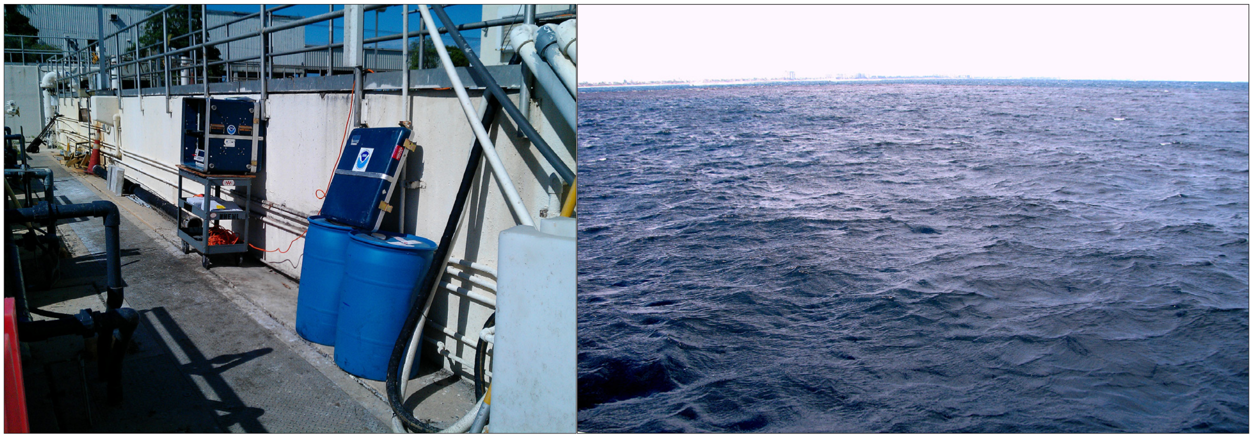

Figure 74. Left: Dosing pump and control equipment at the Broward wastewater treatment plant. Tubing carrying dye passed over the wall into the chlorination tank. Right: View looking northwest showing dye flowing out from the boil.

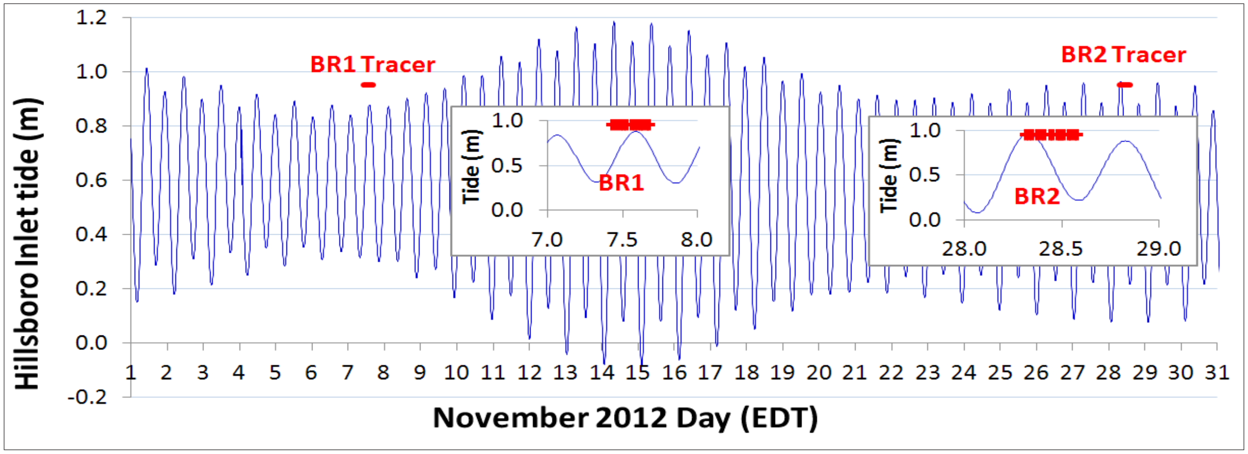

Figure 75. Tides at Hillsboro Inlet during the two Broward tracer studies. Red crosses show the times of CTD casts; insets show details from the November 7 and November 28 studies. Format is similar to Figure 62.

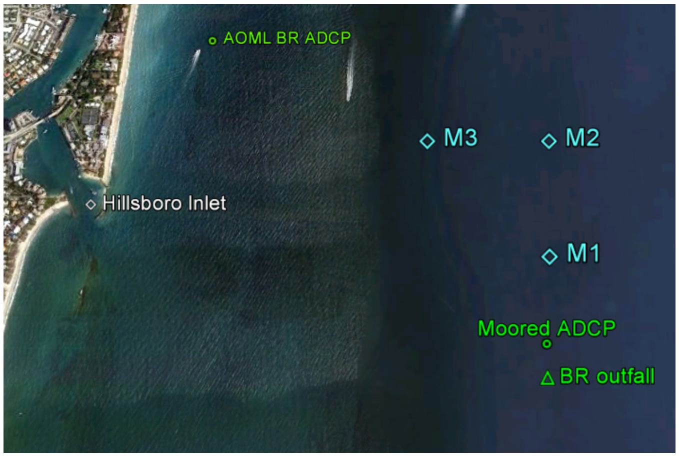

Figure 76. Location of the three moored instruments for the first Broward tracer study (blue). Also shown are the AOML ADCP, the moored ADCP, and the Broward outfall terminus (green).

Table 22. Moorings for the first Broward tracer study.

	Lat (°N)	Long (°W)	Distance to Outfall (km)	Depth (m)	Unit
BR1	26.25570	-80.06171	0.48	0.8	C-6 #1
BR2	26.26025	-80.06145	0.99	0.7	C-6 #2
BR3	26.26036	-80.06667	1.10	8.2	C-6 #3
ADCP	26.25260	-80.06200	0.14	40.5	

10 am but at a very low velocity. The mooring flow started a counterclockwise rotation at about 3 am but continued to the south, resuming a northerly flow at about 7 am. At this time, the inshore flow was also to the north. At 11 am, the nearshore data again indicated a southerly flow, and the velocity was variable with a maximum velocity obtained at 2 pm (Figure 77).

Dosing was set up as described above and occurred from 7 am to 3 pm (Figure 78). Following events at the plant, dosing was lowered at 8:40 EST and remained at that level throughout the experiment, averaging 158.2 ml/min with an outfall flow rate averaging 167.4 L/min. This resulted in an average overall dye concentration in the pipe of 1361 ppb.

During the experiment, 12 CTDs were cast. These are listed in Table 23 and mapped in Figure 79. The boat drifted during the casts, due to the ambient current, and this became an additional indication of the current.

We note that all casts after #1 drifted south to southeast. This agrees with the currents as measured by the moored ADCP (Figure 80), which indicates that the currents rotated clockwise to the south at the beginning of the experiment and continued south-southeast for most of the experiment. Thus, we didn't expect to observe any dye from the moorings during the southward current since all moorings had been deployed north of the outfall under the expectation of a northward current (changing the location of the mooring during the study would have absorbed too much available cruise time). This was the result (Figure 81); dye was only observed at surface mooring #1 (depth 1.3 m) early in the

Table 23. CTD casts during the first Broward tracer study.

CTD Number	Drift Distance (m)	Drift Time (hr)	Drift Velocity (cm/s)	Drift Angle (degree)
1	50.1	n/a	n/a	274.6
2	85.4	3.0	0.8	105.0
3	103.8	3.3	0.9	113.1
4	98.7	3.3	0.8	179.9
5	100.0	2.9	0.9	147.3
6	n/a	n/a	n/a	n/a
7	162.0	3.5	1.3	112.1
8	95.0	2.9	0.9	107.3
9	81.1	2.6	0.9	108.9
10	87.6	2.8	0.9	128.2
11	53.8	2.0	0.7	114.6
12	95.3	2.8	0.9	124.4

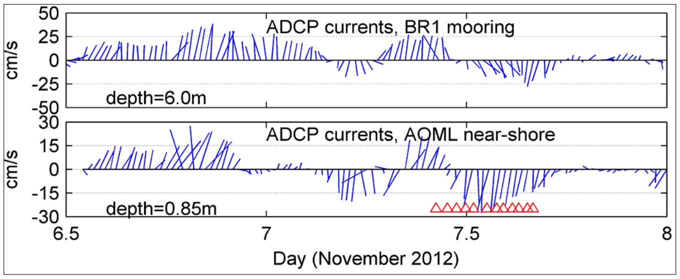

Figure 77. Surface currents as measured by the moored ADCP (upper panel) and the nearshore ADCP (lower panel). Red symbols denote times of CTD casts.

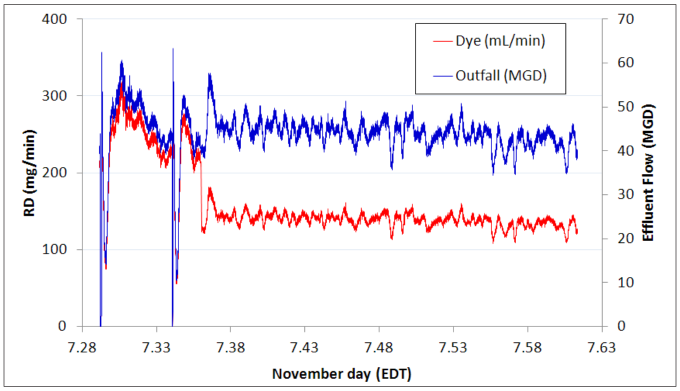

Figure 78. Wastewater effluent flow (blue) and dye flow (red) during the November 7 Broward tracer study.

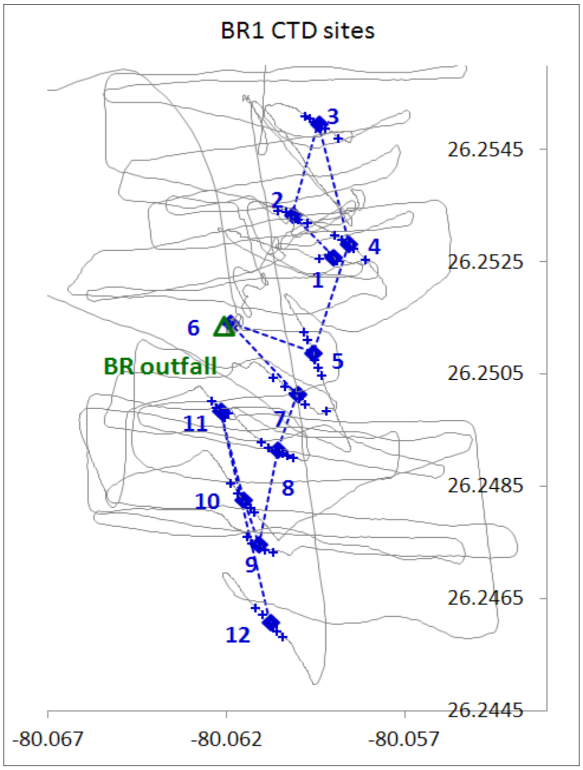

Figure 79. Casts during the November 7 Broward tracer study. Blue + signs show the location of bottle openings; diamonds indicate average location. First bottle was always the most northwest location. Grey line is the track of the R/V *Hildebrand*.

experiment. A six-point moving average of the dye signal (Figure 81, upper plot) appears to resolve two peaks; we may be seeing two boluses of the plume or a pulse of dye twice: once going north and again when the pulse was moved south by the change in current direction. No dye was subsequently observed. Turbidity was low essentially all of the time; CDOM decreased for outer moorings M1 and M2, while chlorophyll-a increased for all moorings in the afternoon.

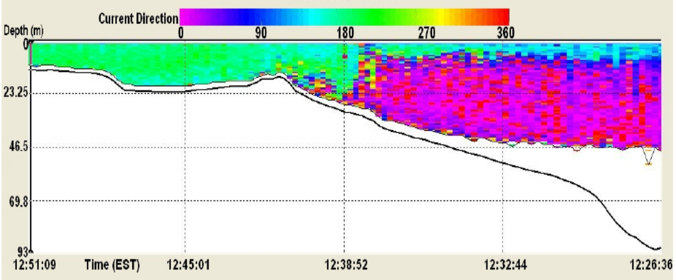

Figure 80. Current directions during the November 7 Broward tracer study as measured from the R/V *Cable*. The direction is denoted by color as denoted in the color bar at the top of the figure. Inshore flow is southerly; offshore non-surface water is northerly.

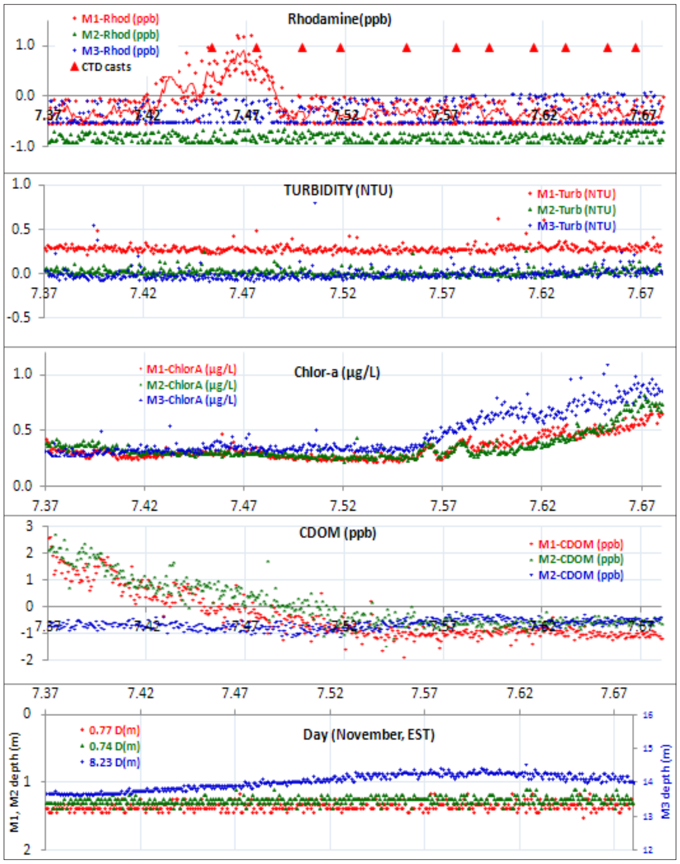

Figure 81. Measurements made from the three instrument moorings during the November 7 Broward tracer study. Red triangles in uppermost plot denote times of CTD casts; red line is a six-point moving average of RD.

Because of the southward current during most of the study, the mooring data were not as important as the data from the ship's flow-through system and from the 12 CTD casts. The ship was directed to perform many back-and-forth crossings of the plume (Figure 79), and casts were deployed in an attempt to capture elevated RD locations. Consistently, however, it was found that the region of elevated RD was quite mobile, with the region moving away from the ship during the cast operations.

The CTD casts provided a ready means of examining the downward movement of the RD plume. Except for a single high RD value from cast 1 (north of the outfall and during the period of northerly flow), the dye was seen to be confined to the uppermost 5 m near the surface (Figure 82). The region of elevated RD sampled in cast 1 was not resampled in the subsequent casts, indicating that it must have been small, or that it otherwise dissipated rapidly. From the entire set of RD data from the flow-through system, the most significant peaks were then selected (57 peaks); these are plotted versus distance from the outfall in Figure 83. The main body of the plume was considered to be marked by the highest concentration at a given distance; these peaks were regressed and attained the statistic shown in Figure 83.

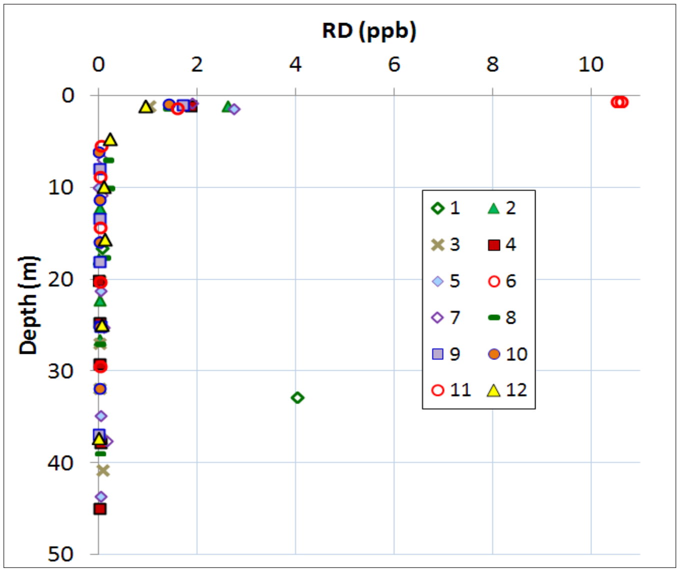

Figure 82. RD concentrations from the 12 CTD casts. Cast 6 was at the boil. A high RD concentration was found in cast 1 at a depth of 32.8 m.

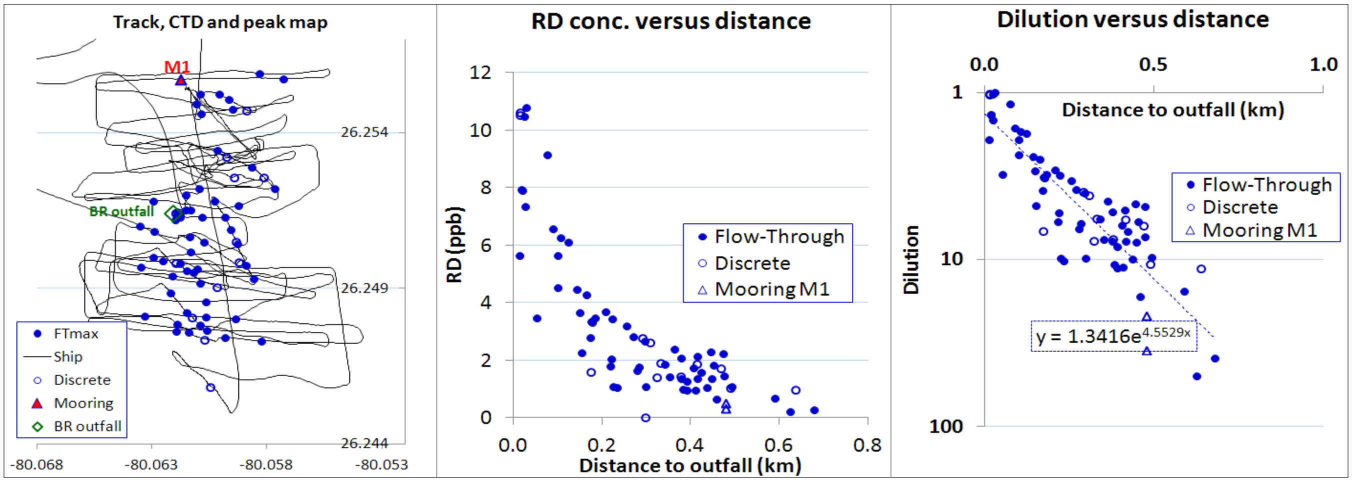

Figure 83. Left: Ship track and location of discrete samples and flow-through maxima; Middle: RD concentrations versus distance for all three sources of data; Right: Dilution of RD concentrations versus distance, arbitrarily split into initial and downcurrent dilution rates. A single outlier (d = 0.3 km, RD = 0.01 ppb) was removed.

The maximum RD concentration found from the flow-through system was 10.8 ppb (1:15 pm, ~26.251°N, 80.062°W), while the highest concentration from the CTD sample bottles was 10.6 ppb (cast 6). With an estimated in-pipe concentration of 1361 ppb, we have an initial dilution (pipe to surface) of ~126. Subsequently, as noted in Figure 83, a rapid dilution of the plume was observed, so that the plume had almost disappeared at a distance of 0.7 km from the boil (~35 dilution of boil concentration). The resolution of the data is not sufficient to observe a distinction between near-field (~0.1-0.2 km) and far-field dilutions. The rapid dilution was probably due to the current reversal, which occurred at the beginning of the study.

The second Broward tracer study was conducted on November 28, 2012. The dosing apparatus was similar to the first study (Figure 74); dosing rates during the experiment are shown in Figure 84. The average RD flow was 146 ml/min, the average effluent flow was 46.41 millions of gallons per day, and the computed concentration in the pipe was 1171 ppb.

Moorings M1 and M2 were fixed to surface floats instead of underwater floats, which insured a shallower depth for water sampling, as well as a faster recovery when the experiment was completed. M3 was mounted to a weight on the seafloor to measure dye that would impact the third reef tract. This turned out to be problematic: when the mooring was to be retrieved, the line became wrapped around the ship's propeller and had to be cut. The instrument was recovered several days later.

Details on the moorings are given in Table 24 and mapped in Figure 85. Winds and currents are depicted in Figure 86. Each mooring was equipped with a Turner Designs C-6 instrument as before; each C-6 was configured to measure rhodamine, chlorophyll-a, turbidity, CDOM, and temperature (salinities and densities were computed from those data).

Measurements from the moorings are shown in Figure 87 (CDOM has been corrected for RD). The near-constant depths noted therein denote calm seas; M3 did evidence some decrease in elevation (due to a decrease in current velocity) as the day progressed; this can be seen in the ADCP current data at depth (Figure 88). Clearly, no significant amount of RD was found at M3; the plume could not be shown to have impacted that location from these data. The M1 and M2 dye concentrations are informative because

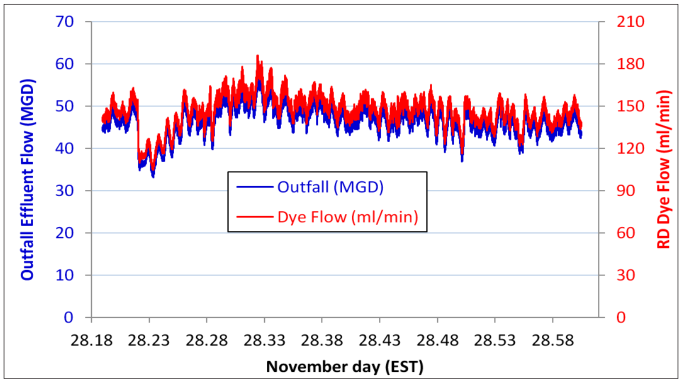

Figure 84. Wastewater effluent flow (blue) and dye flow (red) during the November 28 Broward tracer study.

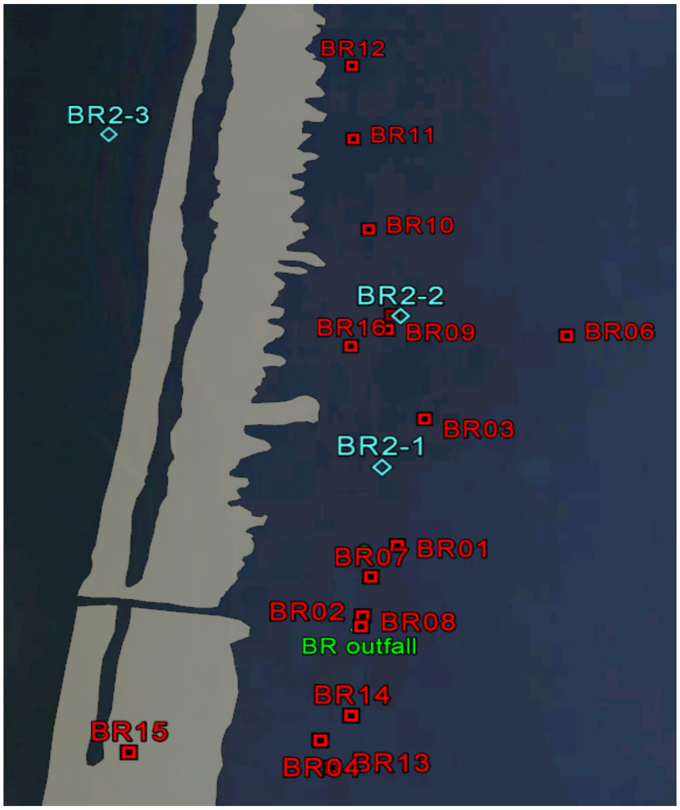

Figure 85. Google Earth map showing the location of moorings (blue), CTD casts (red), and outfalls (green). Gray patches indicate outline of third reef tract.

they represent plume water at the surface at a distance of 0.6 and 1 km from the outfall.

We now turn to dye measurements from the ship's flow-through data. As with the first study, the R/V *Hildebrand* was directed through a sequence of east-west passes through the plume (as best as could be determined), dropping CTD casts when we appeared to be at the boil. We again found the boil to be ephemeral, moving away from us as the cast was in preparation. Still, many good data were obtained. These results, along with the flow-through and mooring data, are presented in Figure 89. For the mooring data in Figure 89 (upper left), peak concentrations and their associated times at each mooring were averaged and plotted. Although

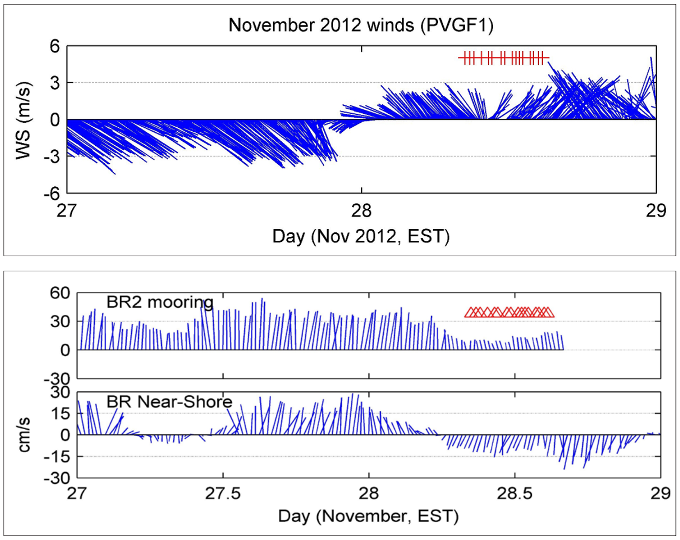

Figure 86. Upper: Winds from PVGF1 (Port Everglades) meteorological convention (lines denote direction where wind came from). Lower: Currents at the BR2 mooring and at the Broward nearshore ADCP (oceanographic convention, lines indicate direction where current was going).

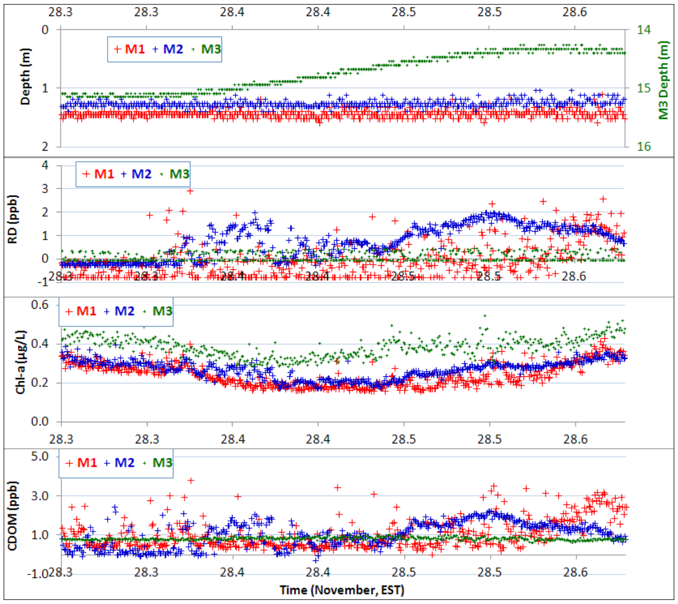

Figure 87. Data from moorings M1, M2, and M3 as denoted by color. Depth axis (uppermost plot) has been plotted in reverse (increasing downward), with M3 using the right-hand axis.

Table 24. Moorings for the second Broward tracer study.

Mooring	Latitude (°N)	Longitude (°W)	Distance to Outfall (km)	Average Depth (m)	Maximum RD (ppb)	Maximum Chlorophyll-a (µg/L)	Maximum Turbidity (NTU)	Maximum CDOM (ppb)
M1	25°15'14.21"	80°3'42.32"	0.29	0.83	3.5	3.5	1.7	7.3
M2	25°15'24.00"	80°3'41.38"	0.59	0.73	2.0	2.0	1.0	2.5
M3	25°15'36.90"	80°4'00.00"	1.09	48.59	0.5	1.1	6.9	1.3

CTD casts were performed throughout the plume region, RD was found essentially only from the casts at/near the outfall (Figure 89, upper right). As was seen in the previous tracer study, the decrease in concentration with distance was dramatic, with concentrations approaching zero within a kilometer of the boil.

The concentration at the boil was measured at 17.1 ppb with the CTD measurements. This resulted in an initial dilution of ~68 (from pipe to boil). The downstream dilution values are shown in Figure 89 (lower left). It appears that the data were able to separately resolve the near-field dilution from the far-field dilution, with a boundary at about 0.1 km, similar to the other tracer studies. The dilution at 1 km was approximately 35.

Backscatter has been known to be useful in the tracking of treated-wastewater plumes.[130] In Figure 90, we present two backscatter views taken from the R/V *Cable* that demonstrate the nature of the plume rising from the surface, even on these fairly calm seas. In both cases, the plume had been disturbed prior to its presentation on the surface. The first image was obtained during a south-to-north run from

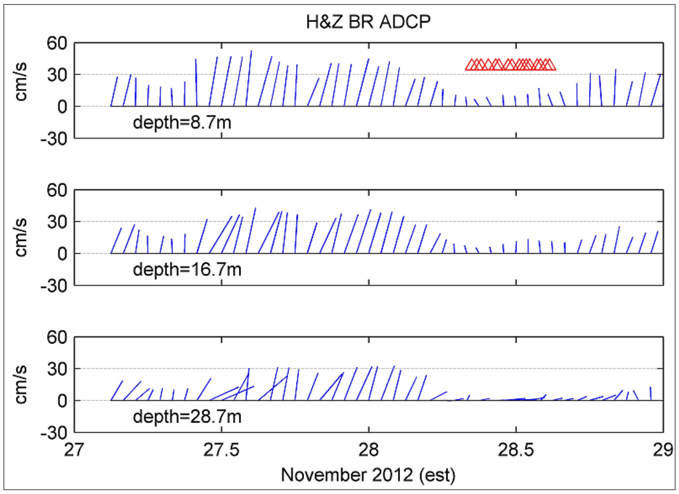

Figure 88. ADCP data from the Hazen and Sawyer instrument near the Broward outfall. Depth of bins is indicated; red triangles denote times of CTD casts.

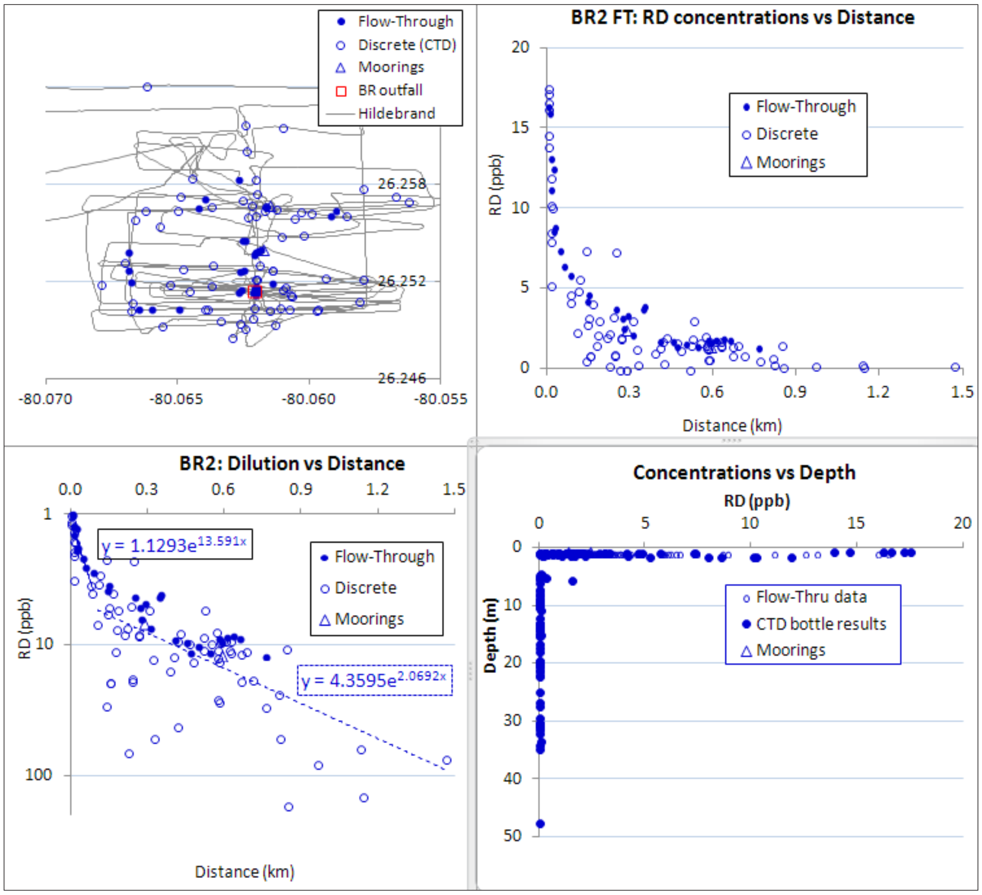

Figure 89. Upper left: Map with discrete samples, moorings, and flow-through maxima locations and ship track. Upper right: RD surface concentrations versus distance. Lower left: Dilution versus distance of surfaces samples, arbitrarily separated into near-field and far-field samples at 0.1 km. Lower right: All samples plotted versus depth.

14:47:30-14:49:17 UT. The second image was obtained from a west-to-east run from 19:12:00-19:13:20 UT.

Lastly, we present contour plots of the three tracer studies (Figure 91). Contour plots are artificial: they represent a modeling of real data, not the actual data. In addition, these plots represent the aggregate of surface measurements as if they occurred at the same time. Of course, each tracer experiment lasted several hours. Nevertheless, they do show the distribution of surface concentrations as derived from the ship's flow-through system and the surface CTD bottle samples across the sampling region. In each case, the plumes were confined to regions around the outfall (well away from the coast) and along a narrow expression aligned with the current, beyond which background concentrations were attained.

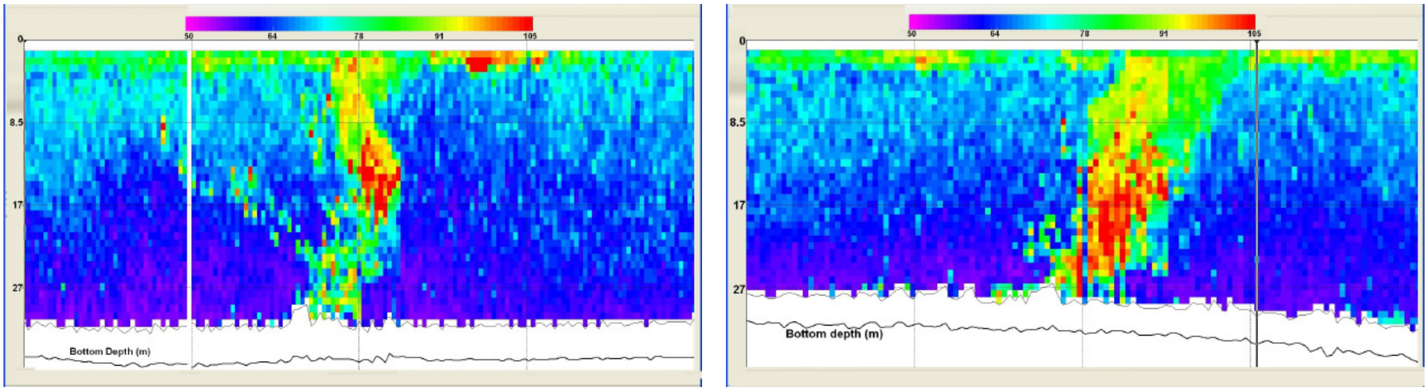

Figure 90. Backscatter profiles of the plumes. The left image is from south-to-north at 9:47:30-9:49:17 am EST; the right image is from an west-to-east crossing at 2:12:00-2:13:20 pm EST. In both views, the plume is disturbed before reaching the surface.

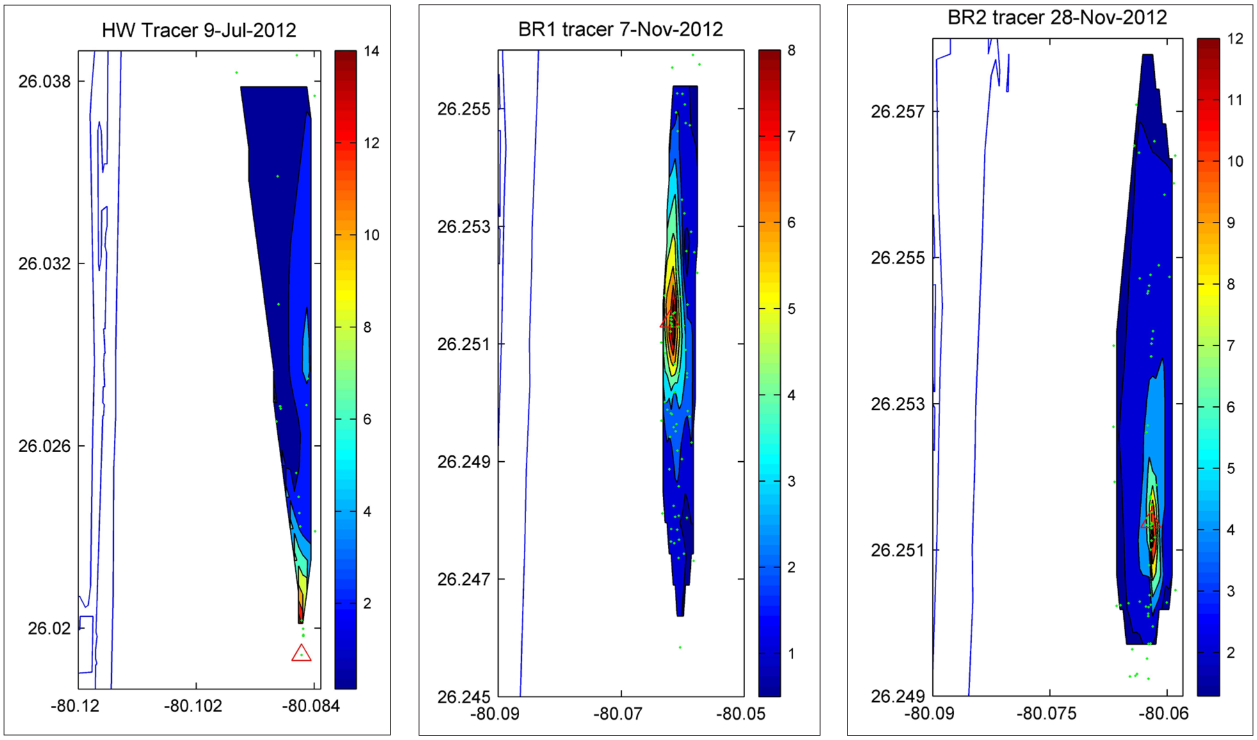

Figure 91. Contours of the surface RD concentrations from the three tracer studies, as denoted in the plot titles (Matlab "contourf"). Outfall locations are denoted by the red triangles. Curving blue line to the left is the coastline. Color coding of RD concentrations (ppb) is provided by the vertical bar to the right of each plot. Green dots denote the location at which the water sample was obtained.

6. Microbiology Studies

6.1 Results from Monthly Survey Cruises

Water samples were collected, filtered, and processed for a variety of microbial entities during the regular monthly survey cruises as described in section 3.4. DNA for molecular analysis was collected and extracted from sites BR7A, BR7C, BR9A, BR9C, BR10A, BR10B, BR10C, BR11A, BR11C, BR13A, BR14A, BR15A, HW2A, HW2C, HW4A, HW4B, HW4C, HW5A, HW5C, HW9A, HW9C, HW14A, BR1A, and BR1C. Note that "A" sites are surface, "B" sites are mid-depth, and "C" sites are bottom depth. Site locations are shown in Figure 21. Viable enterococci (i.e., living fecal indicator bacteria, FIB) were measured at all sites listed above, as well as additional mid-depth samples from sites BR9B, BR11B, HW2B, HW5B, HW9B, and BR1B. Large volume samples (100+ liters) for protozoan cysts were only collected from the outfall surface expression boils (i.e., sites HW4A and BR10A). Table 1 in Appendix 4 summarizes all of the microbiological measurements from the monthly survey cruises.

6.1.1 Viable Enterococci Fecal Indicator Bacteria Measurements

In general, measurements were relatively low for viable enterococci, with most samples being below or near detection limits. In the new 2012 EPA recommendations for enterococci exposure in recreational waters, there are two alternate exposure thresholds for two different illness rates: a geometric mean of 35 enterococci per 100 mL for a predicted illness rate of 36/1000 and a geometric mean of 30 enterococci per 100 mL for a predicted illness rate of 32/1000. At the time of this writing, the FDEP was currently in the process of revising the State of Florida recreational water quality criteria based upon the recent EPA recommendations, but had not yet promulgated such new criteria. At the time of sampling for this project, the prior State of Florida criteria utilized an exposure threshold of 35 enterococci per 100 mL for marine recreational waters. If we consider for purposes of site comparison in this study the most protective currently proposed criteria by the EPA (i.e., recommendation 2 in the 2012 guidelines targeting an illness rate of 32/1000), the exposure threshold for recreational marine waters using enterococci FIB would be 30 cells per 100 mL (i.e., 30 cfu/100 mL for mEI agar plate counts and 30 MPN/100 mL for IDEXX EnteroLert® chromogenic substrate assay).

Enterococci abundance was highest at the inlets and outfalls and diluted rapidly with distance to background levels near detection limits, typically within about 1 km (Figures 92 and 93). Only 15 samples during the entire combined monthly cruise study exceeded the most protective exposure threshold of 30 MPN/100 mL for viable enterococci (see red highlighted cells in Appendix 4, Table 1). Of the samples in exceedance, 10 of the 15 samples were from the sites immediately within or just offshore of the Hillsboro Inlet (sites HW12, HW14, and HW15). Two samples in exceedance were from the Hollywood outfall boil (site HW4), one sample was just offshore of the Port Everglades Inlet (site BR1), one sample was from the outer reef tract offshore of Hillsboro Inlet (BR10), and one was from the outer reef tract about midway between the outfalls (site BR7). However, all measured levels of viable enterococci were of relatively low magnitude, even for those sites in exceedance with the highest measured being 52 MPN/100 mL (Hillsboro Inlet sites BR15 and BR16). Thus, during the period of this study the Hillsboro Inlet appeared to have the highest abundance of viable enterococci and to be the most frequent contributor of live fecal bacteria to the coastal region.

6.1.2 Total Enterococci General Fecal Indicator Bacteria Measurements by qPCR

Unlike viable enterococci, which showed the highest levels in the Hillsboro Inlet, the greatest abundance for total enterococci (as measured by the molecular marker for the EPA entero1A qPCR assay) was observed at the Hollywood outfall surface expression boil (Figures 94-96). Note that the IDEXX EnteroLert® for viable enterococci and the qPCR assay for enterococci genetic markers were actually measuring two different but overlapping enterococci populations. The qPCR assay detected DNA from all intact enterococci cells with the appropriate target DNA sequence regardless of cell status, be it live, dormant, or dead. As long as the DNA was contained in a particulate form that could be filtered (i.e., in an intact cell, even if metabolically inactive or even if the membrane was compromised and the cell was dead), and the target DNA was not degraded and amplifiable, a signal would be generated for the qPCR assay from those cells, even those that would not grow on culture media.

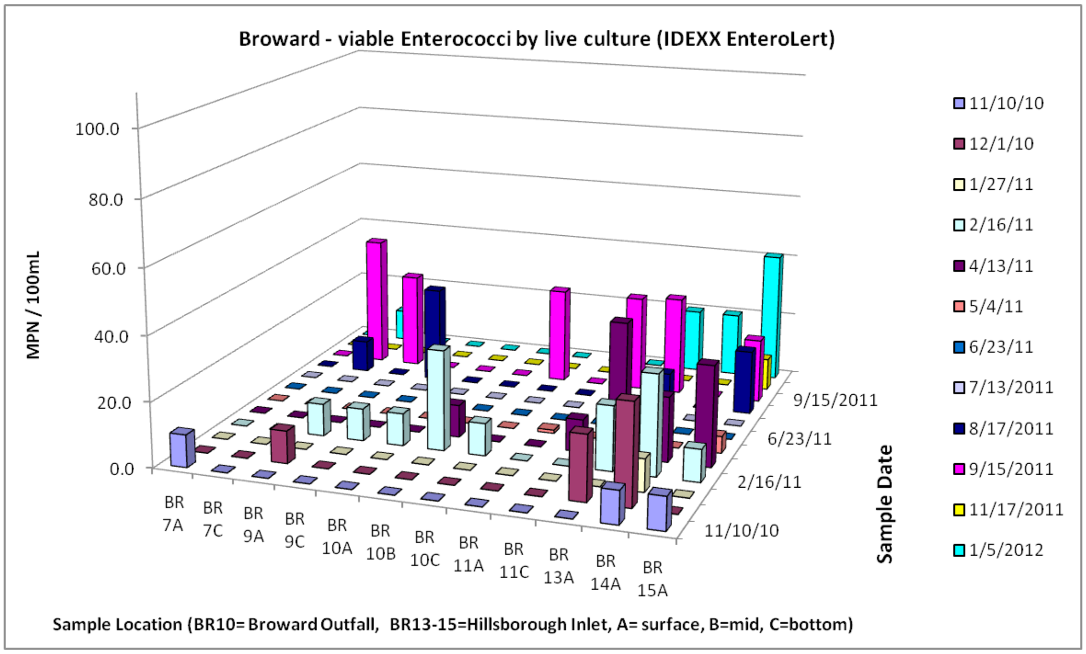

Figure 92. Live enterococci measurements from the Broward monthly cruises. The EPA recommended maximum limit for single-grab samples is 30 MPN/100 mL.

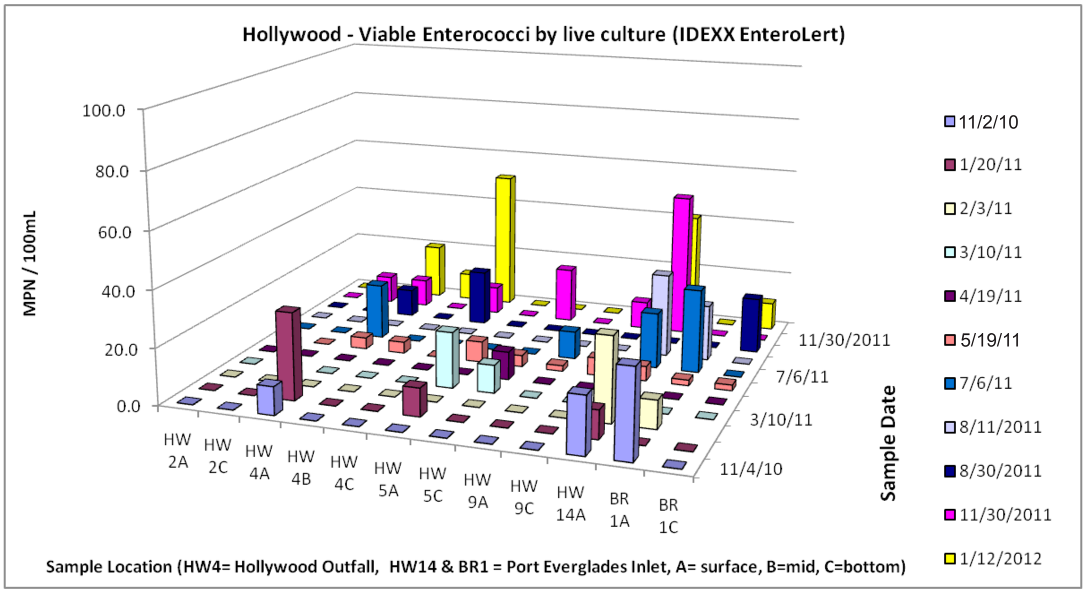

Figure 93. Live enterococci measurements from the Hollywood monthly cruises. The EPA recommended maximum limit for single-grab samples is 30 MPN/100 mL.

Given the fact that the outfalls discharge treated wastewater that has been subjugated to chlorination and other antimicrobial treatments, it is consistent that measured fecal indicators would give substantially higher genetic signatures than they would viability measurements. The inlet sites from Hollywood (HW14) and Broward (BR13-BR15) also had elevated total enterococci levels by qPCR (but inlets also had substantial levels of live cells as well). From a comparison of the outfall sites BR10 and HW4 to inlet sites HW14-BR1 and BR13-BR15, it can be seen that while both inlets and outfalls represented a significant source of export of intact FIB, the FIBs exported from the outfalls (and presumably the other bacterial pathogens they serve as a proxy) were effectively rendered dormant or dead. However, a large proportion of the FIBs exported from the inlets were live and potentially infectious (as were presumably the pathogens they served as a proxy). From this perspective, it would appear that the coastal inlets represented a more

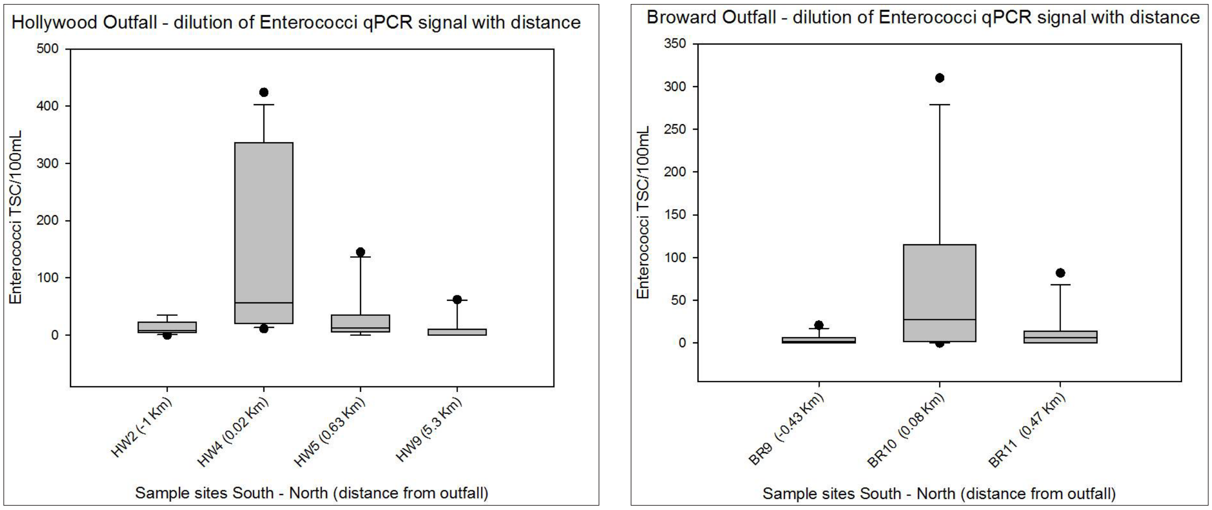

Figure 94. Box plots of all cumulative monthly cruise data showing the decrease in abundance with distance from the outfall for total enterococci (dead, dormant, and live) as measured by the Entero1A qPCR assay at the Hollywood (left) and Broward (right) outfalls.

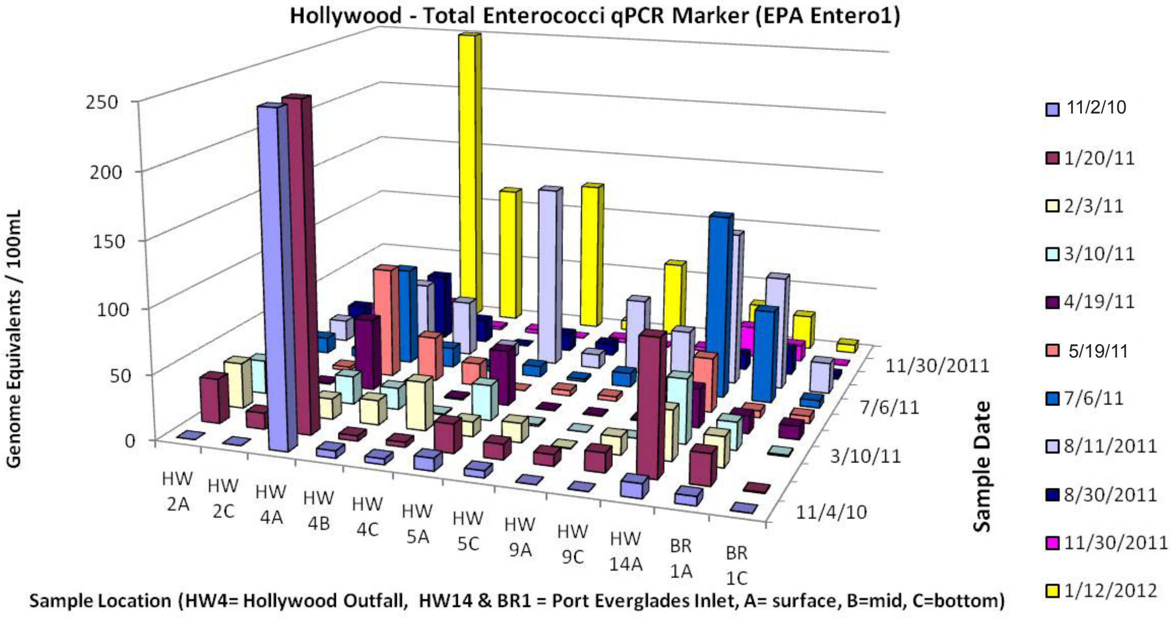

Figure 95. Total enterococci measurements by EPA Entero1A qPCR assay for the Hollywood monthly cruises.

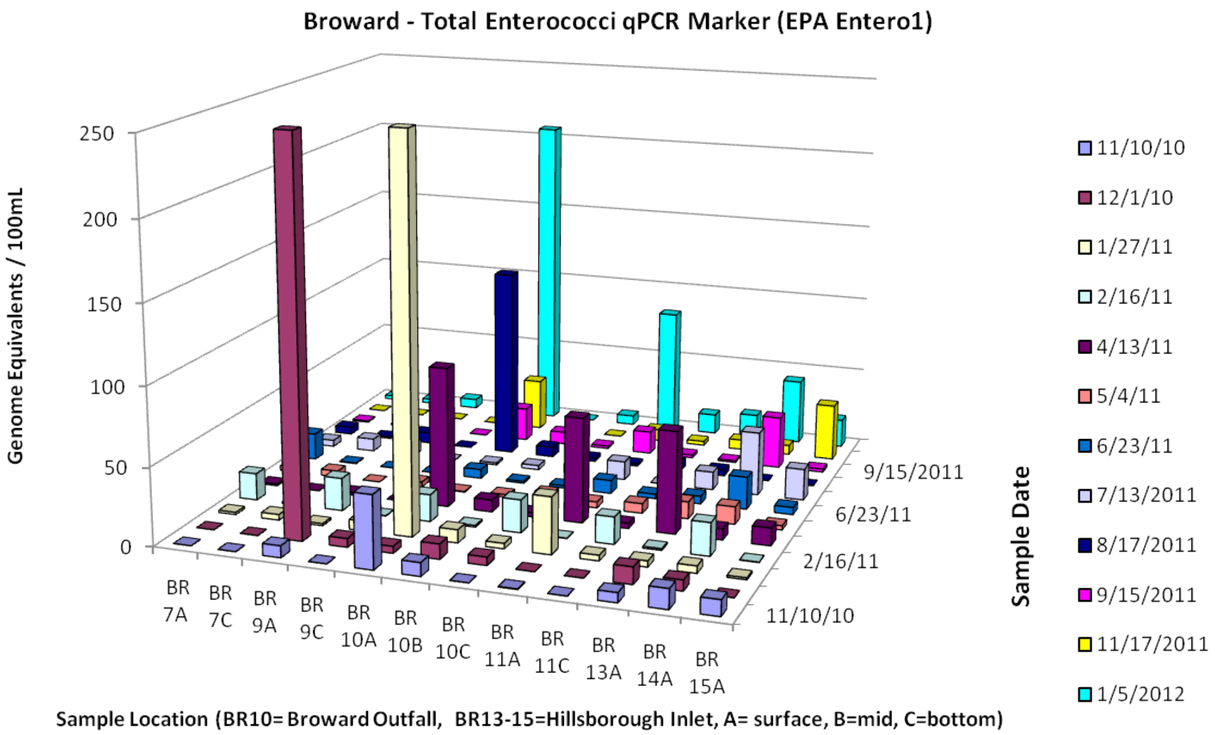

Figure 96. Total enterococci measurements by EPA Entero1A qPCR assay for the Broward monthly cruises.

significant threat than the outfalls for exporting potentially infectious bacterial agents to the coastal waters of the study region.

Enterococci may not, however, be a good proxy for types of pathogens other than bacteria. It has been shown in previous studies that pathogenic protozoan cysts such as *Cryptosporidium* and *Giardia* may survive common wastewater chemical treatment methods, as can some viral pathogens.[131,132,133] Thus, bacterial indicators such as enterococci may not adequately mimic the transport and fate of non-bacterial pathogens discharged with treated wastewater to the coastal region. However, the FIB load as measured by enterococci by either viable counts or by qPCR genetic signature diluted very rapidly with distance from the source, be it coastal inlet or treated-wastewater outfall. Figure 94 shows box plot graphs of the cumulative qPCR measures for enterococci from the Hollywood and Broward outfalls versus distance from the outfall. In these box plots, it can be seen that there is a rapid and substantial decrease of enterococci genetic signature just within 500 meters of the outfalls.

From Figures 95 and 96, it can be seen that the bulk of this enterococci genetic signature was associated with the buoyant plume water from the outfalls, with the greatest abundance primarily at the surface and typically diluting by at least a log or more within the first 500 meters downcurrent of the outfall. A similar dilution phenomenon was observed for the coastal inlets with highest abundance at the inlet itself and diluting rapidly offshore. In the case of the inlets, the greatest abundance was also observed in surface waters. At Port Everglades Inlet, in particular, the hydrology is complex, with different rates or even different directions of flow between the surface and bottom at different periods.[134] As seen for site BR1, the bulk of the FIB signal for both viable enterococci and the enterococci genetic signature was observed in the surface waters. Of note in these figures is the fact that there was significant temporal variation for the FIB levels of both the inlets and the outfalls. In addition, there appeared to be a seasonal trend for the outfalls, with higher enterococci abundance in the winter months (particularly November through January). However, there were no significant seasonal trends observed for the coastal inlets, although they also showed a high degree of temporal variability with no discernible pattern.

6.1.3 General Bacteroidales Fecal Indicator Bacteria Measurements by qPCR

The general Bacteroidales genetic signature for the 16S rRNA, as measured by the EPA GenBac3 qPCR assay, has been proposed as an alternative general FIB marker to represent potential fecal contamination to coastal waters.[135] Preliminary epidemiological studies of bathers in recreational waters of temperate fresh water and marine coastal beaches have suggested a relationship between measured Bacteroidales abundance and reported recreational water illness (particularly gastrointestinal illness).[136] However, a number of caveats for this particular assay should be considered. The relative environmental background of this general Bacteroidales genetic marker is unclear, but it appears to be abundant in many areas, including Florida coastal waters. This particular marker does not have a host-source tracking capability, and the phylogenetic range of this marker is unclear among environmental Bacteroidales populations. In addition, some previous studies have suggested that the general non-host-specific Bacteroidales qPCR assays may not adequately discriminate between environmental and fecal origins.[137] There are also no regulatory thresholds or limit guidance to interpret the environmental measurement of this marker.

While the EPA has provided a multi-lab tested protocol for this assay, it has not promulgated any regulations or specific guidance on its usage, nor has it established any clear thresholds or exposure limits for interpreting what levels of detected general Bacteroidales may represent impaired waters. Although it has been suggested by some researchers that an abundance of this marker over 10,000 genome equivalents per 100 mL might reflect waters potentially impaired by general fecal contamination (personal communications), there are no official guidelines or a general consensus yet regarding exposure thresholds for this marker. It should be noted that there is some debate over this, and other researchers have suggested levels over only 1000 cells/100 mL should be considered significant.

Given these considerations and caveats, Figures 97 and 98 show the genetic signature for general Bacteroidales as measured by this GenBac3 qPCR assay for the monthly Hollywood and Broward cruises, respectively. It should be noted that previous studies by both AOML's Environmental Microbiology Laboratory and others have shown highly random but frequent elevations in the background of this GenBac3 marker in a variety of South Florida coastal waters (data not shown), but that this background is usually less than 10,000 GEU/100 mL.

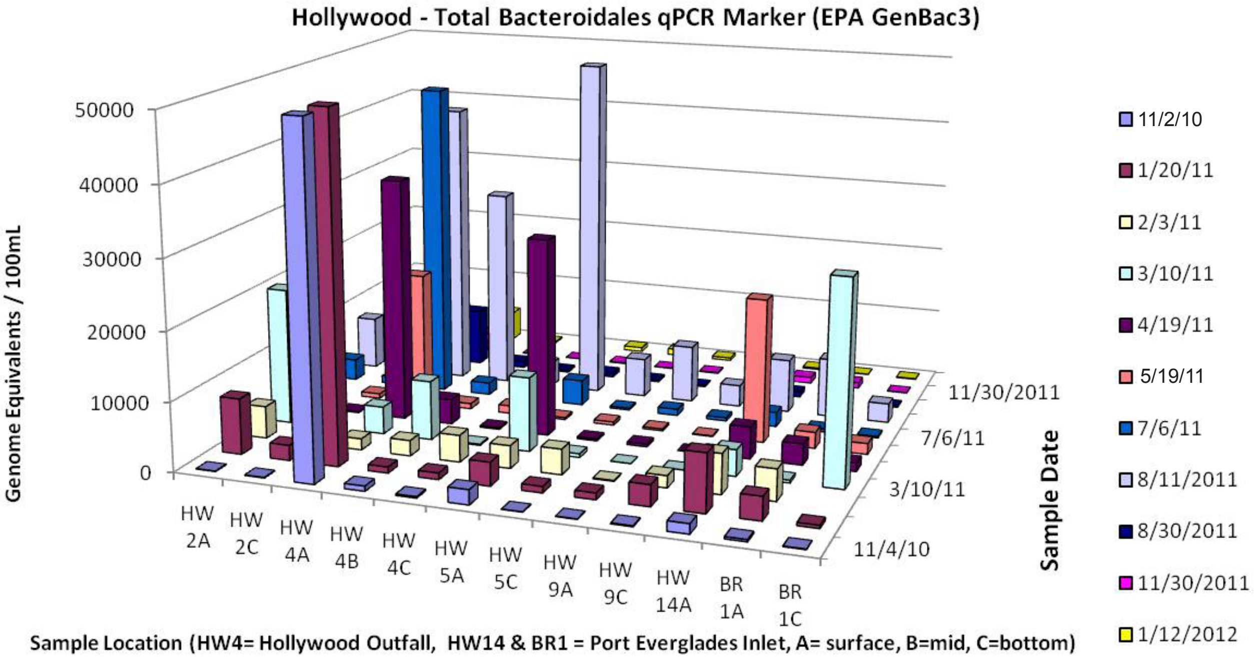

Figure 97. General Bacteroidales measurements by EPA GenBac3 qPCR for the Hollywood monthly cruises.

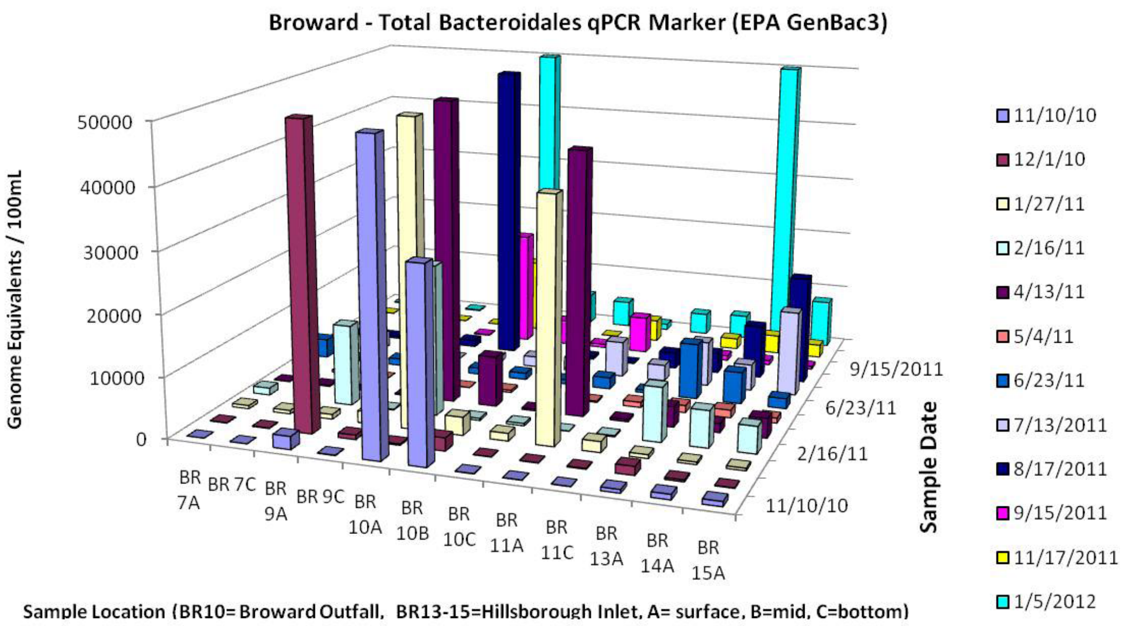

Figure 98. General Bacteroidales measurements by EPA GenBac3 qPCR for the Broward monthly cruises.

Therefore, we will use this somewhat arbitrary threshold to reflect potential impairment of coastal waters by fecal contamination as measured by this GenBac3 qPCR marker. From Figures 97 and 98 it can be seen that both the Hollywood and Broward outfalls commonly export much higher levels of the GenBac3 marker than this, with several sample dates even exceeding 40,000 GEU/100 mL.

There is no an equivalent standardized, culture-based assay for viability of this particular FIB as there is for enterococci but, given the previous enterococci data, this export of Bacteroidales from the Hollywood and Broward outfalls presumably represents mostly dead or dormant cells. Still, even if one assumes this represents only dead cells, this still clearly represents a very significant export of intact genetic information from land-based microbial contaminant sources. Presumably, the genetic information from any potential pathogenic bacterial populations in the exported wastewater would likewise be intact and represent a source of genetic information from land-based pollution that would be available for horizontal gene transfer to native microbial populations in the receiving waters. This could include undesirable genes of public health concern such as virulence genes or antibiotic-resistance genes. This Bacteroidales GenBac3 marker represents the highest measured microbial contaminant signal of this study and also appears to have the widest geographic transport and scope.

Although many of the samples demonstrated elevated levels of the GenBac3 marker, only 31 samples had measured levels higher than 10,000 GEU/100 mL (see Table 1, Appendix 4). The outfall boil sites BR10 and HW4 both showed the greatest frequency of exceedances with 9 and 7 samples respectively, while the next greatest frequency of exceedance was for HW5 (5 exceedances) ~0.5 km north of the outfall boil. The sites just south and north of the Broward outfall boil (BR9 and BR11, respectively) each had 2 exceedances. The Hillsboro Inlet sites BR14 and BR15 had 1 and 2 exceedances respectively. The Port Everglades inlet sites HW14 and BR1 each showed 1 exceedance, while the site HW2 south of the Hollywood outfall showed 1 exceedance. Thus, all observed exceedances were at or near either an outfall or an inlet.

It is clear that both the outfalls and inlets represented significant sources of export for this marker to the coastal waters of the study region (although presumably the outfall export was dead bacterial cells only representing the export of genetic information, whereas the inlets may represent live, intact cells potentially representing a public health risk). Like the other markers observed, the GenBac3 signal showed a rapid and substantial decrease with distance from the outfalls or inlets, although data from this marker suggests that bacterial particulate transport from the sources may carry them much farther downcurrent than the other bacterial markers have indicated. Like the other markers, the GenBac3 signal showed substantial temporal variation, but with no clear seasonal trend. The greatest abundance was also observed for surface waters, with the bulk of the marker transported downcurrent primarily in surface waters. However, the scope of export of this marker appeared much greater from the outfalls than from the inlets. In addition, this marker showed occasional periodic elevations (although less than the arbitrary 10 k/100 mL threshold) in surface waters of geographically distant reef tract sites, suggesting that bacterial particulates from the outfall might occasionally reach the waters of the reef tract. Still, the occasional elevations for GenBac3 observed for reef tract sites have only been seen in surface waters, and no significant elevations have been observed at depth for the reef tract sites.

It should be remembered that this particular Bacteroidales marker does not have a source-tracking capability, and the GenBac3 signal seen at the reef tract waters cannot be directly linked to the GenBac3 signal observed at the outfall or inlet sites, thus caution must be observed when trying to interpret this GenBac3 data. Alternatively, the human-associated Bacteroidales markers discussed in section 6.1.4 have a clear link to human fecal origin (and thus land-based sources of FIB contamination) and may provide additional clarity to the fate and transport of sewage-associated Bacteroidales that cannot be clearly established by the general Bacteroidales marker.

6.1.4 Human-Host-Specific Bacteroidales Fecal Indicator Bacteria Measurements by qPCR

Two different qPCR assays targeting the same 16S rRNA gene region specific for human-associated Bacteroidales (the EPA HF183 Taqman qPCR assay and the BacHum-UCD Taqman qPCR assay) were used to measure human-specific fecal contamination in the study region that could be linked to land-based sources of microbial contamination to better assess the fate and transport of bacterial particulates from the outfalls and inlets to the reef tract. Both of these human-specific fecal marker qPCR assays have been validated in large multi-laboratory validation trials by the EPA and State of California (i.e., the Source Identification Protocol Project or SIPP). However, it should be noted that, to date, the EPA has not promulgated any official regulatory criteria for human-specific fecal molecular markers, nor have they provided any recommendations about exposure thresholds or any guidance on how to interpret human-specific fecal marker data.

Again, similar to the other markers observed, the human fecal markers measured in this study showed the greatest abundance at the outfalls and inlets with a rapid decrease in concentration with distance from the outfalls or inlets. However, as can be seen in Figures 99-103, the abundance of these human fecal markers was often orders of magnitude higher in the surface waters of the outfalls than at any other

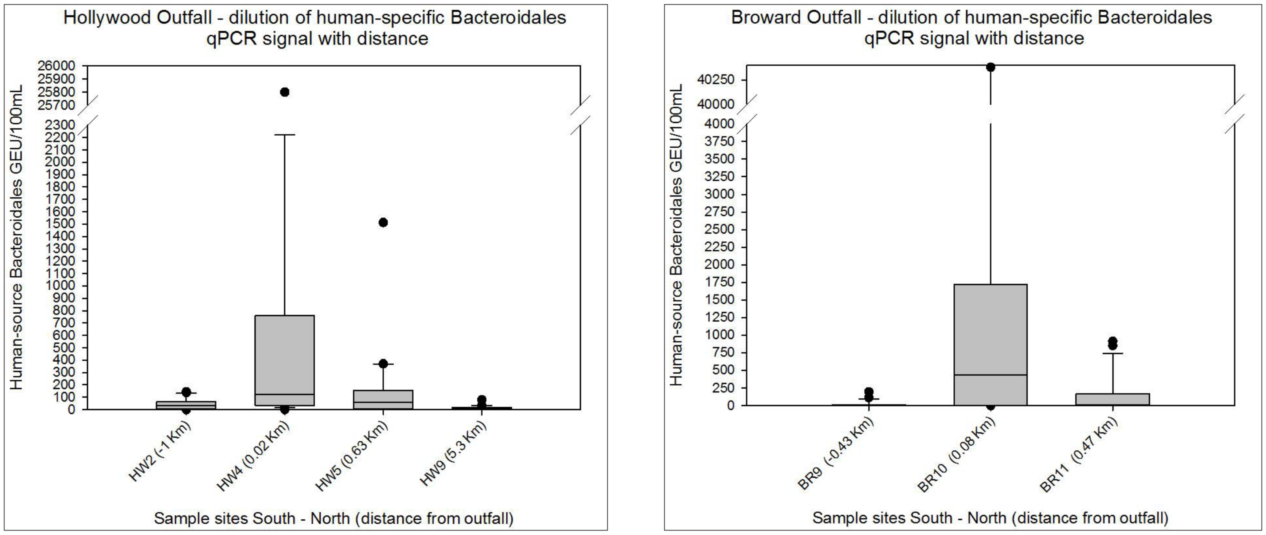

Figure 99. Box plots of all cumulative monthly cruise data showing the decrease in abundance with distance from the outfall for the human-host-specific Bacteroidales human fecal marker (combined data from both the BacHum-UCD and HF183 qPCR assays) at the Hollywood (left) and Broward (right) outfalls.

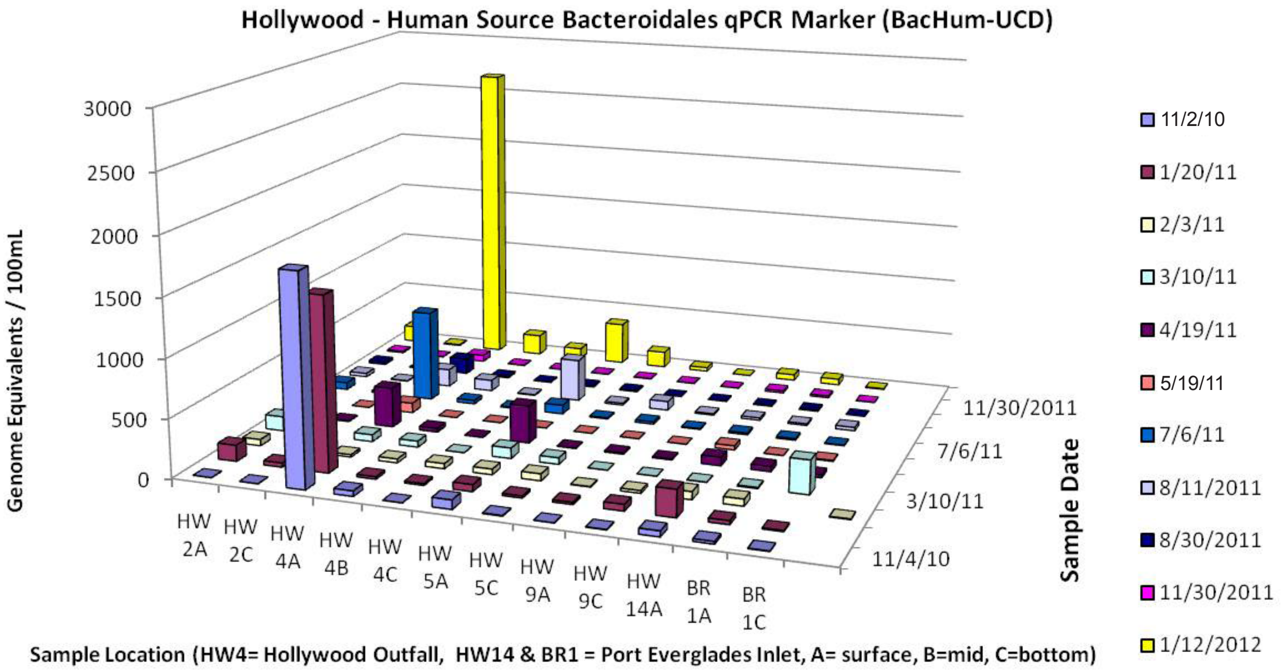
Hollywood - Human Source Bacteroidales qPCR Marker (BacHum-UCD)

Figure 100. Human-host-source Bacteroidales measurements by BacHum-UCD qPCR for the Hollywood monthly cruises.

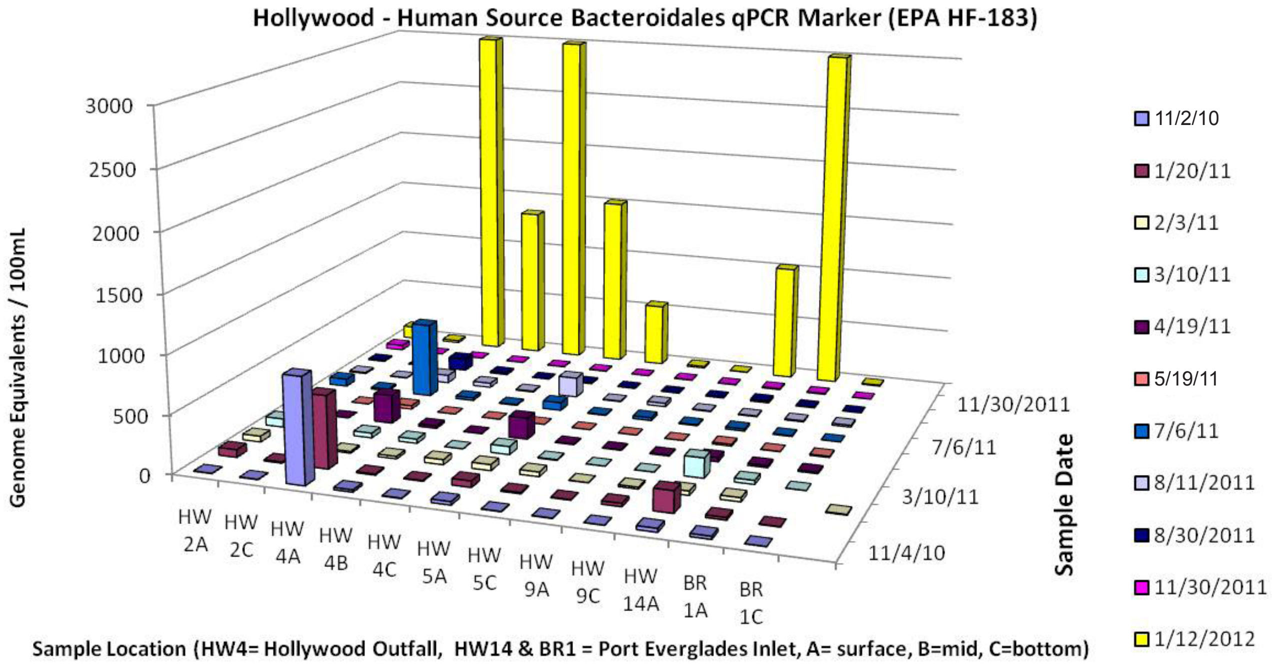
Hollywood - Human Source Bacteroidales qPCR Marker (EPA HF-183)

Figure 101. Human-host-source Bacteroidales measurements by HF183 qPCR for the Hollywood monthly cruises.

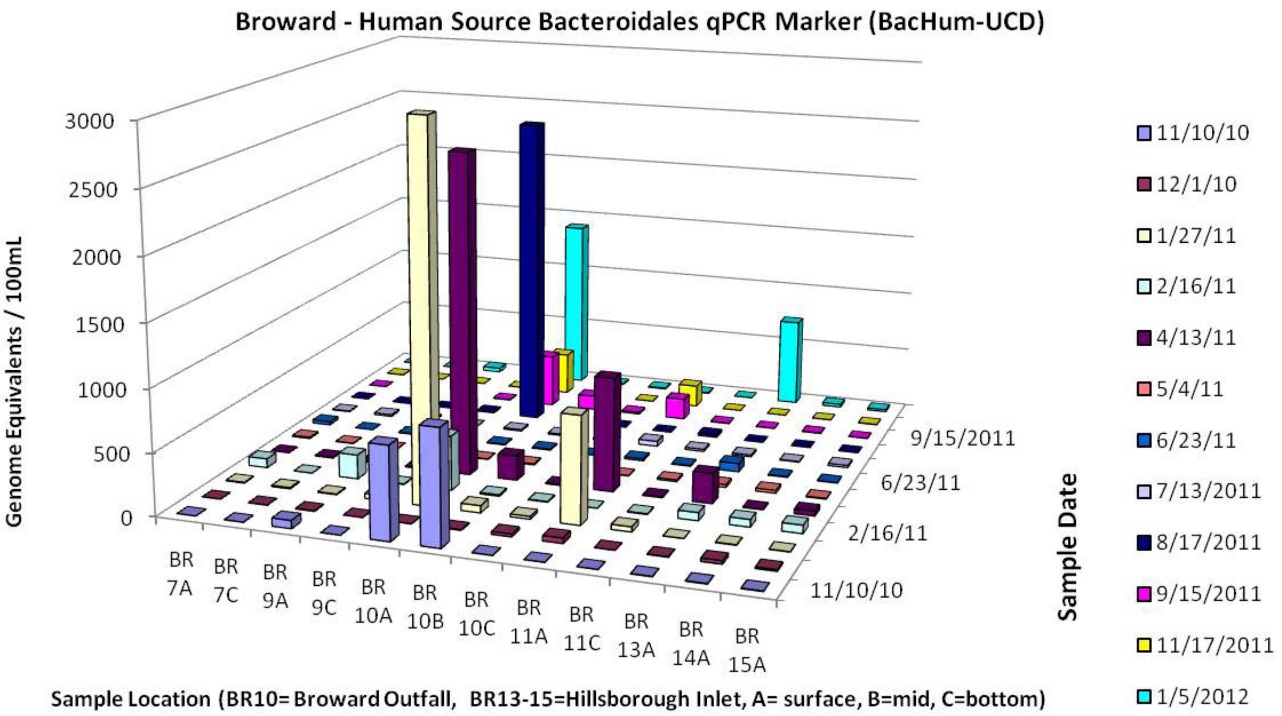

Figure 102. Human-host-source Bacteroidales measurements by BacHum-UCD qPCR for the Broward monthly cruises.

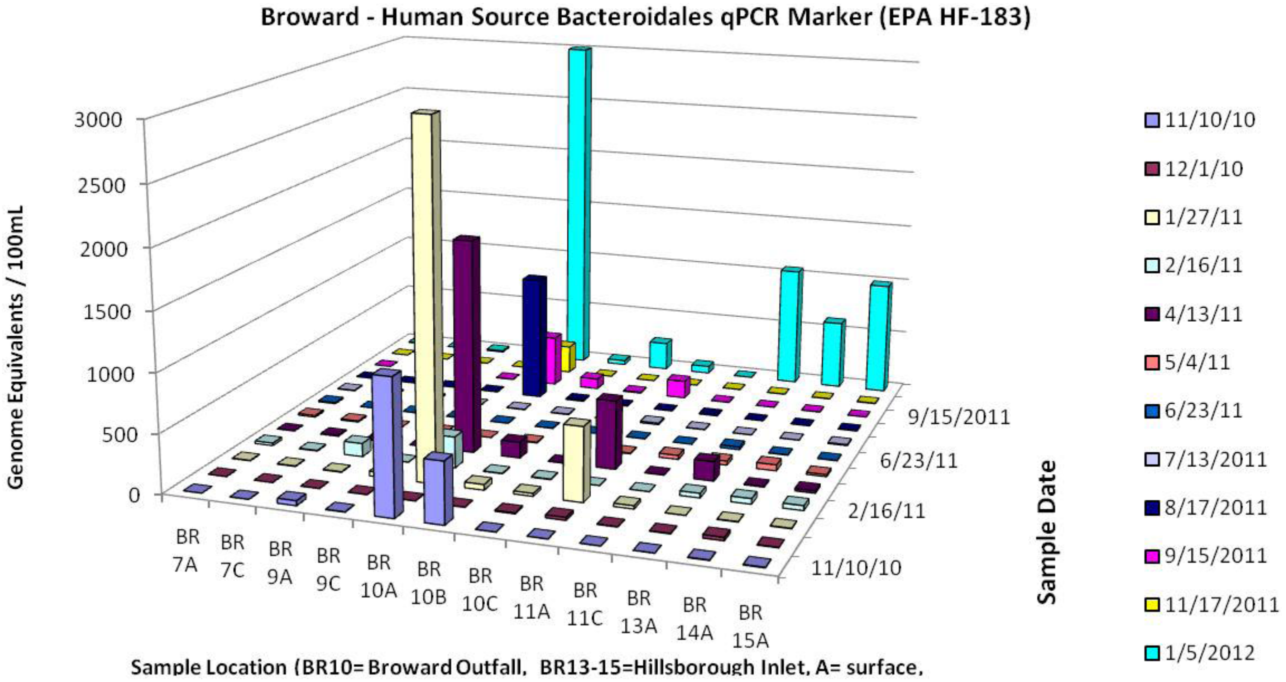

Figure 103. Human-host-source Bacteroidales measurements by HF183 qPCR for the Broward monthly cruises.

sites for this study, even the inlet sites. Figure 99 shows box plots of the decrease in abundance of human fecal marker with distance from the Hollywood and Broward outfalls for all of the cumulative human-specific Bacteroidales marker data combined from both the HF183 and BacHum-UCD qPCR assays. Given the frequent, very high elevations of these human fecal markers at the outfall boils, there is often an extremely dramatic decrease in these markers with distance from the outfalls (often more than two logs within 0.5 km downcurrent from the outfall).

While the specificity and scope of these human fecal markers have been verified by a number of multi-laboratory validation tests, and some epidemiological studies have found an association between the abundance of these markers and reported illness for some recreational waters, the EPA has not promulgated any recommendations about exposure limits of these markers, nor is there any official guidance on interpretation of abundance of these markers in coastal waters. However, given the relatively low background measures of these markers in the regional coastal waters of South Florida and the often extremely high elevations in abundance of these markers at the outfall surface boils, we suggest that these human fecal markers may actually represent the best proxies of this study for the fate and transport of sewage-associated bacterial particulates.

Given the lack of current consensus in interpreting the scale of these markers in coastal waters, we further suggest here for purposes of analysis of this particular study that levels of these human fecal markers above 100 GEU/100 mL may represent potentially impaired coastal waters impacted by sewage-associated bacteria. Please note, however, that like the other molecular qPCR assays described here, the current methods for measuring these markers cannot discriminate between dead, dormant, or live cells. The bulk of the signal from these markers at the treated-wastewater outfalls was presumably from dead/dormant cells, but there is as yet no available standardized and multi-lab validated assays to specifically measure viable human-source Bacteroidales. Promising research is underway to develop such discrimination capabilities for qPCR between live and dead cells, and such live/dead discrimination for these human fecal markers may become available in the relatively near future.[138] Still, the current data from this study reflect a very substantial export of intact genetic information (potentially including undesirable genes such as virulence or antibiotic-resistance genes) from sewage-associated bacteria into the coastal waters of the region.

Table 1 in Appendix 4 shows that while exceedances of this arbitrary 100 GEU/100 mL threshold were frequent in the immediate vicinity of both outfalls, only 12 samples (7.9%) from any depth of either of the inlets exceeded this level: four samples (5.2%) from Port Everglades Inlet and eight samples (10.5%) from Hillsboro Inlet (but four of those Hillsboro samples were from the same day of January 5, 2012). In addition, three samples (2.0%) of all inlet samples were above 1000 GEU/100 mL (but all of these inlet exceedances of 1000 GEU/100 mL were only seen for the HF183 marker: one from Hillsboro Inlet and two from Port Everglades Inlet). Neither of the two reef tract sites HW9 or BR7 showed any levels of human fecal marker above 100 GEU/100 mL. In fact, even when considering a threshold of only 10 GEU/100 mL for these markers, both reef sites together only showed 15 samples (16.3%) above 10 GEU/100 mL, with HW9 showing 10 samples (21.7%) above this and BR7 with five samples (10.8%) above this level. Most of the samples above 10 GEU/100 mL at the two reef sites were from surface waters (11% of all samples from these two sites), although some levels above this value were seen for bottom samples from the reef sites (6.5% of all samples from these two sites).

As previously seen for enterococci, the pattern of abundance for these human fecal markers appeared highly temporally variable. Also like enterococci, no discernible seasonal pattern was obvious for the inlet sites, whereas there did appear to be significantly higher abundances of these human fecal markers during the winter (from November to January). With only one year's worth of monthly data, it is hard to know if this seasonal pattern is typical. There was also one anomalously high sample day for both human markers (January 12, 2012) where very high levels were observed for both the Port Everglades Inlet and the Hillsboro Inlet (levels significantly higher than any other sample date for these inlet sites). It is unclear what the reasons were for this anomalous elevation of human marker at both inlets on this day, but it could be speculated that there might have been human fecal sources impacting the Intracoastal Waterway more than typical on this date.

Based upon the cumulative data for both general and human specific markers, it appears that fecal-associated bacterial particulates usually dilute substantially within a relatively short distance from the discharge source of outfall or inlet (i.e., within about 1 km); however, occasionally elevated levels may be carried farther downcurrent than this typical dilution pattern, although these farther-field elevations appear to be mainly constrained to surface waters. The mechanisms of this sporadic far-field transport of bacterial particulates are unclear; it should be noted that these fresher water discharges do not flow evenly but, as shown by the hydrology studies previously discussed, they may be turbulent and complex. We postulate that occasionally fresher-water eddies may break away from such discharges, entraining bacterial particulates and carrying them farther afield than typically observed, potentially transporting them as far as the reef tract sites, but primarily only in surface waters. It is presumed that when such eddies finally dissipate, the bacterial particulates they may carry will also dilute rapidly from that point.

6.1.5 Canine-Host-Specific Bacteroidales Fecal Indicator Bacteria Measurements by qPCR

A canine-host-source Bacteroidales qPCR assay targeting the 16S rRNA gene was used to measure dog-specific fecal contamination in the study region. This assay has been tested and validated in a set of multi-lab trials by the State of California (i.e., the SIPP study). In general, the dog fecal marker as measured in the Hollywood and Broward coastal regions by this DogBact qPCR assay was relatively low throughout the region, with no distinct seasonal trends (**Figures 104** and **105**). However, for a few sampling dates, high levels of this dog fecal marker were observed for some areas. The most consistent source of dog fecal marker to the coastal region appeared to be the Hillsboro Inlet, although on at least two occasions high levels of dog fecal marker were seen at outfall boils and within 0.5 km downcurrent of these outfall boils (August 30th for Hollywood and May 4th for Broward). It should be noted, however, that on these two days, the inlets (Port Everglades and Hillsboro, respectively) also showed high levels of canine-host Bacteroidales.

For all days that the Broward region showed a regionally elevated dog fecal marker, the Hillsboro Inlet had a substantially higher abundance of canine Bacteroidales than other regional sites. This may represent flushing via the inlet of regional urban runoff. In general, the Broward region showed more frequent and widespread elevations of dog fecal marker in coastal water than did the Hollywood region. However, on August 30th, very high levels of dog fecal marker of about the same magnitude were observed at both the Hollywood outfall and Port Everglades Inlet (although the highest levels at the inlet were observed at the bottom of the site just offshore of the inlet, i.e., site BR1C). Recall that the hydrology of Port Everglades Inlet is complex, and there can be multiple layers of water moving in the inlet at different speeds or even in different directions at any given time.[134]

On this day (August 30th), both the Hollywood boil and the site 0.5 km downcurrent from the boil had high levels of dog marker at the about the same magnitude so there was substantial transport of this marker without the rapid dilution more commonly seen. However, the surface abundance of this marker was approximately two orders of magnitude more than the bottom, so clearly the vast majority of this marker was being transported farther afield than was constrained to the surface layers. This high level near the outfalls was also clearly originating from outfall discharge, as the site immediately upcurrent of the outfall had a substantially lower abundance of this marker at both the surface and the bottom, whereas the site immediately downcurrent had very similar levels as the outfall boil itself (but only on the surface). On this same sampling day, an elevation in dog marker was also detected at the reef site HW9 on both the surface and the bottom. Although this was a relatively minor elevation, dog fecal marker appeared more abundantly at the bottom reef site than the surface (unlike the pattern that was more commonly observed for fecal markers during this study).

6.1.6 Pathogenic Protozoan Cyst Measurements

During the monthly cruises, pathogenic protozoan (oo)cysts for *Cryptosporidium* and *Giardia* were concentrated and measured from seawater by EPA method 1623 for IMS-IF microscopy;[92] however, due to the large sample volumes required (i.e., 100+ liters), this could only be conducted for the surface waters of the outfall expression boils themselves. The required large sample volumes are due to the highly infectious nature of these protozoans. Swallowing even one cyst may be enough to establish disease; therefore, large sample volumes are necessary to ensure an assay sensitivity relevant to public health risk from these eukaryotic microorganisms.

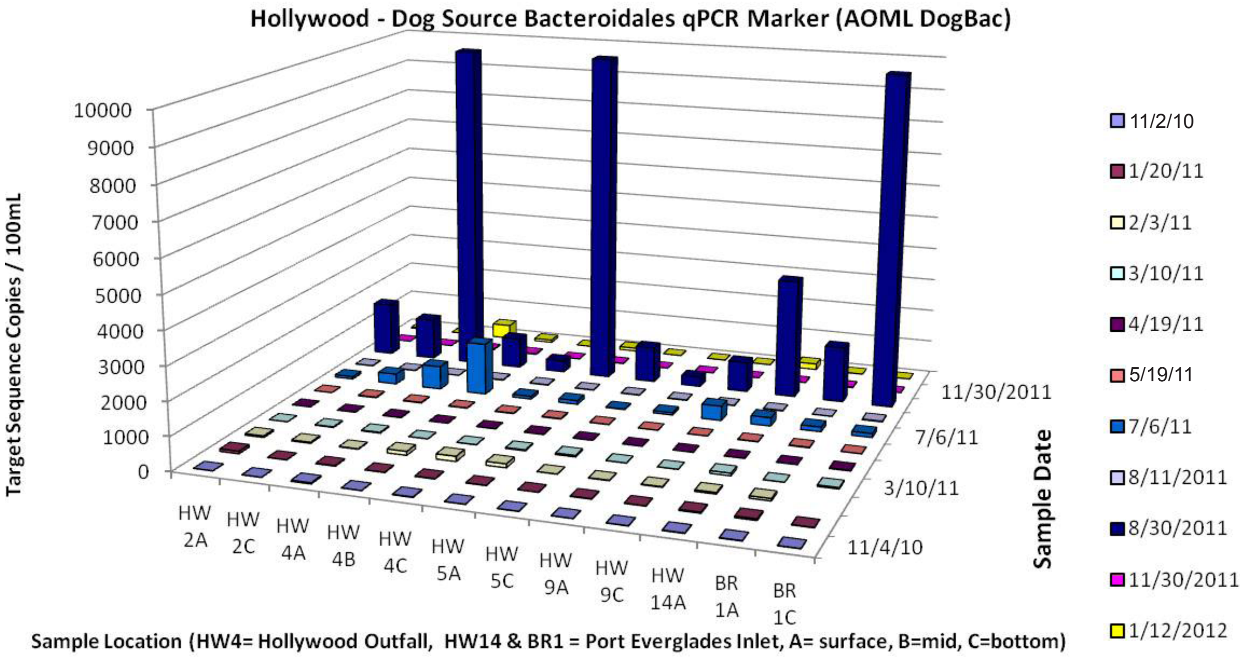

Figure 104. Canine-host-source Bacteroidales measurements by DOGbac qPCR for the Hollywood monthly cruises.

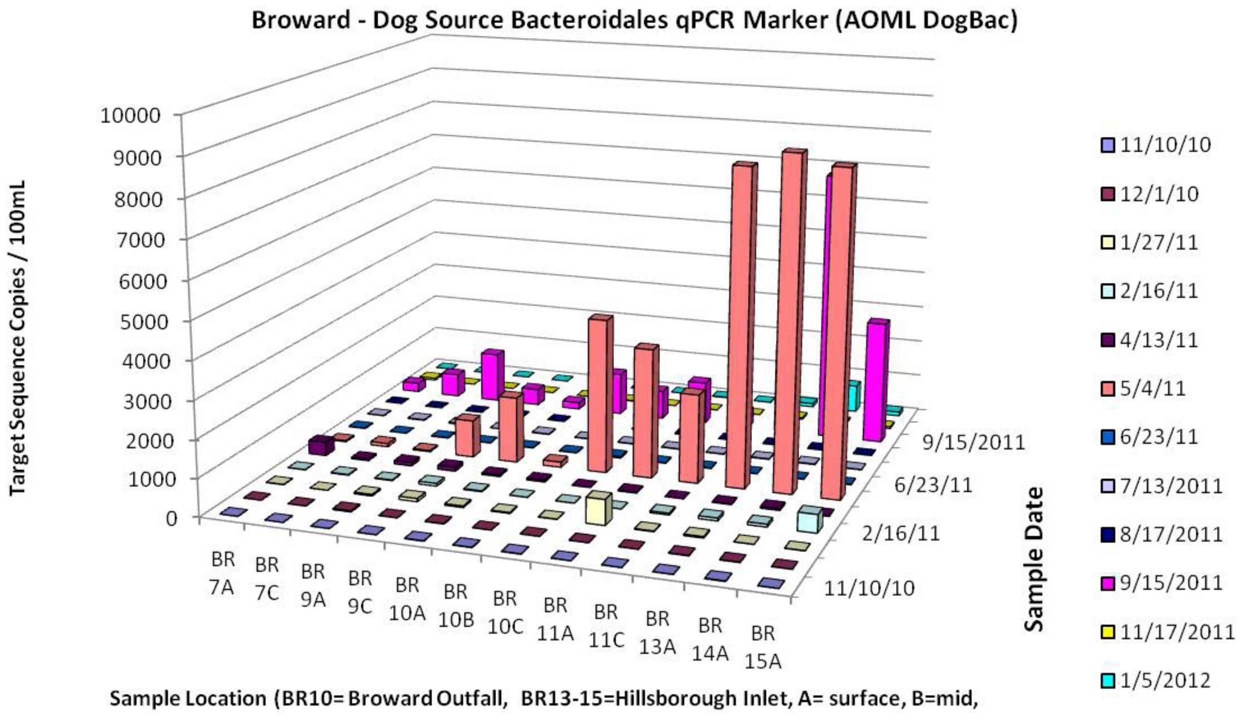

Figure 105. Canine-host-source Bacteroidales measurements by DOGbac qPCR for the Broward monthly cruises.

Such microorganisms may be especially problematic for treated-wastewater outfalls since the cyst stage of these pathogens can be highly resistant to many chemical disinfectants (such as chlorine) at concentrations employed by treated-wastewater facilities. Elevated levels of these protozoan cysts were sometimes observed during previous studies at the outfall boils of the oceanic wastewater outfalls along the southeast Florida coast. However, in this study we report that intact (oo)cysts of *Giardia* or *Cryptosporidium* were rarely observed at either the Hollywood or Broward outfall boils during the monthly cruises. The highest concentrations observed were never more than 4 (oo)cysts per 100 liters for any of the samples, except for one outlier of 20/100 L of *Giardia* oocysts detected from the Broward outfall boil on January 5, 2012. The distribution of *Giardia* and *Cryptosporidium* abundance at the outfalls during this study is summarized by box plots in Figure 106. All results of protozoan pathogen measurements for this study are given in Table 1, Appendix 4.

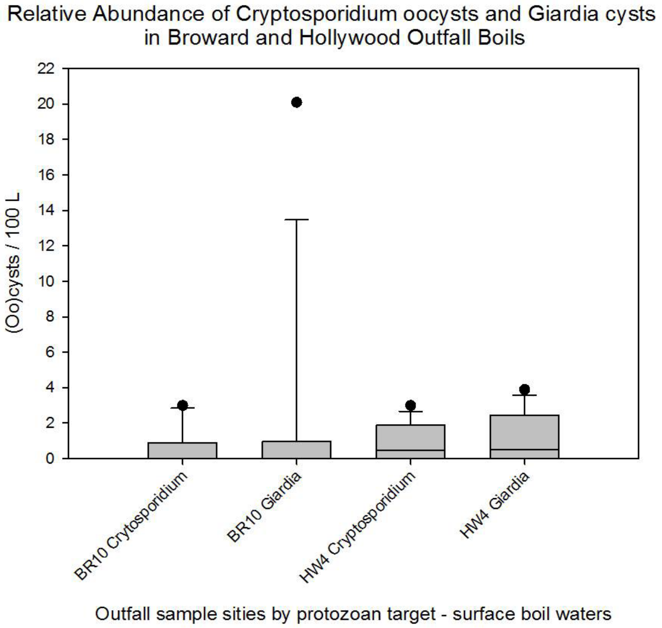

Figure 106. Box plots of all cumulative monthly cruise data for the Hollywood and Broward outfalls showing the relative abundance of pathogenic protozoan (oo)cysts in 100 liter volume samples from the outfall expression boil surface waters.

6.1.7 Preliminary Bacterial Community Metagenomic Sequence Analysis

Samples of total microbial community DNA extracts from a few selected sites and dates of this study were given to our collaborator, Dr. Jose Lopez of Nova Southeastern University's (NSU) Oceanographic Center at Dania Beach, Florida. To examine and compare the bacterial population community structure between these samples, Dr. Lopez arranged for high-capacity, next-generation-sequencing (NGS) by 454 pyrosequencing and conducted a bacterial metagenomic analysis of the NGS sequencing results as part of his larger project on coral reef metagenomics for the Earth Microbiome Project. The metagenomic analysis of these samples is a value-added component of this study that was not in the original experimental design and is still ongoing, but we report here some preliminary results of this metagenomic investigation.

The samples selected represent a combination of inlet, reef, and outfall samples from different seasons during this study. The locations of the sites are summarized in Figure 107. Samples selected were sites BR7 (reef–bottom), BR10 (outfall–surface, middle, and bottom), BR14 (inlet–surface), HW9 (reef–surface and bottom), HW4 (outfall–surface and bottom), and HW14 (inlet–surface) for January, July, and November of 2012. A non-related sediment sample was used as an outlier control to anchor the comparison.

As shown in Table 25, the 454 pyrosequencing of these samples resulted in the generation of 91,081 bacterial DNA sequences comprising 6,051 Operational Taxonomic Units (OTUs). OTUs are the number of distinct sequences at a certain cut-off level of sequence diversity. This cut-off can be at different taxonomic threshold levels (i.e., order, family, genus, etc.) or can be set at a certain level of sequence similarity. The analysis builds a library of distinct OTUs from the population of sequences in the sample and compares them for the richness and relative abundance of OTUs comprising the population of the sample. Table 25 shows the statistics of the OTU library for the samples

Table 25. Library statistics generated from QIIME.

Number of operational taxonomic units (OTUs)	6,051
Total sequences	91,081
Sequences/sample summary:	
Minimum (BR10B, July 2012)	328
Maximum (BR10C, July 2012)	6,266
Median	3332.5
Mean	3,252
Standard deviation	89,285 714
Median absolute deviation	806

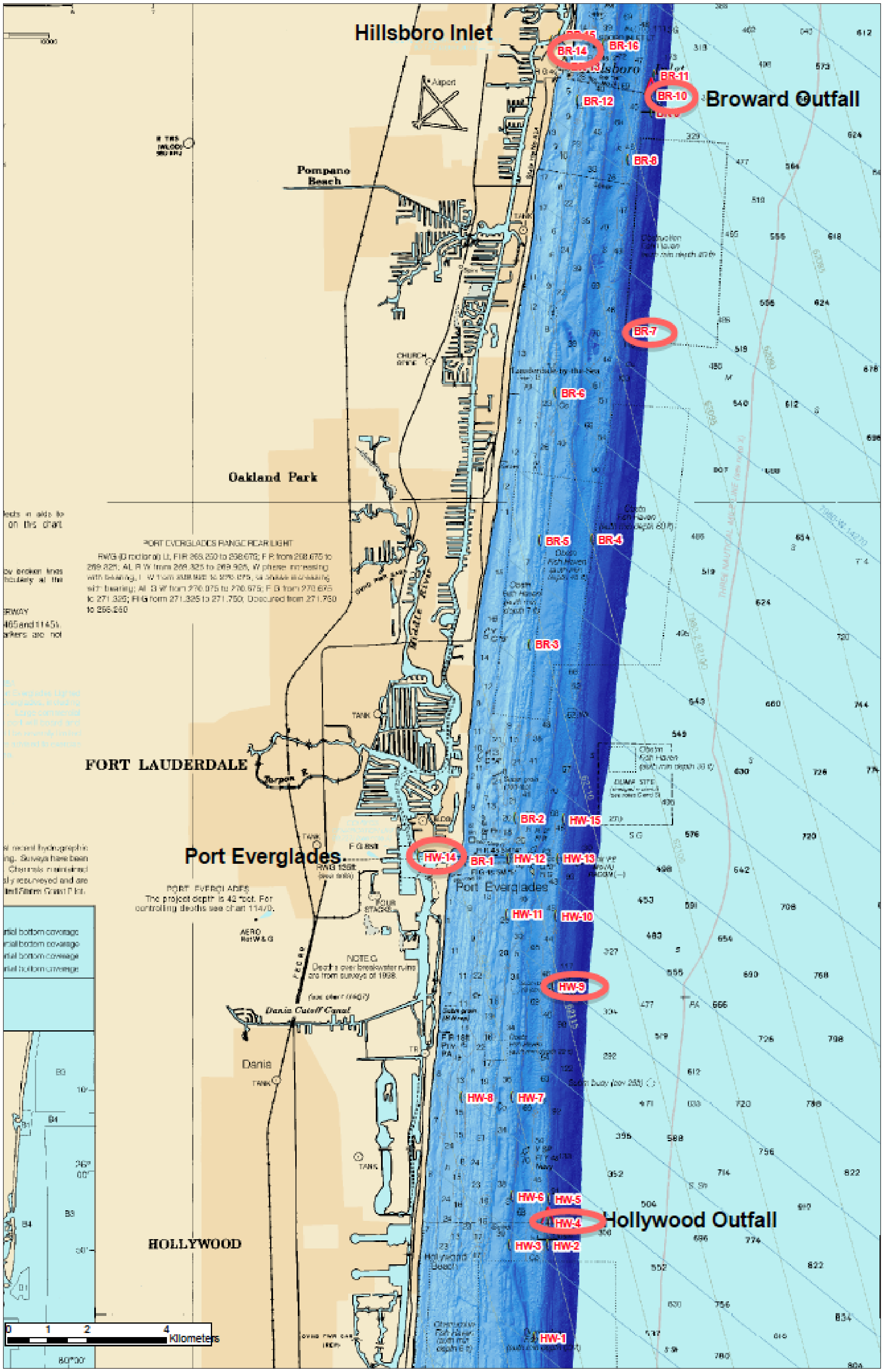

Figure 107. Map showing site locations (red circles) for total bacterial community pyrosequencing and metagenomic analysis.

from this study generated by the Quantitative Insights into Microbial Ecology (QIIME) analysis tool. The July sample from the bottom depth of the Broward outfall boil generated the greatest number of sequences (6266), while the middle depth of the Broward outfall boil from the same month generated the fewest sequences (328).

Figure 108 shows the rarefaction plots of the OTU sampling depth for coastal water samples and sediment outliers (panel A), Broward cruise samples (panel B), and Hollywood cruise samples (panel C). These plots were created with the Cloud Virtual Resource (CloVR) tool. Essentially, these plots show the relative abundance of unique OTU sequences found per number of sequences sampled. The greater the abundance of unique OTUs there are for the number of sequences sampled, the greater the diversity of the population. From these plots, it can be seen that the outlier control (sediment) population had the greatest diversity of bacterial types of any of the samples. This is expected, as sediments and soils can have highly complex and variable microbial population structures with high levels of species richness when compared to water column microbial communities.

For the actual regional water samples tested here, there appeared to be two relative clusters of taxonomic richness, with the Hollywood outfall generally showing the highest bacterial diversity and the water of Broward reef site BR14 showing the lowest bacterial diversity of unique OTUs. The plateau of some of the rarefaction plots for some samples indicates that the sequencing depth was saturated and was a strong measure of the species diversity in a given sample. For other samples, the sequencing depth was low, indicating still greater diversity than what has been identified here. A certain number of these OTUs represented the core microbiome of these samples. The "core microbiome" is defined as those taxa that occur in every sample and are present at over 50%.

Figure 109 shows a "heat map" type display of the core microbiome for these samples. The sample identifications are shown on the x-axis: the different colors indicate the different core taxa, and the length of that color in a sample indicates the percent relative abundance of that taxa in that particular sample. Panel A of Figure 109 shows the core microbiome to the taxonomic level of Order, while panel B shows the core microbiome to the taxonomic

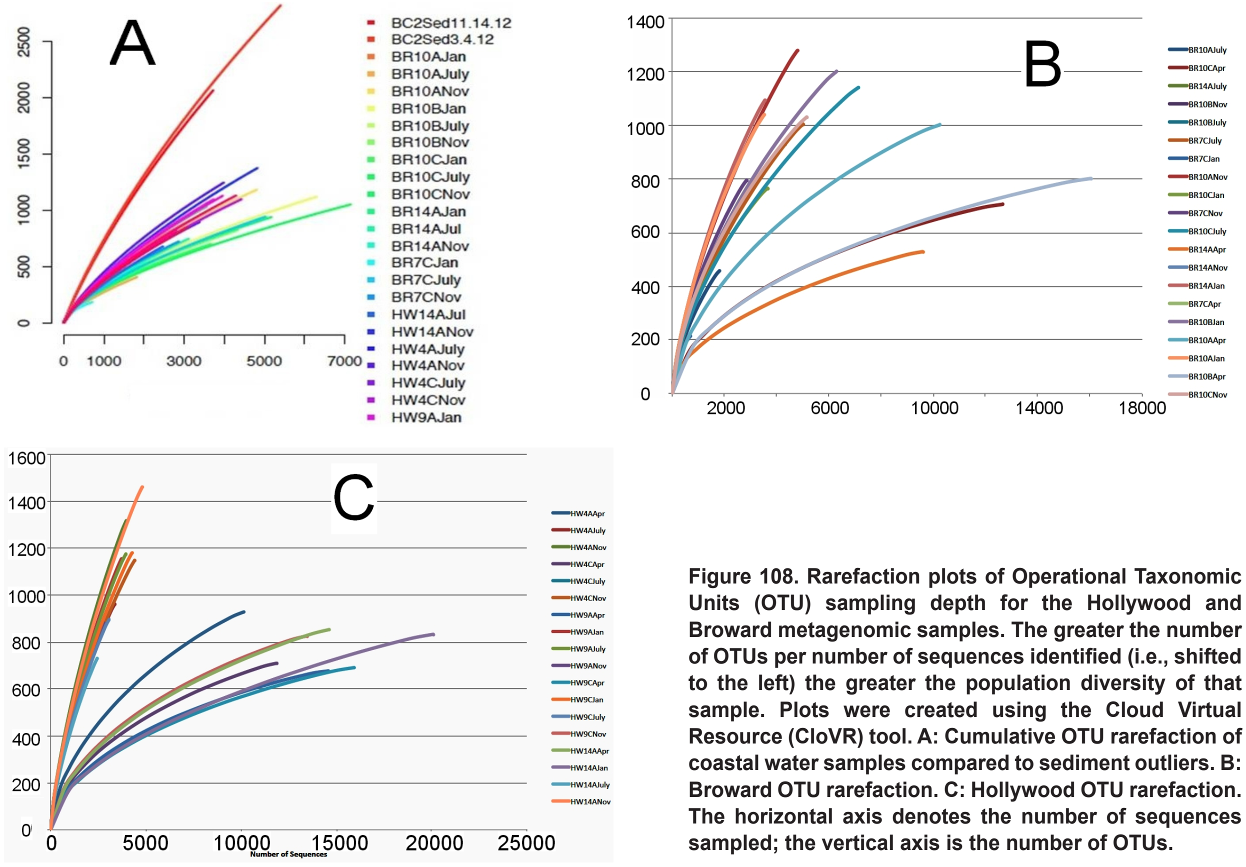

Figure 108. Rarefaction plots of Operational Taxonomic Units (OTU) sampling depth for the Hollywood and Broward metagenomic samples. The greater the number of OTUs per number of sequences identified (i.e., shifted to the left) the greater the population diversity of that sample. Plots were created using the Cloud Virtual Resource (CloVR) tool. A: Cumulative OTU rarefaction of coastal water samples compared to sediment outliers. B: Broward OTU rarefaction. C: Hollywood OTU rarefaction. The horizontal axis denotes the number of sequences sampled; the vertical axis is the number of OTUs.

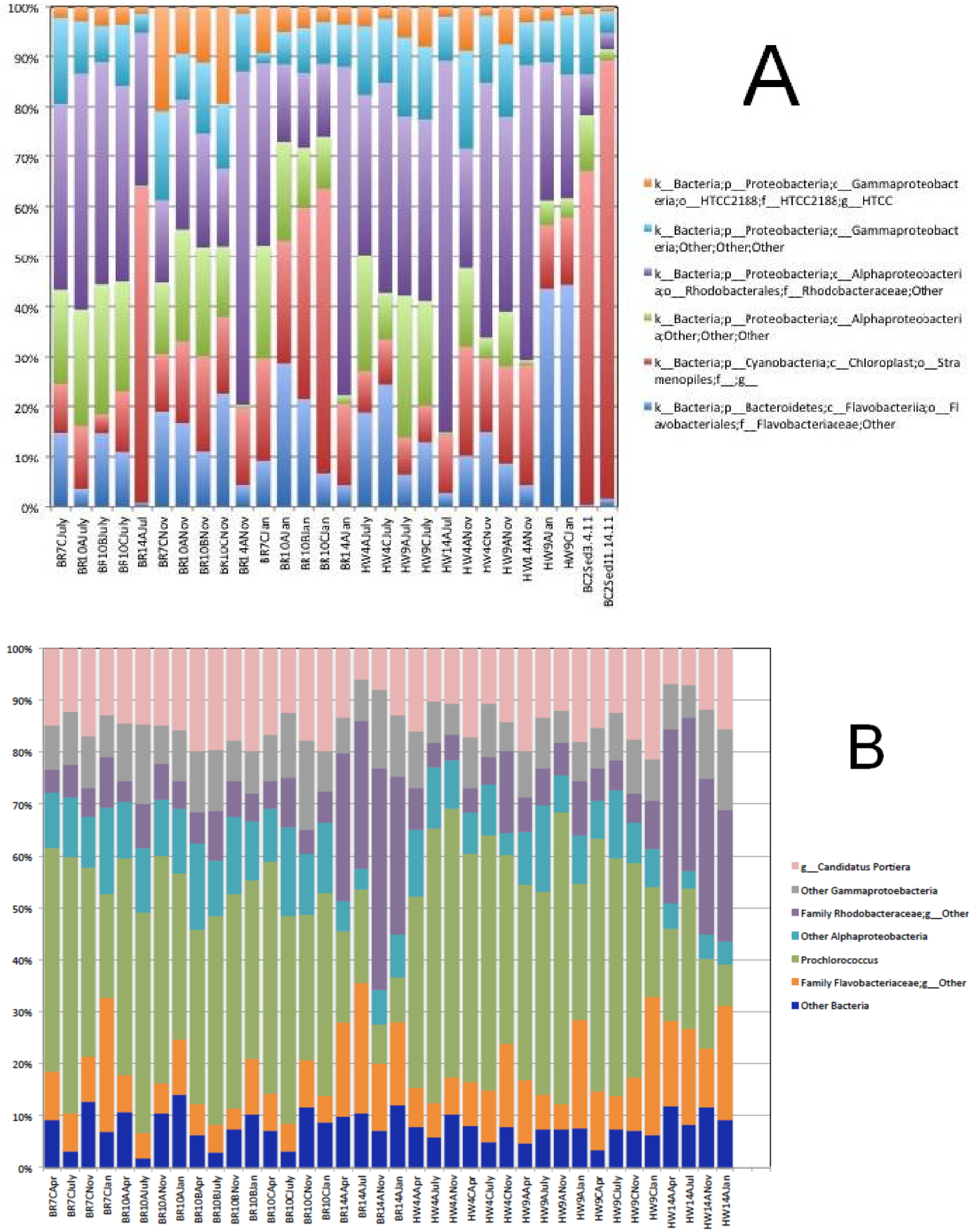

Figure 109. Taxa summary to the level of Order (panel A) and to the level of Genus (panel B) for the core microbiome from the Hollywood and Broward monthly cruise samples. The "core microbiome" is defined as those taxa that occur in every sample and are present over 50%. Note in panel A how the Port Everglades site BR14A in July is different from November and January. The order *Stramenopiles* was dominant in July but, as the months progressed, the order *Rhodobacterales* became dominant. Seasonal variations are not as apparent for the Genus level in panel B.

level of Genus. The dominant taxa were comprised mainly within the phyla *Proteobacteria* and *Cyanobacteria*. This figure provides an indication of the microbial composition based on the site and season, and it can be seen that at this particular level of taxonomic resolution (i.e., based on the cutoff threshold of the OTU definition used here), there were some slight differences in community composition by seasonality and by site type. In particular, note how the community composition at the level of Order for Hillsboro Inlet (BR14) is different from November and July. The order *Stramenopiles* was dominant in July but, as the months progressed, the order *Rhodobactereales* became dominant. This seasonality was less apparent at the Genus level for the core microbiome.

Figure 110 shows a principal coordinates cluster analysis plot for the similarities of the OTU composition and relative abundance between the samples, where the more similar the metagenomic bacterial community composition of any two samples are, the closer those two samples will cluster together in the principal coordinates of analysis (PCoA). UniFrac is a β-diversity measure that uses phylogenetic information to compare environmental samples. UniFrac, coupled with standard multivariate statistical techniques including PCoA, identifies factors to explain the differences among microbial communities. The PCoA analysis shown in Figure 110 examines these variations of community diversity based on site type community taxon composition (unweighted UniFrac shown in panel A) and based on taxon abundance (weighted UniFrac shown in panel B). The unweighted UniFrac provides an estimate of how similar or different the population of the site types are based upon what bacterial groups live in them, and the weighted UniFrac gives an estimate of how similar or different those populations are based upon the relative abundance of those bacterial groups.

In this case, the PCoA cluster plots have been color coded by site type, with blue and purple for outfall samples, red and green for inlet samples, orange and yellow for reef samples, and orange for the sediment outlier control samples. Note that the sediment outlier communities distinctly clustered well away from all other groups with very little similarity in community composition to any of the regional water samples tested here (data not shown on these plots).

While the inlet sites clustered together, showing a high degree of community composition similarity to each other either by taxon type or taxon abundance, this distinct inlet pattern clustered by itself well away from the other site types. The inlet samples thus demonstrated substantially more similarity between all inlet sites than they did to either reef or outfall sites. The inlet sites did show some differences between one another in the winter months, but showed very similar community composition in July (at this level of taxonomic resolution) for both the Port Everglades and Hillsboro inlet samples. The outfall samples showed the greatest range of variability in microbial composition, with two loosely separated clusters and a scattering of intermediate states. With one exception, most of the reef samples showed a significantly greater similarity to the lower of these outfall clusters than the higher cluster. This exception was for the reef site waters of BR7 in November, which showed a higher degree of similarity in microbial composition to the Broward outfall site (BR10) in the upper

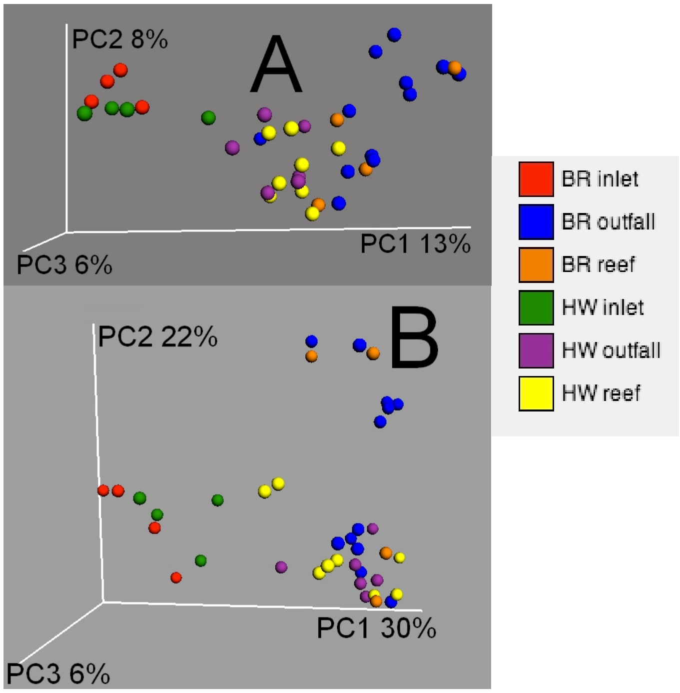

Figure 110. Principal coordinates of analysis plot of bacterial community diversity using either unweighted UniFrac (panel A) or weighted UniFrac (panel B) to examine the similarities and differences of bacterial diversity for sample site types by either taxon composition (panel A) or taxon abundance (panel B). Panel A: Community diversity characterized by sample site types using unweighted UniFrac. Unweighted UniFrac measures how communities differ by what can live in them. Panel B: Community diversity characterized by sample taxon abundance using weighted UniFrac. Weighted UniFrac measures how communities differ by the relative abundance of taxonomic groups.

left-hand lobe of the cluster. This upper lobe might reflect a time with greater transport of bacterial particulates from the outfalls to reef waters. With these minor exceptions, the microbial composition of the surface waters of the outfalls and reefs appeared to be relatively similar to each other in the lower right-hand lobe, but both were quite distinct from the composition of the inlet water populations.

Figure 111 shows the similarity of shared species between sites for the cumulative pyrosequencing data set (all dates together). For the Bray-Curtis box plots shown in Figure 111, a score closer to zero (0) shows more shared species between each site, and a score closer to one (1) would indicate fewer shared species. For most sites, the median dissimilarity score was close to 0.5, an intermediate score. When compared to the Hollywood reef site, the Broward outfall was approaching 1, indicating that there were differences in the species composition at that site.

Over the cumulative year of data, the microbial populations between this reef and outfall site were more distinct from each other. The Hollywood reef site compared to the Hollywood inlet site also showed this distinction. Similarly, the Broward inlet and Broward reef also had some differences, as well as the Broward outfall site. When the Broward inlet was compared to the Hollywood inlet, the dissimilarity score was near the intermediate, which indicates that species composition between the two sites had some similarities and some differences.

The two inlet sites were much more similar in species composition to one another than they were to the outfall or reef sites. This likely reflects the unique microbial assemblages accumulating within the Intercoastal Waterway from the surrounding urban landscape and from further up the watershed via canals that discharge to the coastal zone from these coastal inlets. This also indicates that the outfall discharge (when considering the dilution that occurs from the bottom to the surface and rapidly downcurrent) is far more similar to the background microbial community composition of the coastal zone offshore waters than is the more unique microbial community composition of the coastal inlets which receive microbial loading from a much wider variety of land-based sources of pollution, including extensive septic field drainage, urban runoff, agricultural runoff carried by canals, etc. Table 2 in Appendix 4 summarizes the cumulative abundant taxa (>1%) across all samples.

Finally, the cumulative sequence data by site were screened for the detection of known pathogens and potential pathogenic genera using BLAST (Basic Local Alignment Search Tool) screened against Enterobacteriaceae, Vibrio, Bacillales, and Epsilonproteobacteria. The summary of

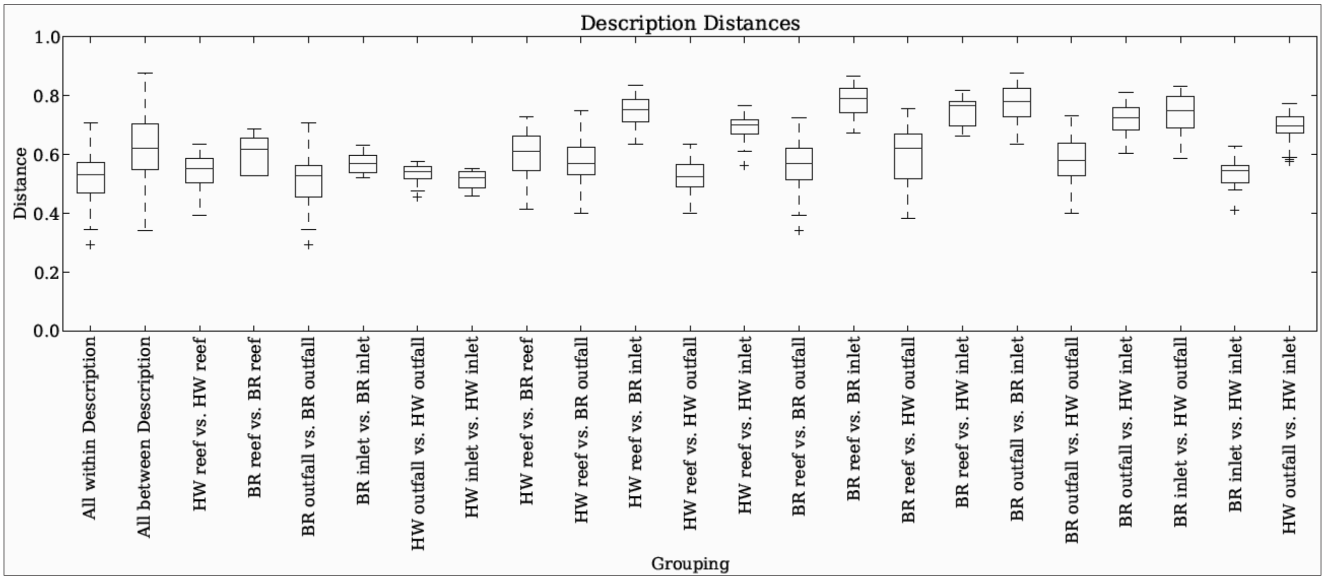

Figure 111. Box plot comparisons of bacterial species similarity of the cumulative 454 pyrosequencing data for sample sites using Bray-Curtis dissimilarity analysis. For the Bray-Curtis box plot, a score closer to 0 shows more shared species between each site, and a score closer to 1 indicates fewer shared species.

identified organisms from these groups, including potential pathogens, is shown in the Table 3 of Appendix 4. In addition, some selected pathogens of note identified during this screening are shown in Table 26. These are known pathogens of particular human and ecosystem health concern, but a greater variety of potential pathogens are summarized in Table 3 of Appendix 4.

In particular, the skin pathogen Staphylococcus aureus was found multiple times in waters of the Port Everglades Inlet (site HW14). Port Everglades Inlet waters also had multiple strains of *Serratia marcescens*, including strains of known human pathogenicity, as well as strains known to be involved in white pox disease in corals. Both inlets had multiple pathogenic species of *Campylobacter* detected within their bacterial communities, including *Campylobacter jejuni*. These pathogens found in the inlet waters by sequencing are presumably alive and potentially infectious, although this pyrosequencing method cannot discriminate viability or infectious potential.

Pathogenic *Helicobacter* species were found in Hillsboro Inlet samples, as well as multiple *Campylobacter* species. Several species of pathogenic *Camplylobacter*, along with multiple strains of *Staphylococcus aureus*, were identified from communities in the surface waters of the Hollywood outfall, while multiple strains of *Serratia marcescens* were found in Broward outfall waters (including strains involved in coral disease). Presumably, most of the bacterial cells from the outfalls were dead or dormant based upon the viable enterococci observations of the outfalls (gram negative *Serratia* strains are much more sensitive to killing by wastewater treatment than gram positive *Enterococcus* strains). However, even if most of these bacterial cells from the outfall were dead (or at least non-culturable), this still represents an export of genetic information from known pathogenic species available in the coastal environment for horizontal gene transfer that might be of public health and ecosystem health concern.

The sequencing of samples from both the Hollywood and Broward reefs contained genetic signatures from know pathogens, including native marine *Vibrio* species (both *V. vulnificus* and *V. parahaemolyticus*), as well as enteric fecal pathogens such as *Salmonella*, *Klebsiella*, and *Campylobacter* species. This particular study did not investigate if such fecal pathogens found in the reef surface waters could actually penetrate into the coral reef mucus and tissue microbial communities (although such follow-up studies may be conducted in the near future). The detection of *Vibrio* pathogens in the reef waters (highlighted in yellow in Table 26) is not unexpected, since such *Vibrio* species are

Table 26. Cumulative summary of selected pathogens of public and coral reef health concern detected by community sequence analysis of sample sites.

Other Pathogens Detected to Date in Bacterial Community Sequence Data from 454 Pyrosequencing

HW14—Port Everglades Inlet

- *Staphylococcus aureus*
- *Serratia marcescens* (3 strains)
- *Campylobacter jejuni*

HW4—Hollywood Outfall

- *Staphylococcus aureus* (3 strains)
- *Campylobacter jejuni*
- *Campylobacter mucosalis*
- *Helicobacter pullorum*

HW9—Reef

- *Campylobacter mucosalis*
- *Campylobacter concisus*
- *Vibrio parahaemolyticus*

BR14—Hillsboro Inlet

- *Campylobacter mucosalis*
- *Campylobacter jejuni*
- *Campylobacter concisus*
- *Helicobacter pullorum*

BR10—Broward Outfall

- *Serratia marcescens* (2 strains)

BR7—Reef

- *Salmonella enterica* (subspp. *enterica* and *arizonae)*
- *Klebsiella pneumoniae*
- *Vibrio parahaemolyticus*
- *Vibrio vulnificus*

typically part of the native microbial flora of these marine ecosystems. However, these native organisms can cause both wound infections and food poisoning if ingested with seafood, and they can also be induced to bloom at high concentrations given the right environmental triggers. Since the *Vibrios* detected were native marine flora, they were presumably alive and potentially infectious, although a variety of environmental and anthropogenic factors can influence the degree of virulence of *Vibrio* pathogens at any particular moment, and the environmental factors controlling such virulence of *Vibrio* cells are still not fully understood.

As for the fecal pathogens detected, it is unknown if they were viable or not, since the community sequencing methods currently do not discriminate between sequences from live versus dead versus dormant cells. However, given the pattern of pathogens seen for the inlets, it is a distinct possibility that the pathogens observed by community sequencing in the reef waters might have been viable and potentially infectious. Clearly, the sequencing data showed that coastal inlets are a significant potential source of loading for both human and coral microbial pathogens to the coastal waters of the region.

6.2 Tracer Studies

A rhodamine dye tracer cruise for the region of the Hollywood outfall was conducted on July 9, 2012, and two rhodamine dye tracer cruises were conducted for the region of the Broward outfall on November 7 and November 28, 2012. During these cruises, water samples were collected, filtered, processed, and analyzed as described in section 3.4 for the following microbiological analytes: total enterococci by the Entero1A qPCR assay, total Bacteroidales by the GenBac3 qPCR assay, and human-host-specific Bacteroidales by both the BacHum-UCD and HF183 Taqman qPCR assays. Viable enterococci were also measured, but for these dye tracer cruises the membrane filtration plate count method on mEI agar was used according to EPA method 1600.[91]

As an additional value-added analyte for the two Broward dye tracer cruises, the artificial sweetener Sucralose was also measured. The Sucralose analysis of these Broward dye tracer cruise samples was conducted as a research collaboration between AOML and the FDEP. Separate Sucralose-dedicated samples were collected and sent to the FDEP environmental laboratory in Tallahassee, Florida, where they were analyzed for Sucralose concentrations in the ambient marine waters according to FDEP SOP LC-001-2 (based on EPA method 8321B).[104]

Sucralose is a non-nutritive artificial sweetener that is now utilized extensively by the human population in North America, where the bulk of it that is consumed is not metabolized but excreted in human feces. It is well known in the U.S. as the commercial sweetener Splenda.® Sucralose is highly resilient to degradation in the environment with no natural source, and it is highly resistance to degradation by typical wastewater-treatment methods. It has been found in wastewater effluent and sewage-impacted environmental waters from many areas around the world.

Sucralose is being proposed as a chemical marker for human fecal contamination in the environment as it has no natural source, is almost exclusively associated with human diets, and the vast majority of it that is consumed by humans is excreted in the feces. It also appears to be highly stable and persistent as a human-source fecal excretion marker, can be detected from environmental water matrices with very high sensitivity, and has been found in treated-wastewater effluent and in environmental surface waters from a variety of locations around the U.S., including southeast Florida and the Florida Keys.[139]

6.2.1 Hollywood Tracer Study

The field program, sampling, and experimental design of the Hollywood tracer study is described in section 5.1. We have abbreviated this tracer experiment here as the HYTEX cruise. The map describing the location of the HYTEX cruise CTD cast sample sites in relation to the Hollywood outfall and the field conditions during the sampling cruise are also described in section 5.1 and Figure 71. The full data for the HYTEX cruise can be found in Appendix 4, Table 4. The relative abundance of the various microbial entities with distance from the outfall can be seen in Figure 112.

All microbiological analytes demonstrated a rapid decrease over a short distance from the outfall, typically dropping by close to a log or more within 0.5 km of the outfall and decreasing to near or below detection limits within 2 km of the outfall. In the case of human Bacteroidales, which is likely the best marker for bacterial particulates associated with sewage, this drop was primarily within the first 0.5 km. The

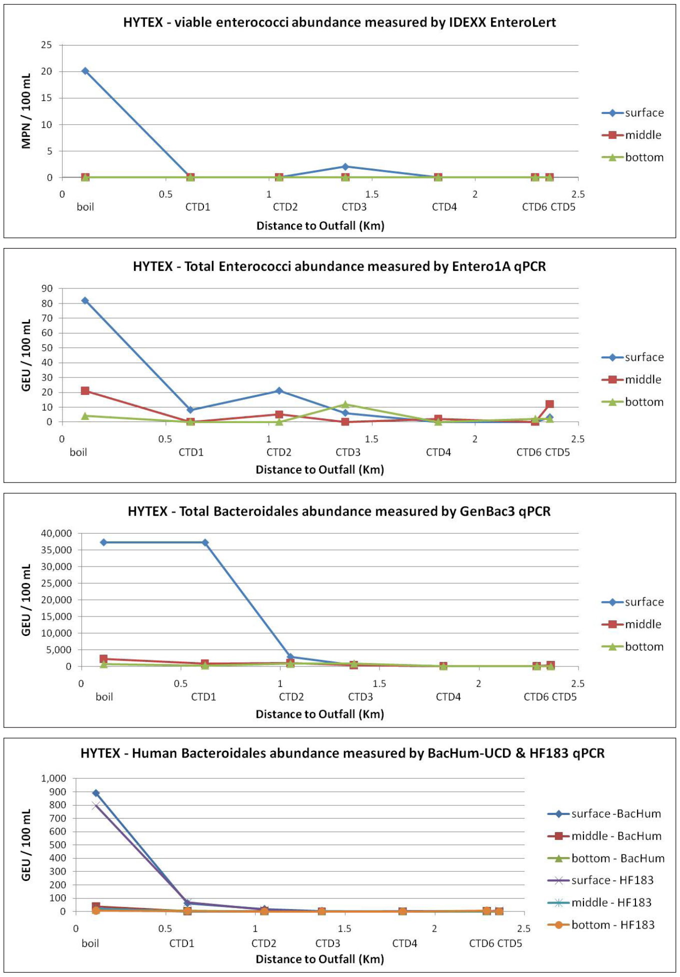

Figure 112. Relative abundance of fecal indicator bacteria and microbial source tracking markers with distance from the Hollywood outfall during the Hollywood dye tracer cruise of July 9, 2012.

vast majority of the signal from all of these microbiological entities was in the surface of the outfall near-field waters. Abundance and transport along the bottom for sewage-associated bacterial particulates appeared negligible.

6.2.2 Broward Tracer Studies

The experimental design, cruise, and field conditions of the two Broward dye tracer cruises are described in section 5.2, and the locations and patterns of drift during CTD casts are shown in Figures 79 and 85. We have abbreviated the first Broward dye tracer experiment cruise on November 7, 2012 as BOTEX1 and the second cruise on November 28, 2012 as BOTEX2.

On November 7, 2012 for the BOTEX1 cruise, the current at the start of the experiment was northerly, but during the course of the sampling, it swung to the south. The microbiology samples for this cruise were designated BR1 through BR12, corresponding with the CTD cast number. Two samples from the surface expression boil of the Broward outfall were collected by bucket toss rather than by CTD cast at the beginning of the experiment, one "pre-dye-P1-BOIL" sample before the rhodamine plume started flowing, and a second sample termed "P1-BOIL" after the rhodamine flow had been established. All other samples for the BOTEX1 cruise were collected from Niskin bottles of the CTD casts as previously described in section 5.2 (but from surface bottle only). Microbiological analytes were measured only for the surface and bottom Niskin bottles of the CTD casts.

In addition to the suite of microbial entities measured, the concentration of the artificial sweetener Sucralose was also measured from these same samples. Figure 113 shows a geo-referenced sample site map from Google Earth with the actual measured Sucralose concentrations plotted to make it easier to visualize the geospatial relationships of the Sucralose measurements, given the distance, direction, and changing currents in relation to the position of the outfall. Sucralose samples were not collected from the second CTD cast (site BR2). Oppenheimer et al. (2009),[140] in their study of Sucralose as an indicator of wastewater in surface waters, have suggested that Sucralose concentrations in excess of 100 ng/L in environmental waters may represent a significant impairment of those waters by sewage. In the case of the Broward outfall dye tracer experiment, detected Sucralose concentrations above this 100 ng/L threshold were generally constrained to within 0.5 km of the outfall, regardless of direction.

The results of all microbiological measurements from the BOTEX1 cruise, including Sucralose, are given in Appendix 4, Table 5. A summary of the relative abundance of all microbial analytes measured with relation to distance from the Broward outfall is shown in Figure 114. Given the changing current conditions, no consideration was provided in these graphs as to the direction from the outfall. All analytes showed an extremely rapid decrease with distance from the outfall down to essentially background levels within the first 0.5 km, regardless of the direction to the outfall. The highly resilient Sucralose excretion marker continued to be detected in all samples, but the levels did drop below the suggested 100 ng/L threshold within this

Figure 113. Map of first Broward dye tracer experiment (BOTEX1) cruise of November 7, 2012 showing the location and concentration of the artificial sweetener Sucralose (i.e., Splenda®) as a human-source fecal excretion marker in relation to distance from the Broward outfall. Site BR numbers on this map correspond with the CTD cast numbers for this cruise discussed in section 5.2 (i.e., BTX1-BR1 = CTD cast #1 from the first Broward tracer cruise). Sucralose concentrations in natural waters in excess of 100 ng/L have been suggested in some literature to potentially reflect impairment of those waters by sewage and/or septic sources.[139]

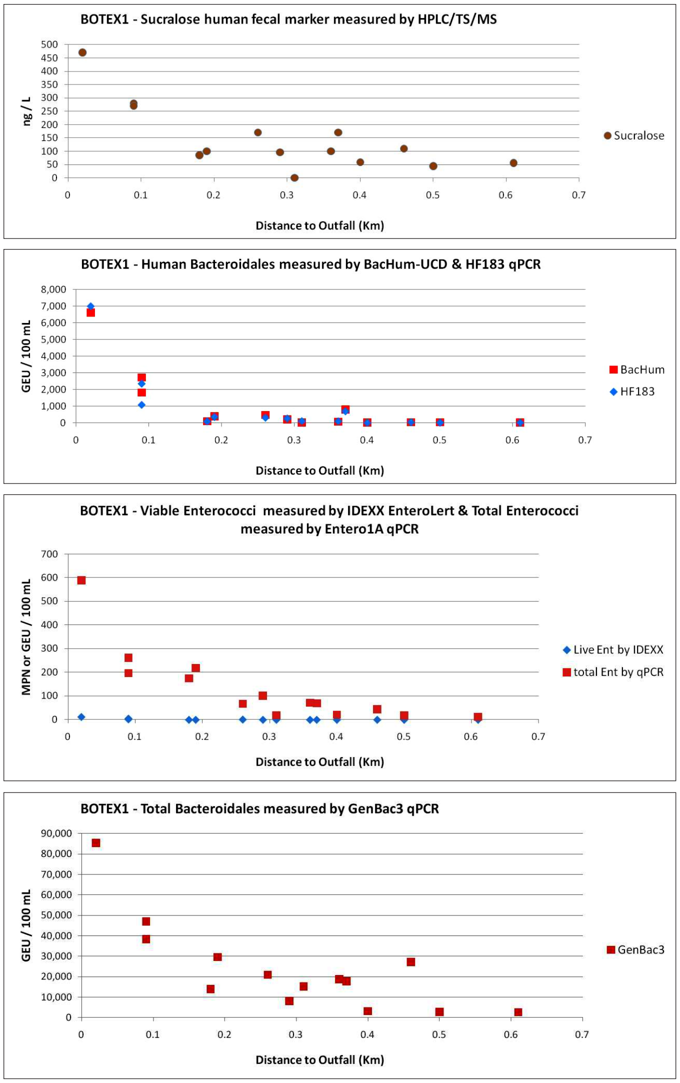

Figure 114. Relative abundance of fecal indicator bacteria and microbial source tracking markers, as well as Sucralose, with distance from the Broward outfall during the BOTEX1 Broward dye tracer cruise of November 7, 2012.

same first 0.5 km from the outfall. The human-source Bacteroidales fecal maker, in particular, which may in fact be the best representative of sewage-associated bacterial particulates, showed an extremely rapid decrease within about the first 0.2 km.

The microbiology samples for the BOTEX2 cruise of November 28, 2012 were designated BR1 through BR16, corresponding with the CTD cast number, and all microbiology samples on this cruise were collected only from surface water with the surface Niskin bottle of the CTD. Since the current generally continued in a northerly direction for the duration, distances from the outfall were given a direction, with "positive" distances being north or downcurrent of the outfall, and "negative" distances being south or upcurrent of the outfall. Analytes were the same as per the previous BOTEX cruise. Except for the second Broward dye tracer experiment, Sucralose was only analyzed for sites BR1-BR12, while the fecal indicators and molecular microbial source tracking markers were analyzed for all 16 CTD casts. The results of all microbiological measurements from the BOTEX2 cruise are given in Appendix 4, Table 6.

Figure 115 shows a georeference map of the 12 Sucralose sites (i.e., CTD casts 1-12). The geospatial relationships of all the BOTEX2 cruise sites in relation to the Broward outfall are

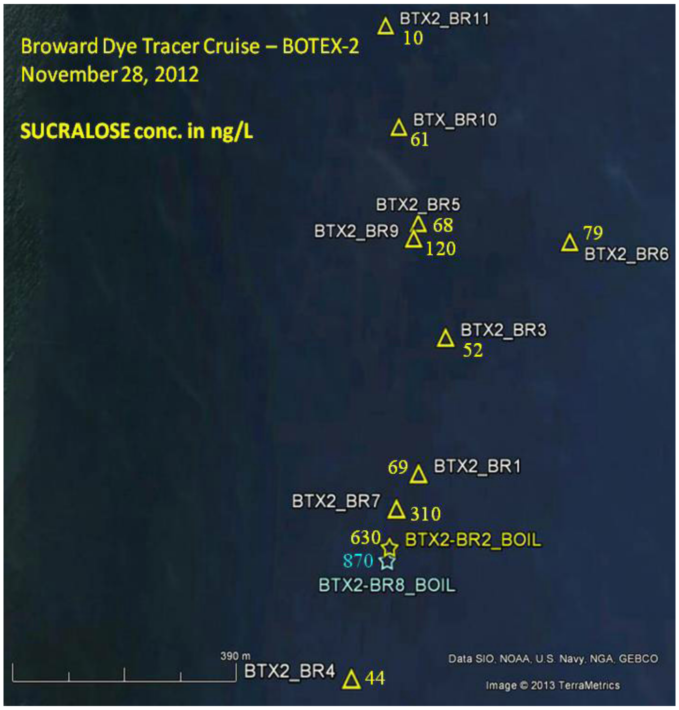

Figure 115. Map of second Broward dye tracer experiment (BOTEX2) cruise of November 28, 2012 showing the location and concentration of the artificial sweetener Sucralose excretion marker in relation to the outfall boil. Sucralose concentrations in ng/L are shown in yellow text and site identifications are shown in white text. Sucralose values in coastal waters over 100 ng/L might be considered impaired by human excretion (i.e., sewage/septic). BR site numbers correspond with the CTD cast numbers for this cruise as shown in section 5.2 (i.e., BTX2-BR3 = CTD cast 3 from the second Broward tracer cruise).

shown in Figure 85. Plots of the abundance of all analytes including Sucralose, FIB, and molecular microbial source tracking markers were plotted versus positive or negative distance to the Broward outfall in Figure 116. On this date, all of the analytes showed elevations farther downcurrent than observed for the previous dye tracer cruises but, again, all analytes still showed a rapid drop to essentially background levels within about the first kilometer from the outfall. However, an interesting anomaly was observed at site BR9 (CTD cast 9), where all measurements, including Sucralose, showed significantly higher levels than other samples taken from this same general area and distance from the outfall. The major difference between samples BR5, BR9, and BR16 was the time of day they were collected during various passes back and forth through the area during the experiment (the ship's track is shown in Figure 89). The reasons for this anomalous farther-field transport for sample BR9 are unclear. Given the pattern of the human marker, it does seem probable that this elevation is, in fact, from the outfall. This is further evidence that elevated levels of sewage-associated bacterial particulates may occasionally travel farther downcurrent than the rapid dilution pattern typically observed.

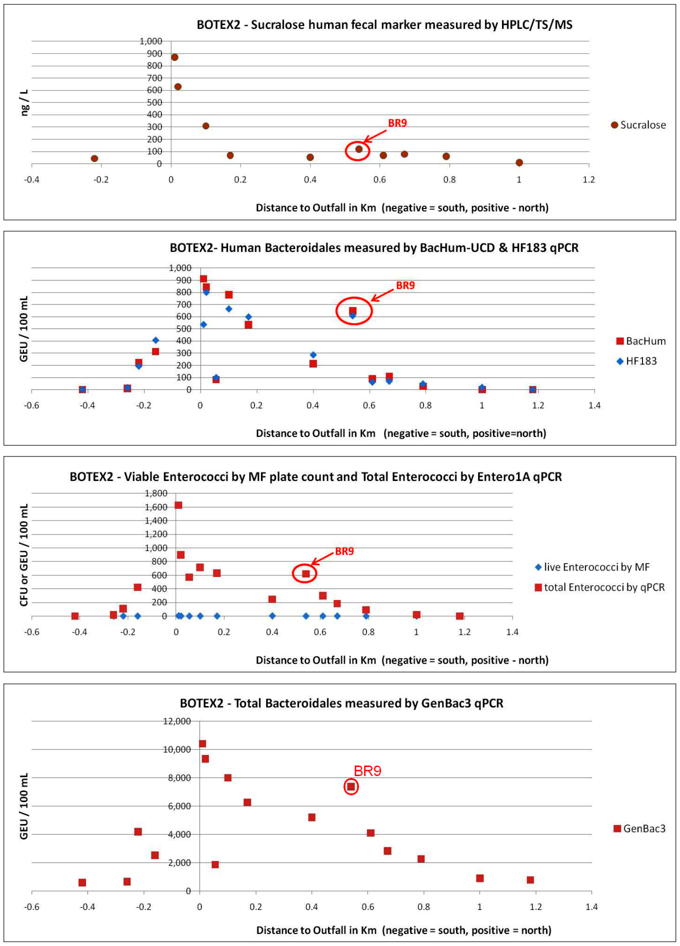

Figure 116. Relative abundance of fecal indicator bacteria and microbial source tracking markers, as well as Sucralose, with distance from the Broward outfall during the BOTEX2 Broward dye tracer cruise of November 28, 2012.

The combination of monthly cruise data, the metagenomic analysis, and the bacterial marker and Sucralose results from the dye tracer experiments all suggest that, during the period of this study, sewage-associated bacterial particulates most commonly diluted rapidly with distance from the outfalls and inlets within the first kilometer from the discharge source, but occasionally traveled much farther down field than this typical dilution pattern would suggest, potentially reaching waters of the coral reef tract farther than this distance. However, if the trends observed during this study are typical of the region, it would appear that this is the exception rather than the rule, and also that the bulk of this farther transport of sewage-associated bacterial particulates appears constrained primarily to surface waters.

The mechanisms for this phenomena are unknown, but we hypothesize that one possible mechanism may be that coherent packets of water bodies or eddies may break off from the discharge, constraining bacterial particulates within it that are then carried farther downcurrent with that water mass until it dissipates, finally releasing those particulates to rapidly dilute in that area. While this appears not to be the common dilution pattern, the frequency and scope of this farther-field transport cannot be determined with greater confidence without higher-frequency and longer-term sampling.

7. Summary and Conclusions

This document reports on a research program centered on a series of monthly water quality cruises off of Broward County, Florida, from November 2010 through January 2012. Measurements made from these cruises included nutrients and salinity, microbiological materials, and physical parameters such as temperature and density at three depths. The cruises were designed to provide information on three categories of the coastal ocean: the vicinity of the Broward and Hollywood treated-wastewater outfalls, the vicinity of the Hillsboro and Port Everglades inlets, and the interstitial ocean more distance from and thus less affected by these point sources of anthropogenic materials. In addition, tracer experiments using a tracer dye were performed at both outfalls. The program also included the measurement of ocean currents by several ADCP units operated by NOAA/AOML and Hazen and Sawyer. Some of the major observations from the study are as follows:

Regional Overview

- Currents in the vicinity of both outfalls, while predominantly northerly, are characterized by frequent, generally counterclockwise reversals. The percentage of northward-flowing water decreases as one moves inshore.
- Water column profile data did not support the view that in winter months the water column is always well mixed (unstratified).
- ADCP temperature data suggest that upwelling occurred frequently. A 6-day episode on August 11, 2011 was fortuitously sampled during one of the monthly cruises; an excess (above "background" concentration) ~4.2 µM nitrate value was found at 21 m depth.

Nutrient Characteristics

- Very little correlation of background (i.e., distance from point sources of pollution) concentrations with latitude were found; thus, there is no clear indication of increasing anthropogenic impact as one travels north (i.e., along the direction of general northerly current flow).
- Dissolved inorganic nitrogen in the region was dominated by ammonium; dissolved organic nitrogen concentrations greatly exceeded dissolved inorganic nitrogen.
- Dissolved phosphorus greatly exceeded particulate phosphorus in all regions of the coast. Dissolved organic carbon greatly exceeded particulate carbon.
- Seasonal freshwater input (as indicated by rain and canal flow) appeared to have a measurable affect on the salinity of the entire water column of the coastal waters of southeast Florida, including at the depth of the reef tract.
- Concentrations of TSS and turbidity were low over the reef tracts, indicative of high water clarity appropriate for healthy reef ecosystems.
- Dissolved oxygen levels were always sufficient to support marine life (>80% of saturation) at all depths.

Nutrient Concentration Correlations

- The total nitrogen/total phosphorus concentration ratios were consistent with other studies that suggest phosphorus is the limiting nutrient for phytoplankton production in coastal waters.
- Little or no correlation was found between salinity and dissolved inorganic nitrogen (or orthophosphate) concentrations, except with samples associated with the inlets or outfalls, indicating the rapid dilution of these nutrients in the receiving waters.

- Chlorophyll-a concentrations exceeded phaeopigments (averaged ratio was 3.5, and always exceeding unity), an indication of non-bloom conditions.

- No significant relationship was observed between chlorophyll-a and dissolved inorganic nitrogen, orthophosphate, dissolved organic carbon, total dissolved nitrogen, total dissolved phosphorus concentrations, or dissolved oxygen. Silica was positively correlated with chlorophyll-a in some inlet samples and with particulate carbon (all depths).

Inlets and Outfalls

- Elevated nutrient concentrations were associated with both inlets and outfalls and were primarily confined to surface samples.

- Elevated nutrient concentrations occurred during the rainy months. The effluent flow through the outfalls varied considerably and was strongly dependent on local rainfall. The concentration of nutrients was not significantly higher during high effluent flow periods.

- Locations more distant from the inlets and outfalls had significantly lower concentrations of nutrients; these concentrations could be considered a "background" concentration for the region.

- Inlets were an important source of nutrients and chlorophyll-a and contained the highest concentrations of chlorophyll-a, phaeopigments, turbidity, and TSS. However, excess concentrations were not observed at distances ≥1.5 km downcurrent from the inlets in the surface ocean.

- The two ocean outfalls were a significant source of nutrients; primarily at the surface. Nutrients decreased to coastal background values usually within 1 km. The outfalls were not a source of excess chlorophyll-a, turbidity, TSS, or reduced or elevated pH.

- No unequivocal evidence of downward movement of nutrients from outfall plumes was observed.

Tracer Experiments

- The Broward tracer experiments had initial dilutions (pipe to boil) of 126 (first experiment) and 68 (second experiment). The far-field dilutions were ~137 at 1 km (first experiment) and ~35 at 1 km (second experiment), with the difference ascribed to the current reversal noted at the start of the first experiment.

- CTD casts were made for each experiment. Few or zero samples were found with elevated dye concentrations away from the boil; this was interpreted as not supporting the downward movement of dye subsequent to initial dilution. Dye concentration measurements at various distances from the boils showed dilutions of ~100 at 2.5 km downcurrent from the Hollywood boil and at about 0.7 km from the Broward boil.

Microbiology

- Elevated concentrations of fecal indicator bacteria and human-specific microbial source tracking markers were associated with the inlets and outfalls. These concentrations were primarily confined to surface samples and most commonly decreased to relative background levels within 1-2 km of the discharge source, with a large decrease in abundance within the first 0.2 km.

- Coastal waters contained low concentrations of viable enterococci. Concentrations were highest near the inlets and outfalls, but diluted rapidly to near detection limits within 1 km.

- Enterococci appeared to be more abundant near the outfalls during winter months. No such significant seasonal trends were observed for coastal inlets.

- The bacterial particulates discharged from the outfalls appeared to be predominately dead or dormant based upon viable enterococci tests. The coastal inlets also periodically discharged high levels of live fecal indicator bacteria and human-specific microbial source tracking markers, as well as dog-specific source tracking markers.

- Coastal inlets appeared to contribute more potentially infectious bacterial agents to the coastal waters than the outfalls. During this study, the Hillsboro Inlet appeared to be the highest contributor of live fecal bacteria to the coastal region.

- Elevated concentrations of canine-specific microbial source tracking markers were primarily associated with inlets, but also occasionally with outfalls. It is likely this may represent at least, in part, an influence of urban runoff on the region. Very occasionally, canine fecal marker was detected in the waters of reef tract sites, especially when levels were extremely high.

- Locations more distant from the inlets and outfalls generally had significantly lower concentrations of fecal indicator bacteria, molecular source tracking markers, and chemical human-specific fecal markers. However, some farther-field samples had elevated concentrations of one or more marker, indicating sewage-associated particulates. While the rapid dilution pattern appeared most commonly, the results suggest that sometimes elevated levels of sewage-associated bacteria may travel farther than was commonly observed in this study. This farther-field transport appears to be relatively rare and primarily constrained to the surface waters. The results observed did not indicate if such bacterial particulates can move down to the reef tract. The actual mechanism, scope, and frequency of this anomalous farther-field transport were unclear.

- Unlike some previous studies of these outfalls, no significant level of pathogenic protozoan (oo)cysts was observed in the surface expression boils of either the Hollywood or Broward outfalls for samples collected during this study, but for one exception.

- Elevated concentrations of the artificial sweetener Sucralose (i.e., Splenda®), as a soluble chemical marker of human-specific fecal contamination, were associated with the outfalls. These concentrations were primarily confined to the surface samples and also decreased rapidly with distance from the outfall, with the most rapid decrease within the first 0.5 km. While Sucralose was detected at some level within all the water samples it was tested with, the concentrations of this human-specific chemical fecal marker dropped below 100 ng/L within 1 km of the outfall.

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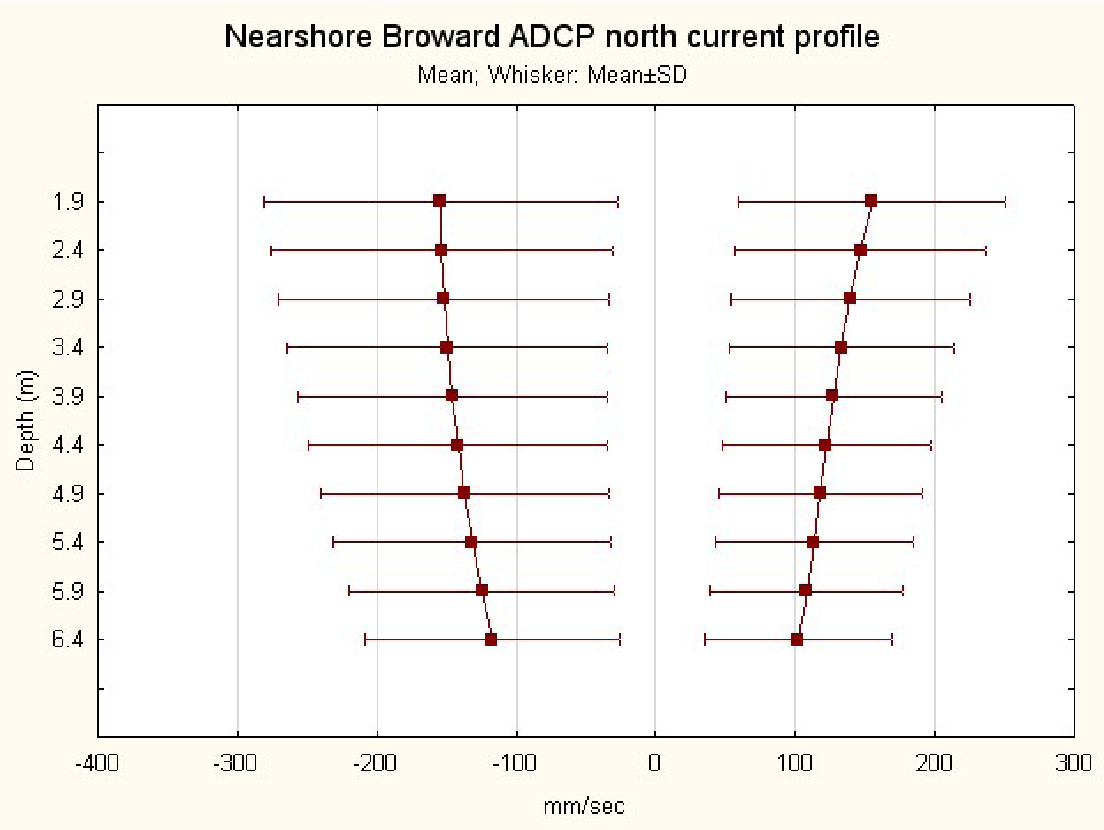
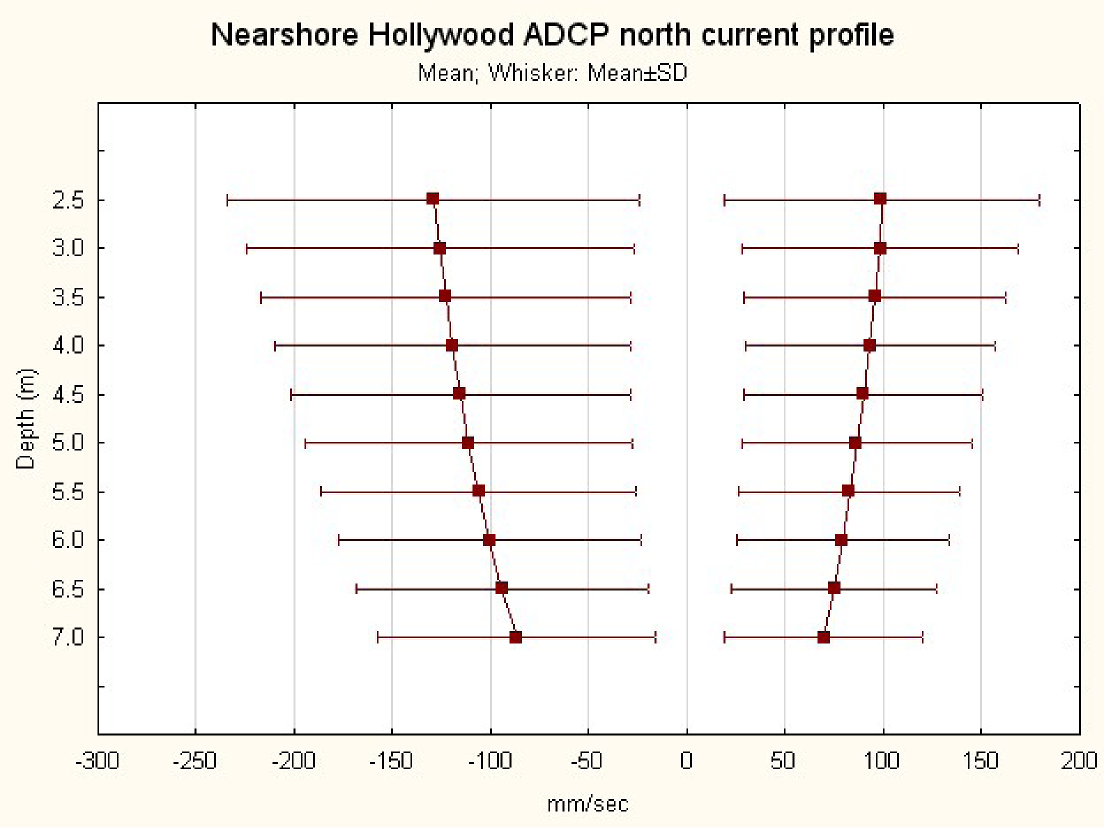
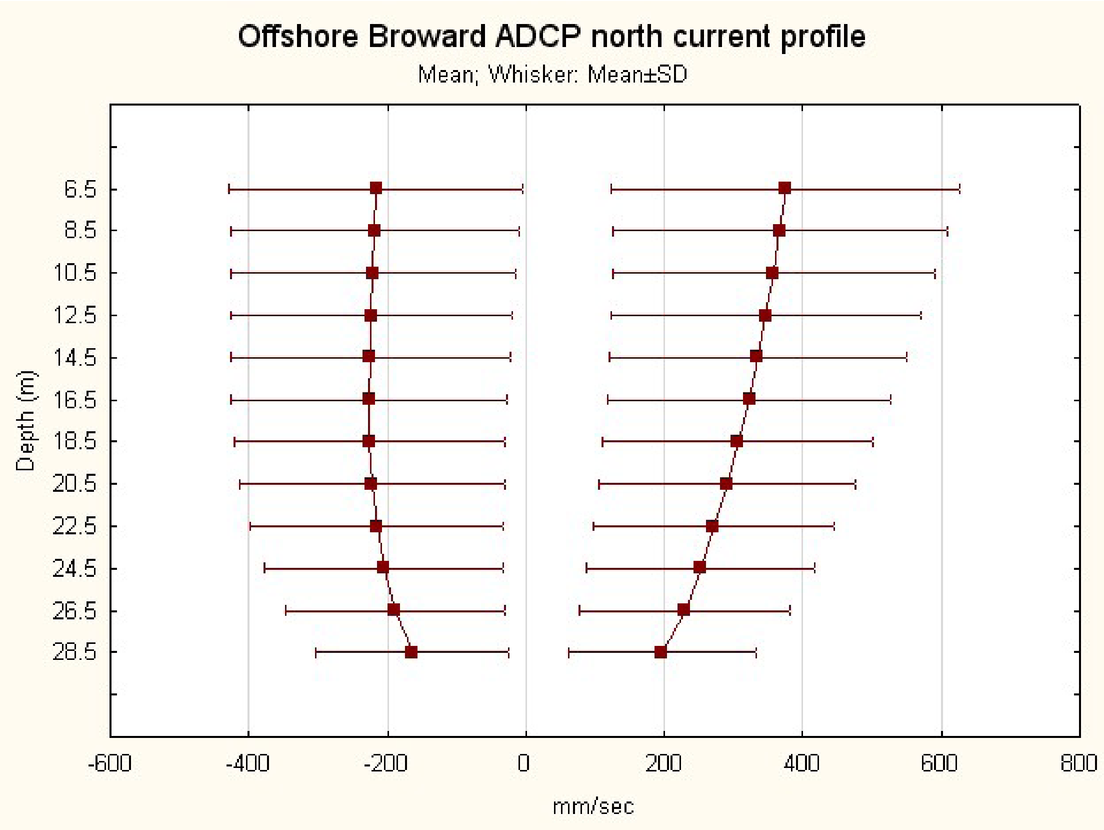
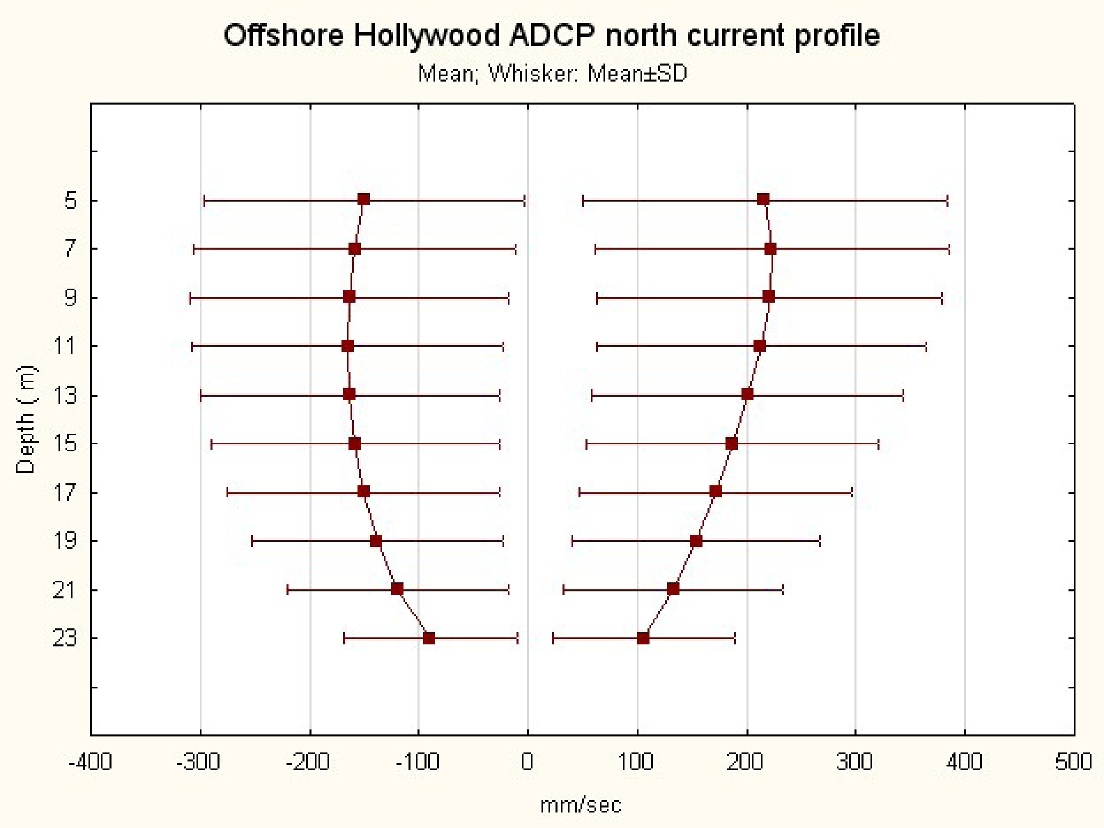
Appendix 1:

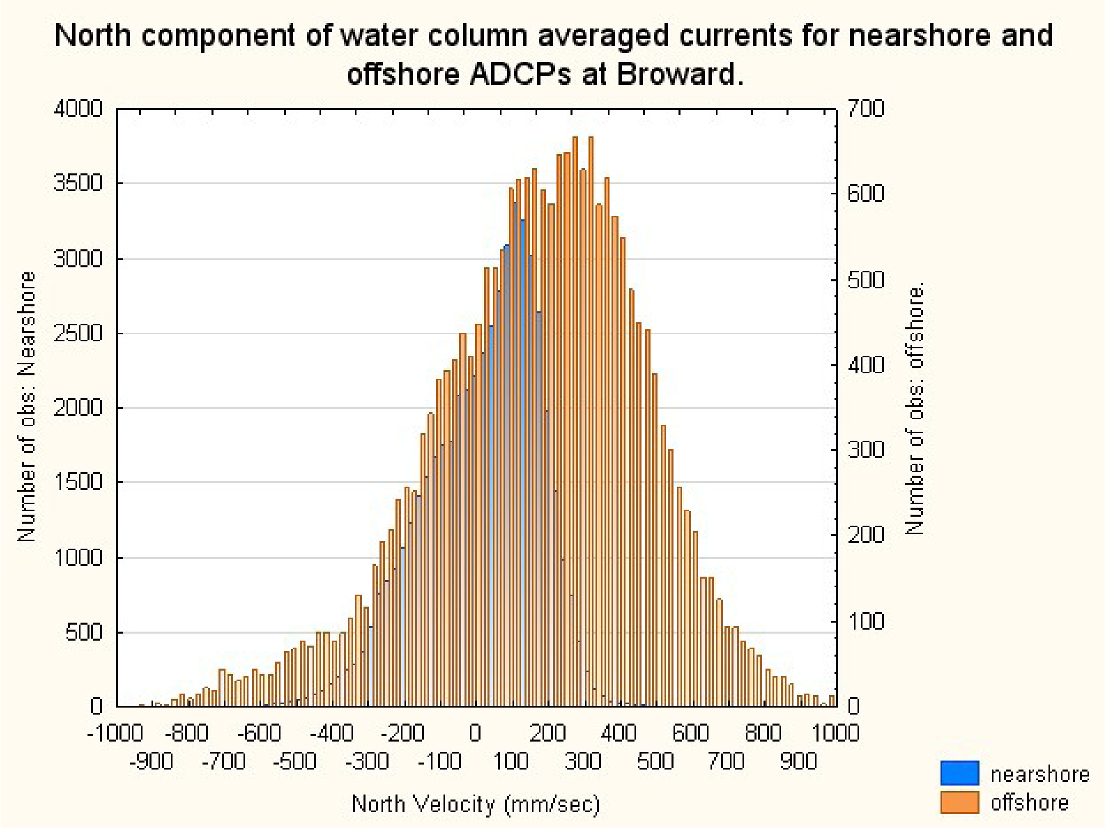
Ocean Current Measurements


Nearshore Broward ADCP north current profile
Mean; Whisker: Mean±SD
Depth (m)
1.9
2.4
2.9
3.4
3.9
4.4
4.9
5.4
5.9
6.4
-400
-300
-200
-100
0
100
200
300
mm/sec

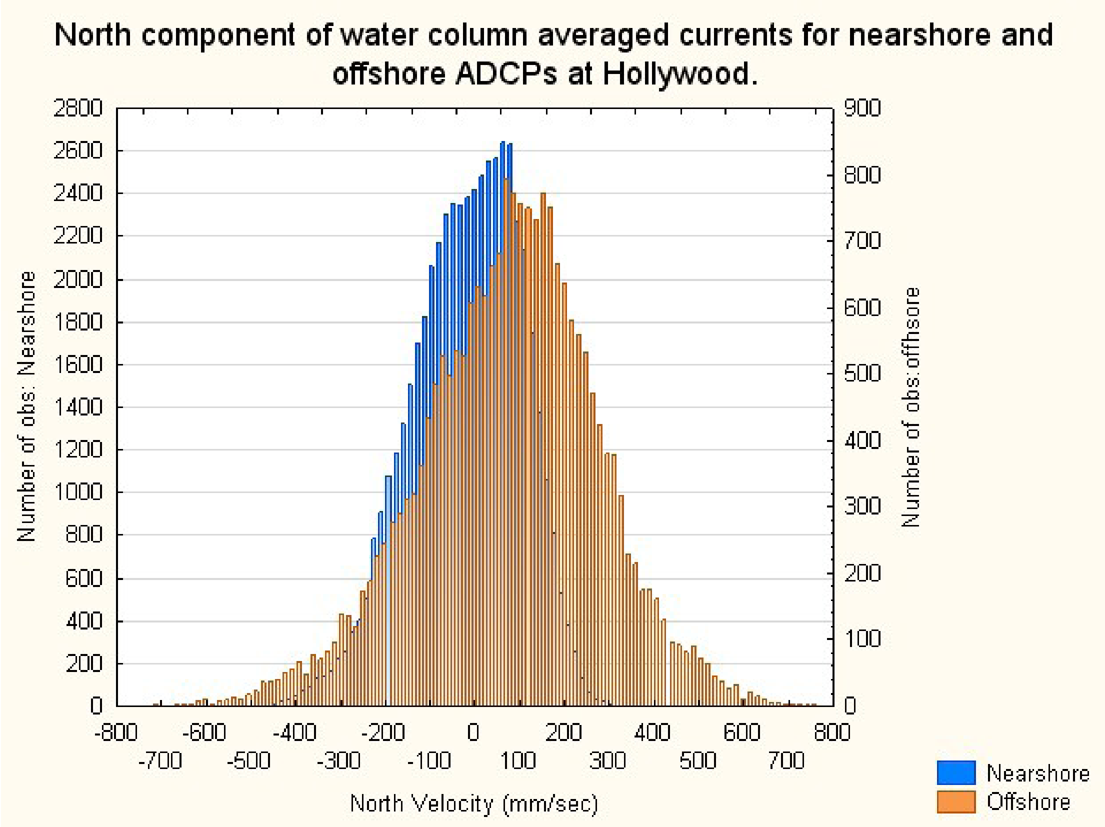

Nearshore Hollywood ADCP north current profile
Mean; Whisker: Mean±SD
Depth (m)
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
-300
-250
-200
-150
-100
-50
0
50
100
150
200
mm/sec


Offshore Broward ADCP north current profile
Mean; Whisker: Mean±SD
Depth (m)
6.5
8.5
10.5
12.5
14.5
16.5
18.5
20.5
22.5
24.5
26.5
28.5
-600
-400
-200
0
200
400
600
800
mm/sec

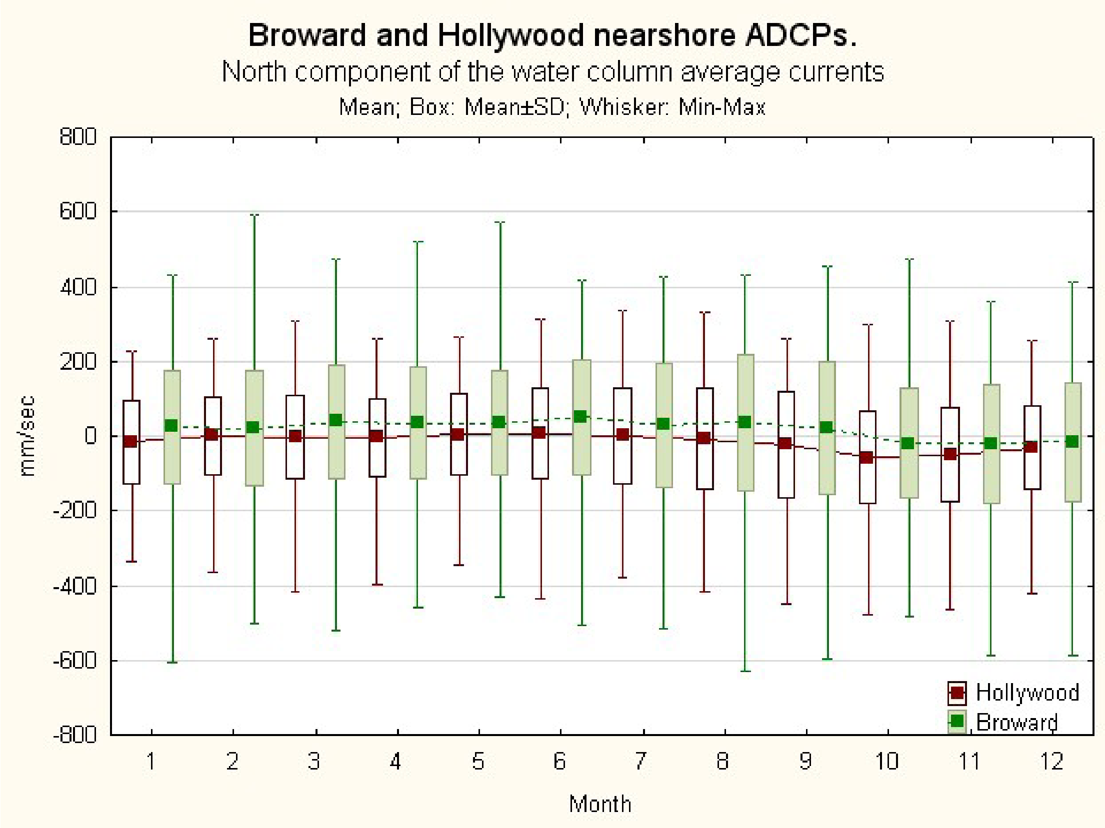

Offshore Hollywood ADCP north current profile
Mean; Whisker: Mean±SD
Depth (m)
5
7
9
11
13
15
17
19
21
23
-400
-300
-200
-100
0
100
200
300
400
500
mm/sec



North component of water column averaged currents for nearshore and offshore ADCPs at Broward.



North component of water column averaged currents for nearshore and offshore ADCPs at Hollywood.



North component of water column average for data when both onshore and offshore data were available.

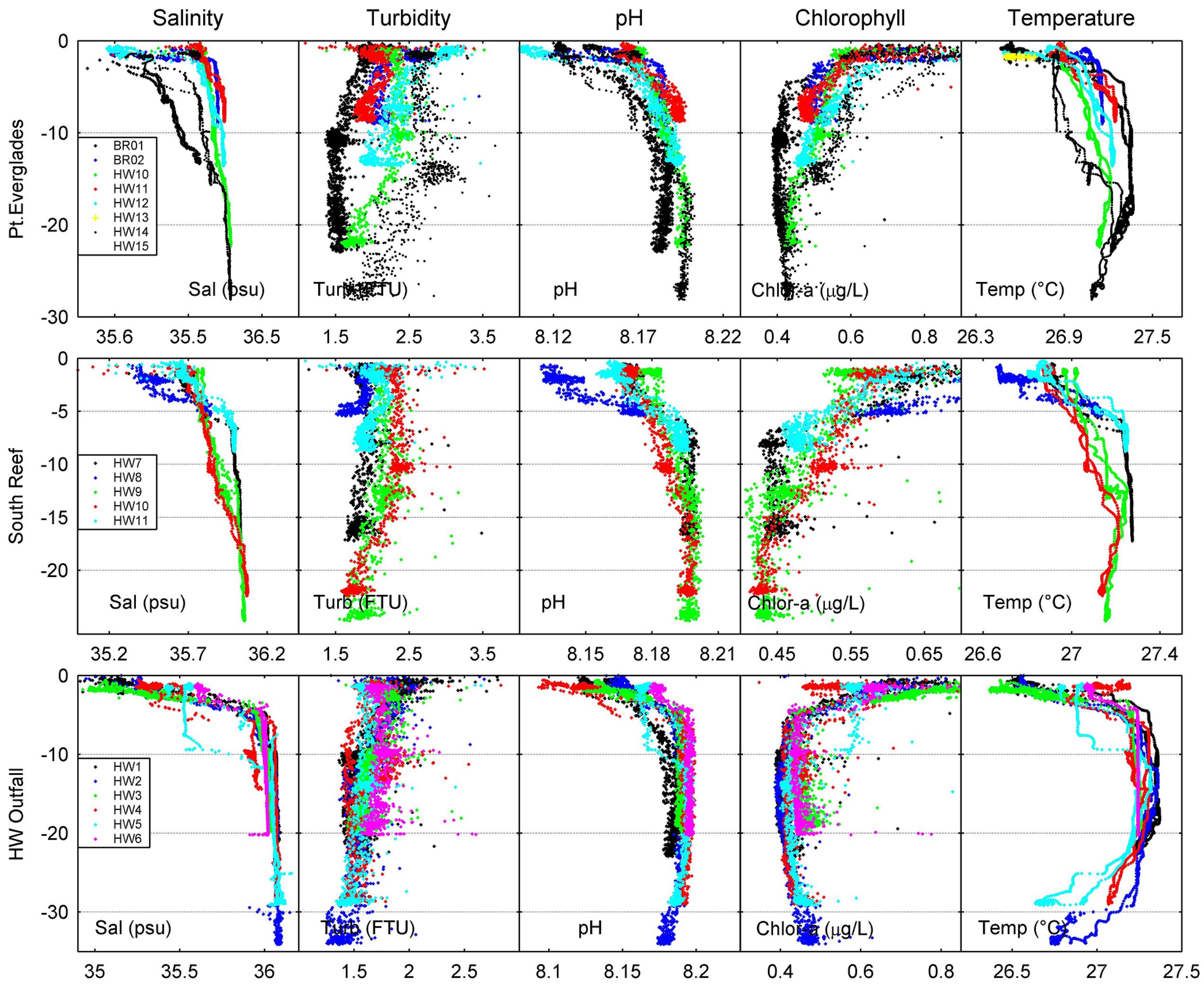
	Inshore Broward	Offshore Broward	Inshore Hollywood	Offshore Hollywood
All data				
N (number)	14422	14422	17694	17694
Mean	20.1	186.8	-13.0	78.0
Median	47.3	207.5	-8.2	86.9
Standard deviation	158.0	280.0	117.7	190.9
Minimum	-604.9	-959.3	-478.1	-722.4
Maximum	491.7	1092.6	311.4	766.4
North flow only				
N (number)	8693	10931	8413	11967
Mean	125.5	306.9	86.9	180.4
Median	121.0	291.5	79.3	159.4
Standard deviation	76.4	187.9	57.6	124.3
Minimum	0.1	0.1	0.1	0.0
Maximum	491.7	1092.6	311.4	766.4
South flow only				
N (number)	5729	3491	9281	5727
Mean	-140.0	-189.2	-103.5	-135.8
Median	-119.0	-143.3	-87.3	-105.5
Standard deviation	107.2	163.5	78.6	112.6
Minimum	-604.9	-959.3	-478.1	-722.4
Maximum	-0.1	-0.1	-0.1	-0.1
Percentage of southern flow	39.7	24.2	52.5	32.4
Percentage of southern flow for all available data for a particular site	40.2	27.1	51.7	33.7

Appendix 2:

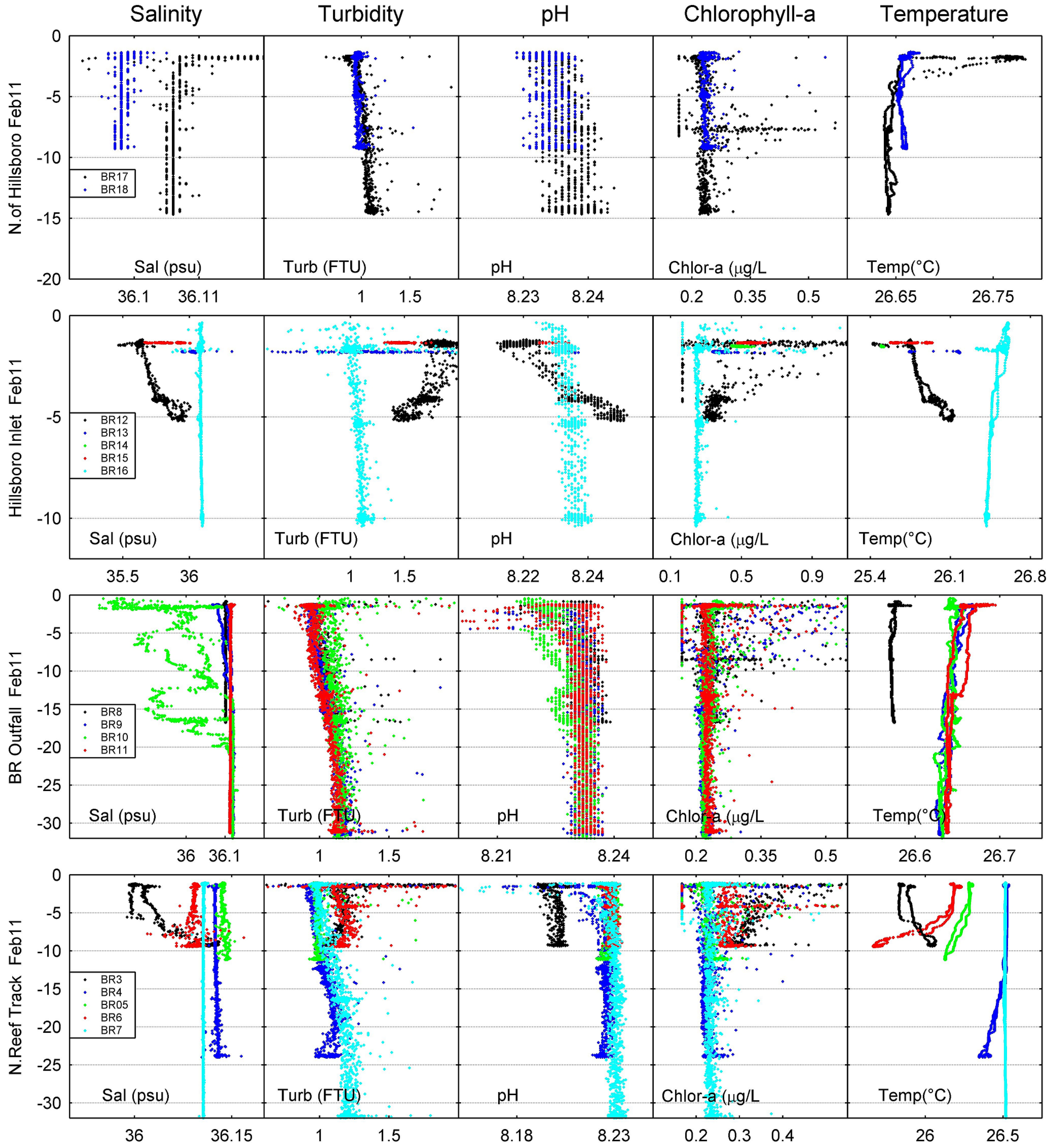
Water Column Profiles

Each of the following plots contains water column profile data for the Hollywood (HW) or Broward (BR) cruises, grouped by the sampling regions described in Table 12. A legend denoting the colors for each sample designation is given in the leftmost panel; these designations apply to all the plots in that row. Measured parameters and measurement units are given at the bottom center of each plot. The vertical axis is depth, plotted with the surface (depth = 0) at the top. The horizontal axis has been modified for each plot to enhance readability. Not all parameters are plotted for each cruise.

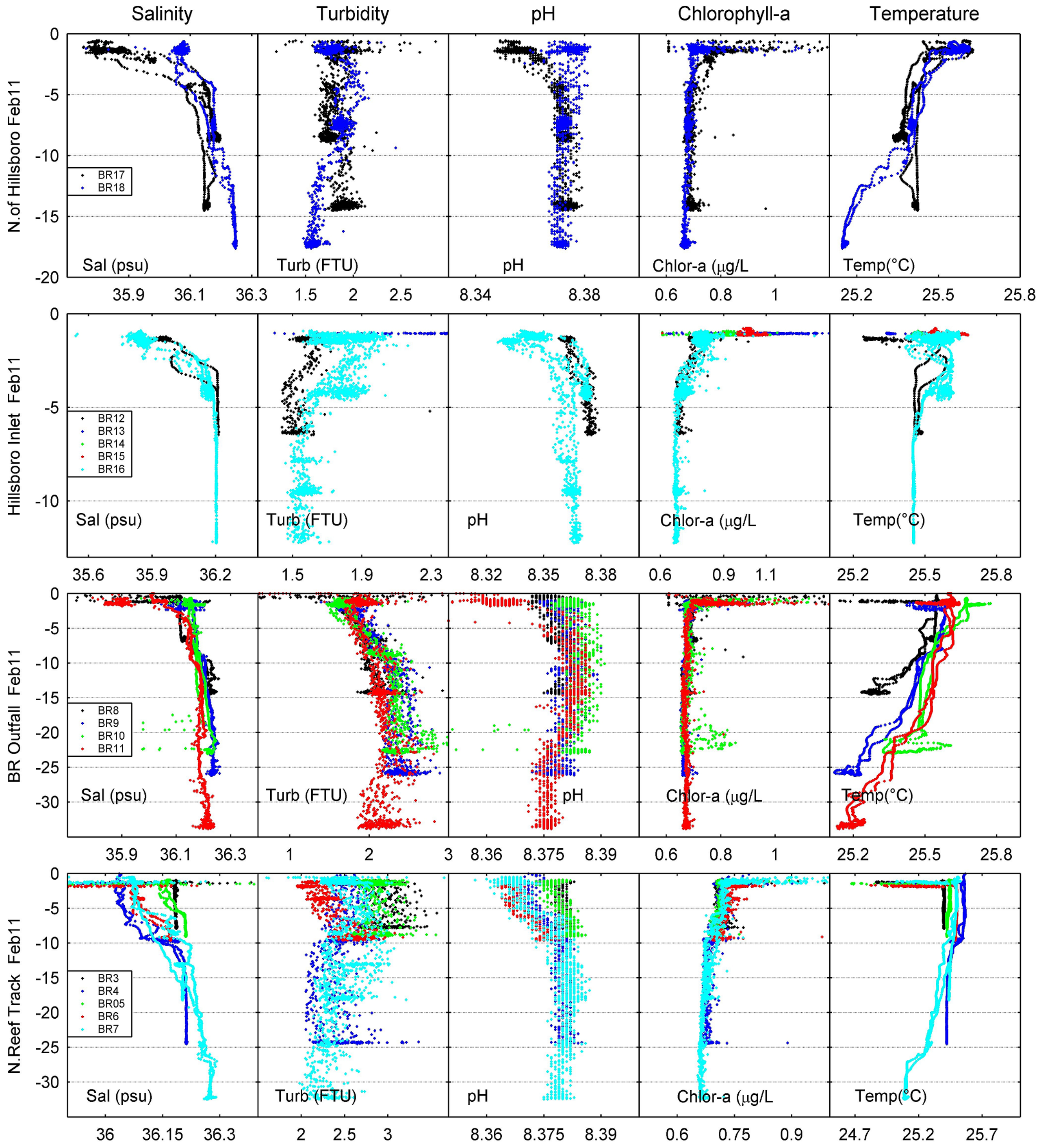
Hollywood Cruise: November 2, 2010



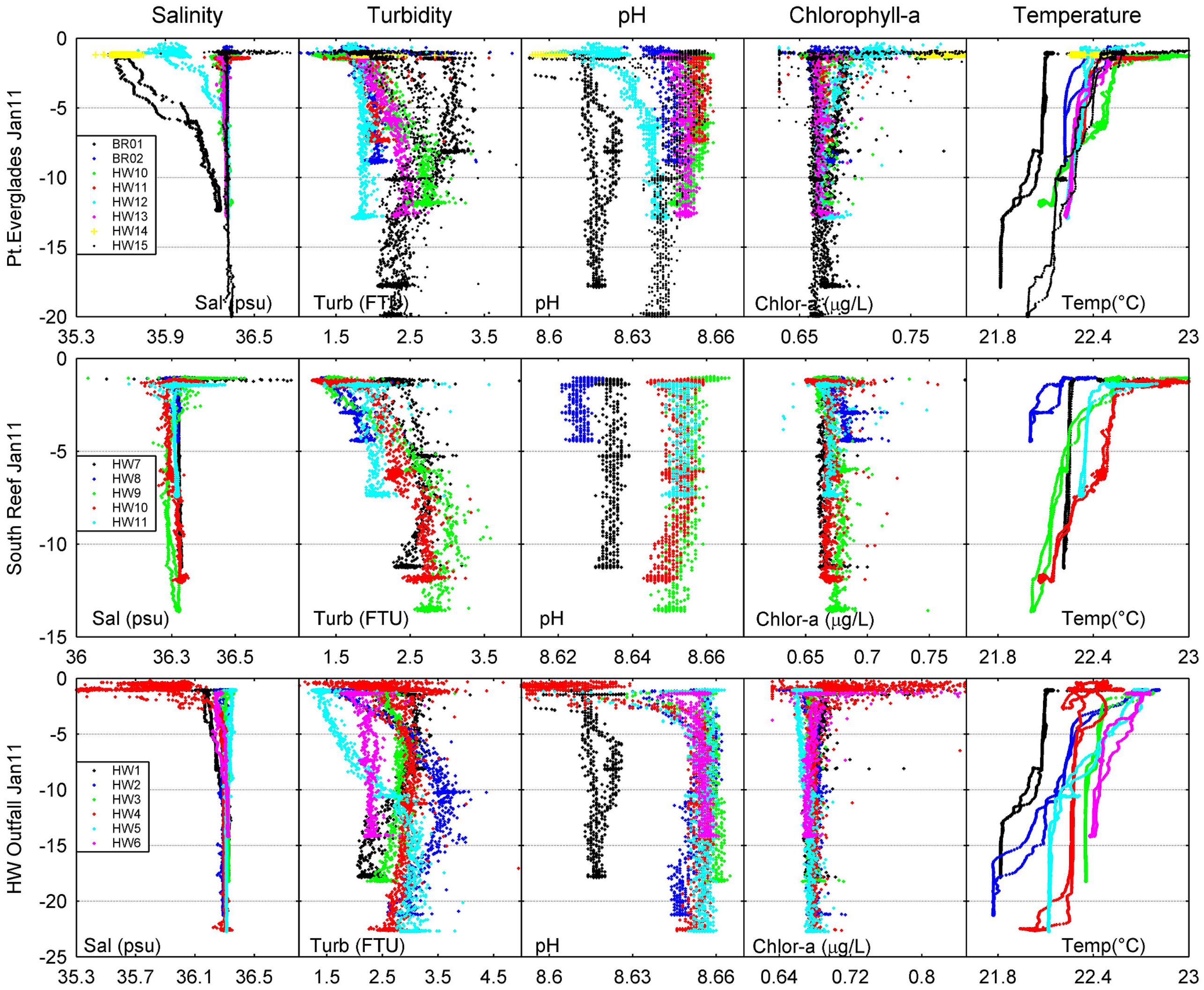
Broward Cruise: November 10, 2010



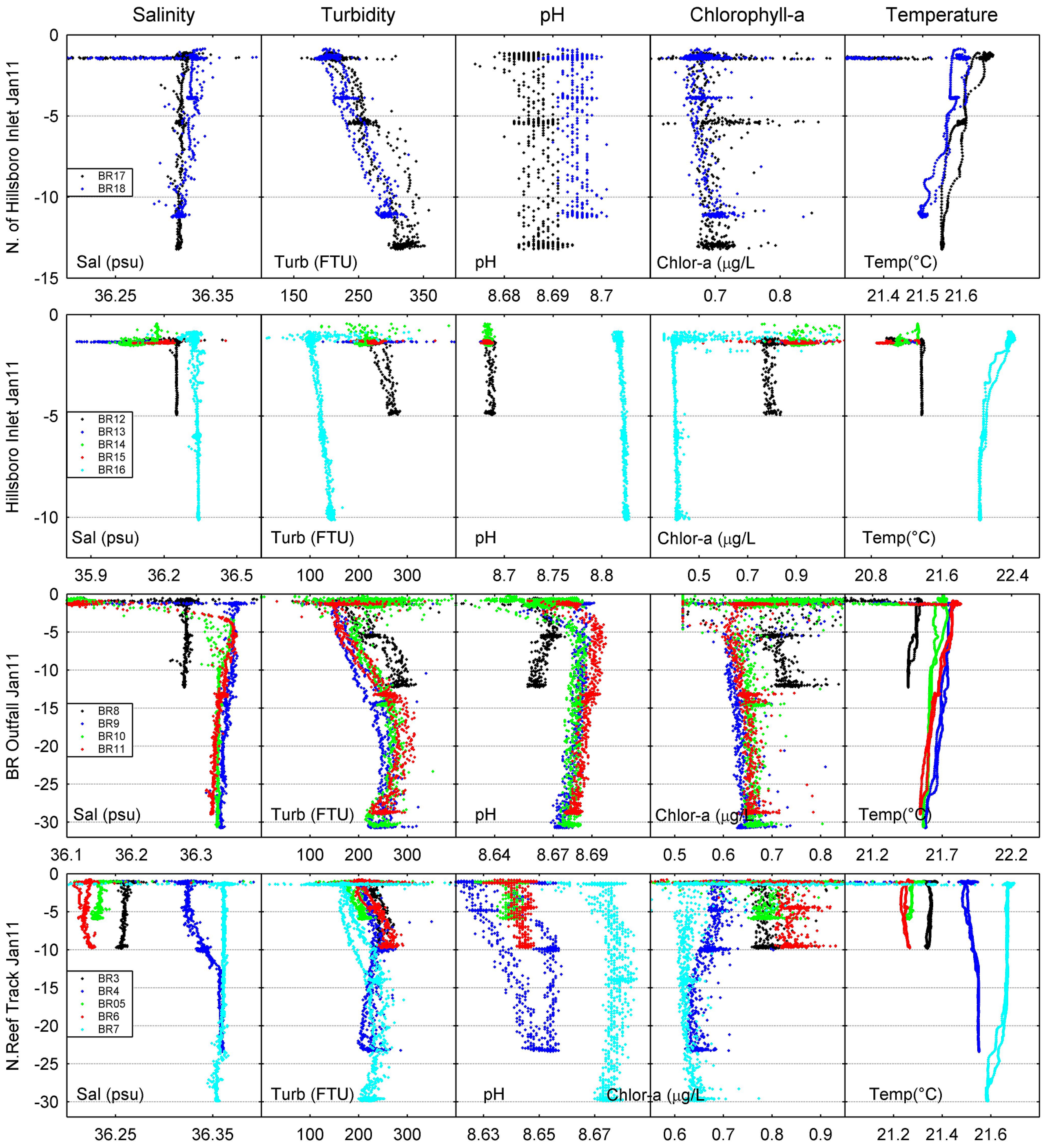
Broward Cruise: December 1, 2010



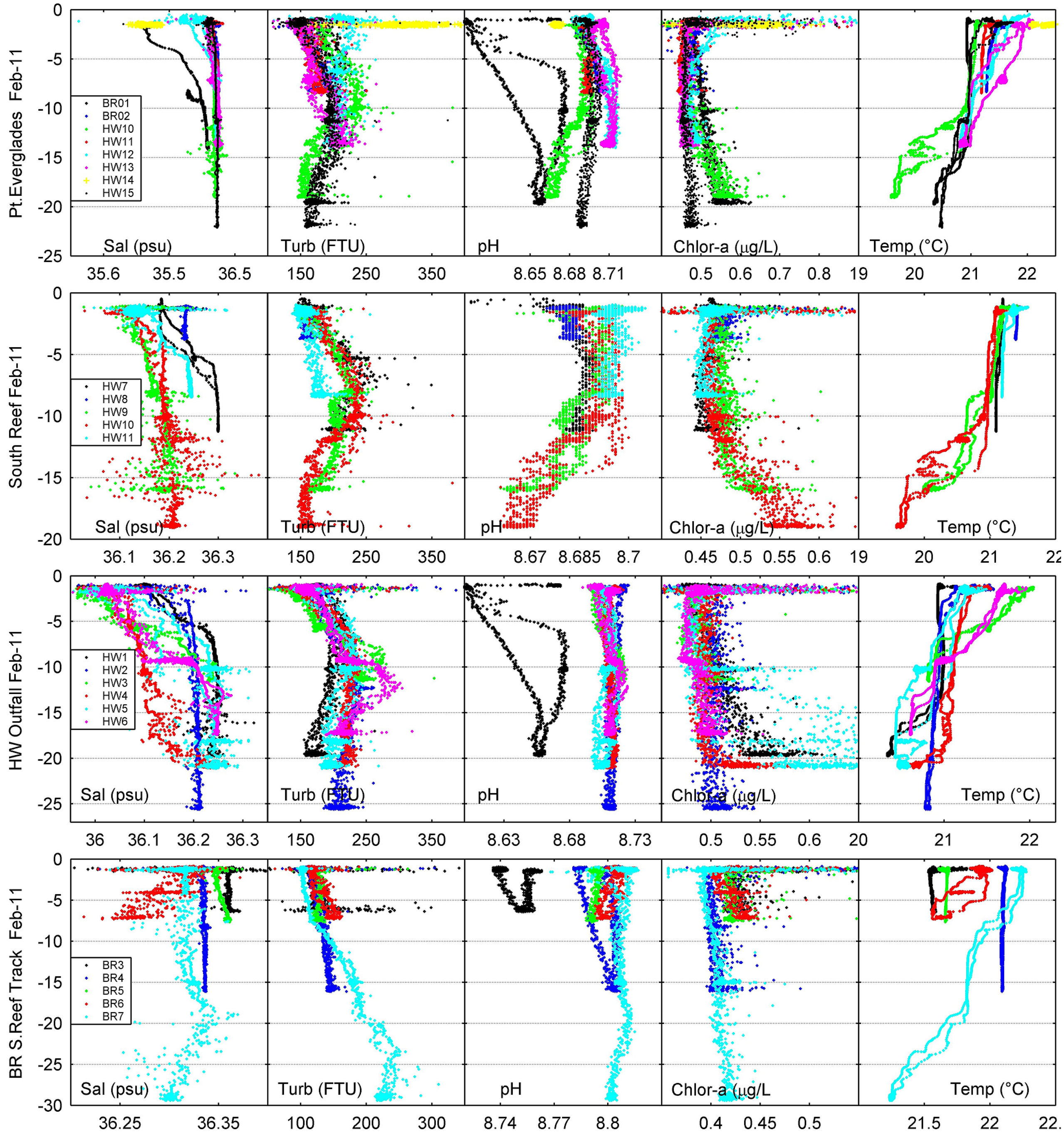
Hollywood Cruise: January 20, 2011



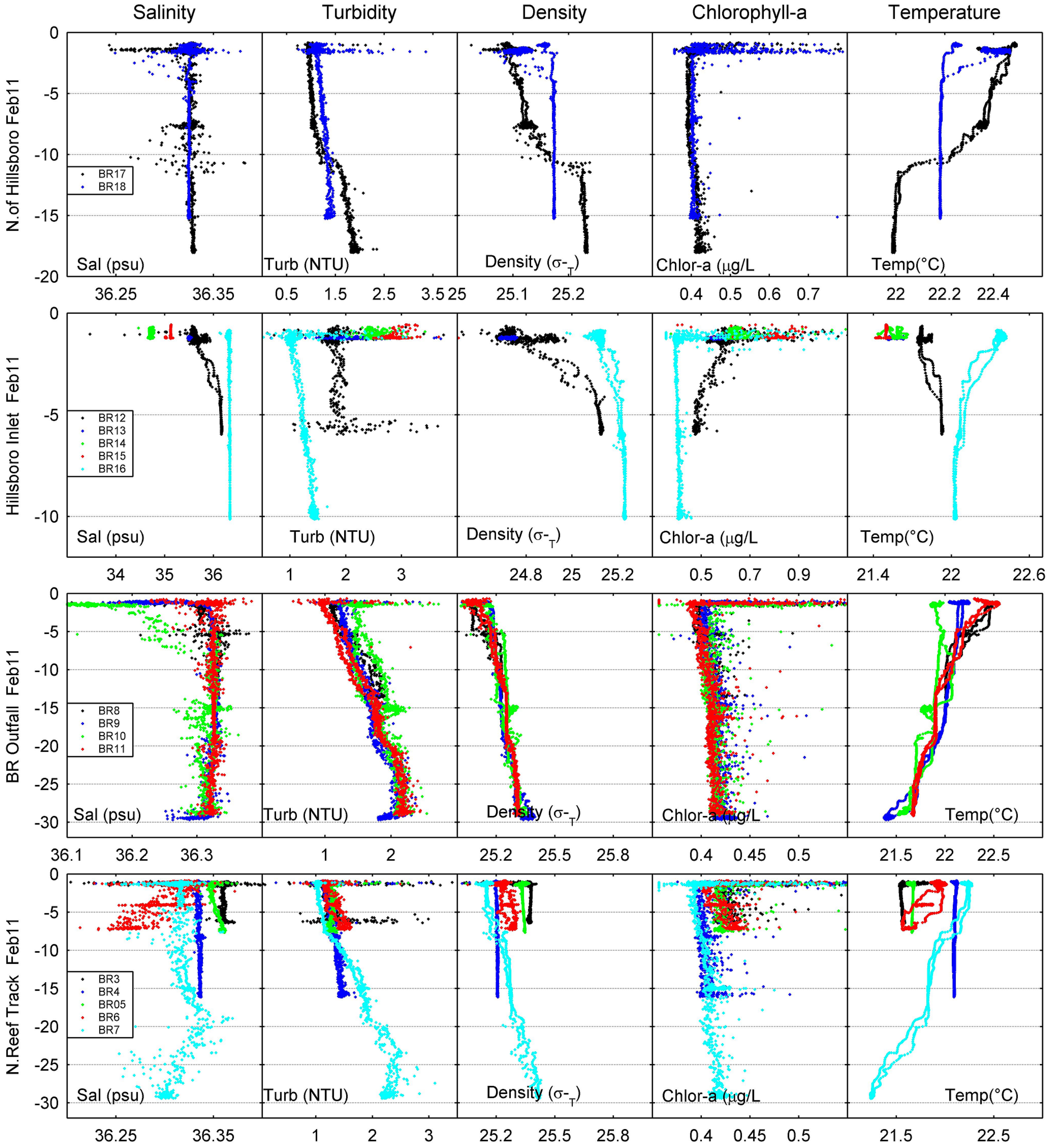
Broward Cruise: January 27, 2011



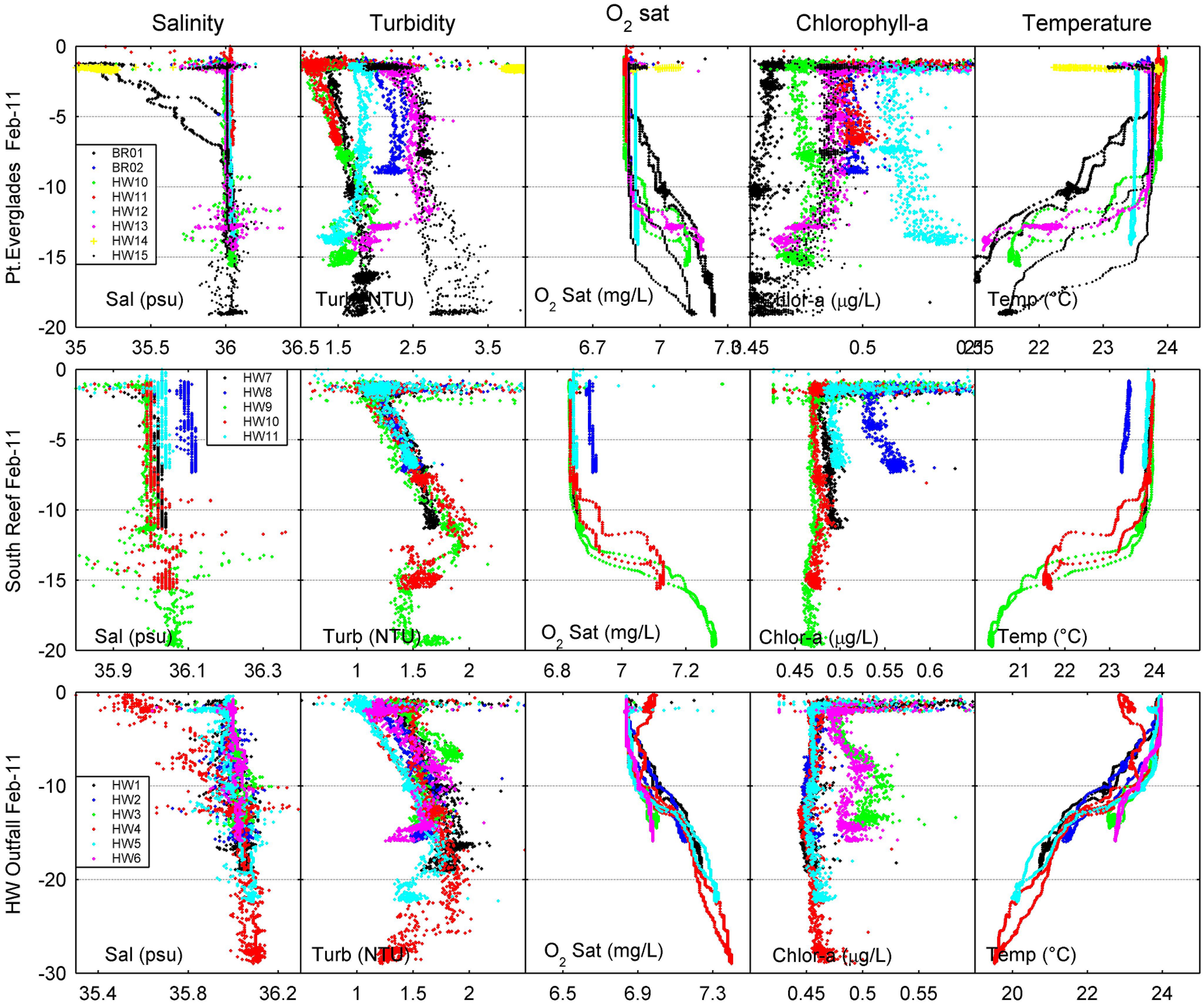
Hollywood Cruise: February 3, 2011



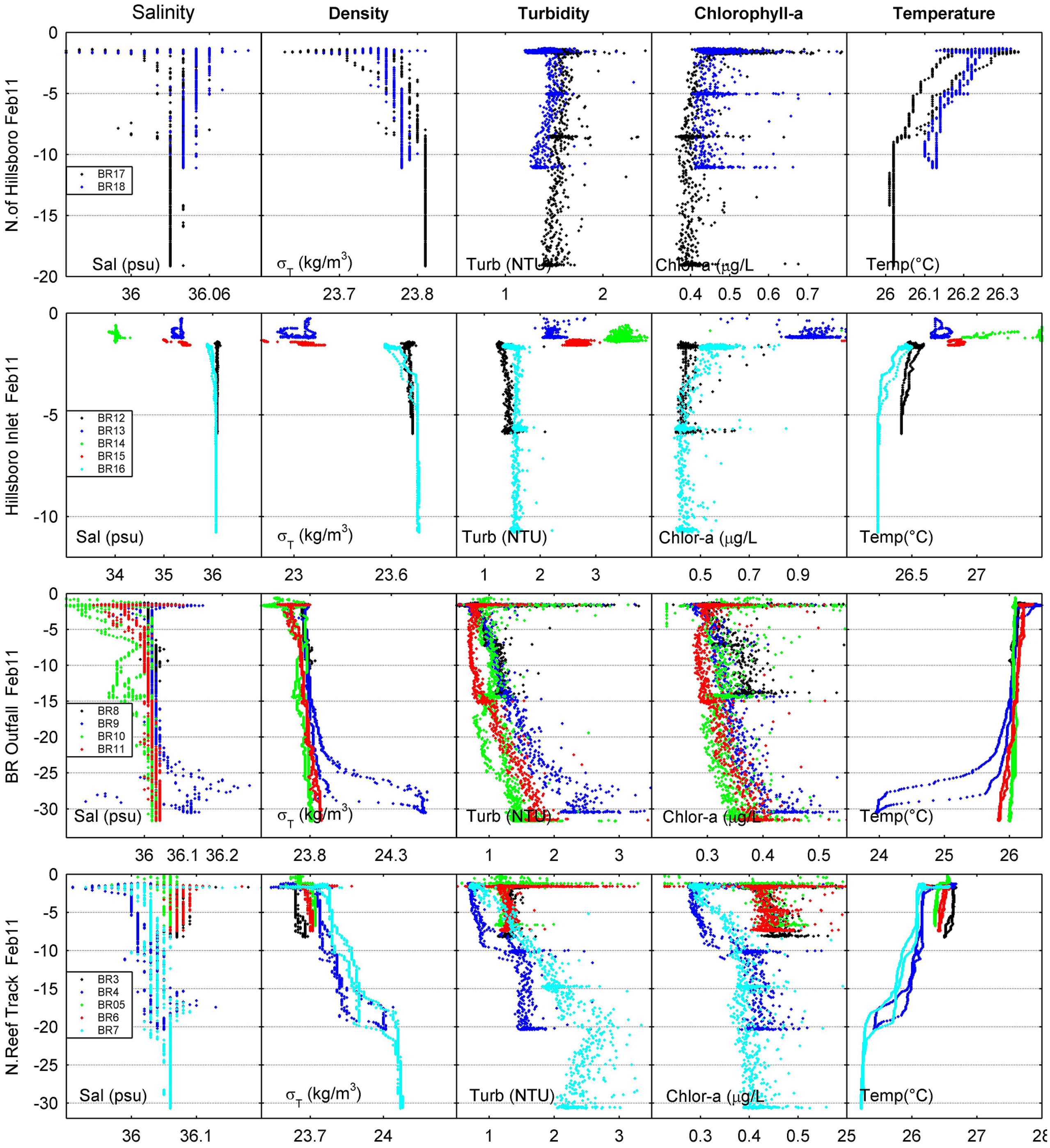
Broward Cruise: February 16, 2011



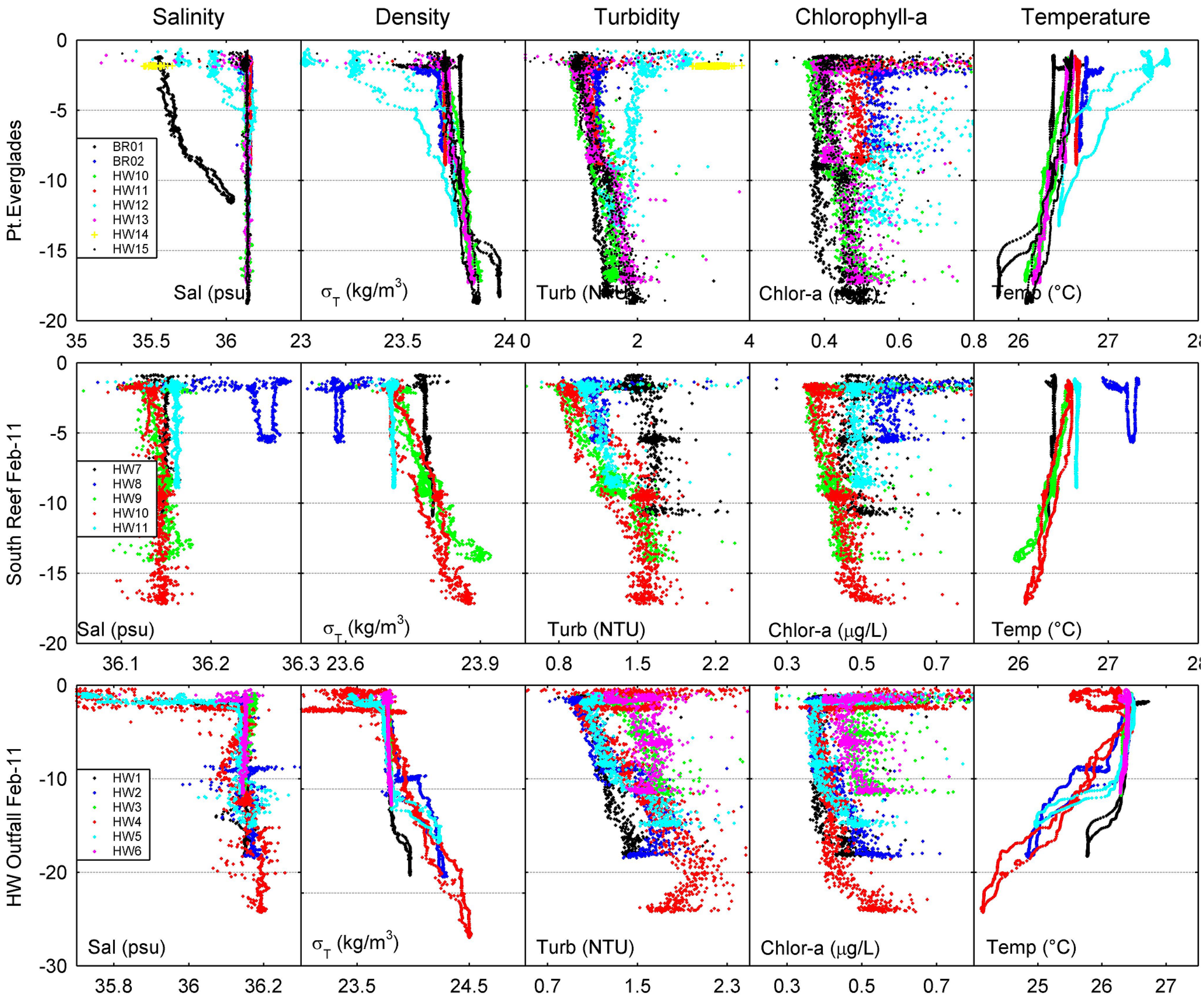
Hollywood Cruise: March 10, 2011



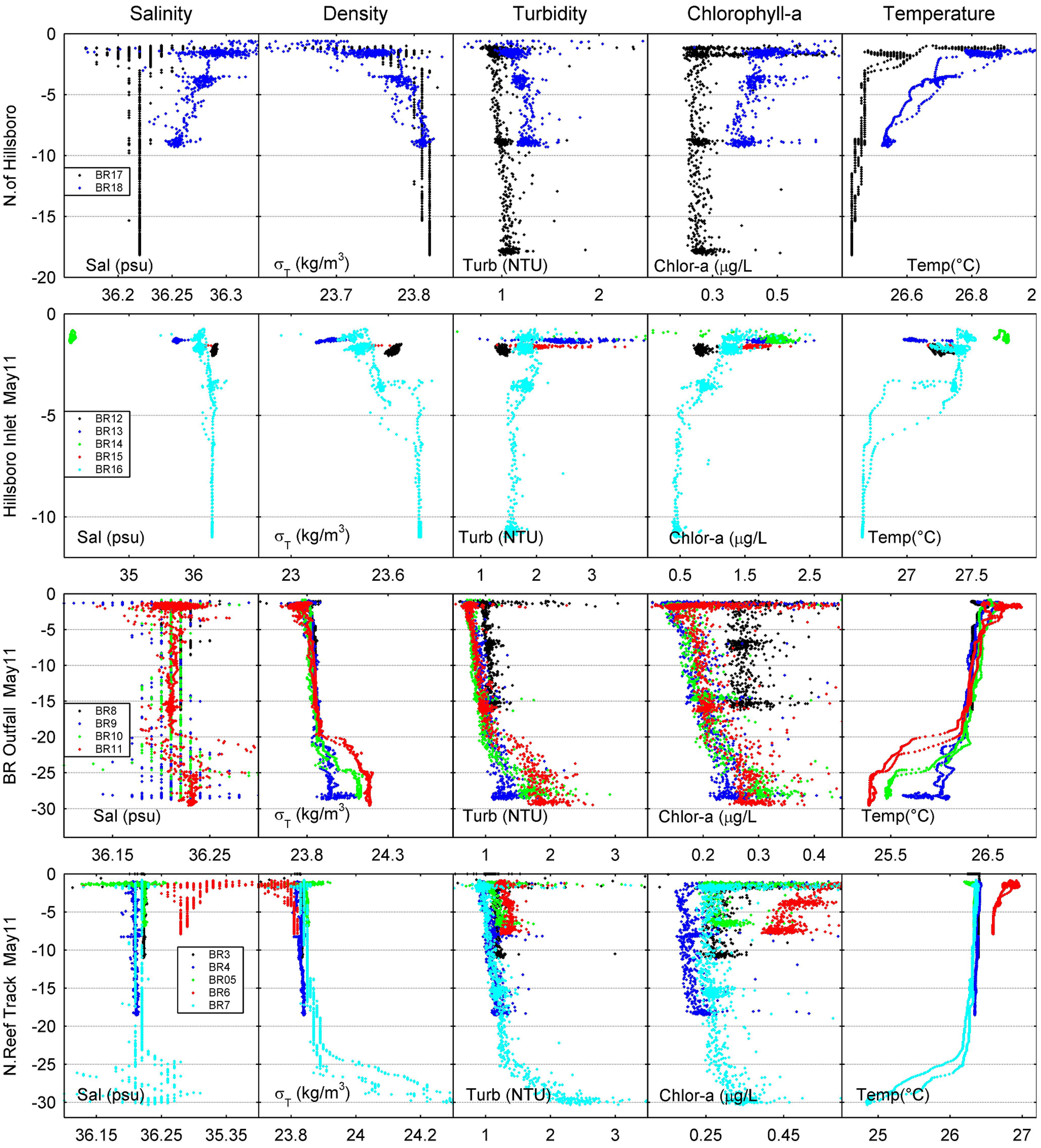
Broward Cruise: April 13, 2011



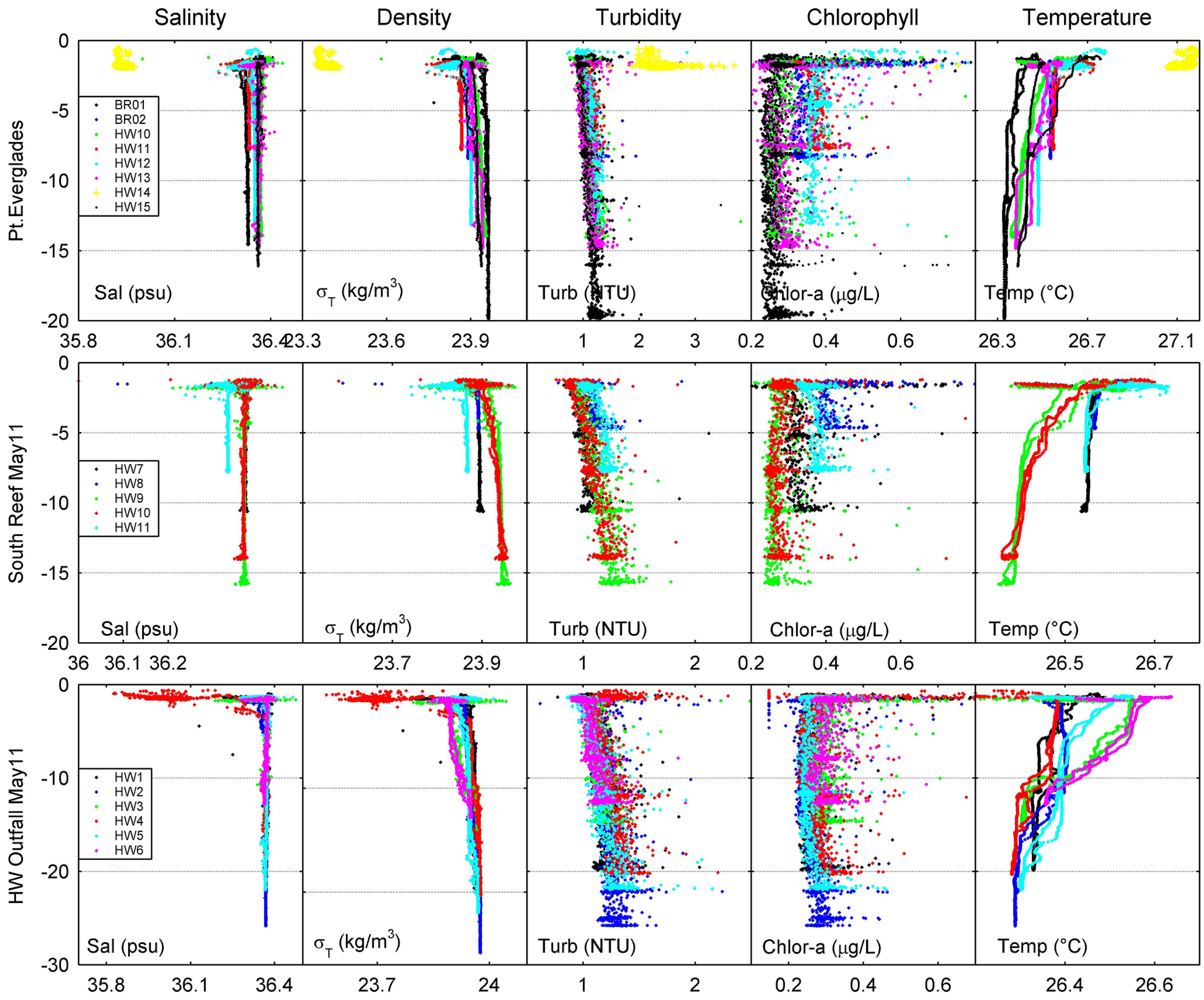
Hollywood Cruise: April 19, 2011



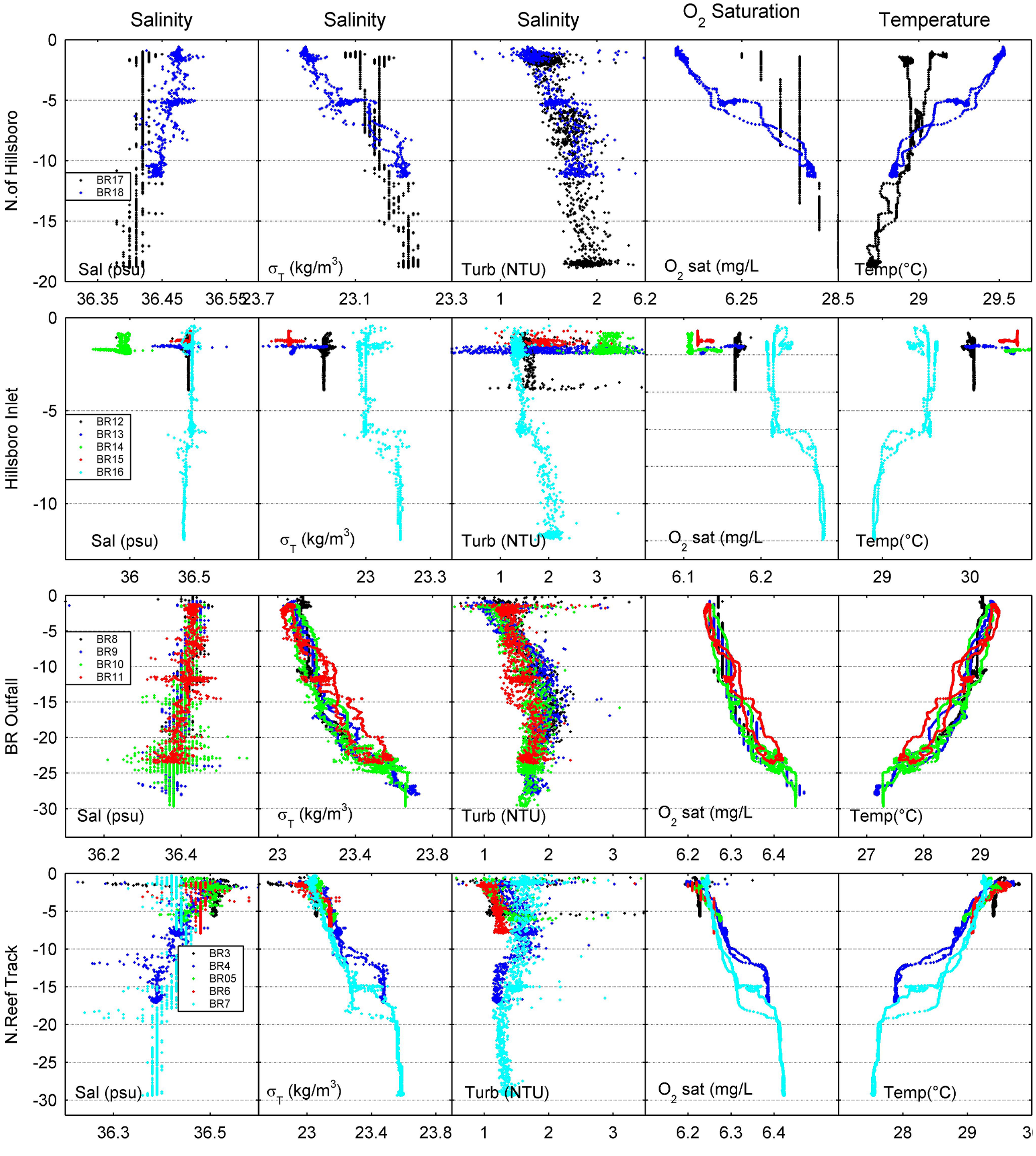
Broward Cruise: May 4, 2011



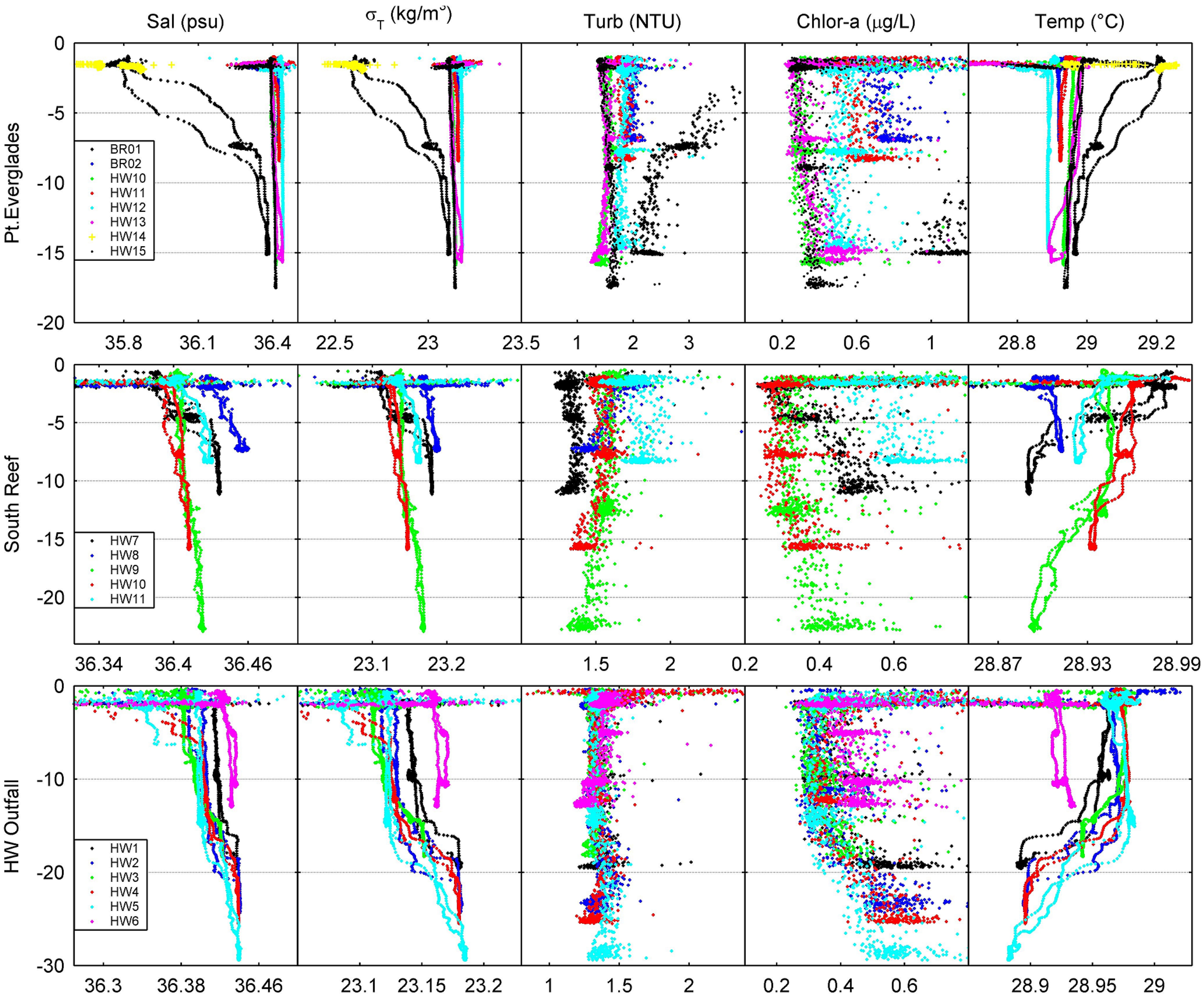
Hollywood Cruise: May 19, 2011



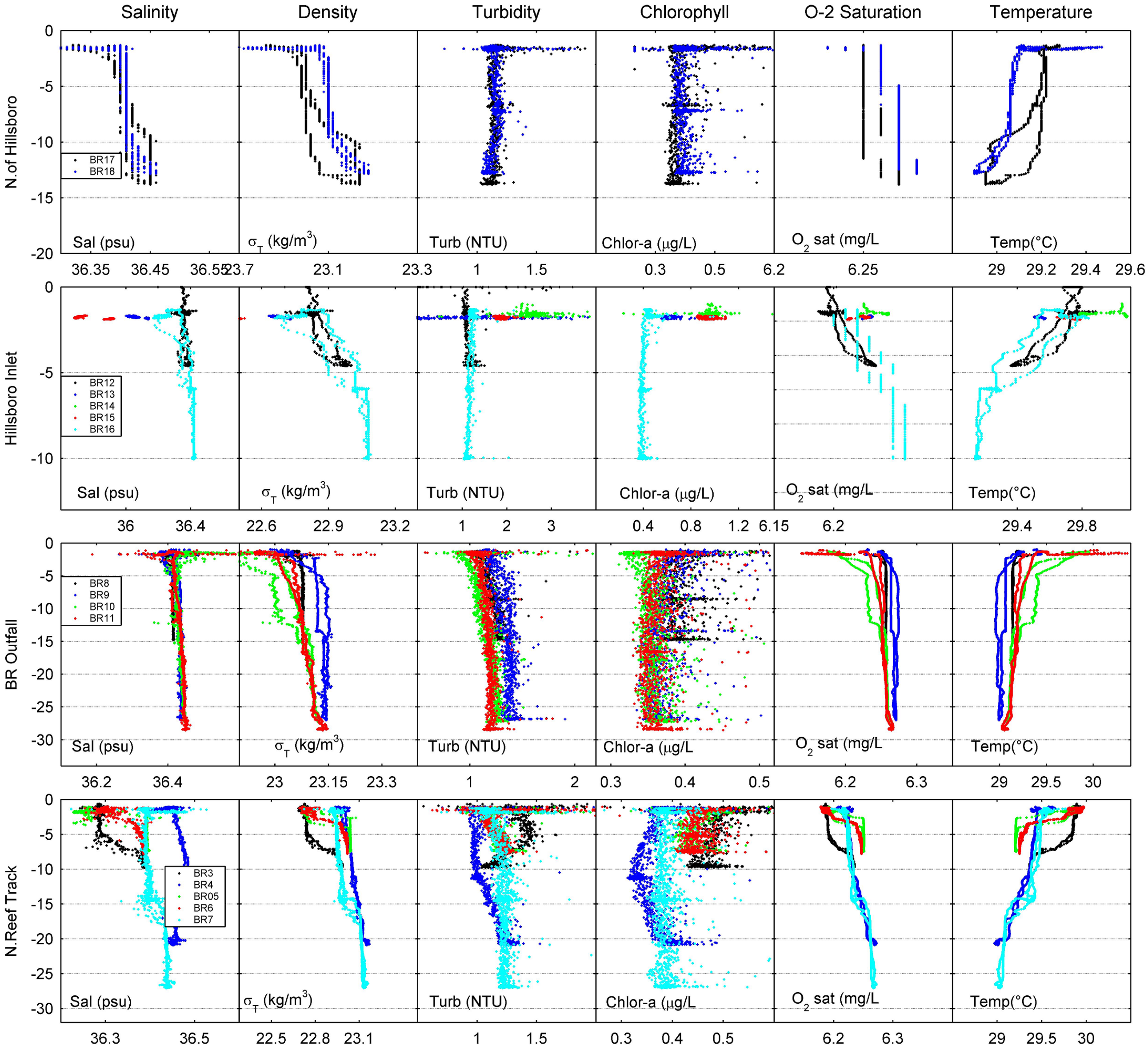
Broward Cruise: June 23, 2011



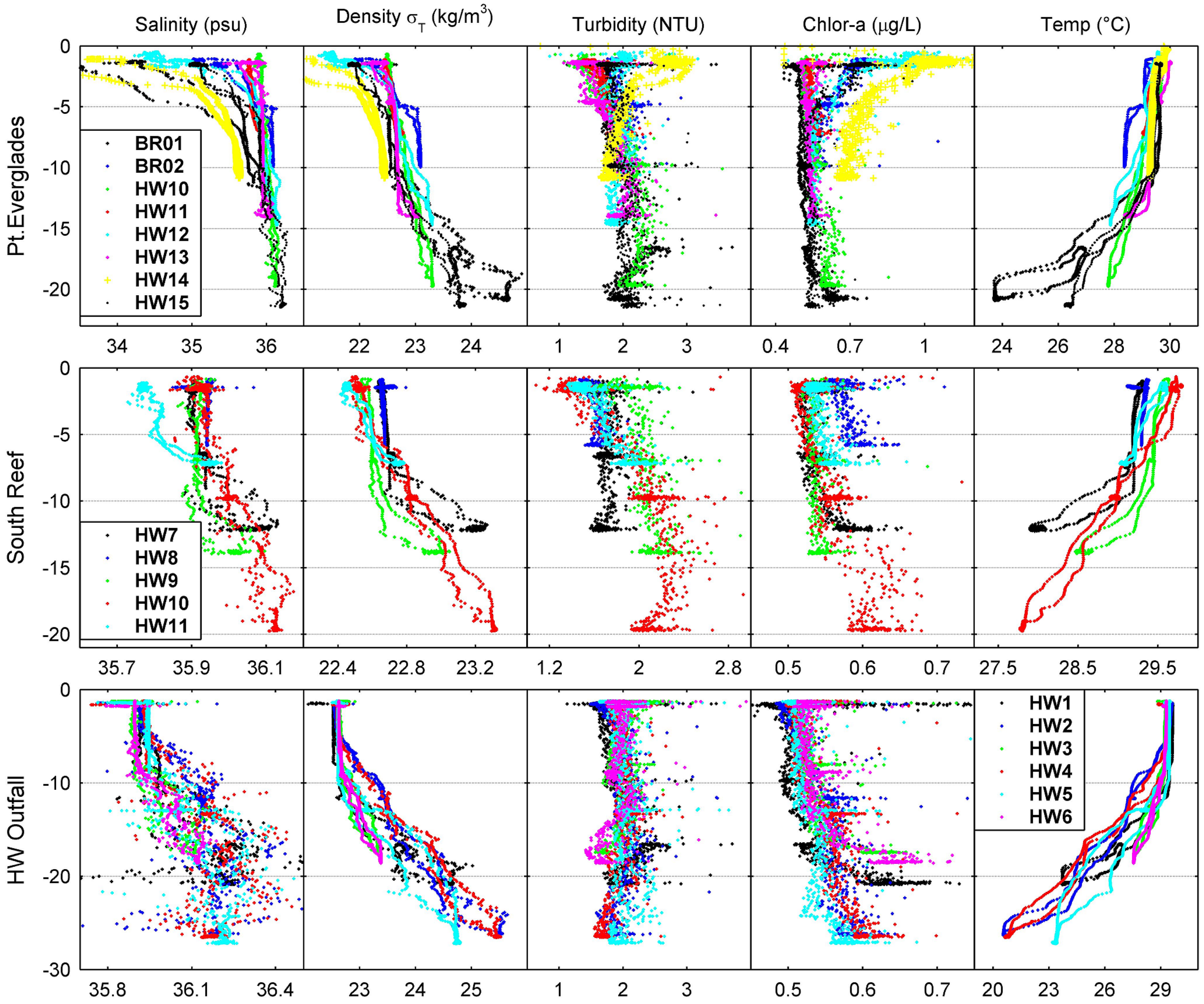
Hollywood Cruise: July 6, 2011



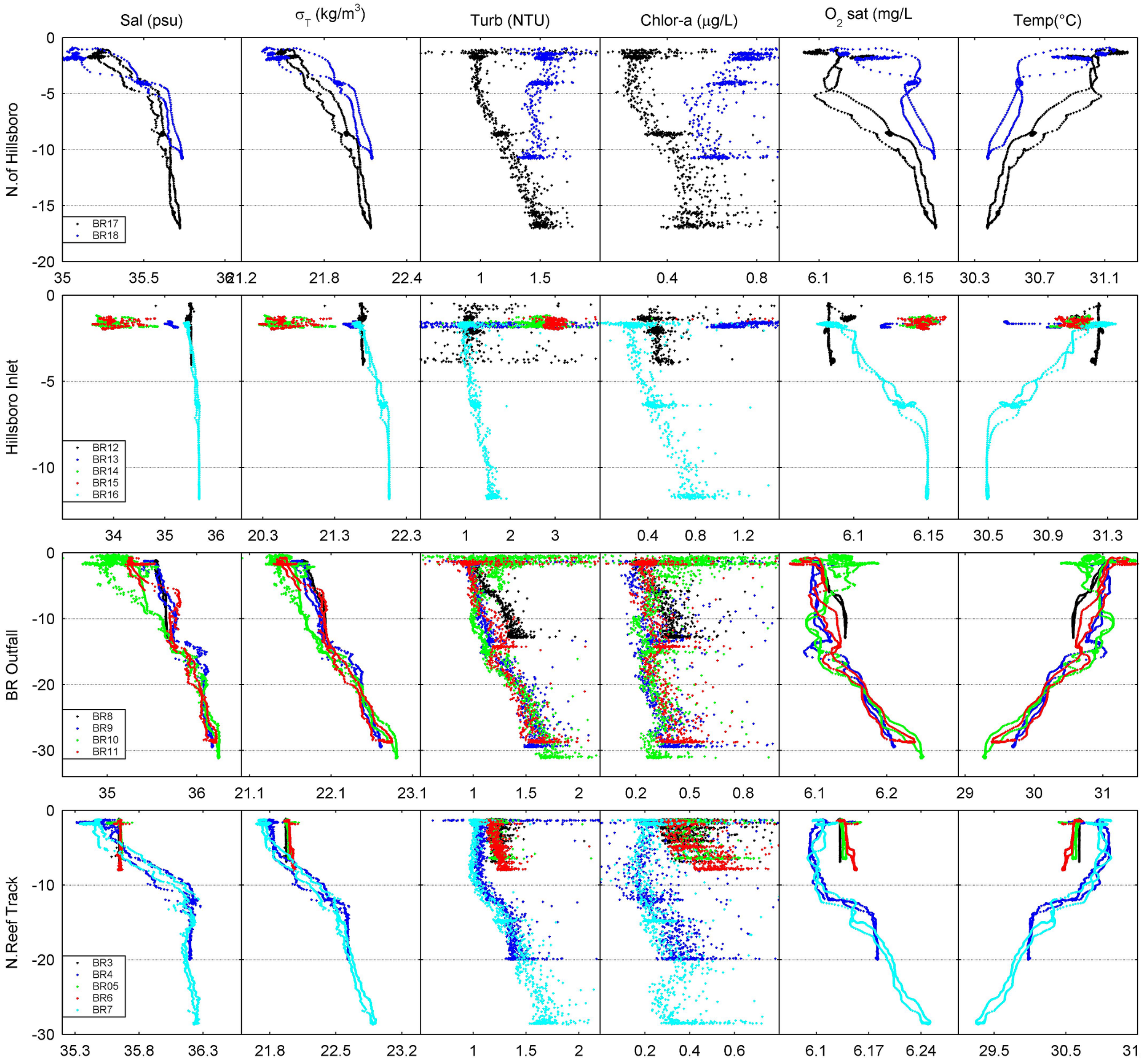
Broward Cruise: July 13, 2011



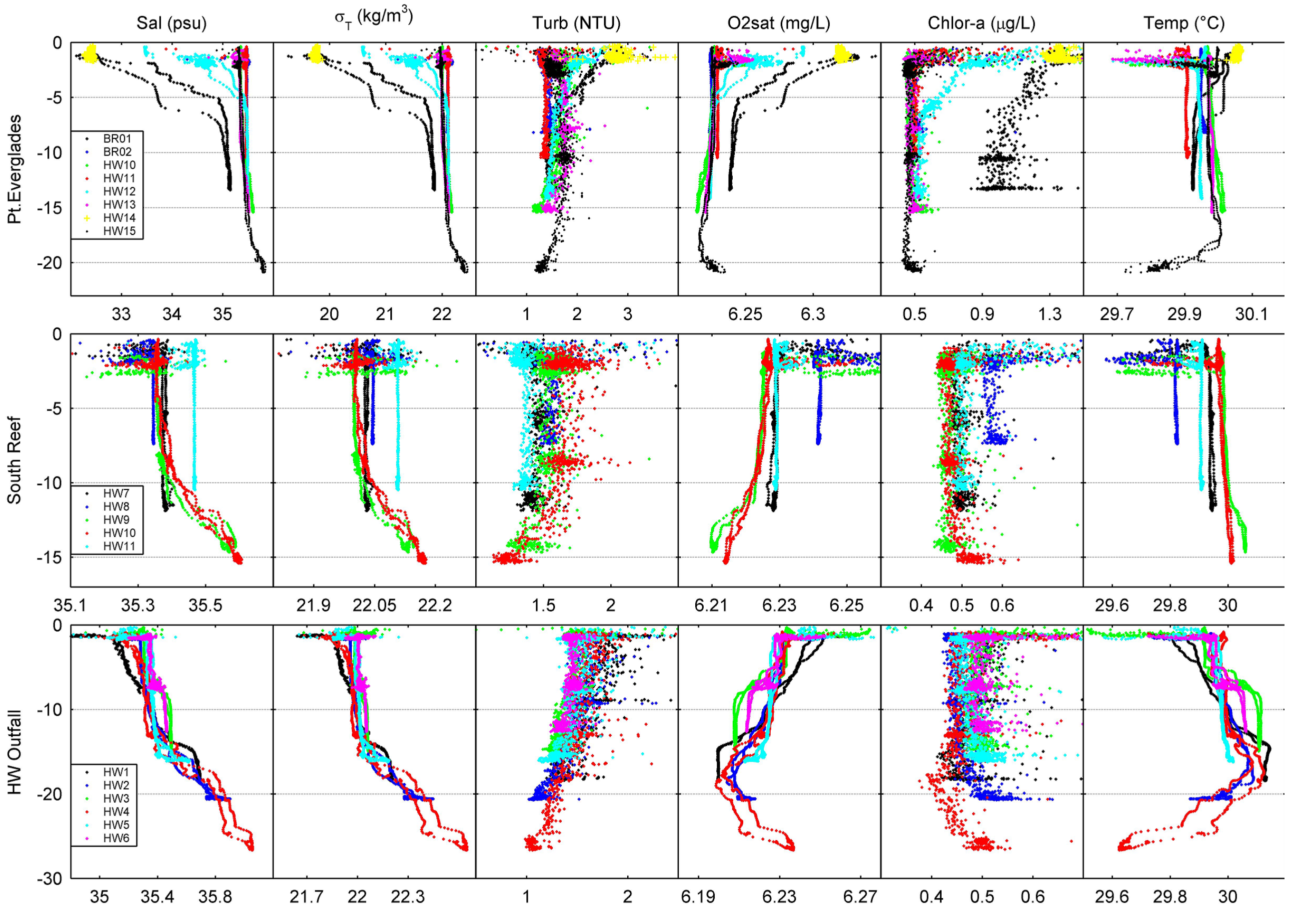
Hollywood Cruise: August 11, 2011



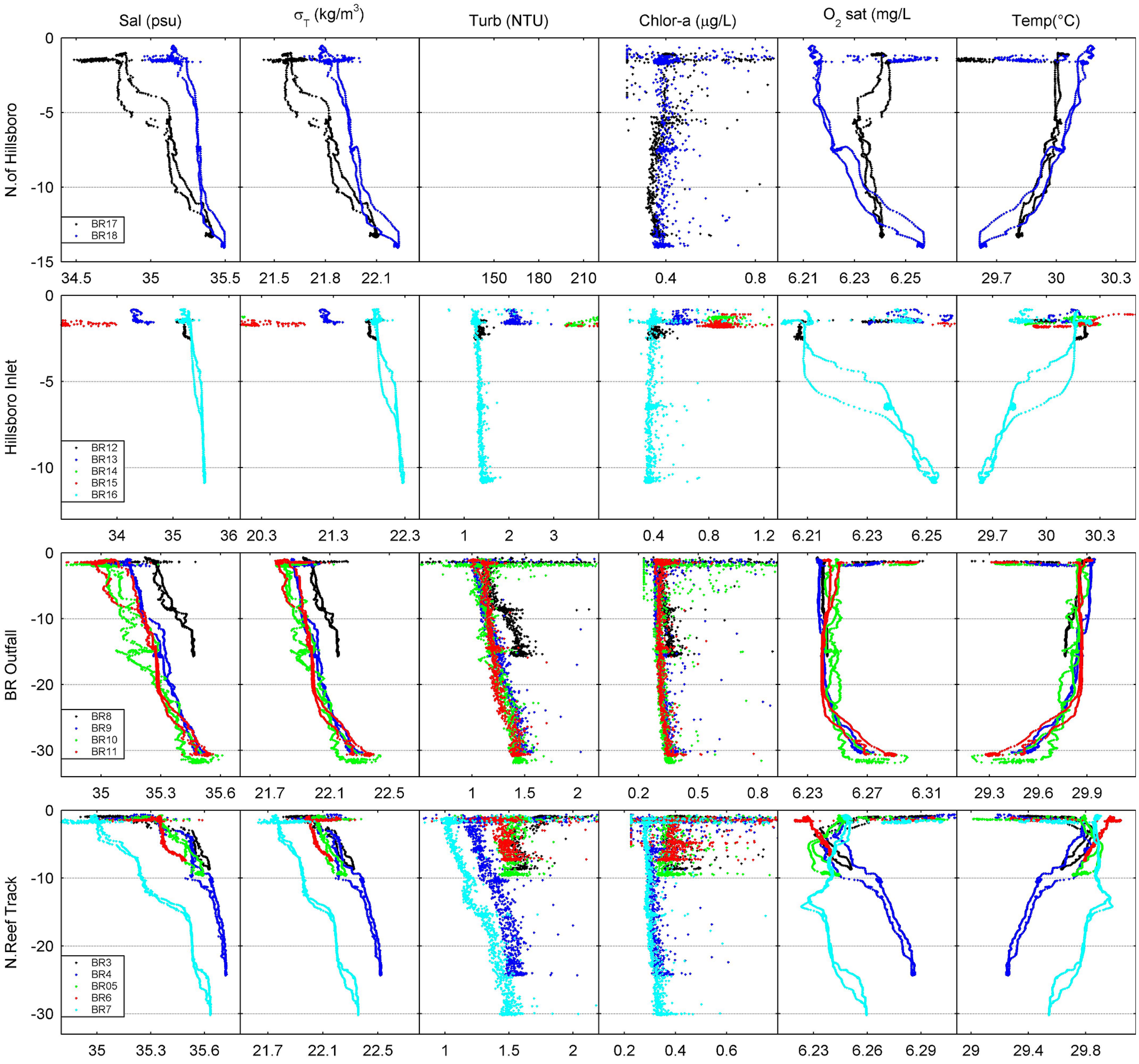
Broward Cruise: August 17, 2011



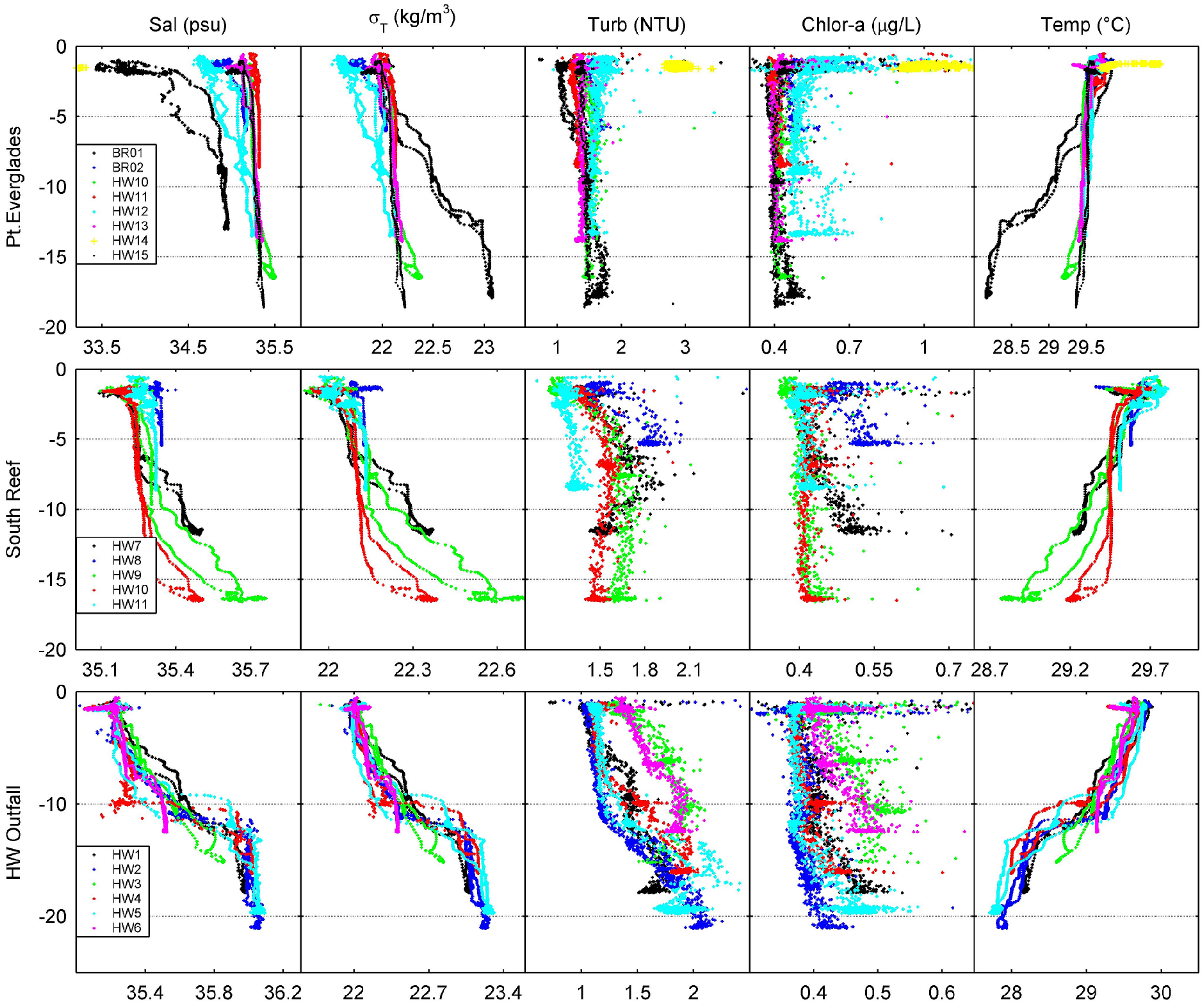
Hollywood Cruise: August 30, 2011



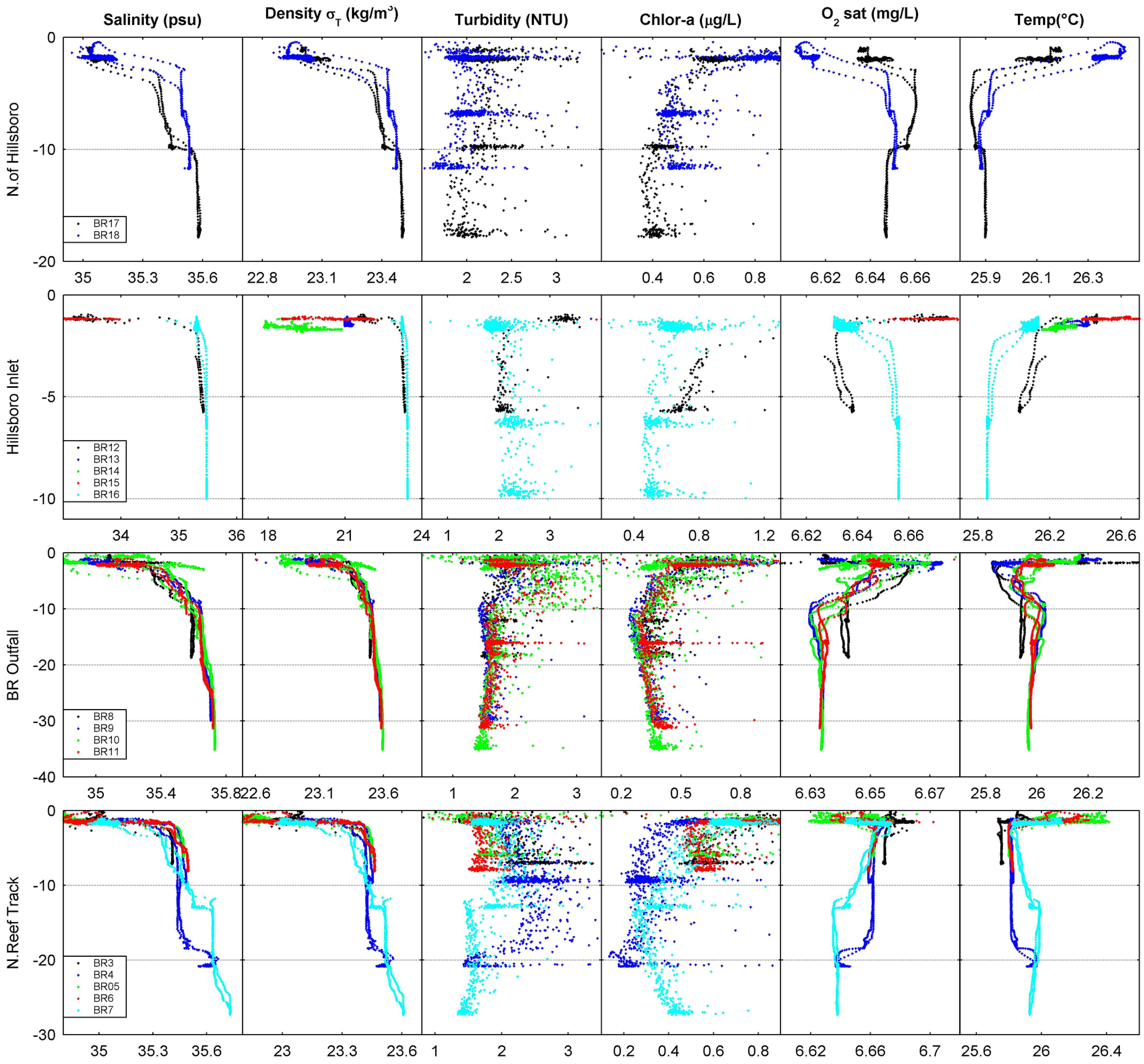
Broward Cruise: September 15, 2011



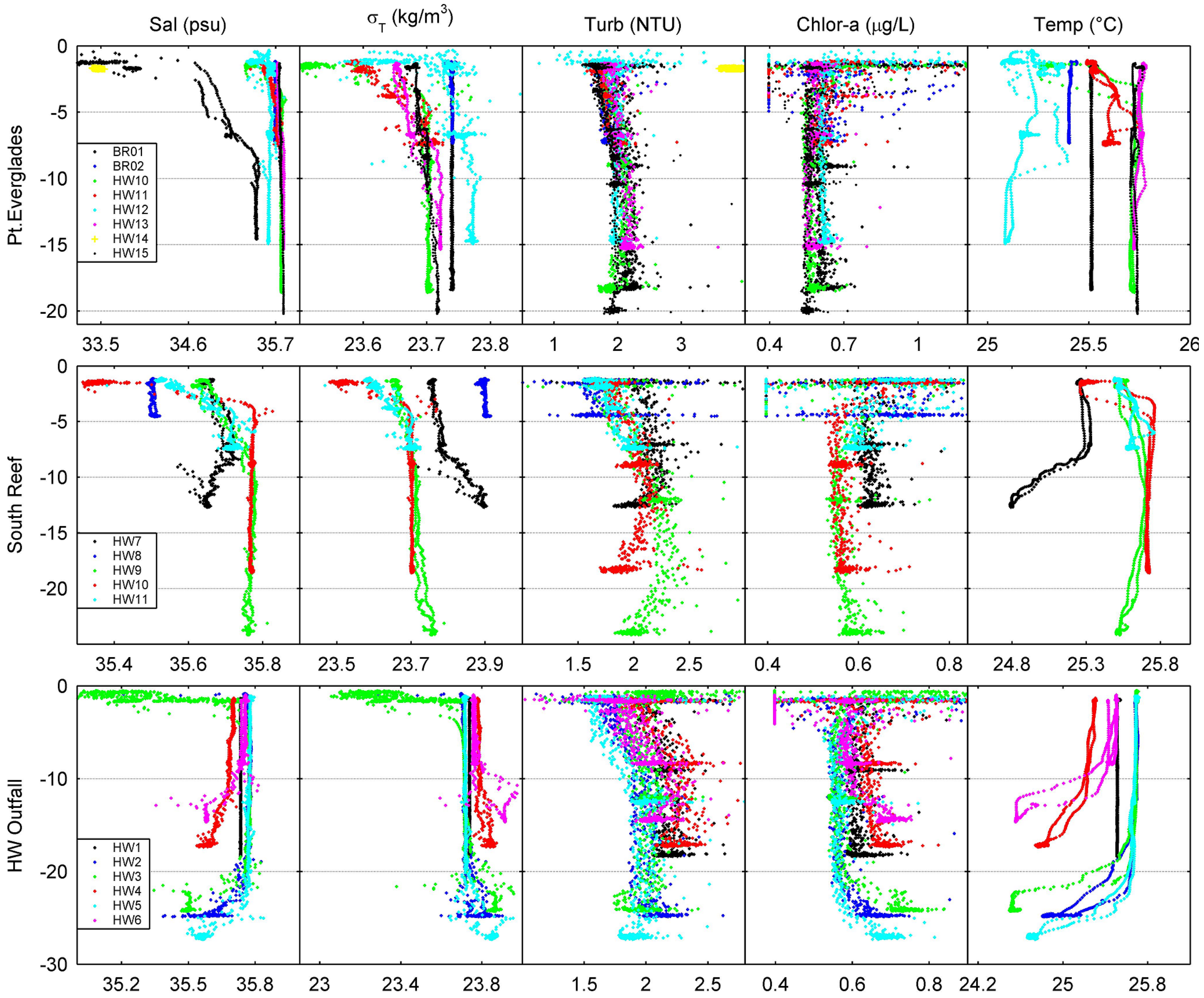
Hollywood Cruise: September 29, 2011



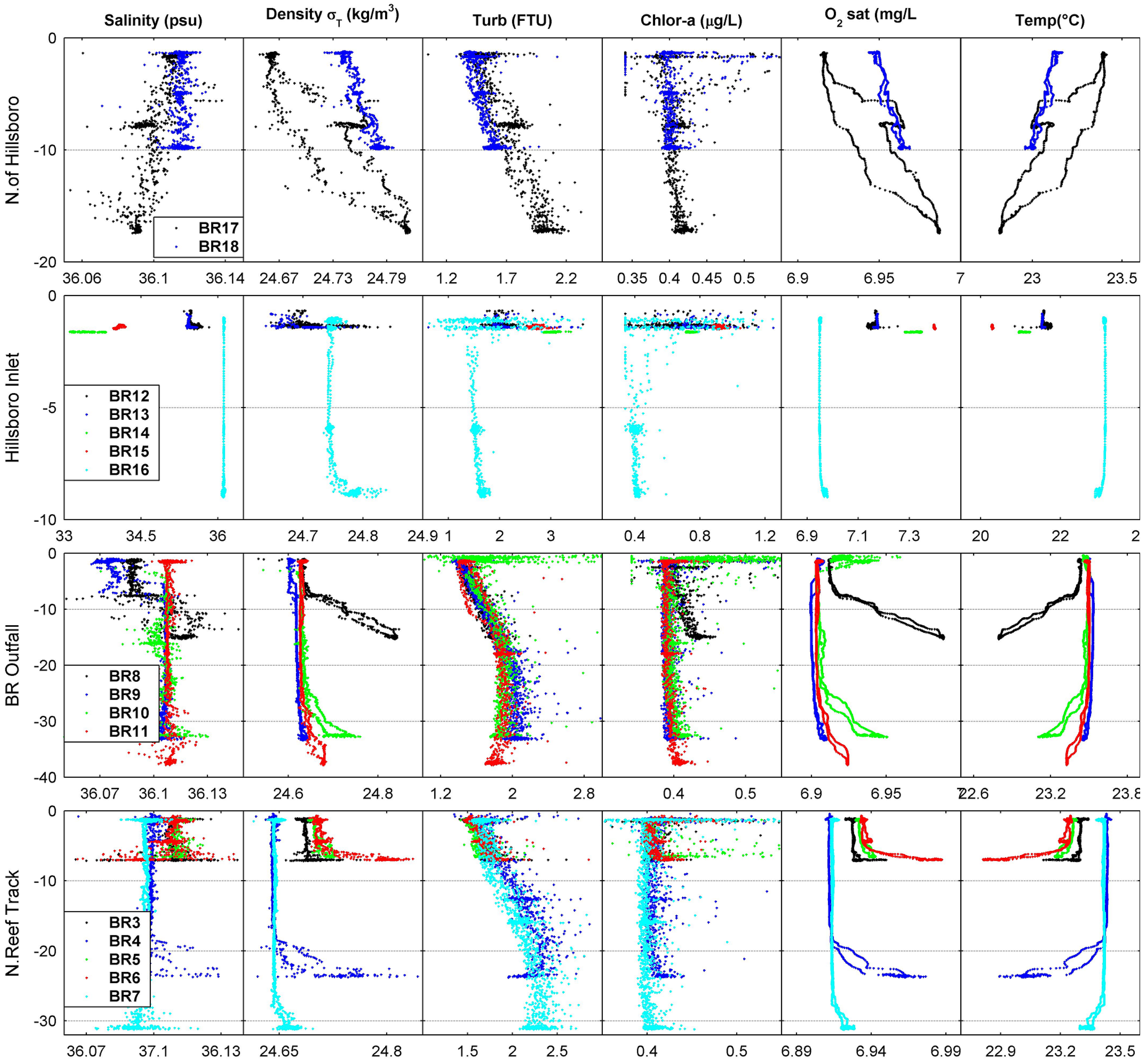
Broward Cruise: November 17, 2011



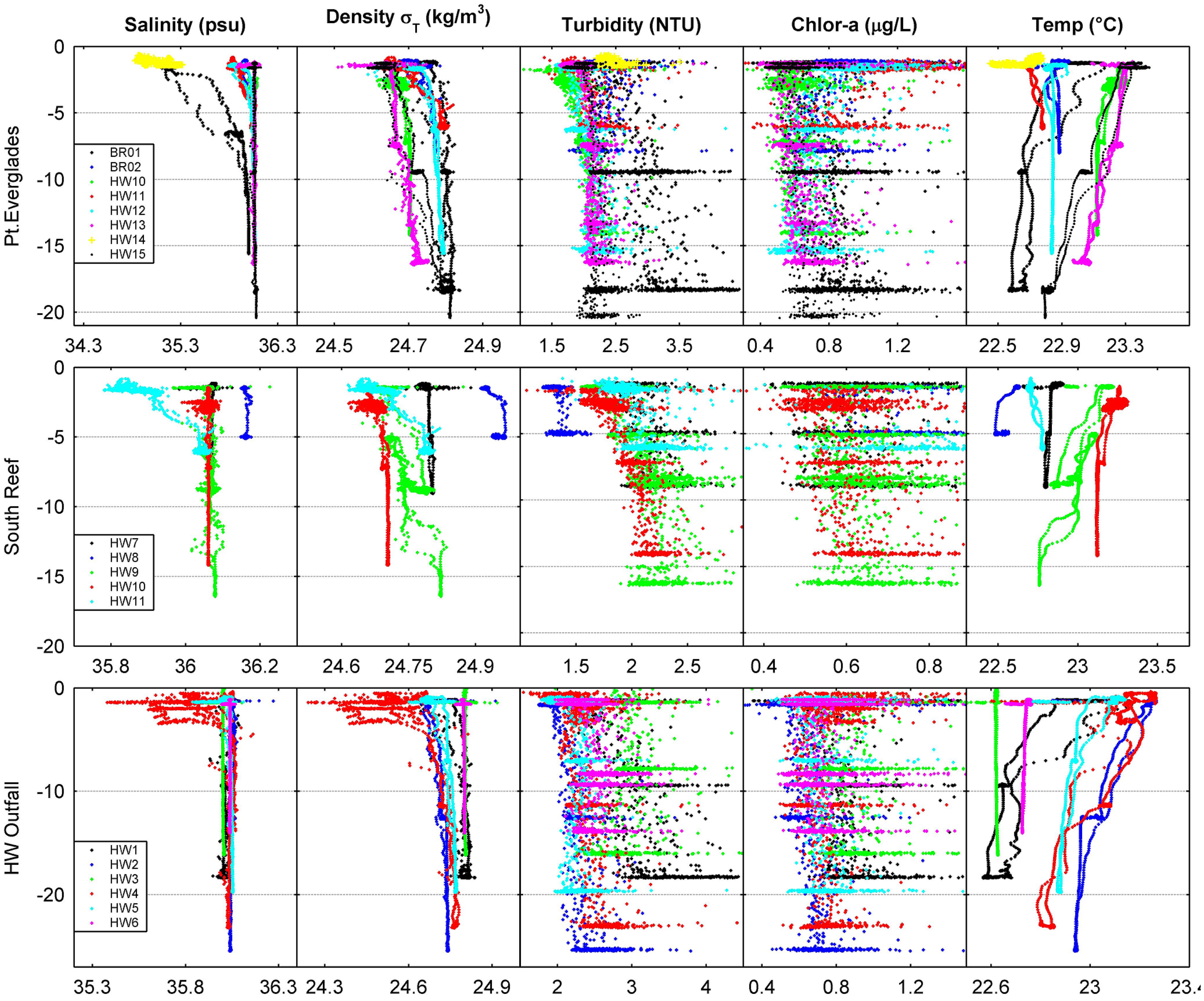
Hollywood Cruise: November 30, 2011



Broward Cruise: January 5, 2012



Hollywood Cruise: January 12, 2012



Appendix 3:

Discrete Sample Analytical Results

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-1A	11/2/2010	8:29	25.9958	-80.0861	1.8	35.14	26.52	1.631	6.58	8.06	246.0	0.564	0.219	0.77	1.971	1.273	0.136
HW-1B	11/2/2010	8:26	25.9958	-80.0861	11.0	36.04	27.31	5.700	6.46	8.11	244.3	0.314	0.073	0.22	1.607	0.372	0.021
HW-1BX	11/2/2010	8:26	25.9958	-80.0861	11.0	36.04	27.31	0.428	6.46	8.11	244.3	N/A	N/A	0.64	1.607	0.300	0.004
HW-1C	11/2/2010	8:20	25.9958	-80.0861	21.4	36.06	27.29	0.836	6.46	8.12	243.4	0.302	0.087	0.42	1.454	0.421	0.024
HW-2A	11/2/2010	9:11	26.0150	-80.0839	1.7	35.25	26.58	2.006	6.57	7.94	222.8	0.349	0.088	0.27	1.724	1.216	0.144
HW-2B	11/2/2010	9:08	26.0150	-80.0839	17.0	36.06	27.32	0.603	6.46	8.02	222.1	0.250	0.097	0.24	1.493	0.422	0.004
HW-2C	11/2/2010	9:04	26.0150	-80.0839	33.4	36.08	26.78	1.880	6.51	8.01	222.8	0.466	0.149	0.55	1.342	1.464	0.069
HW-3A	11/2/2010	9:38	26.0150	-80.0917	2.9	35.31	26.66	2.006	6.56	7.95	221.0	0.520	0.184	0.66	1.697	1.222	0.138
HW-3B	11/2/2010	9:35	26.0150	-80.0917	10.2	36.00	27.23	1.047	6.47	7.99	220.9	0.383	0.146	0.30	1.648	0.798	0.051
HW-3C	11/2/2010	9:34	26.0150	-80.0917	17.5	36.04	27.26	1.771	6.46	8.00	220.8	0.410	0.125	0.36	1.504	1.314	0.041
HW-4A	11/2/2010	10:22	26.0198	-80.0856	1.6	35.28	27.16	13.656	6.50	7.86	221.0	0.377	0.123	0.23	1.685	4.991	1.767
HW-4B	11/2/2010	10:21	26.0198	-80.0856	10.8	36.06	27.30	1.129	6.46	7.96	220.5	0.477	0.110	0.23	1.492	0.679	0.085
HW-4C	11/2/2010	10:19	26.0198	-80.0856	27.8	36.07	27.10	0.798	6.48	7.98	220.9	0.334	0.131	0.23	1.478	0.766	0.004
HW-5A	11/2/2010	11:07	26.0259	-80.0947	1.3	35.43	26.79	1.812	6.54	8.07	221.5	0.546	0.156	0.43	1.596	0.983	0.201
HW-5B	11/2/2010	11:06	26.0259	-80.0947	13.9	36.05	27.24	0.918	6.47	7.98	221.6	0.405	0.091	0.16	1.539	0.355	0.048
HW-5C	11/2/2010	11:05	26.0259	-80.0947	27.5	36.06	26.96	1.349	6.49	7.97	221.7	0.313	0.104	0.22	1.418	1.294	0.004
HW-6A	11/2/2010	11:36	26.0257	-80.0922	1.3	35.63	26.96	1.261	6.51	7.96	224.3	0.575	0.083	0.46	1.817	0.783	0.059
HW-6B	11/2/2010	11:37	26.0257	-80.0922	9.5	36.01	27.24	0.960	6.47	8.10	223.6	0.437	0.124	0.27	1.707	0.502	0.031
HW-6BX	11/2/2010	11:37	26.0257	-80.0922	9.5	36.01	27.24	1.098	6.47	8.10	223.6	N/A	N/A	0.13	1.707	0.454	0.093
HW-6C	11/2/2010	11:38	26.0257	-80.0922	17.6	36.02	27.24	0.955	6.47	7.98	223.9	0.487	0.124	0.19	1.624	0.443	0.076
HW-7A	11/2/2010	12:30	26.0460	-80.0922	1.8	35.65	26.92	1.222	6.51	7.94	231.4	0.575	0.134	0.39	1.865	0.767	0.125
HW-7B	11/2/2010	12:29	26.0460	-80.0922	7.9	35.98	27.24	0.409	6.47	8.10	231.0	0.531	0.114	0.29	1.922	0.344	0.010
HW-7C	11/2/2010	12:28	26.0460	-80.0922	15.7	36.03	27.27	0.501	6.46	7.98	230.5	0.612	0.127	0.24	1.792	0.345	0.014
HW-8A	11/2/2010	12:59	26.0452	-80.1047	1.5	35.46	26.76	1.582	6.54	8.05	235.2	0.656	0.186	0.69	1.974	1.199	0.122
HW-8AX	11/2/2010	12:59	26.0452	-80.1047	1.5	35.46	26.76	2.050	6.54	8.05	235.2	N/A	N/A	0.77	1.974	1.195	0.178
HW-8C	11/2/2010	12:58	26.0452	-80.1047	5.2	35.80	27.10	1.499	6.49	7.96	234.6	0.559	0.199	0.46	1.773	0.974	0.127
HW-9A	11/2/2010	13:37	26.0687	-80.0834	1.3	35.79	27.02	1.979	6.50	7.95	231.9	0.652	0.138	0.43	2.149	0.942	0.201
HW-9B	11/2/2010	13:36	26.0687	-80.0834	12.5	36.01	27.25	1.518	6.47	7.98	231.4	0.781	0.167	0.19	2.023	0.565	0.103
HW-9C	11/2/2010	13:35	26.0687	-80.0834	24.1	36.05	27.26	1.099	6.47	7.98	231.7	0.482	0.146	0.25	1.831	0.562	0.028
HW-10A	11/2/2010	13:59	26.0832	-80.0830	1.1	35.70	26.88	1.455	6.52	7.95	238.2	0.773	0.169	0.45	2.269	0.772	0.137
HW-10B	11/2/2010	13:58	26.0832	-80.0830	10.1	35.86	27.10	0.928	6.49	8.07	237.3	0.808	0.166	0.33	2.367	0.451	0.110
HW-10C	11/2/2010	13:57	26.0832	-80.0830	21.6	36.07	27.13	0.752	6.48	7.98	237.3	0.396	0.121	0.24	1.650	0.517	0.031
HW-11A	11/2/2010	14:20	26.0832	-80.0941	1.6	35.67	26.83	1.071	6.52	7.94	227.8	0.735	0.196	0.51	2.087	0.615	0.126
HW-11C	11/2/2010	14:19	26.0832	-80.0941	7.2	36.00	27.25	0.683	6.47	7.98	227.8	0.453	0.106	0.32	1.905	0.651	0.203
HW-12A	11/2/2010	15:48	26.0942	-80.0958	0.9	34.66	26.64	2.685	6.58	7.88	250.6	1.120	0.436	1.27	3.097	2.298	0.223
HW-12B	11/2/2010	15:47	26.0942	-80.0958	7.2	35.81	27.10	1.051	6.49	8.07	248.7	0.636	0.253	0.64	2.195	0.719	0.042
HW-12BX	11/2/2010	15:47	26.0942	-80.0958	7.2	35.81	27.10	0.904	6.49	8.07	248.7	N/A	N/A	0.75	2.195	0.726	0.065
HW-12C	11/2/2010	15:46	26.0942	-80.0958	13.3	35.98	27.22	0.557	6.47	7.98	247.1	0.516	0.154	0.64	2.005	0.525	0.004
HW-13A	11/2/2010	14:43	26.0967	-80.0831	N/A	N/A	N/A	0.667	N/A	7.95	N/A	0.801	0.168	0.80	N/A	0.635	0.030
HW-13B	11/2/2010	14:42	26.0967	-80.0831	N/A	N/A	N/A	0.672	N/A	7.96	N/A	0.906	0.187	1.00	N/A	0.640	0.025
HW-13C	11/2/2010	14:41	26.0967	-80.0831	N/A	N/A	N/A	0.751	N/A	7.98	N/A	0.597	0.150	0.69	N/A	0.526	0.005

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-1A	11/2/2010	8:29	1.137	0.358	0.044	3.076	7.637	0.190	7.165	0.019	N/A	128.17	0.208	7.637	135.33	99.8%	22.65
HW-1B	11/2/2010	8:26	0.351	0.373	0.020	1.210	6.142	0.151	3.298	0.006	N/A	81.51	0.157	6.142	84.81	99.8%	23.06
HW-1BX	11/2/2010	8:26	0.296	0.128	0.053	1.216	7.376	0.156	2.894	0.009	N/A	79.13	0.164	7.376	82.03	99.8%	23.06
HW-1C	11/2/2010	8:20	0.397	0.415	0.027	1.515	6.121	0.060	3.375	0.009	N/A	72.28	0.069	6.121	75.65	99.7%	23.08
HW-2A	11/2/2010	9:11	1.072	0.790	0.041	3.098	7.017	0.145	6.446	0.019	N/A	67.38	0.164	7.017	73.82	99.8%	22.71
HW-2B	11/2/2010	9:08	0.418	0.181	0.017	1.326	6.521	0.575	3.951	0.010	N/A	115.75	0.585	6.521	119.70	99.8%	23.07
HW-2C	11/2/2010	9:04	1.395	0.416	0.069	1.872	5.674	0.151	4.611	0.007	N/A	69.23	0.158	5.674	73.84	99.7%	23.27
HW-3A	11/2/2010	9:38	1.084	0.784	0.041	2.395	5.721	0.092	7.706	0.018	N/A	54.52	0.110	5.721	62.22	99.8%	22.73
HW-3B	11/2/2010	9:35	0.747	0.249	0.031	1.505	6.266	0.158	4.020	0.008	N/A	63.88	0.166	6.266	67.89	99.8%	23.06
HW-3C	11/2/2010	9:34	1.273	0.457	0.031	1.595	4.617	0.132	3.751	0.008	N/A	46.06	0.140	4.617	49.81	99.7%	23.08
HW-4A	11/2/2010	10:22	3.224	8.665	0.372	6.200	15.137	0.558	5.551	0.060	N/A	99.33	0.618	15.137	104.88	99.7%	22.54
HW-4B	11/2/2010	10:21	0.594	0.450	0.073	1.572	5.993	0.162	4.617	0.009	N/A	68.23	0.171	5.993	72.84	99.8%	23.08
HW-4C	11/2/2010	10:19	0.762	0.032	0.034	1.390	6.581	0.162	7.230	0.006	N/A	60.11	0.168	6.581	67.34	99.7%	23.15
HW-5A	11/2/2010	11:07	0.782	0.829	0.053	2.039	7.634	0.149	6.123	0.018	N/A	54.38	0.167	7.634	60.50	99.8%	22.77
HW-5B	11/2/2010	11:06	0.307	0.563	0.022	1.178	6.756	0.128	3.965	0.011	N/A	64.18	0.139	6.756	68.14	99.8%	23.09
HW-5C	11/2/2010	11:05	1.290	0.055	0.056	1.582	6.003	0.147	3.351	0.006	N/A	49.68	0.153	6.003	53.03	99.7%	23.19
HW-6A	11/2/2010	11:36	0.724	0.478	0.044	1.800	5.904	0.145	6.575	0.018	N/A	50.40	0.163	5.904	56.98	99.7%	22.87
HW-6B	11/2/2010	11:37	0.471	0.458	0.034	1.198	5.141	0.154	5.121	0.011	N/A	46.38	0.165	5.141	51.50	99.8%	23.06
HW-6BX	11/2/2010	11:37	0.361	0.644	0.035	1.238	5.045	0.140	4.497	0.010	N/A	52.40	0.150	5.045	56.90	99.8%	23.06
HW-6C	11/2/2010	11:38	0.367	0.512	0.020	1.280	5.401	0.192	4.752	0.031	N/A	62.42	0.223	5.401	67.17	99.8%	23.07
HW-7A	11/2/2010	12:30	0.642	0.455	0.032	1.780	5.846	0.137	6.435	0.018	N/A	52.48	0.154	5.846	58.91	99.7%	22.90
HW-7B	11/2/2010	12:29	0.334	0.065	0.018	1.251	6.096	0.177	4.810	0.013	N/A	61.22	0.189	6.096	66.03	99.8%	23.04
HW-7C	11/2/2010	12:28	0.331	0.156	0.016	1.233	5.687	0.129	4.075	0.009	N/A	56.52	0.138	5.687	60.59	99.7%	23.07
HW-8A	11/2/2010	12:59	1.077	0.383	0.065	2.629	5.823	0.152	8.659	0.017	N/A	55.42	0.169	5.823	64.08	99.8%	22.81
HW-8AX	11/2/2010	12:59	1.017	0.855	0.045	2.055	5.762	0.133	9.661	0.021	N/A	70.95	0.153	5.762	80.61	99.8%	22.81
HW-8C	11/2/2010	12:58	0.847	0.525	0.044	1.651	8.248	0.180	7.424	0.015	N/A	85.33	0.195	8.248	92.76	99.7%	22.95
HW-9A	11/2/2010	13:37	0.741	1.037	0.061	2.651	5.623	0.135	5.395	0.014	N/A	60.03	0.149	5.623	65.43	99.8%	22.97
HW-9B	11/2/2010	13:36	0.462	0.953	0.031	1.431	5.283	0.042	4.922	0.013	N/A	50.91	0.055	5.283	55.83	99.8%	23.06
HW-9C	11/2/2010	13:35	0.534	0.537	0.067	1.496	4.549	0.132	3.571	0.008	N/A	50.94	0.140	4.549	54.51	99.8%	23.09
HW-10A	11/2/2010	13:59	0.635	0.683	0.045	2.404	6.108	0.122	6.786	0.017	N/A	79.22	0.139	6.108	86.00	99.8%	22.95
HW-10B	11/2/2010	13:58	0.341	0.477	0.023	1.501	6.944	0.159	6.126	0.014	N/A	83.92	0.173	6.944	90.04	99.8%	23.00
HW-10C	11/2/2010	13:57	0.486	0.235	0.028	1.193	4.676	0.145	3.531	0.005	N/A	70.23	0.150	4.676	73.76	99.8%	23.14
HW-11A	11/2/2010	14:20	0.489	0.456	0.030	1.550	6.769	0.136	7.040	0.010	N/A	57.98	0.146	6.769	65.01	99.7%	22.94
HW-11C	11/2/2010	14:19	0.448	0.032	0.036	1.290	4.763	0.136	5.800	0.013	N/A	59.41	0.149	4.763	65.21	99.8%	23.05
HW-12A	11/2/2010	15:48	2.075	0.387	0.128	6.334	8.381	0.263	16.661	0.027	N/A	102.58	0.289	8.381	119.24	99.7%	22.25
HW-12B	11/2/2010	15:47	0.677	0.332	0.053	1.521	6.648	0.155	6.486	0.014	N/A	46.55	0.169	6.648	53.04	99.8%	22.96
HW-12BX	11/2/2010	15:47	0.661	0.178	0.037	1.633	6.003	0.130	5.055	0.010	N/A	54.62	0.140	6.003	59.67	99.8%	22.96
HW-12C	11/2/2010	15:46	0.521	0.032	0.025	1.218	5.925	0.139	3.845	0.028	N/A	56.71	0.168	5.925	60.55	99.7%	23.05
HW-13A	11/2/2010	14:43	0.605	0.032	0.027	1.487	4.907	0.140	7.315	0.014	N/A	62.21	0.154	4.907	69.52	N/A	N/A
HW-13B	11/2/2010	14:42	0.615	0.032	0.027	1.554	6.660	0.187	5.877	0.013	N/A	64.37	0.200	6.660	70.24	N/A	N/A
HW-13C	11/2/2010	14:41	0.521	0.225	0.034	1.271	7.679	0.139	4.255	0.006	N/A	62.55	0.145	7.679	66.80	N/A	N/A

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-14A	11/2/2010	16:23	26.0942	-80.1108	1.7	31.39	26.67	7.501	6.70	7.79	136.9	2.055	0.981	1.96	5.082	6.162	0.430
HW-15A	11/2/2010	15:01	26.1024	-80.0796	1.3	34.84	26.86	0.729	6.55	8.07	232.6	0.953	0.257	0.46	2.733	0.720	0.085
HW-15AX	11/2/2010	15:01	26.1024	-80.0796	13.8	34.84	26.86	1.014	6.55	8.06	232.3	N/A	N/A	0.53	2.767	0.793	0.094
HW-15B	11/2/2010	15:00	26.1024	-80.0796	13.8	35.76	27.03	0.519	6.50	7.98	232.3	0.937	0.192	0.35	1.746	0.438	0.015
HW-15C	11/2/2010	14:59	26.1024	-80.0796	26.1	36.05	27.16	0.625	6.47	7.98	231.9	0.431	0.126	0.46	4.805	0.611	0.004
BR-1A	11/2/2010	16:05	26.0938	-80.1057	1.2	32.29	26.73	6.131	6.66	7.81	230.7	1.619	0.797	1.94	4.805	4.855	0.515
BR-1B	11/2/2010	16:04	26.0938	-80.1057	6.4	35.20	26.61	1.407	6.57	7.90	231.0	0.940	0.296	1.31	2.790	1.261	0.156
BR-1C	11/2/2010	16:03	26.0938	-80.1057	13.1	35.64	26.94	1.257	6.51	8.04	230.9	0.719	0.255	0.78	2.151	1.074	0.113
BR-2A	11/2/2010	15:26	26.1025	-80.0929	1.3	34.62	26.94	1.782	6.55	7.92	226.9	0.807	0.400	1.04	2.655	1.539	0.118
BR-2C	11/2/2010	15:25	26.1025	-80.0929	8.6	35.91	27.16	1.101	6.48	7.97	227.2	0.634	0.210	0.41	2.023	0.801	0.097
BR-3A	11/10/2010	8:57	26.1378	-80.0900	1.6	36.02	25.91	1.279	6.62	8.11	231.5	0.218	0.101	0.18	1.366	1.247	0.043
BR-3C	11/10/2010	8:56	26.1379	-80.0901	9.3	36.10	26.03	1.255	6.59	8.11	230.0	0.170	0.110	0.23	1.062	1.223	0.058
BR-3CX	11/10/2010	8:56	26.1379	-80.0901	9.3	36.10	26.03	0.000	6.59	N/A	230.0	N/A	N/A	0.20	1.062	N/A	N/A
BR-4A	11/10/2010	9:23	26.1595	-80.0753	1.5	36.13	26.52	0.947	6.54	8.12	208.8	0.198	0.090	0.17	1.214	0.915	0.021
BR-4AX	11/10/2010	9:23	26.1595	-80.0753	1.5	36.13	26.52	0.909	6.54	8.12	208.8	N/A	N/A	0.13	1.214	0.877	0.024
BR-4B	11/10/2010	9:22	26.1595	-80.0754	12.2	36.13	26.52	1.014	6.54	7.94	209.9	0.200	0.071	0.11	1.019	0.899	0.004
BR-4C	11/10/2010	9:20	26.1596	-80.0755	23.6	36.13	26.41	0.404	6.56	8.11	212.8	0.182	0.078	0.19	1.215	0.372	0.003
BR-5A	11/10/2010	9:44	26.1592	-80.0874	1.3	36.13	26.28	0.401	6.57	8.13	207.3	0.211	0.078	0.11	0.973	0.369	0.010
BR-5C	11/10/2010	9:43	26.1592	-80.0875	11.0	36.14	26.13	0.604	6.58	8.12	208.7	0.152	0.078	0.10	1.000	0.572	0.004
BR-6A	11/10/2010	10:06	26.1899	-80.0839	1.5	36.09	26.22	0.436	6.58	8.11	220.6	0.280	0.095	0.22	1.120	0.404	0.003
BR-6B	11/10/2010	10:05	26.1899	-80.0840	4.0	36.09	26.17	0.419	6.58	8.12	220.7	0.286	0.132	0.20	1.152	0.387	0.026
BR-6C	11/10/2010	10:04	26.1898	-80.0841	9.2	36.10	25.72	1.802	6.63	7.90	219.9	0.268	0.113	0.15	1.192	0.489	0.073
BR-7A	11/10/2010	10:26	26.2017	-80.0672	1.2	36.11	26.52	0.403	6.54	8.12	223.6	0.232	0.079	0.17	0.974	0.371	0.045
BR-7B	11/10/2010	10:24	26.2019	-80.0674	16.5	36.11	26.51	0.864	6.54	8.13	223.4	0.260	0.101	0.12	1.149	0.235	0.006
BR-7C	11/10/2010	10:23	26.2020	-80.0675	31.5	36.11	26.52	0.583	6.54	8.12	223.4	0.232	0.089	0.14	1.146	0.282	0.004
BR-8A	11/10/2010	10:52	26.2362	-80.0673	1.3	36.10	26.58	4.626	6.53	8.12	232.6	0.253	0.088	0.24	0.919	0.407	0.008
BR-8B	11/10/2010	10:51	26.2365	-80.0675	8.4	36.10	26.57	1.394	6.54	8.13	231.9	0.236	0.084	0.11	0.997	0.257	0.004
BR-8C	11/10/2010	10:50	26.2367	-80.0676	16.4	36.10	26.57	0.463	6.54	8.13	231.1	0.246	0.084	0.10	1.077	0.194	0.049
BR-9A	11/10/2010	11:15	26.2462	-80.0624	1.7	36.11	26.65	1.537	6.53	8.12	234.5	0.247	0.083	0.12	1.070	0.258	0.078
BR-9B	11/10/2010	11:13	26.2465	-80.0625	15.1	36.12	26.65	0.547	6.53	8.13	233.4	0.241	0.086	0.10	1.090	0.099	0.004
BR-9C	11/10/2010	11:12	26.2469	-80.0626	31.1	36.12	26.63	0.950	6.53	8.12	233.1	0.241	0.084	0.09	1.309	0.095	0.002
BR-10A	11/10/2010	11:37	26.2507	-80.0620	0.9	35.82	26.64	12.440	6.53	8.11	233.1	0.251	0.090	0.16	1.128	1.311	0.747
BR-10B	11/10/2010	11:35	26.2507	-80.0621	16.2	36.00	26.64	4.779	6.53	8.11	232.4	0.237	0.084	0.15	1.091	0.618	0.318
BR-10C	11/10/2010	11:33	26.2503	-80.0618	33.9	36.12	26.64	0.388	6.53	8.11	232.6	0.239	0.084	0.09	1.198	0.210	0.034
BR-11A	11/10/2010	12:22	26.2537	-80.0619	1.5	36.12	26.68	0.579	6.53	8.11	230.9	0.231	0.078	0.42	0.901	0.225	0.053
BR-11B	11/10/2010	12:20	26.2539	-80.0619	13.0	36.11	26.65	0.972	6.53	8.12	229.9	0.242	0.085	0.12	1.006	0.252	0.085
BR-11C	11/10/2010	12:19	26.2542	-80.0619	30.9	36.11	26.64	0.719	6.53	8.12	229.5	0.269	0.114	0.12	1.101	0.221	0.033
BR-12A	11/10/2010	14:29	26.2496	-80.0788	1.2	35.65	25.75	3.912	6.64	8.10	247.7	0.701	0.207	0.36	1.804	1.056	0.102
BR-12AX	11/10/2010	14:29	26.2496	-80.0788	1.2	35.65	25.75	2.283	6.64	8.10	247.7	N/A	N/A	0.32	1.804	0.894	0.185
BR-13A	11/10/2010	13:53	26.2596	-80.0831	1.8	36.02	26.17	1.444	6.58	8.12	238.1	0.388	0.150	0.24	3.159	0.487	0.098
BR-14A	11/10/2010	14:15	26.2617	-80.0854	1.5	34.69	25.51	5.116	6.71	8.05	231.7	0.880	0.478	0.46	2.412	2.384	0.177

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-14A	11/4/2010	16:23	5.732	1.339	0.352	19.960	9.150	0.245	28.277	0.044	1.229	108.17	0.289	10.378	136.44	99.7%	19.79
HW-15A	11/4/2010	15:01	0.635	0.009	0.047	2.050	5.786	0.205	7.251	0.020	N/A	50.64	0.225	5.786	57.89	99.7%	22.31
HW-15AX	11/4/2010	15:01	0.699	0.221	0.042	1.953	6.217	0.188	7.983	0.020	N/A	52.48	0.207	6.217	60.46	99.7%	22.31
HW-15B	11/4/2010	15:00	0.423	0.081	0.033	1.752	6.564	0.195	7.774	0.012	N/A	71.44	0.207	6.564	79.22	99.8%	22.94
HW-15C	11/4/2010	14:59	0.607	0.014	0.030	1.169	6.744	0.245	3.425	0.004	N/A	74.13	0.250	6.744	77.56	99.7%	23.12
BR-1A	11/4/2010	16:05	4.340	1.276	0.295	15.148	8.905	0.233	28.521	0.035	1.234	106.50	0.268	10.138	135.02	99.8%	20.44
BR-1B	11/4/2010	16:04	1.105	0.146	0.090	2.772	7.375	0.193	14.985	0.021	0.432	109.92	0.215	7.807	124.90	99.8%	22.66
BR-1C	11/4/2010	16:03	0.961	0.183	0.065	2.284	8.263	0.083	8.094	0.014	N/A	97.17	0.097	8.263	105.26	99.7%	22.88
BR-2A	11/4/2010	15:26	1.421	0.243	0.087	4.039	7.866	0.186	13.278	0.020	N/A	112.42	0.207	7.866	125.69	99.7%	22.12
BR-2C	11/4/2010	15:25	0.704	0.300	0.042	2.116	5.178	0.182	5.586	0.010	N/A	100.75	0.192	5.178	106.34	99.8%	23.01
BR-3A	11/10/2010	8:57	1.204	0.032	0.011	2.225	8.132	0.150	8.987	0.008	N/A	86.00	0.159	8.132	94.99	99.9%	23.50
BR-3C	11/10/2010	8:56	1.165	0.032	0.008	1.505	7.371	0.089	7.847	0.008	N/A	71.48	0.097	7.371	79.33	99.7%	23.53
BR-3CX	11/10/2010	8:56	N/A	N/A	N/A	N/A	8.792	0.121	10.104	0.007	N/A	99.25	0.127	8.792	109.35	99.7%	23.53
BR-4A	11/10/2010	9:23	0.894	0.032	0.011	1.125	7.867	0.071	7.230	0.008	N/A	74.03	0.079	7.867	81.26	99.7%	23.39
BR-4AX	11/10/2010	9:23	0.853	0.032	0.002	1.102	6.450	0.055	7.433	0.008	N/A	85.25	0.063	6.450	92.68	99.7%	23.39
BR-4B	11/10/2010	9:22	0.895	0.115	0.002	1.151	8.027	0.065	5.721	0.009	N/A	63.50	0.075	8.027	69.22	99.7%	23.39
BR-4C	11/10/2010	9:20	0.369	0.032	0.011	1.240	8.499	0.035	5.229	0.006	N/A	78.41	0.041	8.499	83.64	99.9%	23.42
BR-5A	11/10/2010	9:44	0.359	0.032	0.011	1.142	5.966	0.040	5.892	0.011	N/A	73.57	0.051	5.966	79.46	99.8%	23.47
BR-5C	11/10/2010	9:43	0.568	0.032	0.006	1.298	6.365	0.082	7.192	0.006	N/A	87.50	0.088	6.365	94.69	99.7%	23.52
BR-6A	11/10/2010	10:06	0.401	0.032	0.011	1.352	7.378	0.024	6.213	0.010	N/A	84.17	0.034	7.378	90.38	99.8%	23.46
BR-6B	11/10/2010	10:05	0.361	0.032	0.011	1.527	5.622	0.035	5.953	0.013	N/A	76.67	0.047	5.622	82.62	99.7%	23.47
BR-6C	11/10/2010	10:04	0.416	1.313	0.061	1.179	7.957	0.032	4.343	0.013	N/A	77.38	0.045	7.957	81.73	99.7%	23.62
BR-7A	11/10/2010	10:26	0.326	0.032	0.011	1.203	6.511	0.057	3.311	0.007	N/A	73.85	0.064	6.511	77.16	99.7%	23.37
BR-7B	11/10/2010	10:24	0.229	0.629	0.001	0.962	6.712	0.039	5.037	0.007	N/A	75.08	0.046	6.712	80.11	99.7%	23.37
BR-7C	11/10/2010	10:23	0.278	0.301	0.011	0.879	6.770	0.042	2.883	0.008	N/A	71.36	0.049	6.770	74.24	99.7%	23.37
BR-8A	11/10/2010	10:52	0.399	4.219	0.040	2.036	7.802	0.050	5.440	0.008	N/A	77.48	0.059	7.802	82.92	99.7%	23.35
BR-8B	11/10/2010	10:51	0.253	1.137	0.006	0.870	5.642	0.079	3.416	0.008	N/A	81.68	0.087	5.642	85.10	99.8%	23.35
BR-8C	11/10/2010	10:50	0.145	0.269	0.008	0.880	4.459	0.049	3.840	0.009	N/A	85.42	0.057	4.459	89.26	99.8%	23.35
BR-9A	11/10/2010	11:15	0.180	1.279	0.005	0.923	6.864	0.068	4.430	0.014	N/A	73.75	0.082	6.864	78.18	99.8%	23.33
BR-9B	11/10/2010	11:13	0.095	0.448	0.004	0.833	7.247	0.037	3.583	0.006	N/A	90.00	0.043	7.247	93.58	99.8%	23.34
BR-9C	11/10/2010	11:12	0.093	0.855	0.035	1.219	7.629	0.031	2.860	0.007	N/A	78.01	0.038	7.629	80.87	99.8%	23.34
BR-10A	11/10/2010	11:37	0.564	11.129	0.241	2.795	16.050	0.080	6.376	0.016	N/A	91.83	0.095	16.050	98.21	99.6%	23.11
BR-10B	11/10/2010	11:35	0.300	4.161	0.074	1.555	12.585	0.064	3.359	0.013	N/A	90.58	0.077	12.585	93.94	99.7%	23.25
BR-10C	11/10/2010	11:33	0.176	0.178	0.023	0.997	6.819	0.035	3.560	0.007	N/A	82.81	0.041	6.819	86.37	99.8%	23.34
BR-11A	11/10/2010	12:22	0.172	0.354	0.009	0.901	7.585	0.024	3.075	0.007	N/A	83.92	0.032	7.585	86.99	99.8%	23.33
BR-11B	11/10/2010	12:20	0.167	0.720	0.030	1.141	7.089	0.025	4.350	0.007	N/A	75.20	0.031	7.089	79.55	99.8%	23.33
BR-11C	11/10/2010	12:19	0.188	0.498	0.013	1.141	7.147	0.035	2.449	0.007	N/A	73.59	0.042	7.147	76.04	99.8%	23.34
BR-12A	11/10/2010	14:29	0.954	2.856	0.148	6.065	4.803	0.031	6.394	0.014	N/A	77.47	0.045	4.803	83.86	99.7%	23.27
BR-12AX	11/10/2010	14:29	0.709	1.389	0.091	3.280	6.417	0.052	6.404	0.018	N/A	112.92	0.070	6.417	119.32	99.7%	23.27
BR-13A	11/10/2010	13:53	0.389	0.957	0.050	1.947	8.677	0.041	4.929	0.027	N/A	81.89	0.068	8.677	86.82	99.7%	23.42
BR-14A	11/10/2010	14:15	2.207	2.732	0.205	7.603	10.664	0.140	8.319	0.024	N/A	95.08	0.164	10.664	103.40	99.8%	22.63

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-15A	11/10/2010	14:07	26.2629	-80.0836	1.3	35.91	25.88	1.981	6.61	8.11	238.0	0.484	0.212	0.49	1.550	0.737	0.095
BR-16A	11/10/2010	13:34	26.2612	-80.0738	1.6	36.08	26.58	1.511	6.54	8.12	241.1	0.284	0.076	0.12	0.792	0.147	0.084
BR-16B	11/10/2010	13:33	26.2612	-80.0737	5.3	36.08	26.46	1.441	6.55	8.13	240.3	0.308	0.089	0.14	1.073	0.164	0.038
BR-16C	11/10/2010	13:33	26.2611	-80.0736	9.9	36.10	26.41	1.074	6.55	8.13	240.0	0.281	0.100	0.18	1.318	0.223	0.036
BR-17A	11/10/2010	13:15	26.2735	-80.0638	1.8	36.12	26.77	0.500	6.51	8.13	234.2	0.248	0.076	0.34	0.911	0.136	0.060
BR-17B	11/10/2010	13:14	26.2738	-80.0638	7.4	36.11	26.64	0.707	6.53	8.13	234.1	0.268	0.086	0.08	1.015	0.166	0.069
BR-17BX	11/10/2010	13:14	26.2738	-80.0638	7.4	36.11	26.64	1.023	6.53	8.14	234.1	N/A	N/A	0.16	1.015	0.194	0.097
BR-17C	11/10/2010	13:13	26.2741	-80.0638	14.3	36.11	26.64	0.910	6.53	8.13	233.8	0.259	0.080	0.11	1.081	0.168	0.083
BR-18A	11/10/2010	12:55	26.2957	-80.0689	1.7	36.10	26.66	1.463	6.53	8.12	225.0	0.236	0.095	0.14	0.951	0.174	0.045
BR-18B	11/10/2010	12:54	26.2960	-80.0688	4.9	36.10	26.65	1.258	6.53	8.13	224.8	0.266	0.076	0.12	0.973	0.201	0.036
BR-18C	11/10/2010	12:53	26.2962	-80.0687	9.2	36.10	26.66	0.633	6.53	8.12	225.0	0.240	0.083	0.34	0.977	0.207	0.042
BR-3A	12/1/2010	15:16	26.1375	-80.0901	1.2	36.18	25.38	0.587	6.67	8.12	197.4	1.232	0.820	0.33	2.976	0.222	0.068
BR-3C	12/1/2010	15:15	26.1378	-80.0903	7.7	36.19	25.40	0.396	6.66	8.16	195.6	1.170	0.251	0.26	3.116	0.180	0.067
BR-3CX	12/1/2010	15:15	26.1378	-80.0903	7.7	36.19	25.40	0.399	6.66	8.17	195.6	N/A	N/A	0.29	3.116	0.055	0.034
BR-4A	12/1/2010	14:57	26.1599	-80.0754	1.3	36.04	25.55	0.726	6.65	8.11	206.3	0.830	0.139	0.26	2.485	0.112	0.091
BR-4AX	12/1/2010	14:57	26.1599	-80.0754	1.3	36.04	25.55	4.540	6.65	8.13	206.3	N/A	N/A	0.25	2.485	0.263	0.039
BR-4B	12/1/2010	14:56	26.1601	-80.0756	9.5	36.18	25.47	0.723	6.66	8.16	205.0	0.815	0.200	0.15	2.399	0.332	0.055
BR-4C	12/1/2010	14:55	26.1601	-80.0757	24.1	36.21	25.42	0.802	6.66	8.16	203.6	0.679	0.256	0.17	2.192	0.355	0.067
BR-5A	12/1/2010	14:42	26.1586	-80.0881	1.2	36.16	25.45	0.426	6.66	8.12	204.3	1.047	0.223	0.34	2.757	0.174	0.060
BR-5C	12/1/2010	14:41	26.1588	-80.0882	8.7	36.21	25.42	0.519	6.66	8.16	203.3	1.065	0.249	0.26	2.898	0.087	0.066
BR-6A	12/1/2010	14:23	26.1896	-80.0838	1.2	36.08	25.51	0.730	6.65	8.11	189.2	0.749	0.233	0.43	2.082	0.131	0.083
BR-6B	12/1/2010	14:23	26.1897	-80.0839	3.6	36.09	25.50	0.765	6.66	8.14	187.4	0.846	0.194	0.30	2.292	0.309	0.051
BR-6C	12/1/2010	14:22	26.1897	-80.0841	9.2	36.17	25.49	0.445	6.65	8.15	184.3	0.951	0.218	0.23	2.852	0.213	0.029
BR-7A	12/1/2010	14:05	26.2020	-80.0660	1.3	36.08	25.48	0.602	6.66	8.11	195.4	0.967	0.217	0.26	2.483	0.220	0.059
BR-7B	12/1/2010	14:04	26.2021	-80.0663	12.9	36.21	25.44	0.805	6.66	8.15	191.6	0.801	0.178	0.13	2.625	0.333	0.038
BR-7C	12/1/2010	14:03	26.2023	-80.0665	30.4	36.27	25.11	0.875	6.69	8.15	188.2	0.525	0.197	0.16	2.310	0.264	0.059
BR-8A	12/1/2010	13:41	26.2370	-80.0676	1.6	36.12	25.54	1.129	6.65	8.10	219.0	0.680	0.151	0.17	1.693	0.080	0.059
BR-8B	12/1/2010	13:40	26.2372	-80.0674	6.7	36.13	25.53	0.326	6.65	8.14	218.8	0.647	0.138	0.35	2.033	0.057	0.036
BR-8C	12/1/2010	13:38	26.2374	-80.0676	14.0	36.25	25.25	0.559	6.68	8.14	218.7	0.642	0.171	0.14	2.094	0.279	0.049
BR-9A	12/1/2010	13:03	26.2472	-80.0625	1.1	36.17	25.58	0.719	6.64	8.10	208.0	0.684	0.161	0.21	1.722	0.077	0.056
BR-9B	12/1/2010	13:02	26.2473	-80.0626	10.9	36.20	25.47	0.428	6.65	8.10	207.3	0.719	0.166	0.15	2.350	0.050	0.029
BR-9C	12/1/2010	13:01	26.2474	-80.0628	25.3	36.23	25.19	0.745	6.69	8.13	206.8	0.615	0.179	0.12	2.552	0.421	0.053
BR-10A	12/1/2010	12:40	26.2512	-80.0617	1.6	36.16	25.67	0.457	6.63	8.08	195.4	0.602	0.125	0.22	1.686	0.048	0.027
BR-10B	12/1/2010	12:39	26.2513	-80.0618	8.5	36.19	25.53	0.316	6.65	8.08	192.9	0.594	0.168	0.15	2.267	0.053	0.032
BR-10C	12/1/2010	12:38	26.2513	-80.0620	22.7	36.22	25.41	1.697	6.66	8.11	189.4	0.799	0.126	0.26	2.326	0.115	0.094
BR-11A	12/1/2010	12:08	26.2558	-80.0610	1.2	36.03	25.58	0.693	6.65	8.09	215.3	0.604	0.136	0.48	1.853	0.081	0.060
BR-11B	12/1/2010	12:07	26.2556	-80.0611	14.6	36.19	25.54	0.519	6.65	8.13	214.3	0.613	0.144	0.17	2.121	0.059	0.038
BR-11C	12/1/2010	12:06	26.2554	-80.0613	33.1	36.23	25.15	0.788	6.69	8.13	213.6	0.604	0.189	0.14	2.282	0.096	0.075
BR-12A	12/1/2010	13:21	26.2488	-80.0790	1.3	35.95	25.60	1.086	6.65	8.08	218.9	0.599	0.184	0.49	1.654	0.463	0.071
BR-12AX	12/1/2010	13:21	26.2488	-80.0790	1.3	35.95	25.60	0.718	6.65	8.10	218.9	N/A	N/A	0.40	1.654	0.172	0.058
BR-13A	12/1/2010	9:57	26.2592	-80.0832	1.0	34.21	25.49	4.174	6.73	7.98	225.2	0.818	0.488	0.85	3.257	2.355	0.157

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-15A	11/10/2010	14:07	0.642	1.244	0.075	2.777	8.691	0.074	7.577	0.015	N/A	103.42	0.088	8.691	110.99	99.6%	23.43
BR-16A	11/10/2010	13:34	0.063	1.364	0.048	1.246	6.744	0.056	2.520	0.009	N/A	96.58	0.065	6.744	99.10	99.8%	23.33
BR-16B	11/10/2010	13:33	0.126	1.277	0.016	1.435	6.543	0.097	3.942	0.010	N/A	112.58	0.107	6.543	116.53	99.8%	23.37
BR-16C	11/10/2010	13:33	0.187	0.851	0.007	0.966	6.922	0.093	4.196	0.008	N/A	117.00	0.101	6.922	121.20	99.7%	23.40
BR-17A	11/10/2010	13:15	0.076	0.364	0.024	0.968	9.295	0.072	4.204	0.006	N/A	105.42	0.078	9.295	109.62	99.7%	23.30
BR-17B	11/10/2010	13:14	0.097	0.541	0.030	1.126	7.116	0.069	3.197	0.009	N/A	92.83	0.077	7.116	96.03	99.8%	23.33
BR-17BX	11/10/2010	13:14	0.097	0.829	0.011	0.960	6.951	0.109	2.764	0.009	N/A	90.33	0.117	6.951	93.10	99.8%	23.33
BR-17C	11/10/2010	13:13	0.085	0.742	0.041	1.176	6.466	0.093	3.028	0.009	N/A	64.63	0.101	6.466	67.65	99.8%	23.33
BR-18A	11/10/2010	12:55	0.129	1.289	0.021	0.966	8.682	0.133	3.883	0.008	N/A	98.67	0.141	8.682	102.55	99.8%	23.32
BR-18B	11/10/2010	12:54	0.165	1.057	0.043	1.416	5.865	0.066	3.126	0.008	N/A	88.42	0.074	5.865	91.54	99.8%	23.32
BR-18C	11/10/2010	12:53	0.165	0.426	0.024	1.006	5.802	0.133	3.164	0.010	N/A	88.17	0.143	5.802	91.33	99.8%	23.32
BR-3A	12/1/2010	15:16	0.154	0.365	0.110	1.896	14.454	2.909	25.107	0.012	0.844	63.40	2.920	15.298	88.51	99.8%	23.79
BR-3C	12/1/2010	15:15	0.113	0.216	0.007	2.061	10.748	0.247	7.561	0.012	0.774	82.29	0.259	11.522	89.85	99.8%	23.79
BR-3CX	12/1/2010	15:15	0.021	0.344	0.011	1.959	10.422	0.692	7.515	0.010	0.639	55.73	0.702	11.061	63.24	99.8%	23.79
BR-4A	12/1/2010	14:57	0.021	0.614	0.011	1.976	7.135	1.026	6.970	0.012	0.811	58.00	1.038	7.945	64.97	99.8%	23.63
BR-4AX	12/1/2010	14:57	0.224	4.277	0.046	2.156	8.177	0.349	6.870	0.017	0.764	53.47	0.366	8.941	60.34	99.8%	23.63
BR-4B	12/1/2010	14:56	0.277	0.391	0.012	2.036	8.150	0.273	3.176	0.012	0.257	66.03	0.285	8.407	69.20	99.8%	23.76
BR-4C	12/1/2010	14:55	0.288	0.447	0.014	2.158	5.691	0.193	2.944	0.006	0.128	50.56	0.199	5.819	53.50	99.8%	23.80
BR-5A	12/1/2010	14:42	0.114	0.252	0.012	1.762	6.618	0.351	11.584	0.024	1.742	58.06	0.376	8.360	69.64	99.8%	23.76
BR-5C	12/1/2010	14:41	0.021	0.432	0.010	1.448	9.441	0.309	6.617	0.009	0.759	61.62	0.318	10.200	68.23	99.8%	23.80
BR-6A	12/1/2010	14:23	0.048	0.599	0.023	1.702	7.919	0.544	7.846	0.018	0.947	64.47	0.562	8.866	72.31	99.8%	23.67
BR-6B	12/1/2010	14:23	0.258	0.456	0.022	1.632	7.960	0.207	6.281	0.013	0.754	56.22	0.220	8.714	62.50	99.8%	23.69
BR-6C	12/1/2010	14:22	0.184	0.232	0.009	1.429	5.827	0.279	7.077	0.016	0.920	59.33	0.295	6.747	66.41	99.8%	23.75
BR-7A	12/1/2010	14:05	0.161	0.382	0.006	1.358	6.685	1.150	7.740	0.015	0.874	53.89	1.165	7.558	61.63	99.8%	23.69
BR-7B	12/1/2010	14:04	0.295	0.472	0.012	1.435	5.569	0.872	4.938	0.013	0.643	53.03	0.885	6.212	57.97	99.8%	23.79
BR-7C	12/1/2010	14:03	0.205	0.611	0.025	1.657	4.370	0.207	4.075	0.007	0.290	64.62	0.214	4.660	68.69	99.8%	23.95
BR-8A	12/1/2010	13:41	0.021	1.049	0.014	1.436	6.768	0.180	5.789	0.013	0.747	66.96	0.193	7.514	72.75	99.8%	23.69
BR-8B	12/1/2010	13:40	0.021	0.269	0.015	1.445	8.065	0.727	5.464	0.007	0.662	57.03	0.734	8.728	62.50	99.8%	23.71
BR-8C	12/1/2010	13:38	0.230	0.280	0.014	1.433	6.939	0.107	4.081	0.011	0.425	54.76	0.118	7.364	58.84	99.8%	23.88
BR-9A	12/1/2010	13:03	0.021	0.642	0.005	0.379	5.666	0.198	4.886	0.011	0.591	54.66	0.209	6.257	59.54	99.8%	23.72
BR-9B	12/1/2010	13:02	0.021	0.378	0.011	0.459	5.498	0.251	4.727	0.011	0.586	69.03	0.262	6.084	73.75	99.8%	23.78
BR-9C	12/1/2010	13:01	0.368	0.324	0.024	1.378	6.907	0.167	4.092	0.008	0.503	66.18	0.175	7.410	70.27	99.8%	23.89
BR-10A	12/1/2010	12:40	0.021	0.409	0.006	0.260	6.799	0.288	6.749	0.010	0.888	84.50	0.298	7.686	91.25	99.8%	23.68
BR-10B	12/1/2010	12:39	0.021	0.263	0.007	0.699	6.649	0.141	9.169	0.007	1.600	50.98	0.149	8.249	60.14	99.8%	23.75
BR-10C	12/1/2010	12:38	0.021	1.582	0.013	0.509	5.426	0.210	5.259	0.004	0.612	79.33	0.214	6.038	84.58	99.8%	23.81
BR-11A	12/1/2010	12:08	0.021	0.612	0.030	0.537	6.072	0.273	10.850	0.017	1.804	80.76	0.290	7.875	91.61	99.8%	23.61
BR-11B	12/1/2010	12:07	0.021	0.460	0.022	0.217	6.068	0.242	5.173	0.008	0.702	80.07	0.250	6.770	85.24	99.8%	23.75
BR-11C	12/1/2010	12:06	0.021	0.692	0.039	0.346	7.159	0.158	4.590	0.005	0.443	58.98	0.163	7.601	63.56	99.8%	23.91
BR-12A	12/1/2010	13:21	0.392	0.623	0.038	2.167	5.718	0.506	7.057	0.012	0.848	49.85	0.517	6.567	56.91	99.8%	23.54
BR-12AX	12/1/2010	13:21	0.114	0.546	0.041	2.070	5.049	1.021	8.516	0.014	0.925	57.45	1.035	5.974	65.97	99.8%	23.54
BR-13A	12/1/2010	9:57	2.198	1.819	0.260	7.965	8.483	0.179	15.282	0.032	1.401	62.16	0.211	9.884	77.44	99.8%	22.28

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-14A	12/1/2010	10:23	26.2617	-80.0854	1.0	31.56	25.46	8.113	6.83	7.84	221.0	1.131	0.675	1.09	3.120	5.395	0.267
BR-15A	12/1/2010	10:34	26.2634	-80.0833	1.1	34.09	25.52	4.671	6.73	7.95	226.8	0.984	0.694	1.31	2.873	2.727	0.195
BR-16A	12/1/2010	10:48	26.2622	-80.0719	1.2	35.82	25.54	1.172	6.66	8.05	226.0	0.583	0.200	0.35	1.880	0.525	0.098
BR-16B	12/1/2010	10:51	26.2622	-80.0720	4.2	36.17	25.61	0.243	6.64	8.11	226.3	0.551	0.232	0.29	1.789	0.042	0.021
BR-16C	12/1/2010	10:52	26.2617	-80.0726	9.4	36.20	25.45	0.368	6.66	8.11	227.8	0.380	0.136	0.18	1.736	0.167	0.034
BR-17A	12/1/2010	11:44	26.2762	-80.0627	1.4	25.85	25.55	0.419	6.66	8.11	218.3	0.639	0.178	0.42	1.764	0.065	0.044
BR-17B	12/1/2010	11:43	26.2760	-80.0631	8.6	36.16	25.38	0.752	6.67	8.12	218.5	0.538	0.146	0.18	1.763	0.070	0.049
BR-17BX	12/1/2010	11:43	26.2760	-80.0631	8.6	36.16	25.38	0.579	6.67	8.13	218.5	N/A	N/A	0.23	1.763	0.060	0.057
BR-17C	12/1/2010	11:41	26.2756	-80.0636	14.0	36.15	25.41	0.242	6.66	8.10	217.9	0.525	0.145	0.16	1.909	0.049	0.028
BR-18A	12/1/2010	11:17	26.2983	-80.0664	0.7	36.08	25.56	0.194	6.65	8.11	217.7	0.556	0.126	0.24	1.677	0.044	0.023
BR-18B	12/1/2010	11:16	26.2981	-80.0666	7.5	36.17	25.40	0.266	6.66	8.08	217.2	0.543	0.160	0.21	1.804	0.063	0.047
BR-18C	12/1/2010	11:15	26.2979	-80.0667	17.4	36.25	25.12	0.507	6.69	8.11	215.6	0.354	0.141	0.20	1.614	0.207	0.051
HW-1A	1/20/2011	9:00	25.9937	-80.0898	1.5	36.18	22.10	1.122	7.06	8.04	207.8	0.802	0.195	0.30	2.718	0.590	0.119
HW-1B	1/20/2011	8:59	25.9939	-80.0898	8.1	36.24	22.07	1.267	7.06	8.16	208.1	0.745	0.290	0.30	2.987	0.678	0.142
HW-1BX	1/20/2011	8:59	25.9939	-80.0898	8.1	36.24	22.07	1.311	7.06	8.16	208.1	N/A	N/A	0.22	2.987	0.726	0.115
HW-1C	1/20/2011	8:58	25.9941	-80.0897	17.7	36.33	21.82	1.621	7.09	8.12	208.7	0.495	0.215	0.24	2.237	1.226	0.151
HW-2A	1/20/2011	14:49	26.0148	-80.0865	1.2	36.27	22.72	0.250	6.08	8.17	183.8	0.933	0.263	0.31	1.738	0.076	0.055
HW-2B	1/20/2011	14:48	26.0146	-80.0866	10.2	36.29	22.17	0.512	7.04	8.18	183.2	0.978	0.410	0.36	3.584	0.095	0.074
HW-2C	1/20/2011	14:47	26.0145	-80.0864	21.2	36.29	21.77	0.429	7.09	7.96	180.5	0.808	0.322	0.30	2.928	0.171	0.150
HW-3A	1/20/2011	15:14	26.0152	-80.0949	1.3	36.28	22.67	0.175	6.98	8.17	210.7	0.864	0.258	0.39	2.417	0.071	0.050
HW-3B	1/20/2011	15:13	26.0151	-80.0949	7.0	36.14	22.41	0.346	7.01	8.19	210.6	0.900	0.259	0.16	2.780	0.093	0.072
HW-3C	1/20/2011	15:12	26.0150	-80.0949	18.2	36.33	22.35	0.280	7.02	8.19	211.2	0.799	0.242	0.52	2.280	0.082	0.061
HW-4A	1/20/2011	14:23	26.0192	-80.0857	1.2	35.11	22.39	17.213	7.06	7.96	211.8	1.292	0.932	0.52	3.584	3.065	3.044
HW-4B	1/20/2011	14:19	26.0197	-80.0863	11.3	36.30	22.27	0.267	7.03	8.18	219.9	0.837	0.336	0.23	3.000	0.075	0.054
HW-4C	1/20/2011	14:18	26.0195	-80.0862	22.6	36.30	22.05	1.075	7.06	8.19	220.4	0.585	0.217	0.22	2.607	0.727	0.079
HW-5A	1/20/2011	13:58	26.0246	-80.0853	1.2	36.34	22.71	0.455	6.97	8.17	212.2	0.520	0.107	0.20	1.310	0.110	0.089
HW-5B	1/20/2011	13:57	26.0245	-80.0854	10.6	36.32	22.26	0.849	7.03	8.18	212.4	0.779	0.237	0.67	2.442	0.577	0.091
HW-5C	1/20/2011	13:56	26.0245	-80.0854	22.7	36.31	22.12	26.593	7.05	8.19	212.2	0.860	0.240	0.28	3.157	11.791	2.852
HW-6A	1/20/2011	13:42	26.0242	-80.0946	1.4	36.24	22.74	1.046	6.97	8.13	204.9	0.719	0.238	0.43	2.303	0.179	0.158
HW-6B	1/20/2011	13:41	26.0242	-80.0945	7.4	36.31	22.45	0.320	7.01	8.16	204.3	0.742	0.157	0.28	2.230	0.109	0.088
HW-6BX	1/20/2011	13:41	26.0242	-80.0945	7.4	36.31	22.45	0.252	7.01	8.15	204.3	N/A	N/A	0.25	2.230	0.065	0.044
HW-6C	1/20/2011	13:40	26.0242	-80.0944	14.2	36.32	22.39	0.614	7.01	8.17	204.3	0.627	0.232	0.26	2.257	0.358	0.093
HW-7A	1/20/2011	9:29	26.0457	-80.0946	1.4	36.32	22.26	0.320	7.03	8.05	209.2	0.615	0.232	0.30	2.398	0.097	0.076
HW-7B	1/20/2011	9:29	26.0457	-80.0946	5.2	36.32	22.24	0.922	7.03	8.13	209.2	0.664	0.208	0.21	2.592	0.578	0.092
HW-7C	1/20/2011	9:28	26.0457	-80.0945	11.2	36.33	22.21	0.288	7.04	8.15	209.6	0.647	0.223	0.24	2.377	0.098	0.077
HW-8A	1/20/2011	9:49	26.0453	-80.1064	1.4	36.31	22.20	0.937	7.04	8.11	218.6	0.415	0.150	0.26	1.571	0.563	0.115
HW-8AX	1/20/2011	9:49	26.0453	-80.1064	1.4	36.31	22.20	0.982	7.04	8.13	218.6	N/A	N/A	0.38	1.571	0.550	0.088
HW-8C	1/20/2011	9:48	26.0454	-80.1064	4.4	36.32	22.00	0.486	7.06	8.14	219.6	0.424	0.171	0.27	1.797	0.096	0.075
HW-9A	1/20/2011	13:17	26.0676	-80.0855	1.3	36.34	22.60	0.892	6.99	7.95	183.9	0.613	0.137	0.18	1.440	0.354	0.122
HW-9B	1/20/2011	13:17	26.0676	-80.0854	5.9	36.29	22.23	0.635	7.04	8.16	183.0	0.905	0.342	0.67	2.585	0.308	0.061
HW-9C	1/20/2011	13:16	26.0676	-80.0853	13.6	36.32	22.02	1.054	7.06	8.17	181.2	0.795	0.269	0.20	2.773	0.698	0.091

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-14A	12/1/2010	10:23	5.128	2.718	0.537	18.860	11.968	0.557	16.600	0.031	1.774	106.67	0.588	13.741	123.27	99.7%	20.30
BR-15A	12/1/2010	10:34	2.532	1.944	0.334	9.408	8.177	0.681	20.413	0.036	1.937	80.46	0.717	10.115	100.87	99.8%	22.18
BR-16A	12/1/2010	10:48	0.427	0.647	0.065	1.259	4.408	0.182	8.751	0.015	0.935	68.58	0.196	5.342	77.33	99.8%	23.47
BR-16B	12/1/2010	10:51	0.021	0.201	0.026	0.187	6.581	0.225	6.498	0.011	0.811	64.48	0.235	7.392	70.98	99.8%	23.71
BR-16C	12/1/2010	10:52	0.133	0.201	0.028	0.195	5.178	0.135	4.259	0.008	0.359	49.07	0.143	5.538	53.33	99.8%	23.79
BR-17A	12/1/2010	11:44	0.021	0.354	0.021	0.561	5.977	0.535	6.939	0.011	0.812	94.25	0.546	6.789	101.19	94.3%	16.00
BR-17B	12/1/2010	11:43	0.021	0.682	0.041	0.180	3.660	0.747	3.502	0.005	0.347	55.27	0.752	4.008	58.77	99.8%	23.77
BR-17BX	12/1/2010	11:43	0.003	0.519	0.026	0.187	6.109	0.190	4.208	0.006	0.463	64.03	0.196	6.572	68.23	99.8%	23.77
BR-17C	12/1/2010	11:41	0.021	0.193	0.017	0.186	4.689	0.174	3.788	0.006	0.393	60.89	0.180	5.082	64.68	99.8%	23.76
BR-18A	12/1/2010	11:17	0.021	0.150	0.010	0.359	5.060	0.174	5.176	0.012	0.720	51.98	0.185	5.780	57.16	99.8%	23.66
BR-18B	12/1/2010	11:16	0.016	0.203	0.012	0.272	4.703	0.190	5.008	0.009	0.612	55.63	0.200	5.315	60.63	99.8%	23.78
BR-18C	12/1/2010	11:15	0.156	0.300	0.029	0.365	6.109	0.479	3.021	0.006	0.373	43.73	0.485	6.482	46.75	99.7%	23.92
HW-1A	1/20/2011	9:00	0.471	0.532	0.023	0.204	9.781	0.388	8.536	0.019	1.055	81.49	0.406	10.836	90.03	99.8%	24.80
HW-1B	1/20/2011	8:59	0.536	0.589	0.025	BDL	9.130	0.123	6.626	0.016	0.922	87.42	0.139	10.052	94.04	99.8%	24.86
HW-1BX	1/20/2011	8:59	0.611	0.585	0.032	0.162	10.194	0.119	6.813	0.015	0.835	82.72	0.135	11.029	89.53	99.8%	24.86
HW-1C	1/20/2011	8:58	1.075	0.395	0.065	1.071	11.779	0.135	5.577	0.012	0.371	84.67	0.147	12.149	90.24	99.8%	25.00
HW-2A	1/20/2011	14:49	0.021	0.174	0.019	0.207	10.682	0.108	8.272	0.027	1.031	83.67	0.135	11.713	91.94	86.9%	24.69
HW-2B	1/20/2011	14:48	0.021	0.417	0.015	0.160	10.774	0.110	8.033	0.028	0.940	82.64	0.138	11.714	90.67	99.8%	24.87
HW-2C	1/20/2011	14:47	0.021	0.258	0.063	0.718	9.054	0.135	5.697	0.014	0.404	79.16	0.149	9.458	84.86	99.8%	24.98
HW-3A	1/20/2011	15:14	0.021	0.104	0.007	0.178	8.891	0.096	8.574	0.021	0.937	80.93	0.118	9.828	89.51	99.8%	24.71
HW-3B	1/20/2011	15:13	0.021	0.253	0.007	0.184	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.7%	24.68
HW-3C	1/20/2011	15:12	0.021	0.198	0.010	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.84
HW-4A	1/20/2011	14:23	0.021	14.148	0.696	10.650	37.058	0.846	17.633	0.267	2.239	125.58	1.113	39.297	143.22	99.8%	23.91
HW-4B	1/20/2011	14:19	0.021	0.192	0.025	0.187	12.653	0.123	7.587	0.020	0.681	76.07	0.143	13.334	83.66	99.8%	24.84
HW-4C	1/20/2011	14:18	0.648	0.348	0.041	0.422	8.115	0.122	7.642	0.016	0.733	72.45	0.139	8.847	80.09	99.8%	24.91
HW-5A	1/20/2011	13:58	0.021	0.345	0.017	0.555	7.393	0.109	7.081	0.015	0.570	83.50	0.124	7.963	90.58	99.8%	24.74
HW-5B	1/20/2011	13:57	0.486	0.272	0.029	0.483	9.412	0.121	7.662	0.018	0.786	84.00	0.139	10.198	91.66	99.8%	24.86
HW-5C	1/20/2011	13:56	8.939	14.802	0.654	10.242	8.343	0.117	7.746	0.017	0.649	86.83	0.134	8.991	94.58	99.8%	24.90
HW-6A	1/20/2011	13:42	0.021	0.867	0.076	2.298	8.343	0.124	10.499	0.024	1.436	85.33	0.149	9.778	95.83	99.8%	24.65
HW-6B	1/20/2011	13:41	0.021	0.211	0.010	0.062	8.799	0.108	8.090	0.018	0.828	86.67	0.126	9.626	94.76	99.8%	24.80
HW-6BX	1/20/2011	13:41	0.021	0.187	0.012	0.035	7.707	0.132	8.814	0.020	1.211	87.17	0.151	8.919	95.98	99.8%	24.80
HW-6C	1/20/2011	13:40	0.265	0.256	0.020	1.574	7.251	0.101	7.934	0.014	0.826	83.05	0.115	8.077	90.98	99.8%	24.82
HW-7A	1/20/2011	9:29	0.021	0.223	0.023	0.112	11.513	0.103	6.584	0.015	0.963	75.94	0.118	12.475	82.53	99.8%	24.86
HW-7B	1/20/2011	9:29	0.486	0.344	0.018	BDL	9.558	0.108	7.744	0.028	1.042	82.65	0.136	10.601	90.40	99.8%	24.87
HW-7C	1/20/2011	9:28	0.021	0.190	0.017	BDL	9.624	0.125	7.271	0.028	0.980	77.95	0.152	10.603	85.22	99.8%	24.88
HW-8A	1/20/2011	9:49	0.448	0.374	0.024	0.006	8.077	0.110	7.444	0.013	0.906	77.99	0.123	8.982	85.44	99.8%	24.87
HW-8AX	1/20/2011	9:49	0.462	0.432	0.036	0.198	7.002	0.119	7.339	0.019	0.855	82.26	0.137	7.857	89.60	99.8%	24.87
HW-8C	1/20/2011	9:48	0.021	0.390	0.032	0.085	8.370	0.118	5.795	0.013	0.606	76.76	0.132	8.975	82.55	99.8%	24.94
HW-9A	1/20/2011	13:17	0.232	0.538	0.044	0.837	7.523	0.115	6.526	0.017	0.644	86.50	0.132	8.167	93.03	99.8%	24.77
HW-9B	1/20/2011	13:17	0.247	0.327	0.012	0.273	8.609	0.125	8.305	0.017	1.070	91.58	0.142	9.679	99.89	99.8%	24.85
HW-9C	1/20/2011	13:16	0.607	0.356	0.043	0.617	7.566	0.117	7.936	0.014	0.927	88.33	0.130	8.493	96.27	99.8%	24.93

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-10A	1/20/2011	12:19	26.0832	-80.0853	1.2	36.30	22.72	0.941	6.97	8.14	210.2	0.640	0.203	0.15	1.674	0.326	0.141
HW-10B	1/20/2011	12:18	26.0831	-80.0853	6.1	36.30	22.45	1.004	7.01	8.17	211.4	0.820	0.250	0.21	2.251	0.404	0.135
HW-10C	1/20/2011	12:17	26.0829	-80.0852	12.0	36.32	22.08	0.945	7.05	8.17	211.9	0.694	0.218	0.15	2.666	0.706	0.073
HW-11A	1/20/2011	12:37	26.0829	-80.0966	1.4	36.32	22.50	0.508	7.00	8.14	197.0	0.714	0.174	0.20	1.619	0.270	0.039
HW-11C	1/20/2011	12:36	26.0828	-80.0965	7.3	36.32	22.34	0.333	7.02	8.16	196.7	0.617	0.158	0.19	2.160	0.067	0.046
HW-12A	1/20/2011	11:43	26.0941	-80.0943	1.1	35.79	22.45	1.448	7.03	8.08	200.9	0.548	0.190	0.46	1.795	0.931	0.201
HW-12B	1/20/2011	11:42	26.0940	-80.0944	6.4	36.31	22.32	0.745	7.02	8.16	202.6	0.479	0.156	0.14	1.886	0.460	0.092
HW-12BX	1/20/2011	11:42	26.0940	-80.0944	6.4	36.31	22.32	0.861	7.02	8.14	202.6	N/A	N/A	0.27	1.886	0.527	0.078
HW-12C	1/20/2011	11:41	26.0940	-80.0945	12.7	36.33	22.23	1.017	7.03	8.16	203.2	0.489	0.141	0.25	1.809	0.586	0.103
HW-13A	1/20/2011	11:59	26.0954	-80.0838	1.4	36.31	22.46	0.332	7.01	7.94	208.8	0.706	0.184	0.24	1.886	0.224	0.062
HW-13B	1/20/2011	11:58	26.0952	-80.0838	5.9	36.30	22.30	0.429	7.03	8.15	209.0	0.687	0.198	0.21	2.216	0.288	0.047
HW-13C	1/20/2011	11:57	26.0950	-80.0838	12.6	36.31	22.23	0.819	7.03	8.16	209.9	0.593	0.236	0.24	2.354	0.571	0.065
HW-14A	1/20/2011	11:03	26.0941	-80.1157	1.2	35.56	22.28	1.813	7.06	8.10	155.7	0.595	0.266	0.87	2.028	1.196	0.233
HW-15A	1/20/2011	10:25	26.1028	-80.0818	1.5	36.30	22.52	0.568	7.00	8.13	159.6	0.740	0.206	0.23	2.039	0.154	0.133
HW-15AX	1/20/2011	10:25	26.1028	-80.0818	1.5	36.30	22.52	0.781	7.00	8.14	159.6	N/A	N/A	0.22	2.039	0.438	0.116
HW-15B	1/20/2011	10:24	26.1027	-80.0819	10.2	36.32	22.20	0.475	7.04	8.14	156.5	0.598	0.191	0.21	2.342	0.140	0.119
HW-15C	1/20/2011	10:23	26.1025	-80.0819	20.0	36.35	21.99	0.646	7.06	8.14	152.4	0.512	0.205	0.21	2.242	0.166	0.145
BR-1A	1/20/2011	11:21	26.0938	-80.1038	1.2	35.58	22.36	1.960	7.05	7.85	188.2	0.659	0.246	0.54	2.533	1.148	0.208
BR-1B	1/20/2011	11:20	26.0938	-80.1039	6.0	36.05	22.22	0.941	7.05	8.10	188.9	0.481	0.259	0.56	2.064	0.632	0.106
BR-1C	1/20/2011	11:19	26.0937	-80.1041	12.4	36.26	22.23	0.798	7.04	7.93	188.9	0.451	0.162	1.20	1.835	0.525	0.090
BR-2A	1/20/2011	10:42	26.1027	-80.0938	1.1	36.31	22.58	0.812	6.99	8.16	156.8	0.546	0.160	0.28	1.678	0.400	0.129
BR-2C	1/20/2011	10:41	26.1026	-80.0937	8.7	36.32	22.23	0.712	7.04	8.16	154.1	0.484	0.173	0.12	1.925	0.470	0.090
BR-3A	1/27/2011	8:31	26.1376	-80.0897	1.1	36.26	21.35	0.663	7.15	8.25	143.3	0.570	0.248	0.39	2.198	0.541	0.054
BR-3C	1/27/2011	8:30	26.1377	-80.0898	9.9	36.26	21.34	0.761	7.15	8.21	142.6	0.568	0.264	0.37	2.314	0.561	0.048
BR-3CX	1/27/2011	8:30	26.1377	-80.0898	9.9	36.26	21.34	0.683	7.15	8.22	142.6	N/A	N/A	0.36	2.314	0.527	0.045
BR-4A	1/27/2011	8:54	26.1596	-80.0755	1.2	36.32	21.50	0.489	7.13	8.17	146.6	0.619	0.224	0.39	2.118	0.233	0.079
BR-4AX	1/27/2011	8:54	26.1596	-80.0755	1.2	36.32	21.50	0.314	7.13	8.18	146.6	N/A	N/A	0.35	2.118	0.198	0.021
BR-4B	1/27/2011	8:54	26.1597	-80.0756	10.0	36.34	21.53	0.391	7.12	8.21	144.4	0.559	0.210	0.37	2.413	0.263	0.030
BR-4C	1/27/2011	8:52	26.1599	-80.0757	23.3	36.36	21.55	0.154	7.12	8.22	142.4	0.512	0.164	0.22	2.404	0.055	0.034
BR-5A	1/27/2011	9:11	26.1593	-80.0890	1.2	36.23	21.27	0.346	7.16	8.18	176.8	0.544	0.228	0.31	1.719	0.235	0.047
BR-5C	1/27/2011	9:10	26.1594	-80.0890	5.8	36.23	21.26	1.108	7.16	8.20	177.9	0.507	0.245	0.29	2.057	0.817	0.122
BR-6A	1/27/2011	9:37	26.1888	-80.0836	1.0	36.23	21.27	0.166	7.16	8.17	157.2	0.799	0.253	0.33	1.973	0.052	0.031
BR-6B	1/27/2011	9:36	26.1889	-80.0836	4.5	36.22	21.25	0.692	7.16	8.19	156.1	0.695	0.241	0.43	2.374	0.519	0.055
BR-6C	1/27/2011	9:35	26.1890	-80.0837	9.7	36.22	21.27	0.524	7.16	8.19	154.4	0.666	0.263	0.37	2.630	0.025	0.004
BR-7A	1/27/2011	9:56	26.2023	-80.0677	1.3	36.36	21.68	0.053	7.10	8.20	174.0	0.591	0.164	0.14	1.795	0.035	0.014
BR-7B	1/27/2011	9:55	26.2024	-80.0678	14.1	36.36	21.67	0.098	7.10	8.22	174.3	0.581	0.171	0.22	2.336	0.036	0.015
BR-7C	1/27/2011	9:54	26.2025	-80.0678	29.7	36.35	21.59	0.522	7.11	8.23	174.3	0.545	0.188	0.24	2.179	0.397	0.081
BR-8A	1/27/2011	10:17	26.2378	-80.0681	1.4	36.29	21.53	1.340	7.12	8.07	192.3	0.727	0.217	0.25	2.863	0.170	0.149
BR-8B	1/27/2011	10:17	26.2379	-80.0681	5.5	36.28	21.51	1.496	7.13	8.15	193.6	0.756	0.239	0.31	2.219	0.204	0.183
BR-8C	1/27/2011	10:16	26.2380	-80.0681	12.2	36.28	21.46	0.838	7.13	8.16	193.8	0.741	0.280	0.24	2.673	0.455	0.097
BR-9A	1/27/2011	10:32	26.2474	-80.0624	1.2	36.36	21.78	0.139	7.09	8.17	198.1	0.544	0.157	0.21	1.574	0.129	0.020

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-10A	1/20/2011	12:19	0.185	0.615	0.024	0.119	8.630	0.123	7.029	0.018	0.963	81.17	0.141	9.593	88.20	99.8%	24.71
HW-10B	1/20/2011	12:18	0.269	0.600	0.024	0.304	7.539	0.118	8.378	0.032	1.221	84.42	0.149	8.761	92.79	99.8%	24.79
HW-10C	1/20/2011	12:17	0.633	0.239	0.033	BDL	7.783	0.124	5.228	0.014	0.743	77.66	0.138	8.527	82.89	99.8%	24.92
HW-11A	1/20/2011	12:37	0.231	0.238	0.010	BDL	7.588	0.103	7.457	0.016	0.928	76.16	0.119	8.516	83.62	99.8%	24.78
HW-11C	1/20/2011	12:36	0.021	0.266	0.016	BDL	7.800	0.097	7.792	0.016	0.889	74.06	0.113	8.689	81.85	99.8%	24.83
HW-12A	1/20/2011	11:43	0.730	0.517	0.063	2.082	8.283	0.138	7.890	0.019	0.875	95.33	0.157	9.158	103.22	99.8%	24.40
HW-12B	1/20/2011	11:42	0.368	0.285	0.019	BDL	9.510	0.100	5.488	0.014	0.642	83.42	0.114	10.152	88.90	99.8%	24.83
HW-12BX	1/20/2011	11:42	0.449	0.334	0.036	0.320	9.325	0.151	6.510	0.013	0.829	84.08	0.164	10.154	90.59	99.8%	24.83
HW-12C	1/20/2011	11:41	0.483	0.431	0.044	0.239	9.260	0.112	5.817	0.009	0.386	83.58	0.121	9.646	89.40	99.8%	24.87
HW-13A	1/20/2011	11:59	0.162	0.108	0.002	BDL	8.511	0.134	7.014	0.015	1.060	79.00	0.149	9.571	86.01	99.8%	24.79
HW-13B	1/20/2011	11:58	0.241	0.141	0.005	BDL	8.657	0.126	6.067	0.017	0.902	76.47	0.143	9.559	82.53	99.8%	24.83
HW-13C	1/20/2011	11:57	0.506	0.248	0.027	BDL	8.125	0.110	5.270	0.013	0.386	83.92	0.123	8.511	89.19	99.8%	24.86
HW-14A	1/20/2011	11:03	0.963	0.617	0.080	2.766	9.944	0.168	15.025	0.030	1.106	93.42	0.198	11.050	108.44	99.8%	24.28
HW-15A	1/20/2011	10:25	0.021	0.414	0.037	0.814	7.327	0.112	6.355	0.016	1.034	81.93	0.129	8.362	88.29	99.8%	24.77
HW-15AX	1/20/2011	10:25	0.322	0.343	0.032	0.249	8.923	0.112	6.195	0.017	0.944	80.69	0.129	9.867	86.89	99.8%	24.77
HW-15B	1/20/2011	10:24	0.021	0.335	0.055	0.281	9.624	0.110	6.162	0.012	0.451	78.76	0.122	10.075	84.92	99.8%	24.88
HW-15C	1/20/2011	10:23	0.021	0.480	0.053	0.733	9.645	0.131	4.431	0.008	0.173	79.28	0.139	9.818	83.71	99.8%	24.96
BR-1A	1/20/2011	11:21	0.940	0.812	0.069	2.636	9.966	0.134	10.939	0.030	0.991	88.08	0.163	10.956	99.02	99.8%	24.28
BR-1B	1/20/2011	11:20	0.526	0.309	0.037	1.595	9.700	0.124	9.139	0.016	0.801	91.58	0.140	10.501	100.72	99.8%	24.67
BR-1C	1/20/2011	11:19	0.435	0.273	0.029	0.044	9.613	0.112	6.977	0.014	0.749	81.29	0.126	10.361	88.27	99.8%	24.82
BR-2A	1/20/2011	10:42	0.271	0.412	0.049	0.891	9.127	0.118	7.650	0.022	1.071	67.43	0.140	10.198	75.08	99.8%	24.76
BR-2C	1/20/2011	10:41	0.380	0.242	0.027	BDL	8.381	0.133	5.836	0.012	0.718	66.08	0.145	9.099	71.92	99.8%	24.87
BR-3A	1/27/2011	8:31	0.487	0.122	0.011	0.094	9.650	0.435	7.626	0.022	0.663	83.67	0.457	10.313	91.29	99.8%	25.09
BR-3C	1/27/2011	8:30	0.513	0.200	0.005	0.159	9.184	0.380	6.121	0.019	0.601	66.41	0.399	9.785	72.53	99.8%	25.09
BR-3CX	1/27/2011	8:30	0.482	0.156	0.002	0.103	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-4A	1/27/2011	8:54	0.154	0.256	0.011	0.490	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-4AX	1/27/2011	8:54	0.177	0.116	0.011	0.200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-4B	1/27/2011	8:54	0.233	0.128	0.011	0.381	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-4C	1/27/2011	8:52	0.021	0.099	0.011	0.049	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.10
BR-5A	1/27/2011	9:11	0.188	0.111	0.011	0.282	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-5C	1/27/2011	9:10	0.695	0.291	0.056	0.751	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-6A	1/27/2011	9:37	0.021	0.114	0.011	0.211	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-6B	1/27/2011	9:36	0.464	0.173	0.015	0.438	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.08
BR-6C	1/27/2011	9:35	0.021	0.499	0.025	0.217	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.08
BR-7A	1/27/2011	9:56	0.021	0.018	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.06
BR-7B	1/27/2011	9:55	0.021	0.062	0.011	0.231	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.07
BR-7C	1/27/2011	9:54	0.316	0.125	0.001	0.031	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.09
BR-8A	1/27/2011	10:17	0.021	1.170	0.011	0.256	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.05
BR-8B	1/27/2011	10:17	0.021	1.292	0.001	0.298	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.06
BR-8C	1/27/2011	10:16	0.358	0.383	0.002	0.116	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.07
BR-9A	1/27/2011	10:32	0.109	0.010	0.011	0.139	5.639	0.258	5.092	0.020	0.612	66.88	0.279	6.251	71.97	99.8%	25.04

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-9B	1/27/2011	10:31	26.2474	-80.0624	14.3	36.35	21.70	0.437	7.10	8.21	199.1	0.626	0.196	0.21	2.369	0.210	0.053
BR-9C	1/27/2011	10:30	26.2475	-80.0625	30.6	36.34	21.58	0.739	7.12	8.21	200.3	0.619	0.209	0.19	2.548	0.556	0.090
BR-10A	1/27/2011	11:04	26.2514	-80.0618	1.4	35.82	21.72	30.411	7.12	8.17	200.1	0.710	0.243	0.41	2.233	6.029	2.767
BR-10B	1/27/2011	11:00	26.2510	-80.0624	14.7	36.34	21.63	0.908	7.11	8.22	205.6	0.713	0.220	0.24	2.463	0.614	0.092
BR-10C	1/27/2011	10:59	26.2511	-80.0624	30.4	36.33	21.57	0.582	7.12	8.22	207.1	0.614	0.221	0.24	2.333	0.025	0.004
BR-11A	1/27/2011	11:25	26.2546	-80.0624	1.3	36.12	21.83	7.087	7.09	8.19	206.1	0.586	0.158	0.26	1.358	1.484	0.605
BR-11B	1/27/2011	11:25	26.2547	-80.0624	13.2	36.34	21.66	0.732	7.11	8.21	207.4	0.764	0.212	0.20	2.404	0.453	0.087
BR-11C	1/27/2011	11:24	26.2547	-80.0623	28.7	36.32	21.55	1.158	7.12	8.22	208.6	0.636	0.222	0.19	2.591	0.781	0.143
BR-12A	1/27/2011	13:34	26.2484	-80.0798	1.5	36.25	21.37	0.281	7.15	8.18	220.7	1.058	0.326	0.35	2.182	0.219	0.034
BR-12AX	1/27/2011	13:34	26.2484	-80.0798	1.5	36.25	21.37	0.627	7.15	8.19	220.7	N/A	N/A	0.44	2.182	0.025	0.004
BR-13A	1/27/2011	12:55	26.2593	-80.0832	1.3	36.07	21.28	0.297	7.17	8.19	211.8	1.009	0.270	0.68	2.290	0.108	0.021
BR-14A	1/27/2011	13:08	26.2618	-80.0852	1.4	36.16	21.32	0.655	7.16	8.18	226.3	0.999	0.328	0.89	2.100	0.311	0.082
BR-15A	1/27/2011	13:20	26.2630	-80.0835	1.4	36.22	21.34	0.442	7.15	8.14	213.6	0.984	0.306	0.55	2.308	0.246	0.110
BR-16A	1/27/2011	12:44	26.2598	-80.0736	1.2	36.27	21.59	0.605	7.12	8.15	217.7	0.994	0.323	0.39	2.089	0.420	0.068
BR-16B	1/27/2011	12:44	26.2599	-80.0736	4.5	36.27	21.54	0.674	7.12	8.19	217.9	0.986	0.343	0.91	2.504	0.494	0.094
BR-16C	1/27/2011	12:43	26.2600	-80.0736	11.3	36.23	20.91	0.241	7.21	8.20	219.1	1.075	0.332	0.49	3.832	0.088	0.067
BR-17A	1/27/2011	12:04	26.2748	-80.0634	1.3	36.32	21.67	0.626	7.10	8.21	196.1	0.832	0.234	0.30	1.997	0.025	0.004
BR-17B	1/27/2011	12:04	26.2749	-80.0634	5.4	36.32	21.59	0.619	7.12	8.21	196.0	0.801	0.305	0.46	2.567	0.025	0.004
BR-17BX	1/27/2011	12:04	26.2749	-80.0634	5.4	36.32	21.59	0.517	7.12	8.22	196.0	N/A	N/A	0.34	2.567	0.025	0.004
BR-17C	1/27/2011	12:03	26.2750	-80.0634	12.8	36.31	21.55	0.383	7.12	8.18	195.7	0.904	0.362	0.32	3.428	0.025	0.004
BR-18A	1/27/2011	12:24	26.2965	-80.0681	1.3	36.33	21.60	0.624	7.11	8.15	209.6	0.797	0.327	0.32	2.046	0.025	0.004
BR-18B	1/27/2011	12:23	26.2967	-80.0681	3.9	36.33	21.58	0.686	7.12	8.20	210.6	0.808	0.293	0.25	2.417	0.025	0.004
BR-18C	1/27/2011	12:23	26.2968	-80.0681	11.1	36.31	21.51	0.922	7.13	8.21	211.3	0.861	0.305	0.30	2.956	0.025	0.004
HW-1A	2/3/2011	8:36	25.9941	-80.0891	1.0	36.10	20.95	1.063	7.21	8.08	217.8	0.395	0.144	0.48	1.784	0.468	0.176
HW-1B	2/3/2011	8:35	25.9941	-80.0891	10.1	36.25	20.99	1.156	7.20	8.13	213.6	0.351	0.215	0.78	2.039	0.687	0.142
HW-1BX	2/3/2011	8:35	25.9941	-80.0891	10.1	36.25	20.99	0.000	7.20	N/A	213.6	N/A	N/A	0.57	2.039	N/A	N/A
HW-2A	2/3/2011	13:55	26.0165	-80.0858	1.2	36.08	21.24	0.641	7.17	8.11	222.9	0.594	0.158	0.50	1.770	0.119	0.119
HW-1C	2/3/2011	8:34	25.9940	-80.0891	19.5	36.24	20.34	2.923	7.28	8.12	207.0	0.310	0.137	0.63	1.792	2.181	0.224
HW-2B	2/3/2011	13:54	26.0162	-80.0857	12.4	36.21	20.90	1.208	7.21	8.13	223.4	0.526	0.296	0.49	2.341	0.724	0.122
HW-2C	2/3/2011	13:52	26.0159	-80.0858	25.6	36.21	20.79	1.131	7.22	8.13	223.2	0.482	0.279	0.56	1.963	0.803	0.119
HW-3A	2/3/2011	14:16	26.0159	-80.0962	1.5	36.01	21.85	1.285	7.09	8.13	214.5	0.448	0.091	0.41	1.474	0.099	0.099
HW-3B	2/3/2011	14:14	26.0154	-80.0960	5.5	36.09	21.47	0.325	7.14	8.12	214.2	0.551	0.202	0.38	1.876	0.074	0.074
HW-3C	2/3/2011	14:13	26.0152	-80.0959	11.4	36.24	20.81	1.129	7.22	8.14	214.2	0.518	0.350	0.48	2.457	0.786	0.111
HW-4A	2/3/2011	13:28	26.0209	-80.0863	1.7	36.04	21.34	0.415	7.16	8.13	227.2	0.584	0.134	0.38	1.595	0.085	0.085
HW-4B	2/3/2011	13:26	26.0205	-80.0862	10.7	36.10	21.12	0.677	7.19	8.13	227.9	0.692	0.197	0.43	2.206	0.116	0.116
HW-4C	2/3/2011	13:25	26.0199	-80.0863	20.8	36.24	20.72	1.552	7.23	8.13	228.3	0.466	0.195	0.67	2.136	1.067	0.164
HW-5A	2/3/2011	13:04	26.0243	-80.0861	1.5	36.00	21.32	1.189	7.16	8.11	234.1	0.541	0.139	0.39	1.482	0.192	0.115
HW-5B	2/3/2011	13:03	26.0243	-80.0862	10.1	36.23	20.78	1.375	7.22	8.13	234.9	0.511	0.207	0.45	2.319	0.957	0.113
HW-5C	2/3/2011	13:02	26.0242	-80.0862	20.8	36.24	20.52	1.176	7.26	8.11	235.4	0.484	0.171	0.97	1.958	0.171	0.171
HW-6A	2/3/2011	14:33	26.0243	-80.0942	1.3	36.02	21.72	0.887	7.11	8.10	211.8	0.518	0.117	0.41	1.660	0.100	0.100
HW-6B	2/3/2011	14:32	26.0240	-80.0942	9.1	36.15	21.04	0.539	7.19	8.10	212.1	0.538	0.250	0.33	2.135	0.095	0.095

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-9B	1/27/2011	10:31	0.157	0.227	0.006	0.332	4.304	0.260	4.964	0.017	0.561	55.68	0.277	4.866	60.65	99.8%	25.05
BR-9C	1/27/2011	10:30	0.466	0.183	0.016	0.241	6.738	0.391	4.572	0.014	0.531	52.16	0.405	7.268	56.73	99.8%	25.08
BR-10A	1/27/2011	11:04	3.262	24.382	0.215	5.177	27.962	0.427	10.728	0.069	1.400	75.47	0.496	29.362	86.19	99.8%	24.64
BR-10B	1/27/2011	11:00	0.522	0.294	0.017	0.291	5.262	0.422	5.968	0.018	0.766	64.44	0.440	6.028	70.41	99.8%	25.06
BR-10C	1/27/2011	10:59	0.021	0.557	0.028	0.037	5.761	0.418	4.791	0.016	0.388	62.14	0.434	6.148	66.93	99.8%	25.08
BR-11A	1/27/2011	11:25	0.879	5.603	0.055	1.368	10.225	0.349	6.195	0.025	0.732	68.40	0.374	10.957	74.59	99.8%	24.84
BR-11B	1/27/2011	11:25	0.366	0.279	0.003	0.276	5.697	0.278	5.086	0.017	0.392	70.23	0.295	6.089	75.32	99.8%	25.06
BR-11C	1/27/2011	11:24	0.638	0.377	0.024	0.282	4.534	0.299	4.652	0.015	0.323	56.03	0.314	4.857	60.68	99.8%	25.08
BR-12A	1/27/2011	13:34	0.185	0.062	0.011	0.441	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.07
BR-12AX	1/27/2011	13:34	0.021	0.602	0.021	0.113	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.07
BR-13A	1/27/2011	12:55	0.087	0.189	0.011	0.665	8.482	0.127	11.665	0.040	1.244	57.70	0.167	9.725	69.37	99.8%	24.96
BR-14A	1/27/2011	13:08	0.229	0.344	0.028	0.541	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.02
BR-15A	1/27/2011	13:20	0.136	0.196	0.012	0.381	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.06
BR-16A	1/27/2011	12:44	0.352	0.185	0.014	0.503	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.02
BR-16B	1/27/2011	12:44	0.400	0.180	0.021	0.487	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.04
BR-16C	1/27/2011	12:43	0.021	0.153	0.012	0.632	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.19
BR-17A	1/27/2011	12:04	0.021	0.601	0.018	0.142	11.892	0.108	7.421	0.022	0.810	68.18	0.131	12.703	75.60	99.8%	25.03
BR-17B	1/27/2011	12:04	0.021	0.594	0.018	0.107	7.421	0.102	7.779	0.026	0.971	69.67	0.128	8.392	77.45	99.8%	25.06
BR-17BX	1/27/2011	12:04	0.021	0.492	0.021	0.162	8.121	0.850	7.611	0.026	0.996	64.24	0.876	9.117	71.85	99.8%	25.06
BR-17C	1/27/2011	12:03	0.021	0.358	0.008	0.140	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.07
BR-18A	1/27/2011	12:24	0.021	0.599	0.007	0.097	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.06
BR-18B	1/27/2011	12:23	0.021	0.661	0.012	0.044	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.07
BR-18C	1/27/2011	12:23	0.021	0.897	0.015	0.115	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.08
HW-1A	2/3/2011	8:36	0.292	0.595	0.026	0.727	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.08
HW-1B	2/3/2011	8:35	0.545	0.469	0.039	0.769	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.18
HW-1BX	2/3/2011	8:35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.18
HW-2A	2/3/2011	13:55	0.000	0.522	0.023	0.648	4.117	0.121	7.511	0.018	0.376	97.00	0.139	4.493	104.51	99.8%	24.98
HW-1C	2/3/2011	8:34	1.957	0.742	0.122	1.550	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.36
HW-2B	2/3/2011	13:54	0.602	0.484	0.046	0.481	6.723	0.117	7.628	0.017	0.417	71.18	0.134	7.140	78.81	99.8%	25.18
HW-2C	2/3/2011	13:52	0.684	0.328	0.049	0.421	4.230	0.099	8.393	0.018	0.490	73.81	0.117	4.720	82.20	99.8%	25.21
HW-3A	2/3/2011	14:16	0.000	1.186	0.007	0.487	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.75
HW-3B	2/3/2011	14:14	0.000	0.251	0.004	0.343	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.92
HW-3C	2/3/2011	14:13	0.675	0.343	0.042	0.337	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.23
HW-4A	2/3/2011	13:28	0.000	0.330	0.010	0.418	4.657	0.114	7.717	0.025	0.556	74.45	0.139	5.214	82.17	99.8%	24.92
HW-4B	2/3/2011	13:26	0.000	0.561	0.020	0.646	4.699	0.092	7.617	0.025	0.593	74.69	0.118	5.292	82.31	99.8%	25.03
HW-4C	2/3/2011	13:25	0.903	0.485	0.068	0.546	5.963	0.078	6.563	0.018	0.281	91.33	0.096	6.245	97.90	99.8%	25.25
HW-5A	2/3/2011	13:04	0.077	0.997	0.015	0.590	6.058	0.073	6.875	0.023	0.289	107.25	0.096	6.348	114.13	99.8%	24.90
HW-5B	2/3/2011	13:03	0.844	0.418	0.057	0.428	4.598	0.131	7.823	0.019	0.377	72.54	0.150	4.975	80.36	99.8%	25.23
HW-5C	2/3/2011	13:02	0.000	1.005	0.096	0.957	6.296	0.112	9.468	0.021	0.326	76.26	0.133	6.622	85.73	99.8%	25.32
HW-6A	2/3/2011	14:33	0.000	0.787	0.008	0.449	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.80
HW-6B	2/3/2011	14:32	0.000	0.444	0.002	0.263	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.10

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-6BX	2/3/2011	14:32	26.0240	-80.0942	9.1	36.15	21.04	0.503	7.19	8.10	212.1	N/A	N/A	0.75	2.135	0.103	0.103
HW-6C	2/3/2011	14:30	26.0236	-80.0941	17.1	36.25	20.60	0.796	7.25	8.12	211.8	0.472	0.229	0.44	2.016	0.181	0.181
HW-7A	2/3/2011	9:02	26.0447	-80.0946	1.1	36.18	21.20	0.760	7.17	8.11	246.4	0.389	0.128	0.33	1.531	0.284	0.084
HW-7B	2/3/2011	9:02	26.0447	-80.0945	5.4	36.25	21.15	1.922	7.18	8.15	247.4	0.579	0.212	0.37	2.242	0.410	0.111
HW-7C	2/3/2011	9:01	26.0448	-80.0944	11.0	36.30	21.10	1.340	7.18	8.15	248.8	0.512	0.333	0.31	2.084	0.140	0.140
HW-8A	2/3/2011	9:19	26.0446	-80.1063	1.9	36.23	21.42	0.750	7.14	8.12	244.5	0.304	0.123	0.32	1.556	0.122	0.088
HW-8AX	2/3/2011	9:19	26.0446	-80.1063	1.9	36.23	21.42	0.897	7.14	8.12	244.5	N/A	N/A	0.48	1.556	0.105	0.105
HW-8C	2/3/2011	9:18	26.0446	-80.1062	3.7	36.23	21.39	1.294	7.14	8.12	245.5	0.312	0.133	0.31	1.570	0.190	0.119
HW-9A	2/3/2011	9:41	26.0681	-80.0855	1.6	36.12	21.19	1.225	7.18	8.12	262.7	0.424	0.126	0.31	1.704	0.301	0.099
HW-9B	2/3/2011	9:39	26.0680	-80.0854	8.5	36.16	21.04	1.199	7.19	8.12	264.6	0.623	0.209	0.41	2.253	0.126	0.126
HW-9C	2/3/2011	9:37	26.0680	-80.0853	16.0	36.20	20.00	1.284	7.33	8.09	268.6	0.459	0.191	0.44	1.620	0.169	0.169
HW-10A	2/3/2011	9:58	26.0822	-80.0842	1.6	36.09	21.15	1.130	7.18	8.13	253.5	0.504	0.165	0.24	1.593	0.433	0.102
HW-10B	2/3/2011	9:57	26.0821	-80.0842	9.9	36.19	20.90	1.890	7.21	8.13	255.0	0.634	0.196	0.46	2.386	0.164	0.164
HW-10C	2/3/2011	9:55	26.0822	-80.0842	18.9	36.21	19.63	0.867	7.38	7.78	256.7	0.245	0.179	0.57	1.620	0.242	0.242
HW-11A	2/3/2011	10:16	26.0823	-80.0957	1.6	36.15	21.34	1.109	7.15	8.13	240.8	0.407	0.123	0.35	1.519	0.357	0.080
HW-11C	2/3/2011	10:15	26.0823	-80.0957	8.2	36.24	21.19	2.081	7.17	8.12	241.4	0.418	0.225	0.30	1.829	0.614	0.115
HW-12A	2/3/2011	12:08	26.0944	-80.0941	0.9	35.91	21.61	0.980	7.13	8.10	238.8	0.810	0.327	0.50	1.378	0.285	0.124
HW-12B	2/3/2011	12:07	26.0943	-80.0942	6.4	36.23	21.33	1.699	7.15	8.14	239.0	0.570	0.175	0.35	1.996	0.341	0.118
HW-12BX	2/3/2011	12:07	26.0943	-80.0942	6.4	36.23	21.33	0.873	7.15	8.14	239.0	N/A	N/A	0.39	1.996	0.282	0.096
HW-12C	2/3/2011	12:07	26.0942	-80.0943	13.1	36.23	20.82	2.047	7.22	8.13	239.8	0.429	0.363	0.40	1.975	1.217	0.180
HW-13A	2/3/2011	12:26	26.0941	-80.0835	2.0	36.08	21.93	1.266	7.08	8.12	229.2	0.507	0.204	0.25	1.524	0.290	0.117
HW-13B	2/3/2011	12:25	26.0941	-80.0835	7.4	36.15	21.60	1.498	7.12	8.15	229.8	0.520	0.122	0.40	1.583	0.078	0.078
HW-13C	2/3/2011	12:24	26.0942	-80.0836	13.7	36.25	20.84	1.496	7.22	8.13	230.3	0.561	0.196	0.40	2.146	0.898	0.167
HW-14A	2/3/2011	11:34	26.0943	-80.1156	1.7	35.09	22.07	1.670	7.10	8.07	202.6	1.547	0.457	0.95	2.959	0.416	0.188
HW-15A	2/3/2011	10:35	26.1013	-80.0821	1.1	36.14	21.24	1.197	7.17	8.13	237.8	0.492	0.129	0.34	1.490	0.579	0.146
HW-15AX	2/3/2011	10:35	26.1013	-80.0821	1.1	36.14	21.24	1.106	7.17	8.13	237.8	N/A	N/A	0.29	1.490	0.560	0.121
HW-15B	2/3/2011	10:34	26.1014	-80.0821	11.2	36.22	20.94	1.882	7.20	8.13	238.6	0.496	0.160	0.35	1.946	1.147	0.184
HW-15C	2/3/2011	10:32	26.1015	-80.0821	21.8	36.24	20.47	2.579	7.26	8.10	239.4	0.326	0.157	0.37	1.708	1.958	0.219
BR-1A	2/3/2011	11:48	26.0939	-80.1042	1.3	35.12	22.06	1.576	7.10	8.05	215.2	1.422	0.568	1.21	3.348	0.688	0.173
BR-1B	2/3/2011	11:47	26.0938	-80.1044	8.8	35.91	21.49	1.396	7.15	8.10	217.9	0.995	0.322	0.89	2.295	0.504	0.170
BR-1C	2/3/2011	11:46	26.0937	-80.1046	14.0	36.09	21.39	0.740	7.15	8.11	217.9	0.534	0.267	0.68	1.899	0.323	0.137
BR-2A	2/3/2011	10:51	26.1016	-80.0936	1.8	36.12	21.60	0.612	7.12	8.12	229.9	0.429	0.203	0.31	1.682	0.268	0.113
BR-2C	2/3/2011	10:50	26.1017	-80.0935	8.1	36.26	21.28	0.897	7.16	8.15	230.5	0.480	0.200	0.38	1.697	0.380	0.127
BR-3A	2/16/2011	9:13	26.1392	-80.0914	1.6	36.36	21.54	0.374	7.12	8.09	234.3	0.285	0.112	0.23	1.187	0.025	0.004
BR-3C	2/16/2011	9:11	26.1391	-80.0911	6.2	36.36	21.57	1.012	7.12	8.14	240.6	0.263	0.103	0.19	1.233	0.025	0.004
BR-3CX	2/16/2011	9:11	26.1391	-80.0911	6.2	36.36	21.57	0.290	7.12	8.13	240.6	N/A	N/A	0.17	1.233	0.025	0.004
BR-4A	2/16/2011	9:35	26.1596	-80.0774	1.2	36.33	22.12	0.357	7.05	7.92	234.3	0.341	0.105	0.08	1.182	0.025	0.004
BR-4AX	2/16/2011	9:35	26.1596	-80.0774	1.2	36.33	22.12	0.500	7.05	7.98	234.3	N/A	N/A	0.18	1.182	0.025	0.004
BR-4B	2/16/2011	9:34	26.1597	-80.0772	8.3	36.34	22.09	0.264	7.05	8.08	235.6	0.385	0.103	0.15	1.305	0.025	0.004
BR-4C	2/16/2011	9:33	26.1598	-80.0771	16.0	36.34	22.09	0.320	7.05	8.11	238.0	0.350	0.117	0.23	1.486	0.025	0.004
BR-5A	2/16/2011	9:52	26.1597	-80.0892	1.3	36.35	21.68	0.363	7.10	8.12	243.4	0.392	0.101	0.54	1.393	0.025	0.004

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-6BX	2/3/2011	14:32	0.000	0.400	0.007	0.284	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.82%	25.10
HW-6C	2/3/2011	14:30	0.000	0.615	0.081	0.696	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.83%	25.29
HW-7A	2/3/2011	9:02	0.200	0.476	0.016	0.663	5.008	0.077	5.766	0.019	0.525	94.13	0.095	5.533	99.89	99.81%	25.07
HW-7B	2/3/2011	9:02	0.299	1.512	0.042	1.384	4.717	0.070	7.686	0.020	0.906	65.64	0.089	5.623	73.33	99.82%	25.14
HW-7C	2/3/2011	9:01	0.000	1.200	0.041	1.339	5.014	0.077	6.255	0.022	0.582	101.25	0.098	5.596	107.51	99.82%	25.19
HW-8A	2/3/2011	9:19	0.034	0.628	0.022	0.623	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.04
HW-8AX	2/3/2011	9:19	0.000	0.792	0.011	0.682	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.04
HW-8C	2/3/2011	9:18	0.071	1.104	0.008	0.532	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.05
HW-9A	2/3/2011	9:41	0.202	0.924	0.011	0.984	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.03
HW-9B	2/3/2011	9:39	0.000	1.073	0.023	1.082	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.82%	25.10
HW-9C	2/3/2011	9:37	0.000	1.115	0.113	2.286	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.84%	25.43
HW-10A	2/3/2011	9:58	0.331	0.697	0.016	1.072	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.82%	25.02
HW-10B	2/3/2011	9:57	0.000	1.726	0.040	1.297	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.82%	25.17
HW-10C	2/3/2011	9:55	0.000	0.625	0.213	2.419	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.84%	25.54
HW-11A	2/3/2011	10:16	0.277	0.752	0.016	1.021	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.00
HW-11C	2/3/2011	10:15	0.499	1.467	0.024	0.975	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.12
HW-12A	2/3/2011	12:08	0.161	0.695	0.024	1.342	5.963	0.087	9.808	0.031	0.758	84.92	0.118	6.721	94.72	99.81%	24.75
HW-12B	2/3/2011	12:07	0.223	1.358	0.035	0.987	4.141	0.070	7.397	0.020	0.830	81.60	0.090	4.971	89.00	99.81%	25.07
HW-12BX	2/3/2011	12:07	0.186	0.591	0.029	0.900	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.07
HW-12C	2/3/2011	12:07	1.037	0.830	0.060	1.131	4.723	0.079	6.264	0.021	0.477	81.88	0.100	5.200	88.15	99.82%	25.21
HW-13A	2/3/2011	12:26	0.173	0.976	0.010	1.108	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.78
HW-13B	2/3/2011	12:25	0.000	1.420	0.007	0.886	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	24.93
HW-13C	2/3/2011	12:24	0.731	0.598	0.062	0.861	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.82%	25.22
HW-14A	2/3/2011	11:34	0.228	1.254	0.048	3.219	5.803	0.135	18.053	0.043	1.695	105.83	0.177	7.498	123.89	99.80%	23.99
HW-15A	2/3/2011	10:35	0.433	0.618	0.019	1.306	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.03
HW-15AX	2/3/2011	10:35	0.439	0.546	0.014	1.091	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.03
HW-15B	2/3/2011	10:34	0.963	0.735	0.057	1.410	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.82%	25.18
HW-15C	2/3/2011	10:32	1.739	0.621	0.109	1.441	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.83%	25.32
BR-1A	2/3/2011	11:48	0.515	0.888	0.042	3.298	4.331	0.117	16.126	0.045	1.385	101.08	0.161	5.716	117.21	99.80%	24.02
BR-1B	2/3/2011	11:47	0.334	0.892	0.035	2.042	4.901	0.098	10.548	0.037	0.735	95.75	0.135	5.635	106.30	99.81%	24.78
BR-1C	2/3/2011	11:46	0.186	0.417	0.019	1.000	4.375	0.095	9.355	0.028	0.588	82.14	0.124	4.963	91.50	99.81%	24.94
BR-2A	2/3/2011	10:51	0.155	0.344	0.015	1.004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	24.91
BR-2C	2/3/2011	10:50	0.253	0.517	0.023	0.877	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.10
BR-3A	2/16/2011	9:13	0.021	0.349	0.011	BDL	4.156	0.076	5.304	0.013	0.393	90.75	0.089	4.549	96.05	99.81%	25.10
BR-3C	2/16/2011	9:11	0.021	0.987	0.011	0.138	6.036	0.075	4.054	0.012	0.258	51.78	0.087	6.294	55.83	99.81%	25.10
BR-3CX	2/16/2011	9:11	0.021	0.265	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.10
BR-4A	2/16/2011	9:35	0.021	0.332	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.91
BR-4AX	2/16/2011	9:35	0.021	0.475	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.91
BR-4B	2/16/2011	9:34	0.021	0.239	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.93
BR-4C	2/16/2011	9:33	0.021	0.295	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.92
BR-5A	2/16/2011	9:52	0.021	0.338	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.05

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-5C	2/16/2011	9:51	26.1597	-80.0890	7.4	36.36	21.67	0.271	7.10	8.14	245.0	0.272	0.124	0.20	1.204	0.025	0.004
BR-6A	2/16/2011	10:09	26.1895	-80.0850	1.0	36.31	21.91	0.770	7.07	8.11	246.8	0.360	0.125	0.19	1.373	0.025	0.004
BR-6B	2/16/2011	10:08	26.1896	-80.0849	4.1	36.31	21.78	1.038	7.09	8.13	248.4	0.410	0.126	0.19	1.341	0.025	0.004
BR-6C	2/16/2011	10:08	26.1896	-80.0847	7.1	36.26	21.60	0.974	7.12	8.10	250.2	0.379	0.144	0.20	1.398	0.025	0.004
BR-7A	2/16/2011	10:28	26.2020	-80.0680	1.1	36.32	22.23	0.560	7.03	8.09	243.1	0.317	0.103	0.15	1.057	0.025	0.004
BR-7B	2/16/2011	10:27	26.2021	-80.0680	15.0	36.33	21.83	0.239	7.08	8.12	244.4	0.484	0.154	0.19	1.871	0.025	0.004
BR-7C	2/16/2011	10:26	26.2021	-80.0679	28.9	36.30	21.24	0.323	7.16	8.12	245.9	0.503	0.195	0.11	2.357	0.006	0.004
BR-8A	2/16/2011	14:15	26.2371	-80.0683	1.3	36.32	22.41	0.720	7.01	8.13	220.5	0.369	0.089	0.13	1.314	0.025	0.004
BR-8B	2/16/2011	14:14	26.2372	-80.0682	5.3	36.34	22.21	0.566	7.04	8.16	220.0	0.437	0.096	0.17	1.312	0.025	0.004
BR-8C	2/16/2011	14:13	26.2372	-80.0681	13.4	36.33	22.01	0.354	7.06	8.17	219.3	0.482	0.168	0.16	1.806	0.025	0.004
BR-9A	2/16/2011	13:56	26.2465	-80.0639	1.2	36.22	22.24	1.757	7.04	8.14	236.1	0.410	0.135	0.01	1.233	0.025	0.004
BR-9B	2/16/2011	13:55	26.2467	-80.0637	14.7	36.33	22.02	0.289	7.06	8.15	237.4	0.518	0.161	0.10	1.700	0.025	0.004
BR-9C	2/16/2011	13:54	26.2469	-80.0635	29.2	36.31	21.41	2.368	7.14	8.16	238.5	0.463	0.201	0.15	2.018	0.060	0.004
BR-10A	2/16/2011	13:33	26.2503	-80.0620	1.0	36.16	22.01	5.067	7.07	7.95	230.4	0.474	0.131	0.14	1.466	0.578	0.004
BR-10B	2/16/2011	13:32	26.2505	-80.0620	15.1	36.33	21.82	0.231	7.09	8.14	231.6	0.573	0.162	0.22	2.067	0.025	0.004
BR-10C	2/16/2011	13:30	26.2506	-80.0621	28.7	36.31	21.56	0.525	7.12	8.14	232.2	0.549	0.196	0.15	2.203	0.025	0.004
BR-11A	2/16/2011	13:05	26.2543	-80.0621	1.4	36.32	22.55	1.213	7.00	8.14	243.1	0.303	0.073	0.16	0.962	0.025	0.004
BR-11B	2/16/2011	13:03	26.2544	-80.0620	16.4	36.32	21.90	0.257	7.08	8.16	244.6	0.514	0.156	0.03	1.771	0.025	0.004
BR-11C	2/16/2011	13:02	26.2545	-80.0620	28.7	36.32	21.68	0.422	7.10	8.16	245.9	0.571	0.178	0.16	2.100	0.025	0.004
BR-12A	2/16/2011	11:55	26.2496	-80.0796	0.8	35.54	21.77	1.259	7.12	8.10	230.4	0.857	0.366	0.65	1.143	0.025	0.004
BR-12AX	2/16/2011	11:55	26.2496	-80.0796	0.8	35.54	21.77	1.310	7.12	8.11	230.4	N/A	N/A	0.58	1.143	0.025	0.004
BR-13A	2/16/2011	10:53	26.2595	-80.0832	1.3	35.51	21.58	1.758	7.15	7.98	242.5	0.796	0.350	0.57	1.966	0.149	0.004
BR-14A	2/16/2011	11:06	26.2618	-80.0853	1.1	34.71	21.60	1.775	7.18	8.03	234.3	1.063	0.544	0.63	2.496	0.229	0.004
BR-15A	2/16/2011	11:15	26.2630	-80.0835	1.2	35.13	21.51	1.871	7.17	8.06	238.9	1.102	0.605	1.04	2.621	0.431	0.004
BR-16A	2/16/2011	12:07	26.2607	-80.0736	1.3	36.33	22.38	0.367	7.02	7.85	223.6	0.354	0.086	0.10	0.974	0.025	0.004
BR-16B	2/16/2011	12:06	26.2607	-80.0736	6.0	36.34	22.06	0.482	7.05	8.12	222.9	0.462	0.114	0.05	1.265	0.025	0.004
BR-16C	2/16/2011	12:05	26.2607	-80.0735	9.9	36.34	22.03	0.613	7.06	8.13	223.0	0.469	0.131	0.39	1.441	0.025	0.004
BR-17A	2/16/2011	12:23	26.2752	-80.0646	1.1	36.33	22.48	0.871	7.00	8.10	235.4	0.293	0.078	0.11	0.941	0.025	0.004
BR-17B	2/16/2011	12:22	26.2753	-80.0645	7.3	36.33	22.34	0.557	7.02	8.14	237.1	0.311	0.092	0.07	1.067	0.025	0.004
BR-17BX	2/16/2011	12:22	26.2753	-80.0645	7.3	36.33	22.34	0.455	7.02	8.15	237.1	N/A	N/A	N/A	1.067	0.025	0.004
BR-17C	2/16/2011	12:21	26.2753	-80.0645	17.7	36.33	21.99	0.671	7.06	8.15	238.3	0.559	0.140	0.21	1.831	0.025	0.004
BR-18A	2/16/2011	12:40	26.2969	-80.0676	1.1	36.33	22.24	0.462	7.03	8.14	240.6	0.426	0.087	0.17	1.110	0.025	0.004
BR-18B	2/16/2011	12:39	26.2969	-80.0676	7.2	36.32	22.18	2.609	7.04	7.91	241.3	0.440	0.129	0.10	1.266	2.256	2.235
BR-18C	2/16/2011	12:39	26.2970	-80.0675	15.2	36.32	22.18	0.295	7.04	8.12	242.1	0.396	0.126	0.16	1.393	0.025	0.004
HW-1A	3/10/2011	7:55	25.9973	-80.0906	1.3	35.98	23.85	1.147	6.85	7.86	155.4	0.457	0.144	0.26	1.425	0.361	0.130
HW-1B	3/10/2011	7:54	25.9971	-80.0904	10.0	36.00	22.58	2.034	7.00	8.15	155.3	0.454	0.193	0.30	1.661	1.471	0.157
HW-1BX	3/10/2011	7:54	25.9971	-80.0904	10.0	36.00	22.58	0.961	7.00	8.15	155.3	N/A	N/A	0.14	1.661	0.542	0.106
HW-1C	3/10/2011	7:53	25.9970	-80.0902	16.9	36.02	20.91	1.354	7.22	8.12	156.2	0.445	0.205	0.24	1.883	1.082	0.298
HW-2A	3/10/2011	8:19	26.0160	-80.0875	1.7	35.98	23.88	1.509	6.85	8.15	189.6	0.371	0.128	0.12	1.241	0.536	0.084
HW-2B	3/10/2011	8:18	26.0159	-80.0874	8.2	35.98	22.93	1.196	6.96	8.16	190.3	0.435	0.134	0.32	1.574	0.277	0.062
HW-2C	3/10/2011	8:17	26.0157	-80.0873	15.3	36.05	21.58	0.709	7.13	8.14	191.4	0.392	0.183	0.24	1.671	0.246	0.225

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-5C	2/16/2011	9:51	0.021	0.246	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.07
BR-6A	2/16/2011	10:09	0.021	0.745	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.96
BR-6B	2/16/2011	10:08	0.021	1.013	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.99
BR-6C	2/16/2011	10:08	0.021	0.949	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.01
BR-7A	2/16/2011	10:28	0.021	0.535	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.87
BR-7B	2/16/2011	10:27	0.021	0.214	0.011	0.438	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.99
BR-7C	2/16/2011	10:26	0.002	0.317	0.061	0.067	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	25.15
BR-8A	2/16/2011	14:15	0.021	0.695	0.017	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.81
BR-8B	2/16/2011	14:14	0.021	0.541	0.020	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.89
BR-8C	2/16/2011	14:13	0.021	0.329	0.034	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.94
BR-9A	2/16/2011	13:56	0.021	1.732	0.008	BDL	11.357	0.071	5.291	0.023	0.417	58.62	0.094	11.774	63.91	99.80%	24.79
BR-9B	2/16/2011	13:55	0.021	0.264	0.029	BDL	5.536	0.062	6.933	0.021	0.744	50.02	0.083	6.280	56.95	99.80%	24.94
BR-9C	2/16/2011	13:54	0.056	2.308	0.041	0.310	7.169	0.057	5.001	0.012	0.331	48.47	0.068	7.500	53.47	99.81%	25.11
BR-10A	2/16/2011	13:33	0.574	4.489	0.071	0.506	8.013	0.096	9.682	0.032	1.337	53.64	0.128	9.350	63.32	99.80%	24.81
BR-10B	2/16/2011	13:32	0.021	0.206	0.005	BDL	4.023	0.079	6.270	0.030	0.582	47.85	0.109	4.605	54.12	99.80%	25.00
BR-10C	2/16/2011	13:30	0.021	0.500	0.011	BDL	4.614	0.062	6.520	0.018	0.677	40.98	0.080	5.290	47.50	99.81%	25.06
BR-11A	2/16/2011	13:05	0.021	1.188	0.011	BDL	4.240	0.063	5.282	0.031	0.436	42.14	0.094	4.676	47.42	99.79%	24.78
BR-11B	2/16/2011	13:03	0.021	0.232	0.013	0.009	5.355	0.071	7.059	0.026	0.937	48.40	0.097	6.292	55.46	99.80%	24.97
BR-11C	2/16/2011	13:02	0.021	0.397	0.011	BDL	4.282	0.063	5.796	0.018	0.556	43.40	0.081	4.839	49.20	99.81%	25.03
BR-12A	2/16/2011	11:55	0.021	1.234	0.049	1.231	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	24.42
BR-12AX	2/16/2011	11:55	0.021	1.285	0.049	1.194	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	24.42
BR-13A	2/16/2011	10:53	0.145	1.609	0.093	1.445	6.560	0.082	12.669	0.046	1.141	65.69	0.128	7.701	78.36	99.81%	24.46
BR-14A	2/16/2011	11:06	0.225	1.546	0.103	2.144	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	23.84
BR-15A	2/16/2011	11:15	0.427	1.440	0.132	2.871	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.81%	24.19
BR-16A	2/16/2011	12:07	0.021	0.342	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.83
BR-16B	2/16/2011	12:06	0.021	0.457	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.94
BR-16C	2/16/2011	12:05	0.021	0.588	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.94
BR-17A	2/16/2011	12:23	0.021	0.846	0.011	BDL	18.625	0.020	4.172	0.013	0.256	53.73	0.033	18.881	57.90	99.79%	24.80
BR-17B	2/16/2011	12:22	0.021	0.532	0.011	BDL	4.801	0.033	5.493	0.014	0.494	50.50	0.047	5.295	55.99	99.80%	24.84
BR-17BX	2/16/2011	12:22	0.021	0.430	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.84
BR-17C	2/16/2011	12:21	0.021	0.646	0.007	BDL	4.560	0.041	6.157	0.024	0.614	58.60	0.066	5.174	64.76	99.80%	24.95
BR-18A	2/16/2011	12:40	0.021	0.437	0.007	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.87
BR-18B	2/16/2011	12:39	0.021	0.353	0.011	0.100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.89
BR-18C	2/16/2011	12:39	0.021	0.270	0.011	0.091	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.80%	24.89
HW-1A	3/10/2011	7:55	0.231	0.786	0.011	1.238	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.78%	24.12
HW-1B	3/10/2011	7:54	1.314	0.563	0.011	1.198	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.79%	24.53
HW-1BX	3/10/2011	7:54	0.436	0.419	0.011	1.204	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.79%	24.53
HW-1C	3/10/2011	7:53	0.784	0.272	0.011	1.295	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.82%	25.04
HW-2A	3/10/2011	8:19	0.452	0.973	0.011	1.133	11.855	0.063	5.466	0.016	0.441	90.00	0.078	12.295	95.47	99.78%	24.11
HW-2B	3/10/2011	8:18	0.215	0.919	0.011	1.145	7.020	0.094	4.848	0.017	0.344	79.64	0.111	7.363	84.49	99.79%	24.40
HW-2C	3/10/2011	8:17	0.021	0.463	0.011	1.306	5.539	0.110	4.925	0.015	0.363	72.49	0.125	5.902	77.42	99.81%	24.86

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-3A	3/10/2011	8:39	26.0159	-80.0961	1.1	36.00	23.93	0.946	6.84	8.15	199.8	0.543	0.165	0.34	1.331	0.310	0.087
HW-3B	3/10/2011	8:39	26.0158	-80.0960	6.9	36.02	23.82	1.796	6.85	8.16	199.2	0.469	0.206	0.36	1.918	0.774	0.209
HW-3C	3/10/2011	8:38	26.0156	-80.0958	13.7	36.00	22.63	1.205	7.00	8.14	201.3	0.474	0.247	0.49	1.623	0.247	0.065
HW-4A	3/10/2011	9:02	26.0196	-80.0859	2.0	35.60	23.10	12.447	6.96	8.09	196.9	0.372	0.106	0.17	1.416	3.955	0.964
HW-4B	3/10/2011	9:01	26.0198	-80.0858	12.6	36.04	22.43	0.705	7.02	8.15	198.5	0.394	0.118	0.21	1.621	0.446	0.113
HW-4C	3/10/2011	9:00	26.0200	-80.0856	27.7	36.11	19.59	2.154	7.39	8.12	199.7	0.252	0.151	0.23	1.319	2.013	0.528
HW-5A	3/10/2011	9:31	26.0251	-80.0866	1.1	35.98	23.93	1.428	6.84	8.14	193.4	0.401	0.118	0.14	0.987	0.213	0.156
HW-5B	3/10/2011	9:31	26.0250	-80.0865	10.3	35.98	23.47	0.771	6.90	8.18	193.1	0.419	0.133	0.15	1.431	0.194	0.089
HW-5C	3/10/2011	9:30	26.0248	-80.0863	22.1	36.08	20.14	2.051	7.32	8.13	194.9	0.328	0.176	0.23	1.477	1.599	0.467
HW-6A	3/10/2011	9:54	26.0252	-80.0949	2.1	36.00	23.97	0.643	6.84	8.15	204.7	0.480	0.129	0.28	1.352	0.230	0.075
HW-6B	3/10/2011	9:53	26.0251	-80.0948	8.1	36.03	23.55	1.011	6.88	8.15	205.9	0.557	0.187	0.76	1.688	0.300	0.080
HW-6BX	3/10/2011	9:53	26.0251	-80.0948	8.1	36.03	23.55	1.161	6.88	8.15	205.9	N/A	N/A	0.45	1.688	0.562	0.080
HW-6C	3/10/2011	9:53	26.0250	-80.0947	14.8	36.03	22.79	1.449	6.98	8.15	206.4	0.431	0.193	0.39	1.402	0.646	0.160
HW-7A	3/10/2011	10:16	26.0469	-80.0953	1.9	36.00	23.95	0.829	6.84	8.15	207.6	0.525	0.139	0.34	1.064	0.393	0.078
HW-7B	3/10/2011	10:15	26.0466	-80.0951	7.2	36.03	23.81	0.986	6.85	8.14	208.0	0.585	0.159	0.43	1.547	0.304	0.077
HW-7C	3/10/2011	10:15	26.0464	-80.0950	10.6	36.03	23.76	0.947	6.86	8.15	207.6	0.527	0.155	0.41	1.656	0.295	0.088
HW-8A	3/10/2011	10:37	26.0456	-80.1071	1.4	36.10	23.43	0.953	6.90	8.11	209.2	0.489	0.177	0.85	1.043	0.441	0.113
HW-8AX	3/10/2011	10:37	26.0456	-80.1071	1.4	36.10	23.43	0.830	6.90	8.11	209.2	N/A	N/A	0.74	1.043	0.242	0.129
HW-8C	3/10/2011	10:36	26.0454	-80.1069	7.0	36.12	23.27	1.052	6.92	8.13	209.5	0.483	0.195	0.83	1.439	0.175	0.130
HW-9A	3/10/2011	11:10	26.0694	-80.0853	2.4	35.98	23.93	0.905	6.84	8.14	207.8	0.507	0.159	0.30	0.958	0.356	0.085
HW-9B	3/10/2011	11:09	26.0692	-80.0852	11.5	36.00	23.65	0.722	6.87	8.16	208.3	0.567	0.176	0.38	1.888	0.264	0.078
HW-9C	3/10/2011	11:08	26.0689	-80.0850	19.1	36.06	20.37	2.185	7.29	8.14	210.4	0.352	0.190	0.23	1.637	1.405	0.414
HW-10A	3/10/2011	11:52	26.0846	-80.0853	0.9	36.00	23.97	0.587	6.84	8.15	191.6	0.506	0.155	0.31	1.332	0.322	0.111
HW-10B	3/10/2011	11:51	26.0843	-80.0851	7.8	36.01	23.88	0.658	6.85	8.16	191.5	N/A	N/A	0.36	1.519	0.274	0.125
HW-10C	3/10/2011	11:50	26.0839	-80.0849	15.0	36.04	21.55	1.533	7.13	8.14	192.3	0.467	0.235	0.25	1.514	1.068	0.237
HW-11A	3/10/2011	12:10	26.0844	-80.0959	1.4	36.03	23.85	1.097	6.85	8.19	188.6	0.582	0.152	0.35	0.888	0.393	0.084
HW-11C	3/10/2011	12:09	26.0842	-80.0958	7.0	36.04	23.78	0.611	6.86	8.02	188.2	0.541	0.169	0.36	1.514	0.277	0.053
HW-12A	3/10/2011	13:46	26.0928	-80.0943	1.8	36.02	23.50	0.796	6.89	8.13	185.7	0.666	0.232	0.70	1.871	0.446	0.054
HW-12B	3/10/2011	13:45	26.0930	-80.0943	7.3	36.03	23.50	0.700	6.89	8.12	186.0	0.664	0.230	0.69	1.849	0.101	0.080
HW-12BX	3/10/2011	13:45	26.0930	-80.0943	7.3	36.03	23.50	1.001	6.89	8.12	186.0	N/A	N/A	0.64	1.849	0.465	0.124
HW-12C	3/10/2011	13:44	26.0931	-80.0944	13.6	36.07	23.42	0.584	6.90	8.12	186.5	0.530	0.233	0.55	1.381	0.395	0.094
HW-13A	3/10/2011	14:00	26.0922	-80.0844	1.8	36.00	23.78	0.413	6.86	8.16	192.5	0.976	0.218	0.36	2.412	0.184	0.100
HW-13B	3/10/2011	14:00	26.0924	-80.0843	5.0	36.01	23.77	0.777	6.86	8.18	192.6	0.868	0.262	0.45	2.583	0.265	0.064
HW-13C	3/10/2011	13:58	26.0928	-80.0842	12.7	36.09	22.09	1.013	7.06	8.17	193.3	0.662	0.297	0.42	2.085	0.852	0.170
HW-14A	3/10/2011	13:11	26.0940	-80.1149	1.7	35.25	23.86	2.742	6.88	8.07	146.0	1.626	0.500	0.62	3.783	0.788	0.167
HW-15A	3/10/2011	14:16	26.1006	-80.0824	1.3	36.01	23.76	0.274	6.86	8.15	189.0	0.859	0.258	0.51	1.916	0.216	0.071
HW-15AX	3/10/2011	14:16	26.1006	-80.0824	1.3	36.01	23.76	0.577	6.86	8.15	189.0	N/A	N/A	0.42	1.916	0.258	0.058
HW-15B	3/10/2011	14:15	26.1008	-80.0825	7.6	36.01	23.76	0.589	6.86	8.12	189.7	0.852	0.279	0.47	2.640	0.170	0.070
HW-15C	3/10/2011	14:14	26.1009	-80.0825	19.0	36.06	21.40	1.174	7.15	8.15	189.9	0.782	0.302	0.32	3.227	0.677	0.204
BR-1A	3/10/2011	13:28	26.0929	-80.1034	1.6	35.20	23.94	0.851	6.87	7.92	167.2	2.089	0.582	1.41	3.020	0.530	0.166
BR-1B	3/10/2011	13:27	26.0931	-80.1037	7.6	36.01	23.34	0.570	6.91	8.09	167.5	0.681	0.221	1.37	2.053	0.264	0.080

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-3A	3/10/2011	8:39	0.223	0.636	0.011	1.228	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.11
HW-3B	3/10/2011	8:39	0.565	1.022	0.011	1.175	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.16
HW-3C	3/10/2011	8:38	0.182	0.958	0.011	0.926	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-4A	3/10/2011	9:02	2.991	8.492	0.177	4.637	12.572	0.151	6.775	0.084	0.563	73.53	0.234	13.135	80.30	99.8%	24.06
HW-4B	3/10/2011	9:01	0.333	0.259	0.011	1.163	4.220	0.107	6.740	0.022	0.996	73.84	0.129	5.216	80.58	99.8%	24.60
HW-4C	3/10/2011	9:00	1.485	0.141	0.047	1.567	4.451	0.113	4.895	0.015	0.410	73.90	0.128	4.861	78.79	99.8%	25.48
HW-5A	3/10/2011	9:31	0.057	1.215	0.011	1.178	10.204	0.200	5.862	0.018	0.437	85.92	0.218	10.642	91.78	99.8%	24.09
HW-5B	3/10/2011	9:31	0.105	0.577	0.011	1.239	8.143	0.119	5.921	0.020	0.486	62.03	0.139	8.628	67.95	99.8%	24.24
HW-5C	3/10/2011	9:30	1.132	0.452	0.019	1.414	8.166	0.117	4.966	0.012	0.288	71.07	0.128	8.453	76.03	99.8%	25.30
HW-6A	3/10/2011	9:54	0.155	0.413	0.011	1.032	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.10
HW-6B	3/10/2011	9:53	0.220	0.711	0.011	1.017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.25
HW-6BX	3/10/2011	9:53	0.482	0.599	0.011	0.961	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.25
HW-6C	3/10/2011	9:53	0.486	0.803	0.011	1.206	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.48
HW-7A	3/10/2011	10:16	0.315	0.436	0.011	1.090	3.751	0.106	10.829	0.033	1.480	80.82	0.138	5.231	91.65	99.8%	24.11
HW-7B	3/10/2011	10:15	0.227	0.682	0.011	1.003	6.032	0.094	8.538	0.018	0.781	61.09	0.113	6.812	69.63	99.8%	24.17
HW-7C	3/10/2011	10:15	0.207	0.652	0.011	1.013	4.929	0.074	8.987	0.026	0.918	65.33	0.101	5.847	74.32	99.8%	24.19
HW-8A	3/10/2011	10:37	0.328	0.512	0.011	1.435	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34
HW-8AX	3/10/2011	10:37	0.113	0.588	0.011	0.918	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34
HW-8C	3/10/2011	10:36	0.045	0.877	0.011	0.909	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.40
HW-9A	3/10/2011	11:10	0.271	0.549	0.011	1.510	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.09
HW-9B	3/10/2011	11:09	0.186	0.458	0.011	1.304	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.20
HW-9C	3/10/2011	11:08	0.991	0.780	0.011	1.677	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	25.22
HW-10A	3/10/2011	11:52	0.211	0.265	0.011	1.061	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.10
HW-10B	3/10/2011	11:51	0.149	0.384	0.011	1.095	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.14
HW-10C	3/10/2011	11:50	0.831	0.465	0.011	1.227	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.86
HW-11A	3/10/2011	12:10	0.309	0.704	0.011	1.570	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.16
HW-11C	3/10/2011	12:09	0.224	0.334	0.018	1.062	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.19
HW-12A	3/10/2011	13:46	0.392	0.350	0.011	1.103	3.714	0.136	13.469	0.042	1.342	63.88	0.179	5.056	77.35	99.8%	24.26
HW-12B	3/10/2011	13:45	0.021	0.599	0.011	1.738	5.902	0.115	12.714	0.033	1.285	68.88	0.148	7.187	81.60	99.8%	24.27
HW-12BX	3/10/2011	13:45	0.341	0.536	0.011	1.496	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.27
HW-12C	3/10/2011	13:44	0.301	0.189	0.011	0.960	4.508	0.104	12.215	0.026	1.060	67.94	0.129	5.569	80.16	99.8%	24.32
HW-13A	3/10/2011	14:00	0.084	0.229	0.011	1.063	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.16
HW-13B	3/10/2011	14:00	0.201	0.512	0.011	1.510	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.17
HW-13C	3/10/2011	13:58	0.682	0.161	0.011	1.093	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.74
HW-14A	3/10/2011	13:11	0.621	1.954	0.044	5.389	5.493	0.108	28.539	0.064	2.010	88.17	0.172	7.504	116.71	99.8%	23.57
HW-15A	3/10/2011	14:16	0.145	0.058	0.011	1.072	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.17
HW-15AX	3/10/2011	14:16	0.200	0.319	0.011	0.978	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.17
HW-15B	3/10/2011	14:15	0.100	0.419	0.011	1.060	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.17
HW-15C	3/10/2011	14:14	0.473	0.497	0.011	1.240	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.92
BR-1A	3/10/2011	13:28	0.364	0.321	0.020	3.971	6.559	0.095	23.374	0.072	1.641	95.08	0.166	8.200	118.46	99.8%	23.51
BR-1B	3/10/2011	13:27	0.184	0.306	0.011	1.373	7.411	0.088	19.779	0.042	1.274	81.99	0.130	8.685	101.77	99.8%	24.30

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-1C	3/10/2011	13:26	26.0933	-80.1040	14.4	36.05	23.26	0.940	6.92	8.11	167.2	0.690	0.222	1.79	1.783	0.276	0.081
BR-2A	3/10/2011	14:31	26.1012	-80.0933	1.3	36.02	23.73	0.857	6.86	8.15	201.7	0.689	0.206	0.57	2.061	0.323	0.091
BR-2C	3/10/2011	14:30	26.1013	-80.0933	8.9	36.03	23.71	0.619	6.86	8.02	201.7	0.714	0.226	0.51	2.220	0.307	0.110
BR-3A	4/13/2011	14:05	26.1380	-80.0907	1.6	36.07	26.65	0.282	6.53	7.93	210.3	0.473	0.105	0.30	1.355	0.025	0.004
BR-3C	4/13/2011	14:05	26.1380	-80.0906	8.1	36.07	26.51	0.579	6.54	8.08	211.1	0.481	0.165	0.34	1.325	0.033	0.004
BR-3CX	4/13/2011	14:05	26.1380	-80.0906	8.1	36.07	26.51	0.461	6.54	8.12	211.1	N/A	N/A	0.28	1.325	0.104	0.004
BR-4A	4/13/2011	13:51	26.1594	-80.0766	1.2	36.00	26.56	0.282	6.54	8.04	218.2	0.105	0.044	0.13	0.696	0.025	0.004
BR-4AX	4/13/2011	13:51	26.1594	-80.0766	1.2	36.00	26.56	1.058	6.54	8.08	218.2	N/A	N/A	0.10	0.696	0.025	0.004
BR-4B	4/13/2011	13:50	26.1594	-80.0765	10.1	36.04	26.08	0.423	6.59	8.04	218.3	0.395	0.117	0.19	1.479	0.025	0.004
BR-4C	4/13/2011	13:49	26.1594	-80.0764	20.3	36.05	25.43	0.591	6.66	8.03	219.4	0.486	0.195	0.30	1.555	0.379	0.004
BR-5A	4/13/2011	13:36	26.1590	-80.0889	1.2	36.06	26.50	0.515	6.55	8.03	213.8	0.398	0.146	0.24	2.533	0.163	0.033
BR-5C	4/13/2011	13:36	26.1590	-80.0888	6.6	36.06	26.36	0.605	6.56	8.11	213.8	0.389	0.154	0.18	1.279	0.229	0.012
BR-6A	4/13/2011	13:19	26.1886	-80.0856	1.8	36.09	26.56	0.643	6.54	8.03	201.0	0.462	0.143	0.45	1.182	0.160	0.119
BR-6B	4/13/2011	13:18	26.1886	-80.0855	4.8	36.08	26.47	2.065	6.55	8.13	200.7	0.519	0.101	0.19	1.323	0.474	0.144
BR-6C	4/13/2011	13:17	26.1887	-80.0854	7.3	36.07	26.42	0.509	6.55	8.06	201.0	0.411	0.190	0.24	1.317	0.025	0.004
BR-7A	4/13/2011	13:03	26.2023	-80.0683	1.4	36.01	26.17	1.305	6.58	8.06	196.4	0.181	0.056	0.15	0.742	0.213	0.112
BR-7B	4/13/2011	13:02	26.2024	-80.0682	14.8	36.04	25.75	1.400	6.63	8.07	195.7	0.657	0.152	0.28	2.035	0.584	0.131
BR-7C	4/13/2011	13:01	26.2025	-80.0682	30.6	36.06	25.22	1.008	6.69	8.07	195.9	0.727	0.214	0.17	2.447	0.270	0.136
BR-8A	4/13/2011	12:16	26.2374	-80.0683	1.5	36.02	26.21	1.246	6.58	8.04	196.4	0.149	0.062	0.21	1.347	0.580	0.211
BR-8B	4/13/2011	12:15	26.2374	-80.0682	7.2	36.02	26.12	0.582	6.59	8.12	196.4	0.302	0.110	0.15	0.937	0.115	0.073
BR-8C	4/13/2011	12:15	26.2374	-80.0682	13.9	36.03	26.06	1.062	6.60	8.14	195.7	0.325	0.136	0.19	1.164	0.421	0.142
BR-9A	4/13/2011	11:58	26.2465	-80.0635	1.6	36.00	26.04	0.708	6.57	8.03	207.1	0.160	0.034	0.16	0.698	0.228	0.119
BR-9B	4/13/2011	11:57	26.2465	-80.0634	14.3	36.02	26.04	0.789	6.60	8.05	207.4	0.344	0.110	0.13	1.165	0.262	0.084
BR-9C	4/13/2011	11:56	26.2465	-80.0633	30.6	36.12	23.95	1.929	6.83	8.10	208.6	0.676	0.295	0.17	2.469	1.421	0.156
BR-10A	4/13/2011	11:38	26.2519	-80.0624	1.6	35.81	26.09	5.306	6.60	8.04	211.3	0.265	0.092	0.17	1.976	1.274	0.605
BR-10B	4/13/2011	11:36	26.2519	-80.0623	5.6	36.02	26.08	0.779	6.59	8.05	212.2	0.196	0.067	0.09	0.957	0.162	0.075
BR-10C	4/13/2011	11:35	26.2519	-80.0622	31.7	36.03	26.00	1.724	6.60	8.06	212.4	0.450	0.190	0.16	1.546	0.212	0.077
BR-11A	4/13/2011	11:10	26.2554	-80.0619	1.8	35.95	26.20	2.429	6.58	8.11	232.9	0.135	0.039	0.10	0.817	0.518	0.246
BR-11B	4/13/2011	11:09	26.2552	-80.0618	15.0	36.01	26.11	0.925	6.59	8.11	233.9	0.243	0.058	0.07	0.930	0.219	0.072
BR-11C	4/13/2011	11:08	26.2551	-80.0618	31.6	36.04	25.84	0.692	6.62	8.05	235.1	0.493	0.144	0.11	2.016	0.241	0.054
BR-12A	4/13/2011	10:00	26.2490	-80.0790	1.6	36.10	26.55	0.775	6.54	8.09	215.9	0.525	0.128	0.16	1.294	0.284	0.118
BR-12AX	4/13/2011	10:00	26.2490	-80.0790	1.6	36.10	26.55	1.153	6.54	8.09	215.9	N/A	N/A	0.15	1.294	0.939	0.119
BR-13A	4/13/2011	9:22	26.2593	-80.0829	1.2	35.36	26.67	1.823	6.55	8.04	212.0	1.143	0.387	0.64	2.349	1.116	0.179
BR-14A	4/13/2011	9:36	26.2618	-80.0854	1.4	34.02	27.50	2.021	6.51	7.86	212.9	1.553	0.802	0.99	3.643	0.841	0.280
BR-15A	4/13/2011	9:45	26.2631	-80.0835	1.6	35.40	26.87	1.155	6.53	7.87	216.1	0.883	0.374	0.84	2.581	0.453	0.252
BR-16A	4/13/2011	10:17	26.2608	-80.0739	1.8	35.97	26.42	0.801	6.56	7.92	224.2	0.583	0.126	0.23	1.574	0.536	0.093
BR-16B	4/13/2011	10:16	26.2608	-80.0739	5.7	36.07	26.24	1.541	6.57	7.91	225.5	0.558	0.134	0.16	1.566	0.976	0.224
BR-16C	4/13/2011	10:15	26.2608	-80.0739	10.7	36.07	26.24	1.308	6.57	7.97	226.7	0.698	0.216	0.12	1.477	0.241	0.074
BR-17A	4/13/2011	10:31	26.2763	-80.0641	1.5	36.02	26.26	0.840	6.57	7.92	241.0	0.562	0.128	0.32	1.591	0.325	0.050
BR-17B	4/13/2011	10:30	26.2762	-80.0641	8.6	36.03	26.05	0.444	6.60	8.08	242.2	0.506	0.119	0.19	1.457	0.189	0.046
BR-17BX	4/13/2011	10:30	26.2762	-80.0641	8.6	36.03	26.05	0.534	6.60	8.11	242.2	N/A	N/A	0.16	1.457	0.277	0.082

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-1C	3/10/2011	13:26	0.195	0.664	0.011	1.719	7.803	0.092	25.956	0.058	1.457	77.02	0.151	9.260	102.97	99.8%	24.35
BR-2A	3/10/2011	14:31	0.232	0.534	0.011	1.115	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.18
BR-2C	3/10/2011	14:30	0.197	0.312	0.011	1.003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.20
BR-3A	4/13/2011	14:05	0.021	0.257	0.016	1.287	5.693	0.335	13.257	0.042	1.955	79.88	0.377	7.648	93.13	99.8%	23.30
BR-3C	4/13/2011	14:05	0.029	0.546	0.054	1.491	5.454	0.214	7.569	0.028	0.732	70.48	0.242	6.185	78.04	99.8%	23.35
BR-3CX	4/13/2011	14:05	0.100	0.357	0.013	1.394	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.35
BR-4A	4/13/2011	13:51	0.021	0.257	0.012	0.964	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.28
BR-4AX	4/13/2011	13:51	0.021	1.033	0.008	1.060	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.28
BR-4B	4/13/2011	13:50	0.021	0.398	0.014	1.112	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
BR-4C	4/13/2011	13:49	0.375	0.212	0.024	1.271	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.68
BR-5A	4/13/2011	13:36	0.130	0.352	0.038	1.390	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.34
BR-5C	4/13/2011	13:36	0.217	0.376	0.033	1.793	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.39
BR-6A	4/13/2011	13:19	0.041	0.483	0.027	1.317	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.34
BR-6B	4/13/2011	13:18	0.330	1.591	0.022	1.988	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.37
BR-6C	4/13/2011	13:17	0.021	0.484	0.031	1.346	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.37
BR-7A	4/13/2011	13:03	0.101	1.092	0.030	1.934	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.41
BR-7B	4/13/2011	13:02	0.453	0.816	0.059	1.749	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.57
BR-7C	4/13/2011	13:01	0.134	0.738	0.033	1.625	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.75
BR-8A	4/13/2011	12:16	0.369	0.666	0.041	1.781	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.40
BR-8B	4/13/2011	12:15	0.042	0.467	0.010	1.272	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
BR-8C	4/13/2011	12:15	0.279	0.641	0.023	1.672	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
BR-9A	4/13/2011	11:58	0.109	0.480	0.017	1.182	5.359	0.297	3.971	0.011	0.342	80.85	0.308	5.701	84.82	99.3%	23.44
BR-9B	4/13/2011	11:57	0.178	0.527	0.021	1.177	10.850	0.233	4.953	0.014	0.522	72.67	0.247	11.372	77.62	99.8%	23.46
BR-9C	4/13/2011	11:56	1.265	0.508	0.067	1.655	4.950	0.268	5.520	0.015	0.540	57.96	0.283	5.490	63.48	99.8%	24.19
BR-10A	4/13/2011	11:38	0.669	4.032	0.081	1.915	11.672	0.335	8.222	0.032	1.002	77.88	0.367	12.674	86.10	99.8%	23.29
BR-10B	4/13/2011	11:36	0.087	0.617	0.014	1.043	7.076	0.589	4.487	0.015	0.503	73.61	0.604	7.579	78.10	99.8%	23.44
BR-10C	4/13/2011	11:35	0.135	1.512	0.018	1.441	5.966	0.373	5.851	0.020	0.506	76.94	0.393	6.472	82.79	99.8%	23.48
BR-11A	4/13/2011	11:10	0.272	1.911	0.047	1.389	4.425	0.229	4.426	0.018	0.444	70.60	0.247	4.869	75.03	99.8%	23.36
BR-11B	4/13/2011	11:09	0.147	0.706	0.034	1.294	5.236	0.251	3.831	0.017	0.457	75.57	0.268	5.693	79.40	99.8%	23.43
BR-11C	4/13/2011	11:08	0.187	0.451	0.021	1.372	3.319	0.229	5.358	0.017	0.577	68.82	0.246	3.897	74.18	99.8%	23.54
BR-12A	4/13/2011	10:00	0.166	0.491	0.030	1.740	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.36
BR-12AX	4/13/2011	10:00	0.820	0.214	0.041	1.432	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.36
BR-13A	4/13/2011	9:22	0.937	0.707	0.074	3.171	5.781	0.274	14.925	0.062	1.361	77.46	0.336	7.141	92.38	99.8%	22.76
BR-14A	4/13/2011	9:36	0.561	1.180	0.162	6.667	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.49
BR-15A	4/13/2011	9:45	0.201	0.702	0.076	3.511	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.72
BR-16A	4/13/2011	10:17	0.443	0.265	0.029	1.758	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.30
BR-16B	4/13/2011	10:16	0.752	0.565	0.028	1.686	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
BR-16C	4/13/2011	10:15	0.167	1.067	0.018	1.366	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
BR-17A	4/13/2011	10:31	0.275	0.515	0.009	1.523	5.269	0.322	6.230	0.025	0.631	72.65	0.347	5.899	78.88	99.8%	23.39
BR-17B	4/13/2011	10:30	0.143	0.255	0.008	1.278	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.47
BR-17BX	4/13/2011	10:30	0.195	0.257	0.020	N/A	6.499	0.186	5.709	0.019	0.692	63.88	0.205	7.191	69.59	99.8%	23.47

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-17C	4/13/2011	10:29	26.2791	-80.0641	19.1	36.03	26.02	0.725	6.60	7.91	243.3	0.405	0.165	0.23	1.441	0.356	0.140
BR-18A	4/13/2011	10:46	26.2980	-80.0683	1.4	36.05	26.30	0.532	6.57	7.96	249.7	0.539	0.118	0.20	1.422	0.113	0.092
BR-18B	4/13/2011	10:46	26.2980	-80.0683	5.0	36.05	26.19	0.714	6.58	7.98	250.5	0.495	0.120	0.02	1.476	0.176	0.118
BR-18C	4/13/2011	10:45	26.2979	-80.0682	11.1	36.04	26.12	0.981	6.59	8.02	251.5	0.432	0.127	0.16	1.298	0.395	0.152
HW-1A	4/19/2011	9:21	25.9959	-80.0912	1.1	36.15	26.38	1.274	6.56	7.92	130.8	0.398	0.149	0.15	1.197	0.455	0.068
HW-1B	4/19/2011	9:20	25.9959	-80.0910	9.0	36.15	26.36	1.359	6.56	8.09	130.3	0.307	0.074	0.16	1.191	0.323	0.068
HW-1BX	4/19/2011	9:20	25.9959	-80.0910	9.0	36.15	26.36	0.888	6.56	8.09	130.3	N/A	N/A	0.16	1.191	0.214	0.041
HW-1C	4/19/2011	9:19	25.9959	-80.0907	17.9	36.15	25.77	0.997	6.62	8.10	129.2	0.297	0.081	0.21	1.565	0.453	0.075
HW-2A	4/19/2011	9:39	26.0153	-80.0877	1.6	36.15	26.34	0.576	6.56	7.92	149.3	0.273	0.084	0.13	1.012	0.155	0.044
HW-2B	4/19/2011	9:39	26.0151	-80.0874	9.0	36.16	25.92	0.815	6.61	8.12	149.4	0.377	0.137	0.22	1.318	0.251	0.082
HW-2C	4/19/2011	9:37	26.0149	-80.0870	18.0	36.16	24.91	2.054	6.72	8.11	149.7	0.442	0.220	0.26	1.496	1.145	0.109
HW-3A	4/19/2011	9:55	26.0137	-80.0969	1.8	36.16	26.36	0.468	6.56	7.93	162.1	0.582	0.147	0.25	1.327	0.164	0.090
HW-3B	4/19/2011	9:54	26.0137	-80.0967	5.2	36.15	26.33	0.865	6.56	8.13	162.2	0.601	0.166	0.32	1.507	0.272	0.099
HW-3C	4/19/2011	9:54	26.0138	-80.0965	11.4	36.15	26.30	0.979	6.56	8.14	162.4	0.589	0.176	0.27	1.736	0.266	0.110
HW-4A	4/19/2011	10:12	26.0192	-80.0859	2.5	36.14	26.04	10.961	6.59	7.99	164.4	0.401	0.129	0.30	1.428	2.914	1.229
HW-4B	4/19/2011	10:09	26.0192	-80.0864	12.5	36.15	25.59	1.972	6.64	8.11	163.3	0.438	0.141	0.39	1.921	0.680	0.257
HW-4C	4/19/2011	10:08	26.0191	-80.0860	24.1	36.19	24.13	1.547	6.81	7.93	164.2	0.460	0.228	0.22	2.022	1.104	0.129
HW-5A	4/19/2011	10:32	26.0254	-80.0874	1.3	35.79	26.40	9.755	6.57	8.05	159.0	0.297	0.076	0.23	1.112	3.264	1.129
HW-5B	4/19/2011	10:31	26.0252	-80.0872	8.4	36.14	26.32	0.593	6.56	8.15	158.5	0.306	0.085	0.14	1.191	0.110	0.059
HW-5C	4/19/2011	10:30	26.0251	-80.0871	14.7	36.17	24.97	1.385	6.71	8.14	158.9	0.491	0.205	0.18	1.643	0.660	0.166
HW-6A	4/19/2011	10:50	26.0248	-80.0962	1.4	36.15	26.39	0.809	6.55	8.09	153.8	0.583	0.147	0.34	1.589	0.247	0.123
HW-6B	4/19/2011	10:49	26.0247	-80.0959	6.4	36.15	26.37	0.566	6.56	8.14	153.5	0.576	0.155	0.26	1.631	0.169	0.101
HW-6BX	4/19/2011	10:49	26.0247	-80.0959	6.4	36.15	26.37	0.970	6.56	8.14	153.5	N/A	N/A	0.23	1.631	0.226	0.171
HW-6C	4/19/2011	10:48	26.0246	-80.0956	11.5	36.14	26.29	0.828	6.57	8.14	153.0	0.554	0.172	0.28	1.529	0.274	0.143
HW-7A	4/19/2011	11:05	26.0455	-80.0957	1.5	36.15	26.40	0.793	6.55	8.13	163.3	0.586	0.142	0.24	1.401	0.130	0.093
HW-7B	4/19/2011	11:05	26.0455	-80.0956	5.4	36.15	26.38	0.741	6.56	8.16	162.8	0.585	0.134	0.28	1.653	0.124	0.110
HW-7C	4/19/2011	11:04	26.0454	-80.0954	10.6	36.15	26.33	0.718	6.56	8.16	162.8	0.562	0.178	0.33	1.574	0.160	0.134
HW-8A	4/19/2011	11:18	26.0450	-80.1065	1.6	36.28	27.33	1.534	6.45	8.10	161.5	0.348	0.146	0.26	1.063	0.580	0.204
HW-8AX	4/19/2011	11:18	26.0450	-80.1065	1.6	36.28	27.33	1.521	6.45	8.10	161.5	N/A	N/A	0.38	1.063	0.464	0.144
HW-8C	4/19/2011	11:17	26.0450	-80.1064	5.4	36.26	27.29	1.565	6.45	8.14	161.2	0.326	0.134	0.27	1.198	0.471	0.157
HW-9A	4/19/2011	11:43	26.0689	-80.0866	2.0	36.13	26.56	0.735	6.54	8.08	173.6	0.255	0.062	0.12	0.809	0.079	0.058
HW-9B	4/19/2011	11:42	26.0685	-80.0862	8.4	36.14	26.41	0.702	6.55	8.12	173.7	0.441	0.097	0.34	1.193	0.055	0.053
HW-9C	4/19/2011	11:41	26.0683	-80.0858	13.4	36.15	26.02	0.923	6.60	8.11	174.0	0.585	0.171	0.24	1.694	0.185	0.056
HW-10A	4/19/2011	12:03	26.0840	-80.0865	2.4	36.14	26.57	0.715	6.54	8.13	173.1	0.325	0.059	0.17	0.928	0.057	0.036
HW-10B	4/19/2011	12:02	26.0838	-80.0863	9.6	36.13	26.30	4.559	6.57	8.15	173.5	0.680	0.120	0.26	1.546	0.131	0.093
HW-10C	4/19/2011	12:01	26.0835	-80.0860	17.1	36.15	26.07	0.862	6.59	8.16	173.8	0.565	0.145	0.28	2.122	0.279	0.069
HW-11A	4/19/2011	12:19	26.0832	-80.0963	1.5	36.16	26.68	0.648	6.52	8.12	165.8	0.392	0.112	0.37	0.823	0.029	0.008
HW-11C	4/19/2011	12:19	26.0831	-80.0961	8.4	36.16	26.64	1.486	6.53	8.15	165.7	0.414	0.124	0.29	1.318	0.034	0.004
HW-12A	4/19/2011	13:38	26.0951	-80.0967	1.7	35.68	27.66	1.562	6.44	8.04	152.2	1.682	0.503	1.19	2.791	0.689	0.061
HW-12C	4/19/2011	13:37	26.0946	-80.0967	12.2	36.15	26.45	2.178	6.55	8.14	151.9	0.668	0.163	0.99	1.580	0.007	0.004
HW-13A	4/19/2011	12:41	26.0957	-80.0862	2.1	36.14	26.55	0.536	6.54	8.11	166.3	0.428	0.081	0.17	1.048	0.025	0.004

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-17C	4/13/2011	10:29	0.216	0.369	0.025	1.281	5.595	0.165	5.414	0.019	0.542	65.93	0.183	6.138	71.34	99.8%	23.48
BR-18A	4/13/2011	10:46	0.021	0.419	0.025	1.195	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.40
BR-18B	4/13/2011	10:46	0.058	0.538	0.023	1.202	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.44
BR-18C	4/13/2011	10:45	0.243	0.586	0.045	1.314	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.45
HW-1A	4/19/2011	9:21	0.387	0.819	0.012	1.196	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.45
HW-1B	4/19/2011	9:20	0.255	1.036	0.011	1.144	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
HW-1BX	4/19/2011	9:20	0.173	0.674	0.008	1.150	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
HW-1C	4/19/2011	9:19	0.378	0.544	0.010	1.010	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.65
HW-2A	4/19/2011	9:39	0.111	0.421	0.006	1.104	4.877	0.256	4.436	0.015	0.449	87.50	0.271	5.325	91.94	99.8%	23.46
HW-2B	4/19/2011	9:39	0.169	0.564	0.003	1.100	5.318	0.327	4.694	0.018	0.522	69.52	0.344	5.840	74.21	99.8%	23.61
HW-2C	4/19/2011	9:37	1.036	0.909	0.029	1.394	5.465	0.296	5.096	0.014	0.343	66.05	0.310	5.808	71.15	99.8%	23.93
HW-3A	4/19/2011	9:55	0.074	0.304	0.011	0.900	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
HW-3B	4/19/2011	9:54	0.173	0.593	0.008	0.976	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
HW-3C	4/19/2011	9:54	0.156	0.713	0.006	1.128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.48
HW-4A	4/19/2011	10:12	1.685	8.047	0.311	5.096	20.493	0.642	8.051	0.179	0.881	97.58	0.821	21.373	105.63	99.8%	23.55
HW-4B	4/19/2011	10:09	0.423	1.292	0.046	1.522	5.693	0.303	4.548	0.021	0.529	85.58	0.324	6.222	90.13	99.8%	23.70
HW-4C	4/19/2011	10:08	0.975	0.443	0.059	1.380	4.839	0.466	48.756	0.013	0.419	75.29	0.479	5.257	124.05	99.8%	24.19
HW-5A	4/19/2011	10:32	2.135	6.491	0.221	5.155	14.961	0.379	60.079	0.106	0.763	97.67	0.485	15.724	157.75	99.8%	23.18
HW-5B	4/19/2011	10:31	0.051	0.483	0.023	1.116	6.385	0.226	4.279	0.018	0.535	64.84	0.245	6.920	69.12	99.8%	23.46
HW-5C	4/19/2011	10:30	0.494	0.725	0.032	1.485	5.459	0.230	4.304	0.017	0.431	69.89	0.247	5.890	74.20	99.8%	23.91
HW-6A	4/19/2011	10:50	0.124	0.562	0.009	1.252	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.45
HW-6B	4/19/2011	10:49	0.068	0.397	0.006	0.962	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.45
HW-6BX	4/19/2011	10:49	0.055	0.744	0.010	1.333	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.45
HW-6C	4/19/2011	10:48	0.131	0.554	0.006	1.268	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.47
HW-7A	4/19/2011	11:05	0.037	0.663	0.011	0.959	6.940	0.222	8.321	0.028	1.095	76.81	0.250	8.035	85.13	99.8%	23.44
HW-7B	4/19/2011	11:05	0.014	0.617	0.011	0.928	4.436	0.264	6.874	0.026	0.843	83.83	0.290	5.278	90.71	99.8%	23.45
HW-7C	4/19/2011	11:04	0.026	0.558	0.011	1.356	6.124	0.314	7.924	0.025	0.866	83.14	0.339	6.990	91.07	99.8%	23.46
HW-8A	4/19/2011	11:18	0.376	0.954	0.011	1.668	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.23
HW-8AX	4/19/2011	11:18	0.320	1.057	0.011	1.389	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.23
HW-8C	4/19/2011	11:17	0.314	1.094	0.011	1.616	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.24
HW-9A	4/19/2011	11:43	0.021	0.656	0.011	1.392	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38
HW-9B	4/19/2011	11:42	0.002	0.647	0.011	1.351	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
HW-9C	4/19/2011	11:41	0.129	0.738	0.011	1.161	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.57
HW-10A	4/19/2011	12:03	0.021	0.658	0.011	1.365	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38
HW-10B	4/19/2011	12:02	0.038	4.428	0.011	1.585	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
HW-10C	4/19/2011	12:01	0.210	0.583	0.011	1.193	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.55
HW-11A	4/19/2011	12:19	0.021	0.619	0.011	0.005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.36
HW-11C	4/19/2011	12:19	0.030	1.452	0.009	0.422	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.37
HW-12A	4/19/2011	13:38	0.628	0.873	0.041	3.379	7.305	0.279	23.485	0.089	1.809	78.92	0.369	9.114	102.40	99.8%	22.68
HW-12C	4/19/2011	13:37	0.003	2.171	0.009	0.124	4.272	0.251	10.686	0.033	1.012	65.80	0.285	5.284	76.49	99.8%	23.42
HW-13A	4/19/2011	12:41	0.021	0.511	0.014	0.723	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-13B	4/19/2011	12:40	26.0955	-80.0860	8.3	36.14	26.52	0.952	6.54	8.11	166.3	0.439	0.084	0.18	1.145	0.025	0.004
HW-13C	4/19/2011	12:39	26.0953	-80.0857	17.0	36.15	26.24	0.819	6.57	8.11	166.0	0.714	0.240	0.30	1.829	0.025	0.004
HW-14A	4/19/2011	13:55	26.0944	-80.1160	1.9	35.56	28.19	2.461	6.38	8.02	155.6	1.987	0.582	1.34	3.581	0.763	0.091
HW-15A	4/19/2011	13:00	26.1036	-80.0849	1.7	36.14	26.59	0.709	6.53	8.11	167.1	0.388	0.087	0.23	0.800	0.025	0.004
HW-15AX	4/19/2011	13:00	26.1036	-80.0849	1.7	36.14	26.59	0.607	6.53	8.11	167.1	N/A	N/A	0.21	0.800	0.025	0.004
HW-15B	4/19/2011	12:58	26.1032	-80.0846	9.9	36.15	26.37	0.666	6.56	8.13	166.5	0.539	0.129	0.22	1.417	0.025	0.004
HW-15C	4/19/2011	12:58	26.1029	-80.0843	18.6	36.14	26.11	0.565	6.59	8.15	166.8	0.714	0.175	0.22	1.945	0.025	0.004
BR-1A	4/19/2011	14:10	26.0941	-80.1086	1.3	35.56	28.27	3.813	6.38	8.01	165.6	1.917	0.522	1.91	3.020	1.069	0.117
BR-1B	4/19/2011	14:10	26.0940	-80.1086	6.4	35.67	27.86	1.792	6.41	8.04	165.8	1.480	0.446	1.57	2.982	0.905	0.077
BR-1C	4/19/2011	14:09	26.0940	-80.1087	11.5	36.02	27.11	1.387	6.48	8.06	166.1	0.860	0.309	1.02	1.983	0.558	0.045
BR-2A	4/19/2011	13:18	26.1035	-80.0943	1.4	36.17	26.75	0.577	6.51	8.13	166.5	0.454	0.115	0.31	1.460	0.041	0.004
BR-2C	4/19/2011	13:17	26.1034	-80.0942	6.1	36.16	26.67	0.538	6.52	8.14	165.9	0.461	0.098	0.31	1.313	0.018	0.004
BR-3A	5/4/2011	8:16	26.1386	-80.0900	1.4	36.23	26.40	0.703	6.55	8.12	215.3	0.257	0.089	0.18	1.083	0.303	0.140
BR-3C	5/4/2011	8:15	26.1384	-80.0898	10.6	36.22	26.39	0.675	6.55	8.14	216.7	0.255	0.075	0.26	1.119	0.261	0.212
BR-3CX	5/4/2011	8:15	26.1384	-80.0898	10.6	36.22	26.39	0.941	6.55	8.14	216.7	N/A	N/A	0.13	1.119	0.290	0.235
BR-4A	5/4/2011	8:55	26.1609	-80.0769	1.1	36.21	26.38	0.882	6.55	8.09	183.5	0.210	0.068	0.13	1.088	0.259	0.238
BR-4AX	5/4/2011	8:55	26.1609	-80.0769	1.1	36.21	26.38	0.613	6.55	8.09	183.5	N/A	N/A	0.12	1.088	0.242	0.221
BR-4B	5/4/2011	8:54	26.1606	-80.0766	8.3	36.20	26.36	0.680	6.56	8.13	183.1	0.207	0.058	0.13	1.160	0.340	0.248
BR-4C	5/4/2011	8:53	26.1604	-80.0765	18.1	36.21	26.34	0.772	6.56	8.15	183.0	0.294	0.084	0.12	1.120	0.323	0.220
BR-5A	5/4/2011	9:11	26.1599	-80.0884	1.5	36.22	26.36	0.634	6.55	7.91	172.9	0.326	0.082	0.14	1.136	0.325	0.284
BR-5C	5/4/2011	9:10	26.1598	-80.0882	6.6	36.22	26.33	0.671	6.56	7.93	172.4	0.323	0.080	0.19	1.231	0.244	0.148
BR-6A	5/4/2011	9:28	26.1903	-80.0851	1.5	36.34	26.89	0.472	6.49	8.08	140.4	0.455	0.144	0.25	1.268	0.353	0.241
BR-6B	5/4/2011	9:28	26.1901	-80.0850	3.6	36.30	26.69	0.749	6.52	8.13	138.7	0.458	0.135	0.20	1.330	0.411	0.259
BR-6C	5/4/2011	9:27	26.1900	-80.0849	7.3	36.28	26.60	0.837	6.53	8.14	137.6	0.403	0.121	0.24	1.453	0.419	0.242
BR-7A	5/4/2011	9:48	26.2040	-80.0685	2.0	36.22	26.37	0.418	6.55	8.09	163.0	0.257	0.071	0.12	0.945	0.256	0.235
BR-7B	5/4/2011	9:47	26.2790	-80.0683	15.7	36.22	26.28	0.893	6.56	7.90	162.3	0.288	0.084	0.09	1.194	0.239	0.224
BR-7C	5/4/2011	9:46	26.2032	-80.0681	30.3	36.23	24.85	0.636	6.72	7.86	162.3	0.801	0.227	0.20	3.048	0.396	0.287
BR-8A	5/4/2011	10:14	26.2393	-80.0686	1.5	36.22	26.49	0.743	6.54	8.12	163.9	0.316	0.056	0.09	0.945	0.285	0.249
BR-8B	5/4/2011	10:13	26.2390	-80.0685	7.3	36.22	26.39	0.469	6.55	8.15	163.5	0.317	0.060	0.09	1.050	0.265	0.244
BR-8C	5/4/2011	10:12	26.2388	-80.0684	15.3	36.22	26.34	0.363	6.56	8.15	162.5	0.277	0.073	0.13	1.054	0.272	0.251
BR-9A	5/4/2011	10:31	26.2492	-80.0630	1.4	36.22	26.63	0.537	6.53	8.12	174.4	0.099	0.046	0.07	0.756	0.292	0.271
BR-9B	5/4/2011	10:30	26.2490	-80.0630	14.6	36.21	26.29	0.375	6.56	8.12	174.7	0.227	0.065	0.13	0.961	0.311	0.290
BR-9C	5/4/2011	10:29	26.2487	-80.0630	28.2	36.23	25.97	0.447	6.60	8.15	174.8	0.404	0.152	0.15	1.163	0.290	0.268
BR-10A	5/4/2011	10:55	26.2530	-80.0632	1.4	36.20	26.58	0.447	6.53	8.11	176.1	0.106	0.033	0.09	0.710	0.284	0.263
BR-10B	5/4/2011	10:54	26.2527	-80.0632	14.6	36.22	26.34	1.905	6.56	8.14	175.1	0.175	0.060	0.20	0.899	0.351	0.330
BR-10C	5/4/2011	10:53	26.2523	-80.0632	28.0	36.21	25.47	0.597	6.65	8.15	175.5	0.193	0.052	0.13	1.878	0.385	0.308
BR-11A	5/4/2011	11:25	26.2578	-80.0625	1.4	36.21	26.47	0.463	6.54	8.12	179.2	0.159	0.034	0.09	0.817	0.333	0.312
BR-11B	5/4/2011	11:24	26.2572	-80.0623	16.3	36.21	26.29	0.455	6.56	8.15	178.3	0.212	0.070	0.09	1.054	0.292	0.271
BR-11C	5/4/2011	11:23	26.2568	-80.0621	29.1	36.23	25.28	1.005	6.68	8.15	179.0	0.562	0.184	0.15	1.903	0.326	0.294
BR-12A	5/4/2011	11:43	26.2502	-80.0796	1.9	36.32	27.32	0.933	6.45	8.05	178.0	0.632	0.186	0.38	1.385	0.311	0.290
BR-12AX	5/4/2011	11:43	26.2502	-80.0796	1.9	36.32	27.32	0.718	6.45	8.05	178.0	N/A	N/A	0.43	1.385	0.335	0.314

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-13B	4/19/2011	12:40	0.021	0.927	0.011	0.135	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.40
HW-13C	4/19/2011	12:39	0.021	0.794	0.005	0.281	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.49
HW-14A	4/19/2011	13:55	0.672	1.698	0.054	3.751	7.681	0.208	26.795	0.115	2.041	94.85	0.322	9.722	121.65	99.8%	22.41
HW-15A	4/19/2011	13:00	0.021	0.684	0.015	0.460	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38
HW-15AX	4/19/2011	13:00	0.021	0.582	0.011	0.152	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38
HW-15B	4/19/2011	12:58	0.021	0.641	0.004	0.141	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.45
HW-15C	4/19/2011	12:58	0.021	0.540	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.52
BR-1A	4/19/2011	14:10	0.952	2.744	0.069	4.409	4.833	0.188	30.962	0.091	1.722	95.83	0.279	6.555	126.80	99.8%	22.38
BR-1B	4/19/2011	14:10	0.828	0.887	0.060	3.599	5.933	0.292	26.567	0.083	1.633	96.00	0.375	7.566	122.57	99.8%	22.61
BR-1C	4/19/2011	14:09	0.513	0.829	0.040	2.396	4.681	0.207	17.962	0.061	1.387	73.07	0.268	6.068	91.03	99.8%	23.11
BR-2A	4/19/2011	13:18	0.037	0.536	0.011	0.242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.34
BR-2C	4/19/2011	13:17	0.014	0.520	0.001	0.255	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.36
BR-3A	5/4/2011	8:16	0.163	0.400	0.015	0.781	7.803	0.070	5.281	0.015	0.559	84.17	0.085	8.362	89.45	99.8%	23.50
BR-3C	5/4/2011	8:15	0.049	0.414	0.011	0.779	7.300	0.073	3.906	0.013	0.398	77.12	0.087	7.698	81.02	99.8%	23.50
BR-3CX	5/4/2011	8:15	0.055	0.651	0.011	0.732	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.50
BR-4A	5/4/2011	8:55	0.021	0.623	0.006	0.714	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.49
BR-4AX	5/4/2011	8:55	0.021	0.371	0.008	0.748	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.49
BR-4B	5/4/2011	8:54	0.092	0.340	0.010	0.832	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.49
BR-4C	5/4/2011	8:53	0.103	0.449	0.011	1.036	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.51
BR-5A	5/4/2011	9:11	0.041	0.309	0.012	0.944	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.51
BR-5C	5/4/2011	9:10	0.096	0.427	0.010	0.781	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.52
BR-6A	5/4/2011	9:28	0.112	0.119	0.011	1.599	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.42
BR-6B	5/4/2011	9:28	0.152	0.338	0.011	1.184	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
BR-6C	5/4/2011	9:27	0.177	0.418	0.012	1.089	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.48
BR-7A	5/4/2011	9:48	0.021	0.162	0.009	0.681	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.50
BR-7B	5/4/2011	9:47	0.015	0.654	0.009	0.701	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.53
BR-7C	5/4/2011	9:46	0.109	0.240	0.038	0.715	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.00
BR-8A	5/4/2011	10:14	0.036	0.458	0.021	0.754	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.47
BR-8B	5/4/2011	10:13	0.021	0.204	0.019	0.767	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.50
BR-8C	5/4/2011	10:12	0.021	0.091	0.020	0.734	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.51
BR-9A	5/4/2011	10:31	0.021	0.245	0.014	0.686	7.568	0.081	3.284	0.009	0.373	72.68	0.090	7.940	75.96	99.8%	23.42
BR-9B	5/4/2011	10:30	0.021	0.064	0.013	0.946	5.737	0.061	4.326	0.012	0.543	74.78	0.072	6.280	79.10	99.8%	23.52
BR-9C	5/4/2011	10:29	0.022	0.157	0.019	0.771	5.673	0.068	4.875	0.012	0.582	84.33	0.079	6.255	89.21	99.8%	23.64
BR-10A	5/4/2011	10:55	0.021	0.163	0.012	0.706	5.352	0.062	3.788	0.011	0.475	83.83	0.073	5.826	87.62	99.8%	23.42
BR-10B	5/4/2011	10:54	0.021	1.554	0.014	0.807	6.396	0.068	1.828	0.007	0.215	86.08	0.074	6.610	87.91	99.8%	23.51
BR-10C	5/4/2011	10:53	0.077	0.212	0.044	0.728	5.512	0.058	3.747	0.012	0.459	79.91	0.070	5.972	83.65	99.8%	23.79
BR-11A	5/4/2011	11:25	0.021	0.130	0.010	0.726	5.470	0.068	3.992	0.012	0.470	85.50	0.080	5.940	89.49	99.8%	23.47
BR-11B	5/4/2011	11:24	0.021	0.163	0.013	0.710	6.034	0.061	3.595	0.012	0.460	83.02	0.073	6.494	86.61	99.8%	23.52
BR-11C	5/4/2011	11:23	0.032	0.679	0.021	0.591	9.612	0.067	4.546	0.012	0.535	85.75	0.079	10.147	90.30	99.8%	23.86
BR-12A	5/4/2011	11:43	0.021	0.622	0.015	1.715	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.27
BR-12AX	5/4/2011	11:43	0.021	0.383	0.016	1.338	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.27

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-13A	5/4/2011	12:37	26.2593	-80.0830	1.4	35.73	27.34	1.672	6.47	8.04	179.9	1.486	0.417	1.02	2.844	0.396	0.371
BR-14A	5/4/2011	12:23	26.2618	-80.0853	1.4	34.10	27.77	0.697	6.48	7.96	172.4	2.437	1.198	1.40	5.322	0.351	0.330
BR-15A	5/4/2011	12:30	26.2632	-80.0834	1.7	36.17	27.34	1.322	6.45	7.99	175.2	1.125	0.401	0.87	2.008	0.386	0.365
BR-16A	5/4/2011	15:53	26.2622	-80.0736	1.2	36.01	27.52	0.806	6.44	7.99	181.5	0.816	0.297	0.61	1.758	0.069	0.052
BR-16B	5/4/2011	12:52	26.2621	-80.0735	3.7	36.27	27.36	0.678	6.45	8.10	181.7	0.839	0.203	0.47	1.927	0.114	0.079
BR-16C	5/4/2011	12:51	26.2619	-80.0735	11.0	36.28	26.66	0.713	6.52	8.15	182.4	0.581	0.185	0.24	1.511	0.102	0.038
BR-17A	5/4/2011	13:06	26.2765	-80.0643	1.3	36.23	26.78	0.386	6.51	8.03	185.1	0.281	0.082	0.14	0.884	0.071	0.041
BR-17B	5/4/2011	13:05	26.2763	-80.0642	8.9	36.22	26.47	1.270	6.54	8.12	184.5	0.269	0.088	0.20	0.966	0.113	0.037
BR-17BX	5/4/2011	13:05	26.2763	-80.0642	8.9	36.22	26.47	0.617	6.54	8.12	184.5	N/A	N/A	0.19	0.966	0.137	0.051
BR-17C	5/4/2011	13:05	26.2761	-80.0642	17.8	36.22	26.43	0.662	6.55	8.12	184.6	0.322	0.088	0.16	1.091	0.148	0.063
BR-18A	5/4/2011	13:19	26.2989	-80.0684	1.5	36.22	27.02	1.036	6.48	8.05	186.6	0.582	0.091	0.45	1.011	0.083	0.064
BR-18B	5/4/2011	13:19	26.2986	-80.0684	3.8	36.27	26.70	0.357	6.52	8.16	187.0	0.505	0.147	0.41	1.232	0.048	0.045
BR-18C	5/4/2011	13:18	26.2983	-80.0683	8.9	36.25	26.53	0.729	6.54	8.15	187.0	0.438	0.130	0.26	1.210	0.179	0.074
HW-1A	5/19/2011	8:18	25.9950	-80.0892	1.2	36.38	26.47	1.302	6.54	7.89	222.2	0.272	0.086	0.21	1.021	0.145	0.050
HW-1B	5/19/2011	8:16	25.9952	-80.0892	11.5	36.37	26.34	0.471	6.55	7.98	221.4	0.301	0.100	0.18	1.249	0.170	0.040
HW-1BX	5/19/2011	8:16	25.9952	-80.0892	11.5	36.37	26.34	0.671	6.55	7.96	221.4	N/A	N/A	0.12	1.249	0.111	0.034
HW-1C	5/19/2011	8:15	25.9953	-80.0892	19.4	36.37	26.33	1.535	6.55	8.01	222.7	0.258	0.077	0.19	1.258	0.302	0.055
HW-2A	5/19/2011	8:38	26.0139	-80.0859	1.7	36.33	26.37	2.825	6.55	8.09	152.2	0.258	0.081	0.19	1.133	0.592	0.222
HW-2B	5/19/2011	8:37	26.0140	-80.0859	11.4	36.37	26.40	1.509	6.55	8.13	149.6	0.250	0.070	0.20	1.228	0.326	0.040
HW-2C	5/19/2011	8:36	26.0142	-80.0859	22.1	36.37	26.30	0.697	6.56	8.15	146.4	0.318	0.116	0.31	1.298	0.232	0.211
HW-3A	5/19/2011	8:53	26.0140	-80.0945	1.7	36.37	26.56	1.258	6.53	8.09	126.1	0.314	0.091	0.28	1.122	0.245	0.079
HW-3B	5/19/2011	8:52	26.0140	-80.0945	10.1	36.37	26.41	1.608	6.54	8.09	122.6	0.258	0.085	0.23	1.081	0.179	0.038
HW-3C	5/19/2011	8:52	26.0140	-80.0945	14.7	36.37	26.30	1.241	6.56	8.01	119.9	0.259	0.089	0.23	1.330	0.364	0.064
HW-4A	5/19/2011	9:07	26.0184	-80.0862	1.1	36.20	26.38	4.596	6.55	7.91	117.2	0.271	0.081	0.18	1.130	1.515	0.466
HW-4B	5/19/2011	9:06	26.0185	-80.0861	11.9	36.37	26.30	1.241	6.56	8.02	113.2	0.377	0.126	0.16	1.241	0.110	0.040
HW-4C	5/19/2011	9:05	26.0186	-80.0860	20.2	36.37	26.28	0.939	6.56	8.01	109.2	0.368	0.136	0.18	1.579	0.207	0.186
HW-5A	5/19/2011	9:29	26.0245	-80.0862	1.3	36.38	26.54	1.500	6.53	8.12	117.5	0.277	0.069	0.10	0.954	0.176	0.072
HW-5B	5/19/2011	9:29	26.0245	-80.0862	11.6	36.37	26.39	0.510	6.55	8.02	114.5	0.331	0.090	0.13	1.109	0.078	0.057
HW-5C	5/19/2011	9:28	26.0245	-80.0861	21.7	36.37	26.30	1.082	6.56	8.00	110.6	0.344	0.110	0.21	1.194	0.560	0.064
HW-6A	5/19/2011	9:45	26.0247	-80.0946	1.4	36.35	26.63	0.742	6.52	7.97	107.6	0.327	0.084	0.28	1.003	0.174	0.050
HW-6B	5/19/2011	9:44	26.0246	-80.0946	8.1	36.37	26.49	2.623	6.54	8.14	104.6	0.273	0.077	0.18	1.059	0.315	0.089
HW-6BX	5/19/2011	9:44	26.0246	-80.0946	8.1	36.37	26.49	1.278	6.54	8.00	104.6	N/A	N/A	0.20	1.059	0.199	0.079
HW-6C	5/19/2011	9:44	26.0246	-80.0945	12.6	36.36	26.36	0.816	6.55	8.05	101.0	0.336	0.091	0.23	1.234	0.249	0.076
HW-7A	5/19/2011	10:01	26.0453	-80.0945	1.6	36.37	26.59	1.982	6.52	8.09	121.4	0.265	0.068	0.30	0.895	0.214	0.058
HW-7B	5/19/2011	10:00	26.0452	-80.0944	5.3	36.37	26.56	1.742	6.53	8.01	119.9	0.261	0.074	0.24	1.030	0.255	0.085
HW-7C	5/19/2011	10:00	26.0452	-80.0943	10.4	36.37	26.55	3.134	6.53	7.94	117.6	0.245	0.076	0.24	1.023	0.154	0.066
HW-8A	5/19/2011	10:14	26.0448	-80.1060	1.7	36.38	26.58	1.029	6.53	7.90	130.4	0.309	0.093	0.27	1.154	0.169	0.113
HW-8AX	5/19/2011	10:14	26.0448	-80.1060	1.7	36.38	26.58	0.635	6.53	7.92	130.4	N/A	N/A	0.33	1.154	0.169	0.096
HW-8C	5/19/2011	10:13	26.0448	-80.1059	4.5	36.37	26.57	4.773	6.53	7.96	129.4	0.341	0.107	0.22	1.195	0.382	0.061
HW-9A	5/19/2011	10:31	26.0681	-80.0852	1.4	36.40	26.57	6.603	6.53	7.96	137.2	0.306	0.062	0.09	0.979	0.086	0.003
HW-9B	5/19/2011	10:31	26.0680	-80.0851	10.6	36.37	26.39	0.772	6.55	8.02	130.0	0.341	0.095	0.13	1.224	0.099	0.038

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-13A	5/4/2011	12:37	0.025	1.276	0.050	1.698	8.536	0.108	24.258	0.076	2.098	97.08	0.184	10.634	121.34	99.8%	22.82
BR-14A	5/4/2011	12:23	0.021	0.346	0.026	2.368	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.46
BR-15A	5/4/2011	12:30	0.021	0.936	0.027	1.301	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.15
BR-16A	5/4/2011	15:53	0.017	0.737	0.016	1.172	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.97
BR-16B	5/4/2011	12:52	0.035	0.564	0.015	1.241	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.22
BR-16C	5/4/2011	12:51	0.064	0.611	0.012	1.033	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
BR-17A	5/4/2011	13:06	0.030	0.315	0.005	0.628	6.181	0.065	4.894	0.014	0.574	77.57	0.079	6.756	82.46	99.8%	23.38
BR-17B	5/4/2011	13:05	0.076	1.157	0.009	0.916	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.47
BR-17BX	5/4/2011	13:05	0.086	0.480	0.012	0.697	5.518	0.060	5.999	0.018	0.916	79.29	0.079	6.434	85.29	99.8%	23.47
BR-17C	5/4/2011	13:05	0.085	0.514	0.011	0.644	6.168	0.095	3.827	0.014	0.432	85.75	0.109	6.600	89.58	99.8%	23.48
BR-18A	5/4/2011	13:19	0.019	0.953	0.013	1.332	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.29
BR-18B	5/4/2011	13:19	0.003	0.309	0.016	1.010	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
BR-18C	5/4/2011	13:18	0.105	0.550	0.011	0.824	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.47
HW-1A	5/19/2011	8:18	0.095	1.157	0.018	0.224	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.59
HW-1B	5/19/2011	8:16	0.130	0.301	0.013	0.172	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.63
HW-1BX	5/19/2011	8:16	0.077	0.560	0.015	0.136	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.63
HW-1C	5/19/2011	8:15	0.247	1.233	0.034	0.293	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.63
HW-2A	5/19/2011	8:38	0.370	2.233	0.049	0.550	11.024	0.066	5.494	0.014	0.627	94.50	0.080	11.651	99.99	99.8%	23.59
HW-2B	5/19/2011	8:37	0.286	1.183	0.011	0.059	5.788	0.066	6.280	0.015	0.822	67.93	0.081	6.609	74.21	99.8%	23.61
HW-2C	5/19/2011	8:36	0.021	0.465	0.007	0.070	6.018	0.035	5.754	0.016	0.679	59.64	0.050	6.697	65.40	99.8%	23.64
HW-3A	5/19/2011	8:53	0.166	1.013	0.020	0.387	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.56
HW-3B	5/19/2011	8:52	0.141	1.429	0.007	0.139	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.60
HW-3C	5/19/2011	8:52	0.300	0.877	0.007	0.197	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.63
HW-4A	5/19/2011	9:07	1.049	3.081	0.107	1.284	7.768	0.097	5.088	0.025	0.575	62.88	0.122	8.344	67.96	99.8%	23.49
HW-4B	5/19/2011	9:06	0.070	1.131	0.001	0.124	5.113	0.051	6.419	0.013	0.710	69.56	0.064	5.823	75.98	99.8%	23.64
HW-4C	5/19/2011	9:05	0.021	0.732	0.011	0.086	4.954	0.040	5.902	0.013	0.648	63.48	0.053	5.602	69.39	99.8%	23.64
HW-5A	5/19/2011	9:29	0.104	1.324	0.018	0.210	5.992	0.050	6.169	0.023	0.958	79.19	0.072	6.950	85.36	99.8%	23.57
HW-5B	5/19/2011	9:29	0.021	0.432	0.001	0.130	4.599	0.047	4.866	0.013	0.504	70.93	0.060	5.103	75.79	99.8%	23.61
HW-5C	5/19/2011	9:28	0.496	0.522	0.011	0.092	4.575	0.045	4.969	0.017	0.555	75.73	0.063	5.129	80.69	99.8%	23.64
HW-6A	5/19/2011	9:45	0.124	0.568	0.011	0.206	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.52
HW-6B	5/19/2011	9:44	0.226	2.308	0.011	0.717	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.58
HW-6BX	5/19/2011	9:44	0.120	1.079	0.016	0.690	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.58
HW-6C	5/19/2011	9:44	0.173	0.567	0.007	0.384	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.62
HW-7A	5/19/2011	10:01	0.156	1.768	0.001	0.284	5.968	0.060	4.279	0.012	0.495	71.25	0.072	6.462	75.53	99.8%	23.55
HW-7B	5/19/2011	10:00	0.170	1.487	0.009	0.661	4.412	0.045	5.463	0.008	0.591	62.77	0.053	5.003	68.23	99.8%	23.56
HW-7C	5/19/2011	10:00	0.088	2.980	0.014	0.552	4.642	0.057	4.875	0.013	0.560	63.16	0.070	5.202	68.03	99.8%	23.56
HW-8A	5/19/2011	10:14	0.056	0.860	0.010	0.685	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.55
HW-8AX	5/19/2011	10:14	0.073	0.466	0.011	0.667	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.55
HW-8C	5/19/2011	10:13	0.321	4.391	0.029	0.349	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.56
HW-9A	5/19/2011	10:31	0.083	6.517	0.028	0.230	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.57
HW-9B	5/19/2011	10:31	0.061	0.673	0.011	0.050	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.61

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-9C	5/19/2011	10:30	26.0680	-80.0851	15.6	36.37	26.38	1.426	6.55	8.01	128.3	0.337	0.083	0.15	1.221	0.185	0.036
HW-10A	5/19/2011	10:44	26.0831	-80.0849	1.2	36.37	26.66	3.070	6.52	8.04	127.5	0.286	0.065	0.25	0.926	0.044	0.040
HW-10B	5/19/2011	10:43	26.0830	-80.0848	7.8	36.37	26.42	4.082	6.54	8.09	123.6	0.325	0.084	0.20	1.156	0.212	0.043
HW-10C	5/19/2011	10:43	26.0830	-80.0847	13.9	36.35	26.39	0.902	6.55	7.98	121.8	0.344	0.084	0.21	1.155	0.096	0.031
HW-11A	5/19/2011	10:54	26.0826	-80.0957	1.7	36.33	26.68	0.903	6.52	8.01	123.1	0.357	0.110	0.25	1.175	0.205	0.036
HW-11C	5/19/2011	10:53	26.0826	-80.0957	7.4	36.33	26.55	0.629	6.53	8.11	123.9	0.391	0.147	0.28	1.190	0.196	0.051
HW-12A	5/19/2011	11:05	26.0933	-80.0959	1.1	36.36	26.67	15.826	6.52	8.08	129.5	0.346	0.095	0.17	0.958	0.207	0.058
HW-12B	5/19/2011	11:04	26.0933	-80.0959	6.9	36.35	26.49	7.404	6.54	7.98	127.9	0.317	0.084	0.24	1.125	0.202	0.104
HW-12BX	5/19/2011	11:04	26.0933	-80.0959	6.9	36.35	26.49	24.172	6.54	7.98	127.9	N/A	N/A	0.59	1.125	0.339	0.076
HW-12C	5/19/2011	11:04	26.0933	-80.0959	13.2	36.35	26.48	12.412	6.54	8.01	127.1	0.380	0.103	0.25	1.364	0.267	0.078
HW-13A	5/19/2011	11:18	26.0947	-80.0837	1.7	36.37	26.57	0.832	6.53	8.04	131.9	0.312	0.071	0.15	1.056	0.070	0.049
HW-13B	5/19/2011	11:17	26.0946	-80.0837	7.5	36.36	26.45	2.247	6.54	8.09	130.1	0.333	0.099	0.16	1.081	0.069	0.048
HW-13C	5/19/2011	11:17	26.0945	-80.0836	14.4	36.36	26.38	1.778	6.55	8.12	128.7	0.312	0.117	0.19	1.203	0.167	0.080
HW-14A	5/19/2011	12:07	26.0944	-80.1152	1.9	35.96	27.08	6.514	6.49	7.98	143.6	1.421	0.606	0.62	2.433	0.328	0.128
HW-15A	5/19/2011	11:28	26.1027	-80.0830	1.2	36.38	26.71	1.949	6.51	8.08	140.3	0.346	0.086	0.12	0.932	0.126	0.105
HW-15AX	5/19/2011	11:28	26.1027	-80.0830	1.2	36.38	26.71	6.658	6.51	8.08	140.3	N/A	N/A	0.13	0.932	0.140	0.122
HW-15B	5/19/2011	11:27	26.1027	-80.0829	8.1	36.36	26.45	3.024	6.54	8.14	139.9	0.322	0.072	0.13	1.091	0.095	0.025
HW-15C	5/19/2011	11:27	26.1026	-80.0829	15.9	36.36	26.39	1.164	6.55	8.01	138.9	0.302	0.096	0.11	1.191	0.036	0.015
BR-1A	5/19/2011	11:56	26.0936	-80.1059	1.6	36.29	26.68	2.642	6.52	7.93	145.2	0.485	0.161	0.37	1.257	0.204	0.040
BR-1B	5/19/2011	11:55	26.0936	-80.1058	7.5	36.32	26.60	0.787	6.53	8.08	144.9	0.441	0.163	0.36	1.257	0.192	0.171
BR-1C	5/19/2011	11:54	26.0936	-80.1058	13.6	36.33	26.56	1.187	6.53	7.98	143.4	0.442	0.158	0.53	1.265	0.162	0.079
BR-2A	5/19/2011	11:39	26.1028	-80.0937	1.5	36.36	26.58	0.209	6.53	8.03	153.2	0.375	0.103	0.21	0.933	0.041	0.034
BR-2C	5/19/2011	11:38	26.1027	-80.0937	8.3	36.36	26.53	1.088	6.53	8.08	152.6	0.373	0.113	0.25	1.098	0.080	0.041
BR-3A	6/23/2011	12:46	26.1395	-80.0918	1.9	36.49	29.42	0.807	6.23	8.04	179.3	0.397	0.077	0.43	1.146	0.351	0.000
BR-3C	6/23/2011	12:45	26.1392	-80.0916	5.6	36.51	29.41	1.579	6.23	8.04	182.3	0.379	0.072	0.31	1.447	0.443	0.064
BR-3CX	6/23/2011	12:45	26.1392	-80.0916	5.6	36.51	29.41	1.107	6.23	8.04	182.3	N/A	N/A	0.38	1.447	0.394	0.059
BR-4A	6/23/2011	13:07	26.1614	-80.0773	1.5	36.50	29.71	0.808	6.20	8.06	171.8	0.620	0.083	0.44	1.309	0.149	0.000
BR-4AX	6/23/2011	13:07	26.1614	-80.0773	1.5	36.50	29.71	0.899	6.20	8.06	171.8	N/A	N/A	0.32	1.309	0.085	0.000
BR-4B	6/23/2011	13:05	26.1610	-80.0771	7.8	36.43	28.83	1.020	6.29	8.06	173.1	0.659	0.093	0.30	1.726	0.090	0.000
BR-4C	6/23/2011	13:05	26.1608	-80.0769	17.1	36.38	27.89	0.545	6.39	8.06	174.4	0.245	0.086	0.24	1.243	0.000	0.000
BR-5A	6/23/2011	13:19	26.1594	-80.0889	1.8	36.51	29.51	0.987	6.22	8.10	171.8	0.589	0.107	0.34	1.131	0.348	0.008
BR-5C	6/23/2011	13:18	26.1593	-80.0887	6.1	36.45	28.96	1.192	6.27	8.06	172.4	0.386	0.066	0.48	1.415	0.294	0.069
BR-6A	6/23/2011	13:39	26.1908	-80.0857	1.6	36.48	29.65	1.814	6.20	8.09	169.9	0.335	0.061	0.31	1.003	0.358	0.044
BR-6B	6/23/2011	13:38	26.1907	-80.0856	5.0	36.48	29.11	1.242	6.26	8.04	170.4	0.399	0.126	0.33	1.204	0.355	0.000
BR-6C	6/23/2011	13:38	26.1906	-80.0854	7.8	36.48	29.07	1.530	6.26	8.04	170.6	0.409	0.100	0.29	1.162	0.432	0.097
BR-7A	6/23/2011	13:57	26.2058	-80.0686	1.2	36.42	29.35	0.699	6.24	8.05	187.4	0.920	0.108	0.30	2.296	0.000	0.000
BR-7B	6/23/2011	13:56	26.2051	-80.0685	14.9	36.51	28.29	0.717	6.34	8.04	188.9	0.549	0.091	0.29	1.506	0.118	0.006
BR-7C	6/23/2011	13:55	26.2045	-80.0683	29.1	36.37	27.56	0.866	6.42	8.05	189.9	0.633	0.104	0.19	1.402	0.075	0.000
BR-8A	6/23/2011	14:17	26.2399	-80.0702	1.5	36.44	29.23	0.513	6.25	8.03	175.8	0.609	0.086	0.28	1.273	0.049	0.000
BR-8B	6/23/2011	14:16	26.2396	-80.0700	10.6	36.42	28.86	1.516	6.29	8.08	177.1	0.725	0.096	0.29	1.788	0.170	0.000
BR-8C	6/23/2011	14:15	26.2393	-80.0698	20.6	36.39	28.22	1.332	6.35	8.08	178.1	0.700	0.161	0.23	1.750	0.124	0.000

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-9C	5/19/2011	10:30	0.149	1.241	0.002	0.086	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.61
HW-10A	5/19/2011	10:44	0.004	3.026	0.014	0.020	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.52
HW-10B	5/19/2011	10:43	0.169	3.870	0.029	0.227	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.60
HW-10C	5/19/2011	10:43	0.065	0.806	0.011	0.101	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.60
HW-11A	5/19/2011	10:54	0.169	0.698	0.008	0.448	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.49
HW-11C	5/19/2011	10:53	0.145	0.433	0.012	0.486	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.53
HW-12A	5/19/2011	11:05	0.149	15.619	0.066	0.996	3.509	0.043	5.440	0.016	0.690	54.88	0.059	4.199	60.32	99.8%	23.51
HW-12B	5/19/2011	11:04	0.098	7.202	0.054	0.916	3.641	0.050	6.306	0.016	0.612	61.22	0.066	4.253	67.52	99.8%	23.56
HW-12BX	5/19/2011	11:04	0.263	23.833	0.103	0.989	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.56
HW-12C	5/19/2011	11:04	0.189	12.145	0.053	1.114	3.658	0.054	6.163	0.014	0.675	60.40	0.068	4.333	66.56	99.8%	23.57
HW-13A	5/19/2011	11:18	0.021	0.762	0.011	0.144	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.55
HW-13B	5/19/2011	11:17	0.021	2.178	0.022	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.58
HW-13C	5/19/2011	11:17	0.087	1.611	0.022	0.220	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.61
HW-14A	5/19/2011	12:07	0.200	6.186	0.074	3.062	6.280	0.081	18.976	0.050	1.684	92.08	0.131	7.963	111.06	99.8%	23.08
HW-15A	5/19/2011	11:28	0.021	1.823	0.021	0.090	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.51
HW-15AX	5/19/2011	11:28	0.018	6.518	0.045	0.684	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.51
HW-15B	5/19/2011	11:27	0.070	2.929	0.034	0.192	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.58
HW-15C	5/19/2011	11:27	0.021	1.128	0.009	1.259	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.60
BR-1A	5/19/2011	11:56	0.164	2.438	0.021	0.751	4.263	0.077	6.313	0.018	0.615	61.38	0.095	4.877	67.69	99.8%	23.46
BR-1B	5/19/2011	11:55	0.021	0.595	0.035	0.869	4.633	0.076	7.510	0.022	0.691	73.29	0.098	5.323	80.80	99.8%	23.51
BR-1C	5/19/2011	11:54	0.083	1.025	0.007	0.658	6.357	0.078	7.226	0.022	0.758	86.17	0.100	7.114	93.39	99.8%	23.52
BR-2A	5/19/2011	11:39	0.007	0.168	0.011	0.322	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.54
BR-2C	5/19/2011	11:38	0.039	1.008	0.008	0.463	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.56
BR-3A	6/23/2011	12:46	0.351	0.456	0.025	1.474	8.951	0.150	7.065	0.015	0.732	41.63	0.166	9.683	48.70	99.8%	22.69
BR-3C	6/23/2011	12:45	0.379	1.136	0.035	2.229	7.957	0.134	6.074	0.019	0.625	51.69	0.153	8.582	57.77	99.8%	22.71
BR-3CX	6/23/2011	12:45	0.335	0.713	0.035	1.822	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.71
BR-4A	6/23/2011	13:07	0.149	0.659	0.021	1.569	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.60
BR-4AX	6/23/2011	13:07	0.085	0.814	0.027	1.417	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.60
BR-4B	6/23/2011	13:05	0.090	0.930	0.017	1.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.85
BR-4C	6/23/2011	13:05	0.000	0.545	0.020	1.283	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.13
BR-5A	6/23/2011	13:19	0.340	0.639	0.024	1.636	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.68
BR-5C	6/23/2011	13:18	0.225	0.898	0.030	1.277	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
BR-6A	6/23/2011	13:39	0.314	1.456	0.022	1.821	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.61
BR-6B	6/23/2011	13:38	0.355	0.887	0.019	1.424	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
BR-6C	6/23/2011	13:38	0.335	1.098	0.040	1.704	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.80
BR-7A	6/23/2011	13:57	0.000	0.699	0.017	0.733	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.67
BR-7B	6/23/2011	13:56	0.112	0.599	0.022	1.397	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.09
BR-7C	6/23/2011	13:55	0.075	0.791	0.017	1.226	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.23
BR-8A	6/23/2011	14:17	0.049	0.464	0.016	1.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.72
BR-8B	6/23/2011	14:16	0.170	1.346	0.018	1.030	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.83
BR-8C	6/23/2011	14:15	0.124	1.208	0.017	0.884	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.02

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-9A	6/23/2011	14:33	26.2494	-80.0642	1.9	36.45	29.17	0.773	6.25	8.01	181.1	0.405	0.058	0.37	1.034	0.078	0.000
BR-9B	6/23/2011	14:32	26.2487	-80.0639	16.8	36.42	28.73	1.016	6.30	8.05	182.3	0.743	0.139	0.26	2.064	0.103	0.000
BR-9C	6/23/2011	14:31	26.2482	-80.0637	26.8	36.38	27.37	0.958	6.44	8.06	183.1	0.456	0.155	0.18	1.673	0.191	0.021
BR-10A	6/23/2011	14:58	26.2558	-80.0639	1.6	36.43	29.13	1.598	6.26	8.03	175.0	0.456	0.111	0.24	0.931	0.030	0.000
BR-10B	6/23/2011	14:57	26.2552	-80.0638	15.6	36.41	28.74	1.294	6.30	8.07	175.0	0.648	0.110	0.25	2.014	0.105	0.000
BR-10C	6/23/2011	14:55	26.2544	-80.0636	22.6	36.46	27.75	1.397	6.40	8.07	175.6	0.493	0.143	0.20	1.624	0.246	0.072
BR-11A	6/23/2011	15:26	26.2590	-80.0638	1.3	36.45	29.24	0.619	6.25	8.01	148.6	0.581	0.088	0.25	1.188	0.050	0.040
BR-11B	6/23/2011	15:25	26.2583	-80.0635	11.7	36.41	28.75	0.888	6.30	8.07	147.6	0.658	0.101	0.24	1.592	0.137	0.071
BR-11C	6/23/2011	15:24	26.2583	-80.0635	22.7	36.38	27.59	0.866	6.42	8.08	145.8	0.626	0.136	0.21	1.589	0.129	0.030
BR-12A	6/23/2011	17:35	26.2504	-80.0799	1.2	36.46	30.05	1.105	6.17	7.94	152.4	0.583	0.104	0.31	1.495	0.491	0.087
BR-12AX	6/23/2011	17:35	26.2504	-80.0799	1.2	36.46	30.05	0.078	6.17	7.94	152.4	N/A	N/A	0.38	1.495	0.078	0.078
BR-13A	6/23/2011	16:58	26.2597	-80.0834	1.9	36.46	30.48	1.065	6.12	8.02	148.5	0.959	0.190	0.66	0.681	0.212	0.113
BR-14A	6/23/2011	17:08	26.2618	-80.0854	1.8	35.96	30.81	0.963	6.11	7.99	147.7	1.643	0.579	1.16	3.060	0.206	0.206
BR-15A	6/23/2011	17:14	26.2631	-80.0837	1.5	36.47	30.54	0.595	6.12	8.00	151.4	0.776	0.151	0.62	2.089	0.148	0.148
BR-16A	6/23/2011	16:47	26.2625	-80.0742	1.7	36.48	29.63	0.922	6.21	8.00	153.1	0.542	0.086	0.54	1.308	0.125	0.101
BR-16B	6/23/2011	16:46	26.2623	-80.0740	6.1	36.49	29.54	1.549	6.21	8.03	153.3	0.592	0.090	0.32	1.432	0.182	0.173
BR-16C	6/23/2011	16:45	26.2621	-80.0739	11.7	36.42	28.91	1.172	6.28	8.05	152.0	0.793	0.146	0.32	1.946	0.223	0.223
BR-17A	6/23/2011	16:27	26.2768	-80.0660	1.2	36.42	29.09	2.416	6.26	8.00	148.3	0.607	0.098	0.29	1.506	0.273	0.105
BR-17B	6/23/2011	16:26	26.2767	-80.0659	7.0	36.42	29.00	0.392	6.27	8.03	149.6	0.323	0.090	0.29	1.825	0.128	0.128
BR-17BX	6/23/2011	16:26	26.2767	-80.0659	7.0	36.42	29.00	0.961	6.27	8.03	149.6	N/A	N/A	0.32	1.825	0.086	0.086
BR-17C	6/23/2011	16:24	26.2764	-80.0653	18.5	36.42	28.72	0.715	6.30	8.05	143.3	0.775	0.109	0.28	1.978	0.142	0.142
BR-18A	6/23/2011	16:04	26.2989	-80.0693	0.8	36.48	29.52	1.790	6.22	8.02	150.7	0.606	0.079	0.33	1.117	0.218	0.087
BR-18B	6/23/2011	16:04	26.2987	-80.0692	5.3	36.47	29.27	1.331	6.24	8.07	150.7	0.726	0.086	0.53	1.543	0.293	0.009
BR-18C	6/23/2011	16:03	26.2985	-80.0691	11.4	36.43	28.84	0.857	6.29	8.06	149.9	0.756	0.141	0.27	1.692	0.112	0.000
HW-1A	7/6/2011	11:24	25.9960	-80.0893	1.8	36.42	28.96	0.253	6.28	8.06	208.8	0.341	0.080	0.24	1.309	0.063	0.042
HW-1B	7/6/2011	11:23	25.9959	-80.0892	9.2	36.41	28.96	0.636	6.27	7.79	208.8	0.365	0.094	0.23	1.355	0.085	0.064
HW-1BX	7/6/2011	11:23	25.9959	-80.0892	9.2	36.41	28.96	0.758	6.27	7.79	208.8	N/A	N/A	0.35	1.355	0.090	0.069
HW-1C	7/6/2011	11:22	25.9958	-80.0892	19.2	36.44	28.89	1.300	6.28	7.80	219.6	0.346	0.107	0.32	1.352	0.088	0.067
HW-2A	7/6/2011	11:48	26.0154	-80.0860	2.0	36.39	28.97	0.646	6.28	7.83	187.4	0.346	0.060	0.25	1.374	0.132	0.111
HW-2B	7/6/2011	11:47	26.0153	-80.0862	11.0	36.41	28.97	0.795	6.27	8.03	188.7	0.347	0.061	0.24	1.303	0.068	0.047
HW-2C	7/6/2011	11:46	26.0151	-80.0863	23.0	36.44	28.90	1.287	6.28	8.04	192.2	0.438	0.113	0.34	1.345	0.148	0.127
HW-3A	7/6/2011	12:05	26.0156	-80.0930	0.8	36.36	28.97	0.679	6.28	8.04	181.1	0.427	0.060	0.34	1.475	0.113	0.092
HW-3B	7/6/2011	12:04	26.0154	-80.0934	10.2	36.39	28.98	0.669	6.27	7.95	184.3	0.367	0.056	0.34	1.295	0.127	0.106
HW-3C	7/6/2011	12:03	26.0152	-80.0937	14.4	36.41	28.95	2.007	6.28	7.73	185.6	0.378	0.068	0.25	1.344	0.165	0.144
HW-4A	7/6/2011	12:18	26.0193	-80.0864	1.7	36.14	28.97	7.318	6.28	7.81	177.9	0.386	0.080	0.28	1.455	2.336	0.432
HW-4B	7/6/2011	12:18	26.0192	-80.0862	12.2	36.40	28.98	2.610	6.27	7.82	180.7	0.435	0.154	0.25	1.322	0.035	0.014
HW-4C	7/6/2011	12:17	26.0191	-80.0860	25.3	36.44	28.90	2.077	6.28	7.80	182.5	0.362	0.110	0.30	1.419	0.118	0.097
HW-5A	7/6/2011	12:41	26.0247	-80.0846	2.0	36.35	28.97	2.295	6.28	7.99	175.0	0.420	0.084	0.27	1.325	0.150	0.129
HW-5B	7/6/2011	12:40	26.0244	-80.0849	15.1	36.40	28.98	0.610	6.27	7.85	178.4	0.387	0.197	0.39	1.335	0.044	0.023
HW-5C	7/6/2011	12:39	26.0244	-80.0852	28.5	36.44	28.88	1.940	6.28	7.87	179.7	0.428	0.126	0.27	1.383	0.041	0.020
HW-6A	7/6/2011	13:02	26.0255	-80.0955	1.6	36.33	28.92	2.321	6.28	8.05	175.4	0.409	0.076	0.26	1.369	0.077	0.056

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-9A	6/23/2011	14:33	0.078	0.695	0.014	1.006	9.619	0.173	5.831	0.015	0.644	56.40	0.188	10.263	62.23	99.8%	22.75
BR-9B	6/23/2011	14:32	0.103	0.913	0.019	0.938	9.248	0.180	7.807	0.018	0.775	44.73	0.197	10.023	52.54	99.8%	22.87
BR-9C	6/23/2011	14:31	0.170	0.767	0.025	1.264	7.820	0.231	4.948	0.012	0.518	32.54	0.243	8.338	37.49	99.8%	23.30
BR-10A	6/23/2011	14:58	0.030	1.568	0.019	0.820	8.837	0.212	5.417	0.014	0.570	41.65	0.226	9.407	47.07	99.8%	22.75
BR-10B	6/23/2011	14:57	0.105	1.189	0.015	0.833	8.528	0.137	7.319	0.017	0.770	44.65	0.154	9.298	51.97	99.8%	22.86
BR-10C	6/23/2011	14:55	0.174	1.151	0.032	1.585	8.522	0.132	4.713	0.012	0.489	35.13	0.144	9.011	39.85	99.8%	23.23
BR-11A	6/23/2011	15:26	0.010	0.569	0.018	1.184	10.219	0.105	7.451	0.020	0.859	39.43	0.125	11.078	46.88	99.8%	22.72
BR-11B	6/23/2011	15:25	0.066	0.751	0.035	1.612	9.019	0.151	6.934	0.022	0.847	43.87	0.173	9.866	50.81	99.8%	22.86
BR-11C	6/23/2011	15:24	0.099	0.737	0.030	1.337	8.102	0.099	5.673	0.012	0.514	27.24	0.112	8.617	32.92	99.8%	23.22
BR-12A	6/23/2011	17:35	0.404	0.614	0.028	2.141	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.45
BR-12AX	6/23/2011	17:35	0.000	0.000	0.029	1.451	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.45
BR-13A	6/23/2011	16:58	0.099	0.853	0.038	2.040	7.351	0.147	14.015	0.040	1.316	36.11	0.187	8.667	50.12	99.8%	22.30
BR-14A	6/23/2011	17:08	0.000	0.757	0.050	2.838	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.81
BR-15A	6/23/2011	17:14	0.000	0.447	0.030	2.151	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.29
BR-16A	6/23/2011	16:47	0.024	0.797	0.041	1.797	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.61
BR-16B	6/23/2011	16:46	0.009	1.367	0.044	2.461	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.65
BR-16C	6/23/2011	16:45	0.000	0.949	0.047	1.896	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.81
BR-17A	6/23/2011	16:27	0.168	2.143	0.034	1.226	11.196	0.164	9.191	0.021	1.019	40.21	0.184	12.215	49.40	99.8%	22.76
BR-17B	6/23/2011	16:26	0.000	0.264	0.039	1.191	8.882	0.123	7.801	0.015	0.805	36.63	0.137	9.688	44.43	99.8%	22.78
BR-17BX	6/23/2011	16:26	0.000	0.875	0.011	0.973	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.78
BR-17C	6/23/2011	16:24	0.000	0.573	0.035	1.662	10.316	0.246	6.858	0.015	0.663	55.34	0.261	10.979	62.20	99.8%	22.88
BR-18A	6/23/2011	16:04	0.131	1.572	0.041	1.958	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.65
BR-18B	6/23/2011	16:04	0.284	1.038	0.034	1.229	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.72
BR-18C	6/23/2011	16:03	0.112	0.745	0.016	1.245	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.84
HW-1A	7/6/2011	11:24	0.021	0.190	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
HW-1B	7/6/2011	11:23	0.021	0.551	0.002	0.117	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
HW-1BX	7/6/2011	11:23	0.021	0.668	0.001	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
HW-1C	7/6/2011	11:22	0.021	1.212	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.83
HW-2A	7/6/2011	11:48	0.021	0.514	0.011	0.072	2.136	0.050	3.887	0.008	0.489	89.75	0.058	2.625	93.64	99.8%	22.77
HW-2B	7/6/2011	11:47	0.021	0.727	0.011	BDL	3.357	0.051	4.865	0.006	0.628	88.75	0.057	3.985	93.62	99.8%	22.78
HW-2C	7/6/2011	11:46	0.021	1.139	0.011	BDL	3.882	0.049	5.021	0.006	0.525	79.40	0.055	4.407	84.42	99.8%	22.83
HW-3A	7/6/2011	12:05	0.021	0.566	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.75
HW-3B	7/6/2011	12:04	0.021	0.542	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.77
HW-3C	7/6/2011	12:03	0.021	1.842	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
HW-4A	7/6/2011	12:18	1.904	4.982	0.142	1.909	10.073	0.132	4.811	0.033	0.480	78.57	0.165	10.553	83.38	99.8%	22.58
HW-4B	7/6/2011	12:18	0.021	2.575	0.011	BDL	4.529	0.059	4.694	0.006	0.631	74.72	0.065	5.160	79.41	99.8%	22.78
HW-4C	7/6/2011	12:17	0.021	1.959	0.007	BDL	5.527	0.071	6.378	0.008	0.908	78.38	0.080	6.435	84.75	99.8%	22.83
HW-5A	7/6/2011	12:41	0.021	2.145	0.006	BDL	5.404	0.082	4.643	0.008	0.541	83.83	0.090	5.946	88.48	99.8%	22.75
HW-5B	7/6/2011	12:40	0.021	0.566	0.011	BDL	5.343	0.068	5.290	0.006	0.716	84.42	0.074	6.059	89.71	99.8%	22.77
HW-5C	7/6/2011	12:39	0.021	1.899	0.011	BDL	5.338	0.079	4.042	0.008	0.476	72.39	0.087	5.814	76.43	99.8%	22.84
HW-6A	7/6/2011	13:02	0.021	2.244	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.74

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-6B	7/6/2011	13:01	26.0255	-80.0954	4.8	36.43	28.92	0.705	6.28	8.07	176.3	0.463	0.086	0.27	1.426	0.153	0.132
HW-6BX	7/6/2011	13:01	26.0255	-80.0954	4.8	36.43	28.92	1.520	6.28	8.07	176.3	N/A	N/A	0.25	1.426	0.117	0.096
HW-6C	7/6/2011	13:00	26.0254	-80.0953	10.3	36.44	28.92	1.277	6.28	7.88	177.4	0.414	0.094	0.27	1.372	0.136	0.115
HW-7A	7/6/2011	13:18	26.0454	-80.0960	1.6	36.39	28.97	1.474	6.27	8.05	175.4	0.341	0.056	0.23	1.342	0.197	0.176
HW-7B	7/6/2011	13:18	26.0453	-80.0957	4.1	36.41	28.96	1.670	6.28	8.05	176.9	0.368	0.071	0.22	1.284	0.063	0.042
HW-7C	7/6/2011	13:17	26.0453	-80.0956	10.7	36.44	28.89	2.310	6.28	8.06	178.4	0.413	0.117	0.27	1.366	0.202	0.181
HW-8A	7/6/2011	13:31	26.0446	-80.1066	1.0	36.43	28.91	1.341	6.28	8.01	176.0	0.657	0.179	0.47	1.688	0.109	0.088
HW-8AX	7/6/2011	13:31	26.0446	-80.1066	1.0	36.43	28.91	1.650	6.28	8.01	176.0	N/A	N/A	0.43	1.688	0.168	0.147
HW-8C	7/6/2011	13:30	26.0446	-80.1065	7.2	36.46	28.91	5.336	6.28	7.65	178.6	0.567	0.165	0.46	1.447	0.181	0.160
HW-9A	7/6/2011	13:51	26.0675	-80.0842	1.3	36.40	28.94	1.649	6.28	8.06	168.8	0.490	0.087	0.20	1.558	0.146	0.125
HW-9B	7/6/2011	13:50	26.0675	-80.0844	12.8	36.41	28.94	2.710	6.28	8.06	171.7	0.471	0.091	0.25	1.567	0.132	0.111
HW-9C	7/6/2011	13:49	26.0675	-80.0846	22.7	36.42	28.89	1.369	6.28	7.98	172.9	0.368	0.104	0.23	1.418	0.168	0.147
HW-10A	7/6/2011	14:05	26.0820	-80.0850	1.3	36.40	28.99	0.961	6.27	8.05	171.0	0.680	0.108	0.21	1.533	0.103	0.082
HW-10B	7/6/2011	14:05	26.0820	-80.0850	7.8	36.40	28.96	1.528	6.28	8.07	173.2	0.472	0.120	0.24	1.577	0.179	0.158
HW-10C	7/6/2011	14:04	26.0820	-80.0849	15.4	36.41	28.93	1.446	6.28	8.07	174.5	0.375	0.107	0.21	1.502	0.105	0.084
HW-11A	7/6/2011	14:16	26.0821	-80.0961	1.1	36.40	28.98	1.505	6.27	8.03	170.9	0.669	0.141	0.32	1.764	0.138	0.117
HW-11C	7/6/2011	14:16	26.0822	-80.0960	8.3	36.43	28.92	2.820	6.28	8.06	173.0	0.734	0.146	0.32	1.852	0.553	0.532
HW-12A	7/6/2011	14:32	26.0933	-80.0946	1.2	36.43	28.92	2.411	6.28	8.04	168.5	0.714	0.134	0.30	1.946	0.226	0.205
HW-12B	7/6/2011	14:31	26.0933	-80.0946	7.7	36.44	28.89	2.638	6.28	8.07	170.8	0.610	0.122	0.29	2.272	0.215	0.194
HW-12BX	7/6/2011	14:31	26.0933	-80.0946	7.7	36.44	28.89	2.724	6.28	8.07	170.8	N/A	N/A	0.25	2.272	0.168	0.147
HW-12C	7/6/2011	14:30	26.0933	-80.0945	14.5	36.44	28.89	1.493	6.28	8.06	172.0	0.620	0.122	0.28	1.671	0.253	0.232
HW-13A	7/6/2011	14:46	26.0942	-80.0847	1.3	36.40	28.98	0.509	6.27	8.07	176.1	0.420	0.074	0.21	1.403	0.266	0.245
HW-13B	7/6/2011	14:46	26.0942	-80.0846	7.0	36.41	28.96	1.183	6.28	8.07	178.5	0.426	0.087	0.19	1.558	0.265	0.244
HW-13C	7/6/2011	14:45	26.0941	-80.0845	14.8	36.44	28.90	2.768	6.28	7.95	180.0	0.481	0.108	0.26	1.451	0.227	0.206
HW-14A	7/6/2011	15:35	26.0942	-80.1159	1.9	35.87	29.21	0.778	6.27	7.97	178.3	3.096	0.734	1.07	4.820	0.147	0.126
HW-15A	7/6/2011	14:57	26.1024	-80.0829	1.3	36.40	29.01	2.607	6.27	8.03	182.1	0.395	0.069	0.22	1.418	0.145	0.124
HW-15AX	7/6/2011	14:57	26.1024	-80.0829	1.3	36.40	29.01	0.697	6.27	8.03	182.1	N/A	N/A	0.24	1.418	0.129	0.108
HW-15B	7/6/2011	14:57	26.1023	-80.0828	8.9	36.40	28.96	1.836	6.28	8.07	184.2	0.461	0.079	0.23	1.556	0.183	0.162
HW-15C	7/6/2011	14:56	26.1023	-80.0827	17.1	36.41	28.94	1.415	6.28	8.08	186.0	0.535	0.140	0.21	1.664	0.165	0.144
BR-1A	7/6/2011	15:22	26.0935	-80.1049	1.3	35.82	29.22	1.138	6.27	7.96	173.0	3.424	0.695	1.01	5.991	0.126	0.105
BR-1B	7/6/2011	15:21	26.0935	-80.1049	7.4	36.27	29.03	1.334	6.27	8.02	174.2	1.398	0.372	0.65	2.792	0.253	0.232
BR-1C	7/6/2011	15:20	26.0935	-80.1050	15.0	36.38	28.97	1.187	6.28	8.03	175.8	0.949	0.225	0.53	2.363	0.199	0.178
BR-2A	7/6/2011	15:07	26.1016	-80.0944	1.3	36.42	28.92	1.391	6.28	7.97	181.4	0.795	0.205	0.41	1.811	0.161	0.140
BR-2C	7/6/2011	15:06	26.1017	-80.0943	6.9	36.42	28.92	2.353	6.28	8.01	182.8	0.790	0.168	0.40	1.973	0.332	0.311
BR-3A	7/13/2011	14:11	26.1382	-80.0893	0.8	36.29	29.89	1.179	6.19	8.11	177.3	0.781	0.186	0.51	2.049	0.250	0.229
BR-3C	7/13/2011	14:10	26.1380	-80.0895	9.5	36.39	29.38	2.179	6.23	8.15	178.9	0.326	0.156	0.30	1.166	0.089	0.068
BR-3CX	7/13/2011	14:10	26.1380	-80.0895	9.5	36.39	29.38	0.983	6.23	8.14	178.9	N/A	N/A	N/A	1.166	0.131	0.110
BR-4A	7/13/2011	13:53	26.1606	-80.0757	1.3	36.47	29.60	0.822	6.21	8.09	171.1	0.387	0.082	0.74	1.084	0.028	0.007
BR-4AX	7/13/2011	13:53	26.1606	-80.0757	1.3	36.47	29.60	1.728	6.21	8.08	171.1	N/A	N/A	0.18	1.084	0.025	0.004
BR-4B	7/13/2011	13:52	26.1605	-80.0757	11.2	36.48	29.37	0.338	6.23	8.13	171.4	0.189	0.045	0.24	1.003	0.025	0.004
BR-4C	7/13/2011	13:50	26.1603	-80.0759	20.7	36.45	29.02	0.802	6.27	8.13	170.0	0.368	0.095	0.26	1.231	0.129	0.108

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-6B	7/6/2011	13:01	0.021	0.552	0.001	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-6BX	7/6/2011	13:01	0.021	1.403	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-6C	7/6/2011	13:00	0.021	1.141	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-7A	7/6/2011	13:18	0.021	1.277	0.011	BDL	3.123	0.067	5.228	0.005	0.667	76.37	0.073	3.791	81.60	99.8%	22.77
HW-7B	7/6/2011	13:18	0.021	1.607	0.011	BDL	4.389	0.075	4.406	0.007	0.591	73.72	0.082	4.981	78.12	99.8%	22.79
HW-7C	7/6/2011	13:17	0.021	2.108	0.011	BDL	3.318	0.061	5.148	0.006	0.610	76.63	0.067	3.929	81.78	99.8%	22.83
HW-8A	7/6/2011	13:31	0.021	1.232	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-8AX	7/6/2011	13:31	0.021	1.482	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-8C	7/6/2011	13:30	0.021	5.155	0.001	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.84
HW-9A	7/6/2011	13:51	0.021	1.503	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.78
HW-9B	7/6/2011	13:50	0.021	2.578	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
HW-9C	7/6/2011	13:49	0.021	1.201	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-10A	7/6/2011	14:05	0.021	0.858	0.011	0.062	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.77
HW-10B	7/6/2011	14:05	0.021	1.349	0.011	0.229	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.78
HW-10C	7/6/2011	14:04	0.021	1.341	0.011	0.006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.80
HW-11A	7/6/2011	14:16	0.021	1.367	0.011	0.149	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.78
HW-11C	7/6/2011	14:16	0.021	2.267	0.019	0.324	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-12A	7/6/2011	14:32	0.021	2.185	0.011	0.234	4.250	0.065	8.517	0.010	0.992	60.23	0.076	5.242	68.75	99.8%	22.82
HW-12B	7/6/2011	14:31	0.021	2.423	0.011	0.197	4.891	0.058	5.335	0.009	0.706	89.92	0.068	5.597	95.25	99.8%	22.84
HW-12BX	7/6/2011	14:31	0.021	2.556	0.011	0.186	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.84
HW-12C	7/6/2011	14:30	0.021	1.240	0.011	0.220	4.830	0.061	5.221	0.008	0.623	63.02	0.069	5.453	68.24	99.8%	22.84
HW-13A	7/6/2011	14:46	0.021	0.243	0.011	0.115	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.77
HW-13B	7/6/2011	14:46	0.021	0.918	0.011	0.140	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
HW-13C	7/6/2011	14:45	0.021	2.541	0.011	0.222	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.83
HW-14A	7/6/2011	15:35	0.021	0.631	0.011	0.158	7.401	0.129	19.523	0.031	1.921	104.00	0.160	9.322	123.52	99.8%	22.30
HW-15A	7/6/2011	14:57	0.021	2.462	0.011	0.198	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.76
HW-15AX	7/6/2011	14:57	0.021	0.568	0.011	0.265	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.76
HW-15B	7/6/2011	14:57	0.021	1.653	0.011	0.460	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.78
HW-15C	7/6/2011	14:56	0.021	1.250	0.011	0.463	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.80
BR-1A	7/6/2011	15:22	0.021	1.012	0.011	0.630	4.506	0.079	18.229	0.036	1.856	78.51	0.115	6.363	96.74	99.8%	22.26
BR-1B	7/6/2011	15:21	0.021	1.081	0.003	2.969	3.408	0.081	10.359	0.017	1.107	67.45	0.097	4.515	77.81	99.8%	22.66
BR-1C	7/6/2011	15:20	0.021	0.988	0.011	1.361	4.880	0.071	7.694	0.014	0.744	66.16	0.085	5.624	73.85	99.8%	22.76
BR-2A	7/6/2011	15:07	0.021	1.230	0.011	0.999	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.81
BR-2C	7/6/2011	15:06	0.021	2.021	0.025	4.030	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.81
BR-3A	7/13/2011	14:11	0.021	0.929	0.031	0.428	9.030	0.080	8.362	0.011	1.256	100.58	0.091	10.286	108.95	99.8%	22.38
BR-3C	7/13/2011	14:10	0.021	2.090	0.024	0.419	3.687	0.067	4.337	0.007	0.543	60.81	0.074	4.229	65.15	99.8%	22.63
BR-3CX	7/13/2011	14:10	0.021	0.852	0.021	0.464	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.63
BR-4A	7/13/2011	13:53	0.021	0.794	0.004	0.337	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.62
BR-4AX	7/13/2011	13:53	0.021	1.703	0.008	0.314	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.62
BR-4B	7/13/2011	13:52	0.021	0.313	0.011	0.208	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.70
BR-4C	7/13/2011	13:50	0.021	0.673	0.020	0.452	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.80

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-5A	7/13/2011	13:38	26.1596	-80.0882	1.6	36.25	29.87	0.961	6.19	8.11	179.2	0.433	0.106	0.27	1.060	0.115	0.094
BR-5C	7/13/2011	13:37	26.1595	-80.0884	7.2	36.39	29.21	1.803	6.25	8.14	180.4	0.495	0.131	0.22	1.195	0.158	0.137
BR-6A	7/13/2011	13:19	26.1902	-80.0836	1.5	36.30	29.95	0.843	6.18	8.09	176.5	0.360	0.083	0.32	1.305	0.098	0.077
BR-6B	7/13/2011	13:18	26.1900	-80.0837	5.1	36.38	29.28	1.002	6.24	8.12	177.3	0.442	0.081	0.26	1.139	0.025	0.004
BR-6C	7/13/2011	13:17	26.1898	-80.0839	7.4	36.39	29.25	1.512	6.25	8.13	176.9	0.457	0.092	0.24	1.242	0.192	0.171
BR-7A	7/13/2011	13:01	26.2044	-80.0687	1.4	36.39	29.54	0.251	6.22	8.07	181.6	0.442	0.091	0.23	1.069	0.025	0.004
BR-7B	7/13/2011	12:59	26.2040	-80.0684	14.5	36.40	29.35	1.966	6.24	8.12	182.6	0.405	0.061	0.19	1.297	0.032	0.011
BR-7C	7/13/2011	12:58	26.2036	-80.0682	26.8	36.44	29.04	1.014	6.27	8.13	182.8	0.399	0.076	0.19	1.258	0.045	0.024
BR-8A	7/13/2011	12:37	26.2377	-80.0685	1.3	36.41	29.20	2.355	6.25	8.10	177.1	0.481	0.114	0.47	1.083	0.025	0.004
BR-8B	7/13/2011	12:36	26.2377	-80.0684	8.6	36.41	29.15	0.216	6.26	8.13	178.3	0.481	0.101	0.19	1.164	0.025	0.004
BR-8C	7/13/2011	12:35	26.2377	-80.0683	14.6	36.42	29.15	0.220	6.26	8.13	178.6	0.393	0.186	0.25	1.263	0.025	0.004
BR-9A	7/13/2011	12:22	26.2476	-80.0641	1.4	36.37	29.24	1.701	6.25	8.09	174.6	0.511	0.083	0.22	1.120	0.025	0.004
BR-9B	7/13/2011	12:21	26.2474	-80.0639	13.4	36.43	29.06	2.314	6.26	8.13	174.6	0.418	0.075	0.11	1.307	0.025	0.004
BR-9C	7/13/2011	12:19	26.2473	-80.0637	26.8	36.44	29.00	1.107	6.27	8.13	175.7	0.429	0.080	0.15	1.419	0.025	0.004
BR-10A	7/13/2011	12:00	26.2526	-80.0637	1.4	36.48	29.89	2.597	6.18	8.05	173.4	0.398	0.118	0.18	1.104	0.072	0.051
BR-10B	7/13/2011	11:58	26.2521	-80.0634	17.8	36.44	29.13	3.283	6.26	8.10	174.8	0.341	0.069	0.14	1.212	0.025	0.004
BR-10C	7/13/2011	11:57	26.2519	-80.0632	27.2	36.45	29.09	3.062	6.26	8.11	173.6	0.352	0.076	0.15	1.223	0.081	0.060
BR-11A	7/13/2011	11:34	26.2562	-80.0623	1.4	36.41	29.51	2.890	6.22	8.04	170.7	0.354	0.045	0.18	1.017	0.109	0.088
BR-11B	7/13/2011	11:33	26.2559	-80.0622	16.6	36.44	29.17	1.086	6.25	8.11	171.7	0.261	0.105	0.14	1.191	0.055	0.034
BR-11C	7/13/2011	11:32	26.2556	-80.0621	28.4	36.45	29.09	3.251	6.26	8.11	171.6	0.261	0.096	0.16	1.231	0.025	0.004
BR-12A	7/13/2011	10:41	26.2499	-80.0794	1.6	36.35	29.72	1.500	6.20	8.03	183.3	0.384	0.128	0.21	1.169	0.100	0.079
BR-12AX	7/13/2011	10:41	26.2499	-80.0794	1.6	36.35	29.72	4.827	6.20	8.03	183.3	N/A	N/A	0.18	1.169	0.137	0.116
BR-13A	7/13/2011	10:09	26.2596	-80.0832	1.8	36.13	29.57	2.351	6.22	7.99	184.5	0.615	0.304	0.41	1.550	0.039	0.018
BR-14A	7/13/2011	10:21	26.2619	-80.0852	1.7	34.73	30.08	2.483	6.22	7.89	176.6	1.505	0.657	0.76	2.052	0.126	0.105
BR-15A	7/13/2011	10:28	26.2632	-80.0834	1.9	35.90	29.76	1.207	6.21	8.01	179.9	1.098	0.380	0.82	1.860	0.076	0.055
BR-16A	7/13/2011	9:59	26.2613	-80.0722	1.4	36.26	29.68	1.861	6.21	8.09	185.8	0.450	0.090	0.20	1.258	0.084	0.063
BR-16B	7/13/2011	9:58	26.2611	-80.0721	6.0	36.39	29.29	5.612	6.24	8.12	185.1	0.346	0.104	0.21	1.150	0.030	0.009
BR-16C	7/13/2011	9:57	26.2610	-80.0721	10.0	36.41	29.16	1.715	6.26	8.12	185.0	0.316	0.116	0.17	1.070	0.024	0.003
BR-17A	7/13/2011	9:41	26.2754	-80.0636	1.5	36.38	29.22	2.377	6.25	8.11	190.3	0.371	0.104	0.18	1.141	0.066	0.045
BR-17B	7/13/2011	9:41	26.2753	-80.0637	6.7	36.41	29.18	1.510	6.25	8.13	191.1	0.346	0.117	0.29	1.147	0.073	0.052
BR-17BX	7/13/2011	9:41	26.2753	-80.0637	6.7	36.41	29.18	0.963	6.25	8.13	191.1	N/A	N/A	0.19	1.147	0.025	0.004
BR-17C	7/13/2011	9:39	26.2752	-80.0638	13.7	36.44	28.98	2.344	6.27	8.13	192.5	0.319	0.124	0.14	1.109	0.025	0.004
BR-18A	7/13/2011	9:22	26.2969	-80.0677	1.6	36.40	29.17	1.246	6.25	8.10	219.3	0.353	0.104	0.19	1.097	0.066	0.045
BR-18B	7/13/2011	9:21	26.2970	-80.0677	7.2	36.41	29.06	2.424	6.27	8.07	221.4	0.317	0.116	0.16	1.191	0.265	0.244
BR-18C	7/13/2011	9:21	26.2970	-80.0677	12.8	36.45	28.90	3.561	6.28	8.10	222.2	0.220	0.127	0.17	1.053	0.037	0.016
HW-1A	8/11/2011	8:23	25.9966	-80.0889	2.0	35.92	29.65	1.916	6.22	8.11	184.9	0.490	0.092	0.22	1.689	0.339	0.089
HW-1B	8/11/2011	8:23	25.9965	-80.0890	9.7	35.98	29.43	1.002	6.24	8.15	187.8	0.539	0.132	0.36	1.836	0.327	0.069
HW-1BX	8/11/2011	8:23	25.9965	-80.0890	9.7	35.98	29.43	2.155	6.24	8.15	187.8	N/A	N/A	0.25	1.836	0.320	0.112
HW-1C	8/11/2011	8:22	25.9965	-80.0890	20.9	36.25	23.82	6.196	6.84	8.04	197.0	0.387	0.244	0.46	2.026	4.229	0.357
HW-2A	8/11/2011	8:54	26.0151	-80.0857	1.6	35.92	29.64	4.283	6.22	8.10	178.1	0.464	0.113	0.30	1.573	1.228	0.176
HW-2B	8/11/2011	8:53	26.0150	-80.0858	11.6	36.13	27.56	2.295	6.43	8.12	184.2	0.468	0.198	0.34	2.041	1.061	0.156

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-5A	7/13/2011	13:38	0.021	0.846	0.020	0.416	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.36
BR-5C	7/13/2011	13:37	0.021	1.645	0.021	0.131	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.69
BR-6A	7/13/2011	13:19	0.021	0.745	0.008	0.700	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.37
BR-6B	7/13/2011	13:18	0.021	0.977	0.011	0.215	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.66
BR-6C	7/13/2011	13:17	0.021	1.320	0.014	0.375	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.67
BR-7A	7/13/2011	13:01	0.021	0.226	0.011	0.228	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.57
BR-7B	7/13/2011	12:59	0.021	1.934	0.006	0.253	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.65
BR-7C	7/13/2011	12:58	0.021	0.969	0.011	0.257	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.78
BR-8A	7/13/2011	12:37	0.021	2.330	0.006	0.212	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.71
BR-8B	7/13/2011	12:36	0.021	0.191	0.011	0.181	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.73
BR-8C	7/13/2011	12:35	0.021	0.195	0.011	0.171	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.73
BR-9A	7/13/2011	12:22	0.021	1.676	0.011	0.270	3.402	0.071	4.979	0.007	0.729	71.88	0.078	4.131	76.85	99.8%	22.67
BR-9B	7/13/2011	12:21	0.021	2.289	0.033	0.427	7.164	0.059	4.924	0.006	0.815	91.33	0.065	7.980	96.26	99.8%	22.77
BR-9C	7/13/2011	12:19	0.021	1.082	0.011	0.174	5.399	0.077	4.201	0.005	0.713	85.83	0.083	6.112	90.03	99.8%	22.80
BR-10A	7/13/2011	12:00	0.021	2.525	0.026	0.189	4.172	0.096	4.366	0.006	0.829	102.67	0.102	5.001	107.03	99.8%	22.52
BR-10B	7/13/2011	11:58	0.021	3.258	0.013	0.152	4.546	0.072	5.143	0.005	0.449	91.00	0.077	4.994	96.14	99.8%	22.75
BR-10C	7/13/2011	11:57	0.021	2.981	0.033	0.192	2.627	0.072	4.376	0.006	0.736	85.58	0.078	3.363	89.96	99.8%	22.77
BR-11A	7/13/2011	11:34	0.021	2.781	0.039	0.297	3.263	0.053	5.276	0.010	0.887	90.75	0.063	4.149	96.03	99.8%	22.60
BR-11B	7/13/2011	11:33	0.021	1.031	0.015	0.180	3.815	0.062	4.067	0.005	0.761	84.67	0.067	4.576	88.73	99.8%	22.74
BR-11C	7/13/2011	11:32	0.021	3.226	0.007	0.142	4.119	0.036	3.685	0.005	0.602	66.16	0.042	4.721	69.84	99.8%	22.77
BR-12A	7/13/2011	10:41	0.021	1.400	0.017	0.502	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.48
BR-12AX	7/13/2011	10:41	0.021	4.690	0.036	0.553	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.48
BR-13A	7/13/2011	10:09	0.021	2.312	0.027	0.811	6.074	0.078	6.147	0.020	0.888	99.83	0.099	6.962	105.98	99.8%	22.37
BR-14A	7/13/2011	10:21	0.021	2.357	0.064	3.297	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.15
BR-15A	7/13/2011	10:28	0.021	1.131	0.031	1.386	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.14
BR-16A	7/13/2011	9:59	0.021	1.777	0.006	0.468	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.43
BR-16B	7/13/2011	9:58	0.021	5.582	0.009	0.244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.67
BR-16C	7/13/2011	9:57	0.021	1.691	0.006	0.208	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.72
BR-17A	7/13/2011	9:41	0.021	2.311	0.011	0.310	4.590	0.047	4.644	0.007	0.708	79.49	0.054	5.299	84.14	99.8%	22.68
BR-17B	7/13/2011	9:41	0.021	1.437	0.006	0.382	10.352	0.055	3.429	0.006	0.521	86.50	0.061	10.873	89.93	99.8%	22.71
BR-17BX	7/13/2011	9:41	0.021	0.938	0.011	0.211	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.71
BR-17C	7/13/2011	9:39	0.021	2.319	0.022	0.270	5.273	0.056	4.231	0.005	0.587	98.33	0.061	5.861	102.56	99.8%	22.81
BR-18A	7/13/2011	9:22	0.021	1.180	0.006	0.272	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.71
BR-18B	7/13/2011	9:21	0.021	2.159	0.056	1.319	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.75
BR-18C	7/13/2011	9:21	0.021	3.524	0.022	0.250	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.84
HW-1A	8/11/2011	8:23	0.250	1.577	0.029	1.056	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.18
HW-1B	8/11/2011	8:23	0.258	0.675	0.022	0.947	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.31
HW-1BX	8/11/2011	8:23	0.208	1.835	0.035	1.240	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.31
HW-1C	8/11/2011	8:22	3.872	1.967	0.246	2.841	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.7%	24.33
HW-2A	8/11/2011	8:54	1.052	3.055	0.044	1.637	10.609	0.079	5.063	0.010	0.630	85.17	0.089	11.239	90.23	99.8%	22.19
HW-2B	8/11/2011	8:53	0.905	1.234	0.036	1.489	9.912	0.125	5.431	0.010	0.540	79.18	0.135	10.451	84.61	99.8%	23.05

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-2C	8/11/2011	8:52	26.0149	-80.0859	26.3	36.18	20.57	3.183	7.25	8.10	191.4	0.282	0.295	0.29	1.743	1.967	0.210
HW-3A	8/11/2011	8:40	26.0152	-80.0948	1.4	35.89	29.28	1.225	6.26	8.13	179.2	0.716	0.185	0.38	2.485	0.089	0.068
HW-3B	8/11/2011	8:40	26.0152	-80.0948	8.1	35.90	29.21	3.697	6.27	8.12	182.5	0.584	0.188	0.26	1.858	2.304	0.168
HW-3C	8/11/2011	8:39	26.0152	-80.0948	17.5	36.11	27.73	8.264	6.41	8.07	185.0	0.473	0.222	0.41	1.688	6.427	0.381
HW-4A	8/11/2011	9:14	26.0200	-80.0854	1.3	35.93	29.48	1.977	6.24	7.96	178.9	0.683	0.132	0.29	1.802	0.834	0.098
HW-4B	8/11/2011	9:13	26.0198	-80.0855	13.3	36.15	27.21	3.989	6.47	8.08	183.0	0.469	0.215	0.30	1.976	2.770	0.246
HW-4C	8/11/2011	9:12	26.0196	-80.0856	26.4	36.19	20.81	9.371	7.22	8.03	190.1	0.253	0.211	0.33	1.703	7.826	0.391
HW-5A	8/11/2011	9:40	26.0249	-80.0852	1.3	35.93	29.51	2.652	6.24	8.14	179.1	0.693	0.158	0.29	1.677	1.042	0.042
HW-5B	8/11/2011	9:39	26.0248	-80.0853	13.0	36.02	28.11	3.585	6.38	8.12	183.1	0.589	0.211	0.23	2.219	2.232	0.205
HW-5C	8/11/2011	9:38	26.0246	-80.0853	27.1	36.22	23.21	0.000	6.92	8.07	189.3	0.349	0.288	0.31	1.865	N/A	N/A
HW-6A	8/11/2011	9:57	26.0248	-80.0940	1.3	35.89	29.32	3.375	6.26	8.07	180.9	0.805	0.194	0.28	1.904	1.355	0.119
HW-6B	8/11/2011	9:57	26.0247	-80.0941	8.9	35.91	29.20	2.516	6.27	8.10	182.8	0.679	0.238	0.23	1.798	1.691	0.145
HW-6BX	8/11/2011	9:57	26.0247	-80.0941	8.9	35.91	29.20	0.000	6.27	8.10	182.8	N/A	N/A	0.23	1.798	N/A	N/A
HW-6C	8/11/2011	9:56	26.0246	-80.0941	18.5	36.12	27.55	3.660	6.43	8.07	185.6	0.355	0.211	0.35	1.685	2.503	0.193
HW-7A	8/11/2011	10:44	26.0456	-80.0937	1.5	35.91	29.30	3.272	6.26	8.01	181.3	0.674	0.163	0.23	1.560	1.534	0.203
HW-7B	8/11/2011	10:43	26.0455	-80.0938	6.7	35.93	29.20	2.689	6.27	8.03	182.6	0.541	0.162	0.25	1.680	1.471	0.153
HW-7C	8/11/2011	10:43	26.0454	-80.0939	12.0	36.09	27.93	3.445	6.39	8.06	185.1	0.422	0.207	0.43	1.624	1.355	0.125
HW-8A	8/11/2011	10:18	26.0447	-80.1046	1.2	35.95	29.37	2.999	6.25	8.05	186.8	0.453	0.144	0.50	1.538	1.566	0.145
HW-8AX	8/11/2011	10:18	26.0447	-80.1046	1.2	35.95	29.37	3.272	6.25	8.01	186.8	N/A	N/A	0.31	1.538	1.534	0.203
HW-8C	8/11/2011	10:17	26.0446	-80.1047	5.8	35.94	29.29	2.790	6.26	8.02	188.8	0.430	0.174	0.34	1.599	1.590	0.208
HW-9A	8/11/2011	13:31	26.0679	-80.0859	1.4	35.92	29.53	2.049	6.24	8.06	185.4	0.952	0.155	0.54	1.836	0.543	0.004
HW-9B	8/11/2011	13:31	26.0677	-80.0858	7.0	35.91	29.42	2.032	6.25	8.10	188.1	0.930	0.188	0.34	2.027	0.761	0.013
HW-9C	8/11/2011	13:30	26.0676	-80.0857	13.9	36.02	28.58	2.053	6.33	8.08	189.2	0.950	0.247	0.37	2.238	1.111	0.004
HW-10A	8/11/2011	13:17	26.0839	-80.0841	1.4	35.93	29.79	1.203	6.21	8.11	189.0	0.728	0.121	0.39	1.432	0.174	0.004
HW-10B	8/11/2011	13:16	26.0837	-80.0840	9.7	36.00	29.01	4.520	6.28	8.11	191.5	0.910	0.215	0.36	2.245	0.766	0.004
HW-10C	8/11/2011	13:16	26.0835	-80.0840	19.7	36.13	27.80	3.506	6.40	8.09	193.1	0.685	0.251	0.36	2.028	1.248	0.004
HW-11A	8/11/2011	13:06	26.0830	-80.0955	1.6	35.77	29.59	1.291	6.23	8.01	184.6	0.719	0.160	0.31	1.449	0.588	0.004
HW-11C	8/11/2011	13:06	26.0830	-80.0955	7.1	35.97	29.03	2.704	6.28	8.04	185.8	0.709	0.207	0.37	1.962	0.796	0.054
HW-12A	8/11/2011	11:44	26.0942	-80.0939	1.3	34.93	29.45	3.833	6.28	8.01	163.2	0.843	0.336	0.88	1.907	1.762	0.268
HW-12B	8/11/2011	11:44	26.0942	-80.0940	7.5	35.93	29.22	3.467	6.27	8.08	166.0	0.707	0.202	0.33	2.036	1.232	0.159
HW-12BX	8/11/2011	11:44	26.0942	-80.0940	7.5	35.93	29.22	2.782	6.27	8.08	166.0	N/A	N/A	0.35	2.036	1.170	0.138
HW-12C	8/11/2011	11:43	26.0942	-80.0942	14.7	36.14	27.88	2.807	6.40	8.08	167.4	0.560	0.258	0.27	1.916	1.761	0.141
HW-13A	8/11/2011	12:53	26.0944	-80.0845	1.4	35.49	30.03	2.008	6.20	8.10	180.5	0.661	0.100	0.28	1.775	0.507	0.002
HW-13B	8/11/2011	12:53	26.0942	-80.0845	4.6	35.93	29.63	1.290	6.22	8.03	182.8	0.789	0.130	0.33	1.523	0.287	0.004
HW-13C	8/11/2011	12:52	26.0940	-80.0844	13.9	36.00	28.57	1.684	6.33	8.12	185.3	0.777	0.185	0.32	1.925	0.764	0.004
HW-14A	8/11/2011	11:12	26.0942	-80.1157	1.1	32.67	29.76	6.509	6.32	7.91	185.3	1.148	0.555	0.91	2.910	3.046	0.382
HW-15A	8/11/2011	12:38	26.1030	-80.0819	1.5	34.99	29.70	3.566	6.25	8.01	180.5	0.716	0.246	0.49	1.587	1.342	0.103
HW-15AX	8/11/2011	12:38	26.1030	-80.0819	1.5	34.99	29.70	3.406	6.25	8.01	180.5	N/A	N/A	0.50	1.587	1.426	0.103
HW-15B	8/11/2011	12:37	26.1028	-80.0820	9.8	35.92	29.58	1.565	6.23	8.09	183.7	0.533	0.308	0.25	2.082	0.253	0.012
HW-15C	8/11/2011	12:37	26.1026	-80.0821	21.2	36.21	26.45	2.711	6.55	8.09	186.8	0.758	0.108	0.28	2.211	1.794	0.042
BR-1A	8/11/2011	11:25	26.0936	-80.1039	1.3	34.20	29.57	6.713	6.29	7.89	186.1	1.000	0.421	0.67	2.610	2.984	0.398

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-2C	8/11/2011	8:52	1.757	1.216	0.111	1.433	14.099	0.403	5.090	0.005	0.332	76.45	0.408	14.431	81.54	99.8%	25.26
HW-3A	8/11/2011	8:40	0.021	1.136	0.026	1.328	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.29
HW-3B	8/11/2011	8:40	2.136	1.393	0.111	1.331	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.32
HW-3C	8/11/2011	8:39	6.046	1.837	0.329	2.829	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.7%	22.98
HW-4A	8/11/2011	9:14	0.736	1.143	0.020	1.094	9.771	0.096	7.049	0.017	0.943	95.58	0.113	10.714	102.63	99.8%	22.25
HW-4B	8/11/2011	9:13	2.524	1.219	0.131	1.871	11.137	0.136	5.084	0.011	0.442	90.92	0.147	11.580	96.00	99.8%	23.18
HW-4C	8/11/2011	9:12	7.435	1.545	0.400	3.030	11.917	0.342	4.523	0.005	0.273	72.79	0.347	12.190	77.31	99.8%	25.19
HW-5A	8/11/2011	9:40	1.000	1.610	0.022	1.014	9.554	0.097	6.136	0.022	0.818	114.00	0.119	10.371	120.14	99.8%	22.24
HW-5B	8/11/2011	9:39	2.027	1.353	0.092	1.434	9.859	0.117	6.178	0.016	0.713	82.90	0.132	10.572	89.08	99.8%	22.78
HW-5C	8/11/2011	9:38	N/A	N/A	N/A	N/A	10.351	0.229	4.625	0.010	0.413	71.95	0.238	10.764	76.58	99.8%	24.50
HW-6A	8/11/2011	9:57	1.236	2.020	0.025	1.107	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.28
HW-6B	8/11/2011	9:57	1.546	0.825	0.021	1.159	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.33
HW-6BX	8/11/2011	9:57	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.33
HW-6C	8/11/2011	9:56	2.310	1.157	0.108	1.309	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.05
HW-7A	8/11/2011	10:44	1.331	1.738	0.042	1.685	8.833	0.094	6.820	0.019	0.932	82.64	0.113	9.764	89.46	99.8%	22.30
HW-7B	8/11/2011	10:43	1.318	1.218	0.043	1.483	10.557	0.070	7.942	0.014	1.165	70.79	0.085	11.721	78.73	99.8%	22.35
HW-7C	8/11/2011	10:43	1.230	2.090	0.025	1.234	9.091	0.102	6.717	0.013	0.736	77.51	0.115	9.826	84.23	99.8%	22.90
HW-8A	8/11/2011	10:18	1.421	1.433	0.027	1.295	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.30
HW-8AX	8/11/2011	10:18	1.331	1.738	0.042	1.685	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.30
HW-8C	8/11/2011	10:17	1.382	1.200	0.031	1.373	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.32
HW-9A	8/11/2011	13:31	0.539	1.506	0.023	1.529	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.22
HW-9B	8/11/2011	13:31	0.748	1.271	0.011	1.704	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.26
HW-9C	8/11/2011	13:30	1.107	0.942	0.013	1.447	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.62
HW-10A	8/11/2011	13:17	0.170	1.029	0.001	1.224	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.15
HW-10B	8/11/2011	13:16	0.762	3.754	0.029	1.617	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.46
HW-10C	8/11/2011	13:16	1.244	2.258	0.044	1.367	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.97
HW-11A	8/11/2011	13:06	0.584	0.703	0.013	1.970	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.7%	22.09
HW-11C	8/11/2011	13:06	0.742	1.908	0.024	1.858	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.43
HW-12A	8/11/2011	11:44	1.494	2.071	0.101	4.825	9.530	0.111	11.380	0.025	1.088	111.83	0.136	10.618	123.21	99.8%	21.51
HW-12B	8/11/2011	11:44	1.073	2.235	0.029	1.488	7.666	0.090	7.313	0.018	0.982	83.75	0.108	8.647	91.06	99.8%	22.34
HW-12BX	8/11/2011	11:44	1.032	1.612	0.017	1.402	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.34
HW-12C	8/11/2011	11:43	1.620	1.046	0.063	1.421	9.489	0.106	5.539	0.013	0.606	78.39	0.119	10.095	83.93	99.8%	22.95
HW-13A	8/11/2011	12:53	0.505	1.501	0.017	2.077	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.73
HW-13B	8/11/2011	12:53	0.283	1.003	0.004	1.356	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.20
HW-13C	8/11/2011	12:52	0.760	0.920	0.025	1.417	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.62
HW-14A	8/11/2011	11:12	2.664	3.463	0.205	11.100	14.615	0.213	17.962	0.036	1.819	162.83	0.249	16.434	180.80	99.8%	19.72
HW-15A	8/11/2011	12:38	1.239	2.224	0.075	4.700	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.47
HW-15AX	8/11/2011	12:38	1.323	1.980	0.083	5.048	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.47
HW-15B	8/11/2011	12:37	0.241	1.312	0.011	1.437	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.21
HW-15C	8/11/2011	12:37	1.752	0.917	0.089	1.605	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.47
BR-1A	8/11/2011	11:25	2.586	3.729	0.191	10.028	10.867	0.212	16.313	0.037	1.545	110.42	0.249	12.413	126.73	99.8%	20.93

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-1B	8/11/2011	11:24	26.0936	-80.1040	7.1	35.70	29.20	3.294	6.28	8.01	189.2	0.480	0.182	0.57	1.897	1.641	0.204
BR-1C	8/11/2011	11:24	26.0936	-80.1042	14.2	36.06	28.40	3.492	6.34	8.03	191.0	0.425	0.184	0.41	1.514	2.009	0.213
BR-2A	8/11/2011	12:25	26.1026	-80.0929	1.2	35.14	29.42	4.570	6.27	8.01	169.3	0.705	0.285	0.55	1.871	1.615	0.139
BR-2C	8/11/2011	12:23	26.1024	-80.0929	9.9	36.09	28.37	3.752	6.35	8.10	172.7	0.650	0.203	0.30	1.808	1.049	0.009
BR-3A	8/17/2011	9:51	26.1367	-80.0914	1.4	35.64	30.70	0.410	6.13	8.09	181.3	0.282	0.084	0.21	1.184	0.132	0.004
BR-3C	8/17/2011	9:50	26.1370	-80.0913	4.2	35.64	30.69	0.353	6.13	8.13	186.0	0.337	0.098	0.14	1.162	0.077	0.004
BR-3CX	8/17/2011	9:50	26.1370	-80.0913	4.2	35.64	30.69	0.737	6.13	8.13	186.0	N/A	N/A	0.18	1.162	0.070	0.016
BR-4A	8/17/2011	10:13	26.1590	-80.0765	1.3	35.51	30.97	0.460	6.11	8.10	185.6	0.216	0.033	0.16	1.102	0.025	0.004
BR-4AX	8/17/2011	10:13	26.1590	-80.0765	1.3	35.51	30.97	0.523	6.11	8.10	185.6	N/A	N/A	0.14	1.102	0.067	0.046
BR-4B	8/17/2011	10:12	26.1592	-80.0763	11.9	36.23	30.64	0.774	6.12	8.07	192.3	0.306	0.089	0.34	1.151	0.028	0.006
BR-4C	8/17/2011	10:11	26.1594	-80.0762	20.0	36.20	29.98	0.734	6.18	8.11	195.6	0.363	0.136	0.19	1.367	0.181	0.004
BR-5A	8/17/2011	10:26	26.1595	-80.0889	1.4	35.64	30.67	0.348	6.13	8.10	169.7	0.321	0.080	0.20	1.143	0.065	0.058
BR-5C	8/17/2011	10:25	26.1597	-80.0888	6.4	35.67	30.61	0.539	6.14	8.10	171.5	0.314	0.098	0.29	1.366	0.119	0.013
BR-6A	8/17/2011	10:45	26.1900	-80.0847	1.4	35.65	30.67	0.455	6.13	7.73	179.7	0.333	0.064	0.17	1.180	0.093	0.072
BR-6B	8/17/2011	10:45	26.1900	-80.0847	4.9	35.65	30.58	0.596	6.14	8.04	181.2	0.402	0.105	0.23	1.225	0.180	0.034
BR-6C	8/17/2011	10:44	26.1900	-80.0846	8.0	35.64	30.46	0.626	6.15	8.10	182.5	0.402	0.093	0.20	1.299	0.231	0.011
BR-7A	8/17/2011	11:01	26.2027	-80.0684	1.3	35.46	31.09	0.565	6.10	7.91	179.6	0.186	0.025	0.16	1.033	0.006	0.004
BR-7B	8/17/2011	11:00	26.2026	-80.0683	14.7	36.23	30.32	0.539	6.15	8.09	185.1	0.349	0.085	0.16	1.278	0.054	0.004
BR-7C	8/17/2011	10:59	26.2026	-80.0682	28.5	36.25	29.27	0.614	6.25	8.09	186.1	0.473	0.175	0.11	2.084	0.306	0.148
BR-8A	8/17/2011	11:24	26.2378	-80.0685	1.4	35.53	31.10	0.648	6.10	8.12	175.1	0.442	0.074	0.18	0.992	0.202	0.181
BR-8B	8/17/2011	11:24	26.2378	-80.0684	5.9	35.60	30.82	0.340	6.12	8.14	177.3	0.328	0.059	0.16	1.210	0.187	0.157
BR-8C	8/17/2011	11:23	26.2377	-80.0682	12.8	35.67	30.57	0.504	6.14	8.14	179.4	0.416	0.079	0.22	1.456	0.243	0.143
BR-9A	8/17/2011	11:36	26.2479	-80.0627	1.3	35.44	31.11	0.495	6.10	8.11	175.4	0.178	0.029	0.14	1.005	0.199	0.135
BR-9B	8/17/2011	11:35	26.2478	-80.0627	13.4	35.71	30.77	0.697	6.12	8.13	177.8	0.294	0.054	0.07	1.123	0.202	0.105
BR-9C	8/17/2011	11:34	26.2476	-80.0626	29.4	36.18	29.70	0.534	6.21	8.13	180.9	0.453	0.137	0.19	1.544	0.253	0.147
BR-10A	8/17/2011	11:59	26.2516	-80.0620	1.5	34.89	30.59	23.152	6.17	8.03	167.5	0.331	0.089	0.29	1.706	6.169	3.039
BR-10B	8/17/2011	11:55	26.2523	-80.0618	15.1	35.77	30.89	0.532	6.11	8.13	172.4	0.257	0.050	0.18	1.096	0.171	0.150
BR-10C	8/17/2011	11:54	26.2521	-80.0618	31.1	36.24	29.30	0.640	6.25	8.13	173.1	0.520	0.195	0.19	1.664	0.187	0.153
BR-11A	8/17/2011	12:51	26.2550	-80.0625	1.3	35.25	31.23	0.569	6.09	8.12	157.8	0.163	0.024	0.17	1.290	0.181	0.160
BR-11B	8/17/2011	12:50	26.2549	-80.0623	14.3	35.77	30.61	0.396	6.13	8.15	161.1	0.374	0.056	0.56	1.234	0.153	0.132
BR-11C	8/17/2011	12:49	26.2548	-80.0622	28.7	36.20	29.45	0.783	6.23	8.14	161.0	0.421	0.157	0.17	1.558	0.400	0.155
BR-12A	8/17/2011	14:29	26.2490	-80.0806	2.1	35.51	31.27	0.517	6.08	8.04	152.8	0.385	0.068	0.13	1.036	0.203	0.160
BR-12AX	8/17/2011	14:29	26.2490	-80.0806	2.1	35.51	31.27	0.497	6.08	8.04	152.8	N/A	N/A	0.18	1.036	0.243	0.086
BR-13A	8/17/2011	13:51	26.2597	-80.0832	1.9	35.23	30.93	1.227	6.12	8.02	152.3	0.984	0.298	0.36	1.252	0.589	0.211
BR-14A	8/17/2011	14:05	26.2618	-80.0855	1.9	34.32	31.06	1.147	6.14	8.01	149.3	2.323	0.632	0.58	2.046	0.753	0.266
BR-15A	8/17/2011	14:14	26.2634	-80.0833	1.8	34.13	31.06	1.266	6.15	8.01	150.4	2.240	0.638	0.42	2.940	0.756	0.339
BR-16A	8/17/2011	13:40	26.2612	-80.0746	1.6	35.42	31.33	0.433	6.08	8.12	161.3	0.208	0.033	0.21	0.875	0.142	0.140
BR-16B	8/17/2011	13:39	26.2611	-80.0744	6.4	35.65	30.65	0.581	6.13	8.15	161.9	0.444	0.169	0.17	1.285	0.328	0.143
BR-16C	8/17/2011	13:39	26.2610	-80.0742	11.8	35.67	30.49	0.836	6.15	8.14	162.6	0.662	0.140	0.38	1.792	0.415	0.174
BR-17A	8/17/2011	13:05	26.2764	-80.0649	1.5	35.20	31.19	0.720	6.10	8.07	163.0	0.177	0.036	0.46	1.372	0.181	0.134
BR-17B	8/17/2011	13:04	26.2762	-80.0648	8.7	35.62	30.65	0.848	6.14	8.15	164.9	0.330	0.063	0.23	1.144	0.290	0.153

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-1B	8/11/2011	11:24	1.437	1.653	0.061	2.458	8.211	0.136	8.526	0.017	0.780	82.89	0.153	8.991	91.42	99.8%	22.18
BR-1C	8/11/2011	11:24	1.796	1.483	0.083	1.554	12.938	0.154	7.106	0.016	0.687	71.12	0.171	13.625	78.22	99.8%	22.72
BR-2A	8/11/2011	12:25	1.476	2.955	0.096	4.647	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.68
BR-2C	8/11/2011	12:23	1.040	2.703	0.037	1.432	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.75
BR-3A	8/17/2011	9:51	0.128	0.278	0.015	0.868	6.516	0.059	4.736	0.007	0.649	115.33	0.067	7.165	120.07	99.8%	21.62
BR-3C	8/17/2011	9:50	0.073	0.276	0.010	0.743	11.049	0.078	5.406	0.008	0.701	117.92	0.086	11.751	123.32	99.8%	21.62
BR-3CX	8/17/2011	9:50	0.054	0.667	0.024	0.903	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.62
BR-4A	8/17/2011	10:13	0.021	0.435	0.008	0.319	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.43
BR-4AX	8/17/2011	10:13	0.021	0.456	0.014	0.400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.43
BR-4B	8/17/2011	10:12	0.022	0.746	0.013	1.105	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.07
BR-4C	8/17/2011	10:11	0.177	0.553	0.017	0.844	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.28
BR-5A	8/17/2011	10:26	0.007	0.283	0.014	1.091	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.63
BR-5C	8/17/2011	10:25	0.106	0.420	0.010	1.070	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.67
BR-6A	8/17/2011	10:45	0.021	0.362	0.013	1.126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.63
BR-6B	8/17/2011	10:45	0.146	0.416	0.012	1.239	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
BR-6C	8/17/2011	10:44	0.220	0.395	0.017	1.201	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.70
BR-7A	8/17/2011	11:01	0.002	0.559	0.009	0.663	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.34
BR-7B	8/17/2011	11:00	0.050	0.485	0.007	1.330	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.18
BR-7C	8/17/2011	10:59	0.158	0.308	0.005	1.718	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.56
BR-8A	8/17/2011	11:24	0.021	0.446	0.007	1.961	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.40
BR-8B	8/17/2011	11:24	0.030	0.153	0.011	2.408	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.55
BR-8C	8/17/2011	11:23	0.100	0.261	0.011	2.036	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.68
BR-9A	8/17/2011	11:36	0.064	0.296	0.001	1.526	8.598	0.057	4.618	0.006	0.552	118.83	0.063	9.150	123.45	99.8%	21.32
BR-9B	8/17/2011	11:35	0.097	0.495	0.011	1.618	7.947	0.062	5.609	0.006	0.754	97.58	0.068	8.701	103.19	99.8%	21.65
BR-9C	8/17/2011	11:34	0.106	0.281	0.003	1.745	7.531	0.072	4.224	0.008	0.653	97.33	0.081	8.183	101.56	99.8%	22.36
BR-10A	8/17/2011	11:59	3.130	16.983	0.559	6.194	25.276	0.389	7.433	0.033	1.110	102.17	0.422	26.386	109.60	99.8%	21.09
BR-10B	8/17/2011	11:55	0.021	0.361	0.005	1.829	11.038	0.075	4.021	0.006	0.517	115.42	0.081	11.555	119.44	99.8%	21.64
BR-10C	8/17/2011	11:54	0.034	0.453	0.002	1.747	7.413	0.083	4.234	0.008	0.639	101.42	0.091	8.052	105.65	99.8%	22.55
BR-11A	8/17/2011	12:51	0.021	0.388	0.001	1.404	7.249	0.078	4.079	0.005	0.530	118.25	0.083	7.779	122.33	99.8%	21.14
BR-11B	8/17/2011	12:50	0.021	0.243	0.005	2.130	8.176	0.062	6.046	0.007	0.798	110.04	0.069	8.973	116.09	99.8%	21.74
BR-11C	8/17/2011	12:49	0.245	0.383	0.002	1.715	7.742	0.080	15.471	0.009	0.693	103.42	0.089	8.434	118.89	99.8%	22.47
BR-12A	8/17/2011	14:29	0.043	0.314	0.011	2.060	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.32
BR-12AX	8/17/2011	14:29	0.157	0.254	0.011	1.669	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.32
BR-13A	8/17/2011	13:51	0.378	0.638	0.015	3.128	11.375	0.095	11.102	0.023	1.443	118.00	0.117	12.817	129.10	99.8%	21.23
BR-14A	8/17/2011	14:05	0.487	0.394	0.040	6.979	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	20.50
BR-15A	8/17/2011	14:14	0.417	0.510	0.040	6.688	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	20.36
BR-16A	8/17/2011	13:40	0.002	0.291	0.011	1.428	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.23
BR-16B	8/17/2011	13:39	0.185	0.253	0.011	1.841	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.64
BR-16C	8/17/2011	13:39	0.241	0.421	0.011	1.884	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.71
BR-17A	8/17/2011	13:05	0.047	0.539	0.011	1.520	7.449	0.075	5.491	0.005	0.754	120.25	0.080	8.202	125.74	99.8%	21.11
BR-17B	8/17/2011	13:04	0.137	0.558	0.011	1.918	9.313	0.253	5.635	0.011	0.849	109.67	0.263	10.162	115.30	99.8%	21.61

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-17BX	8/17/2011	13:04	26.2762	-80.0648	8.7	35.62	30.65	0.866	6.14	8.14	164.9	N/A	N/A	0.19	1.144	0.292	0.197
BR-17C	8/17/2011	13:04	26.2761	-80.0646	16.7	35.72	30.38	0.564	6.16	8.15	166.1	0.487	0.113	0.28	1.507	0.333	0.152
BR-18A	8/17/2011	13:18	26.2981	-80.0685	1.5	35.09	31.06	0.711	6.11	8.00	164.9	1.028	0.193	0.32	1.613	0.380	0.191
BR-18B	8/17/2011	13:17	26.2981	-80.0684	4.2	35.52	30.59	0.666	6.14	8.12	166.1	0.576	0.106	0.25	1.570	0.345	0.154
BR-18C	8/17/2011	13:17	26.2980	-80.0684	10.7	35.74	30.38	0.714	6.16	8.13	167.8	0.489	0.153	0.25	1.407	0.499	0.154
HW-1A	8/30/2011	8:43	25.9974	-80.0897	1.2	35.12	29.83	2.436	6.23	8.04	117.5	0.689	0.188	0.32	1.857	0.742	0.123
HW-1B	8/30/2011	8:42	25.9972	-80.0896	9.0	35.33	29.97	2.542	6.21	8.12	122.1	0.512	0.147	0.31	1.514	0.566	0.127
HW-1BX	8/30/2011	8:42	25.9972	-80.0896	9.0	35.33	29.97	1.551	6.21	8.13	122.1	N/A	N/A	0.28	1.514	0.470	0.099
HW-1C	8/30/2011	8:41	25.9970	-80.0895	18.2	35.68	30.13	2.377	6.18	8.13	122.9	0.298	0.111	0.30	1.358	0.096	0.004
HW-2A	8/30/2011	9:00	26.0165	-80.0870	1.1	35.28	29.94	3.383	6.22	8.05	128.3	0.556	0.131	0.25	1.677	0.632	0.140
HW-2B	8/30/2011	8:59	26.0159	-80.0869	10.6	35.67	29.99	1.634	6.22	8.12	133.6	0.523	0.161	0.27	1.539	0.587	0.079
HW-2C	8/30/2011	8:58	26.0159	-80.0869	20.3	35.77	29.99	1.971	6.19	8.11	133.8	0.219	0.110	0.14	1.197	0.687	0.004
HW-3A	8/30/2011	9:16	26.0159	-80.0965	1.3	35.31	29.92	0.961	6.22	8.04	124.4	0.422	0.129	0.25	1.504	0.244	0.004
HW-3B	8/30/2011	9:15	26.0157	-80.0963	7.5	35.41	30.07	2.039	6.20	8.10	126.3	0.420	0.125	0.26	1.414	0.282	0.004
HW-3C	8/30/2011	9:14	26.0155	-80.0960	13.3	35.49	30.11	2.249	6.19	8.11	126.9	0.326	0.135	0.29	1.315	0.368	0.026
HW-4A	8/30/2011	9:33	26.0208	-80.0857	1.5	35.17	29.96	5.756	6.22	8.03	135.2	0.601	0.145	0.31	1.614	1.635	0.317
HW-4B	8/30/2011	9:32	26.0205	-80.0856	13.0	35.37	30.02	4.418	6.21	8.11	139.4	0.498	0.131	0.26	2.103	0.798	0.130
HW-4C	8/30/2011	9:31	26.0202	-80.0857	25.6	36.04	29.65	2.212	6.22	8.11	141.1	0.152	0.117	0.23	1.027	0.716	0.005
HW-5A	8/30/2011	9:58	26.0261	-80.0878	1.5	35.35	29.96	3.202	6.21	8.08	144.6	0.457	0.128	0.22	1.476	0.561	0.094
HW-5B	8/30/2011	9:57	26.0258	-80.0876	8.0	35.36	29.98	2.588	6.21	8.13	147.6	0.448	0.144	0.27	1.506	0.521	0.075
HW-5C	8/30/2011	9:56	26.0255	-80.0874	15.5	35.41	30.00	1.506	6.21	8.13	150.5	0.387	0.124	0.28	1.365	0.531	0.014
HW-6A	8/30/2011	10:12	26.0259	-80.0957	1.6	35.35	29.95	1.796	6.21	8.06	147.9	0.422	0.116	0.20	1.388	0.297	0.015
HW-6B	8/30/2011	10:11	26.0258	-80.0955	7.5	35.37	29.98	1.001	6.21	8.13	152.4	0.429	0.119	0.28	1.444	0.232	0.004
HW-6BX	8/30/2011	10:11	26.0258	-80.0955	7.5	35.37	29.98	1.090	6.21	8.14	152.4	N/A	N/A	0.18	1.444	0.169	0.004
HW-6C	8/30/2011	10:11	26.0255	-80.0953	11.6	35.46	30.06	0.825	6.20	8.14	154.9	0.378	0.143	0.24	1.320	0.253	0.004
HW-7A	8/30/2011	10:30	26.0459	-80.0962	2.0	35.38	29.94	3.277	6.21	8.06	119.7	0.472	0.126	0.22	1.411	0.744	0.301
HW-7B	8/30/2011	10:29	26.0457	-80.0960	5.9	35.38	29.95	1.050	6.21	8.13	121.8	0.448	0.138	0.28	1.449	0.185	0.004
HW-7C	8/30/2011	10:28	26.0456	-80.0957	11.6	35.38	29.94	1.458	6.21	8.14	121.7	0.453	0.136	0.33	1.433	0.172	0.013
HW-8A	8/30/2011	10:45	26.0456	-80.1073	1.8	35.35	29.83	2.379	6.23	8.09	138.5	0.545	0.135	0.35	1.555	0.143	0.136
HW-8AX	8/30/2011	10:45	26.0456	-80.1073	1.8	35.35	29.83	2.204	6.23	8.09	138.5	N/A	N/A	0.33	1.555	0.103	0.089
HW-8C	8/30/2011	10:45	26.0455	-80.1070	7.2	35.34	29.83	2.169	6.23	8.10	143.7	0.559	0.152	0.38	1.512	0.266	0.062
HW-9A	8/30/2011	11:09	26.0691	-80.0869	1.3	35.35	29.98	1.448	6.21	8.15	136.4	0.501	0.139	0.28	1.566	0.059	0.001
HW-9B	8/30/2011	11:08	26.0689	-80.0867	8.8	35.37	29.99	2.343	6.21	8.16	139.4	0.530	0.125	0.29	1.519	0.144	0.097
HW-9C	8/30/2011	11:08	26.0687	-80.0865	14.4	35.57	30.06	2.167	6.20	8.15	139.9	0.443	0.131	0.29	1.332	0.315	0.038
HW-10A	8/30/2011	11:26	26.0836	-80.0858	1.9	35.36	29.98	0.738	6.21	8.16	142.5	0.589	0.155	0.24	1.491	0.136	0.004
HW-10B	8/30/2011	11:25	26.0834	-80.0857	8.8	35.39	29.98	0.676	6.21	8.12	146.1	0.596	0.135	0.25	1.852	0.149	0.016
HW-10C	8/30/2011	11:25	26.0832	-80.0856	15.4	35.60	30.01	0.778	6.20	8.13	147.6	0.370	0.157	0.28	1.190	0.363	0.004
HW-11A	8/30/2011	11:40	26.0834	-80.0963	1.6	35.47	29.91	1.915	6.21	8.02	147.9	0.442	0.129	0.25	1.293	0.680	0.095
HW-11C	8/30/2011	11:39	26.0832	-80.0961	10.2	35.47	29.91	0.698	6.21	8.12	151.9	0.429	0.143	0.19	1.292	0.382	0.013
HW-12A	8/30/2011	13:30	26.0939	-80.0936	1.6	34.70	29.96	2.307	6.23	8.09	137.8	0.864	0.380	0.59	1.915	0.962	0.083
HW-12B	8/30/2011	13:29	26.0937	-80.0937	5.6	35.40	29.94	1.110	6.21	8.05	139.6	0.754	0.173	0.42	1.743	0.387	0.194

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-17BX	8/17/2011	13:04	0.095	0.574	0.011	2.200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.61
BR-17C	8/17/2011	13:04	0.181	0.231	0.011	1.854	8.094	0.093	6.077	0.009	0.825	109.08	0.103	8.919	115.16	99.8%	21.79
BR-18A	8/17/2011	13:18	0.189	0.331	0.011	3.414	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.07
BR-18B	8/17/2011	13:17	0.191	0.321	0.011	2.250	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.56
BR-18C	8/17/2011	13:17	0.345	0.215	0.011	2.128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.80
HW-1A	8/30/2011	8:43	0.619	1.694	0.071	1.635	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.53
HW-1B	8/30/2011	8:42	0.439	1.976	0.064	1.864	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.64
HW-1BX	8/30/2011	8:42	0.371	1.081	0.062	1.845	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.64
HW-1C	8/30/2011	8:41	0.092	2.281	0.037	1.589	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.84
HW-2A	8/30/2011	9:00	0.492	2.751	0.063	1.463	14.758	0.167	5.704	0.023	0.807	55.87	0.189	15.566	61.57	99.8%	21.61
HW-2B	8/30/2011	8:59	0.508	1.047	0.053	1.529	8.614	0.120	7.021	0.027	0.977	45.73	0.146	9.591	52.75	100.1%	21.88
HW-2C	8/30/2011	8:58	0.683	1.284	0.052	1.470	6.021	0.139	4.704	0.018	0.490	44.80	0.157	6.512	49.50	99.8%	21.95
HW-3A	8/30/2011	9:16	0.240	0.717	0.026	1.722	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.64
HW-3B	8/30/2011	9:15	0.278	1.757	0.023	1.982	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
HW-3C	8/30/2011	9:14	0.342	1.881	0.044	1.611	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.71
HW-4A	8/30/2011	9:33	1.318	4.121	0.172	2.336	13.749	0.304	5.978	0.040	0.893	68.73	0.344	14.642	74.71	99.8%	21.52
HW-4B	8/30/2011	9:32	0.668	3.620	0.062	1.778	9.780	0.104	6.044	0.022	0.775	54.12	0.127	10.555	60.16	99.8%	21.65
HW-4C	8/30/2011	9:31	0.711	1.496	0.066	1.761	5.470	0.148	2.806	0.013	0.208	62.09	0.161	5.678	64.90	99.8%	22.28
HW-5A	8/30/2011	9:58	0.467	2.641	0.044	1.586	6.516	0.151	5.979	0.024	0.856	50.85	0.176	7.372	56.83	99.8%	21.65
HW-5B	8/30/2011	9:57	0.446	2.067	0.047	1.621	5.396	0.162	5.879	0.024	0.713	59.97	0.187	6.109	65.85	99.8%	21.66
HW-5C	8/30/2011	9:56	0.517	0.975	0.044	1.397	5.043	0.166	6.636	0.023	0.879	56.10	0.189	5.922	62.74	99.8%	21.69
HW-6A	8/30/2011	10:12	0.282	1.499	0.024	1.805	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
HW-6B	8/30/2011	10:11	0.228	0.769	0.022	1.611	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
HW-6BX	8/30/2011	10:11	0.165	0.921	0.021	1.592	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
HW-6C	8/30/2011	10:11	0.249	0.572	0.031	1.473	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.70
HW-7A	8/30/2011	10:30	0.443	2.533	0.093	4.938	5.657	0.115	6.045	0.022	0.693	52.31	0.137	6.350	58.36	99.8%	21.69
HW-7B	8/30/2011	10:29	0.181	0.865	0.019	1.541	6.382	0.113	4.758	0.025	0.659	55.98	0.138	7.041	60.73	99.8%	21.68
HW-7C	8/30/2011	10:28	0.159	1.286	0.028	1.805	7.267	0.150	4.984	0.022	0.695	90.08	0.172	7.962	95.07	99.8%	21.68
HW-8A	8/30/2011	10:45	0.007	2.236	0.025	1.457	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.70
HW-8AX	8/30/2011	10:45	0.014	2.101	0.025	1.709	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.70
HW-8C	8/30/2011	10:45	0.204	1.903	0.032	1.958	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.70
HW-9A	8/30/2011	11:09	0.058	1.389	0.022	1.233	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.65
HW-9B	8/30/2011	11:08	0.047	2.199	0.037	1.798	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
HW-9C	8/30/2011	11:08	0.277	1.852	0.048	1.821	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.78
HW-10A	8/30/2011	11:26	0.132	0.602	0.021	1.234	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.65
HW-10B	8/30/2011	11:25	0.133	0.527	0.032	1.827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.67
HW-10C	8/30/2011	11:25	0.359	0.415	0.037	1.406	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.83
HW-11A	8/30/2011	11:40	0.585	1.235	0.054	2.324	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.76
HW-11C	8/30/2011	11:39	0.369	0.316	0.027	1.546	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.76
HW-12A	8/30/2011	13:30	0.879	1.345	0.062	5.711	12.327	0.172	10.835	0.044	0.937	76.33	0.216	13.265	87.16	99.8%	21.16
HW-12B	8/30/2011	13:29	0.193	0.723	0.017	1.733	6.652	1.922	7.511	0.027	0.950	44.70	1.949	7.602	52.21	99.8%	21.69

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-12BX	8/30/2011	13:29	26.0937	-80.0937	5.6	35.40	29.94	1.571	6.21	8.05	139.6	N/A	N/A	0.39	1.743	0.341	0.120
HW-12C	8/30/2011	13:28	26.0934	-80.0937	13.9	35.50	29.95	1.747	6.21	8.12	142.1	0.519	0.153	0.27	1.395	0.425	0.002
HW-13A	8/30/2011	11:59	26.0952	-80.0844	1.9	35.26	29.97	0.407	6.22	8.08	152.5	0.701	0.147	0.29	1.560	0.047	0.031
HW-13B	8/30/2011	11:58	26.0952	-80.0844	7.8	35.36	29.97	0.280	6.21	8.13	154.9	0.733	0.151	0.25	1.816	0.026	0.004
HW-13C	8/30/2011	11:58	26.0951	-80.0843	15.2	35.51	35.51	1.850	6.20	8.15	156.3	0.499	0.152	0.30	1.416	0.376	0.004
HW-14A	8/30/2011	12:48	26.0943	-80.1161	1.1	32.43	30.06	3.338	6.30	7.95	132.7	1.449	0.632	0.88	2.865	2.110	0.379
HW-15A	8/30/2011	12:12	26.1039	-80.0841	1.6	35.35	29.97	0.302	6.21	8.06	151.7	0.679	0.138	0.32	1.469	0.007	0.004
HW-15AX	8/30/2011	12:12	26.1039	-80.0841	1.6	35.35	29.97	1.209	6.21	8.11	151.7	N/A	N/A	0.27	1.469	0.046	0.025
HW-15B	8/30/2011	12:11	26.1037	-80.0840	10.7	35.42	29.97	0.201	6.21	8.13	155.0	0.647	0.135	0.22	1.791	0.062	0.015
HW-15C	8/30/2011	12:10	26.1034	-80.0838	20.6	35.80	29.80	0.315	6.21	8.12	157.1	0.647	0.135	0.22	1.303	0.176	0.004
BR-1A	8/30/2011	13:07	26.0933	-80.1059	1.4	32.31	30.03	3.504	6.31	7.92	135.5	1.409	0.679	1.08	2.714	2.263	0.442
BR-1B	8/30/2011	13:06	26.0933	-80.1059	10.6	35.10	29.93	1.330	6.22	8.06	139.5	0.467	0.261	0.77	1.419	0.640	0.134
BR-1C	8/30/2011	13:06	26.0933	-80.1060	13.2	35.15	29.92	1.505	6.22	8.07	142.5	0.466	0.256	0.83	1.485	0.442	0.120
BR-2A	8/30/2011	12:24	26.1028	-80.0947	1.1	35.48	29.96	1.080	6.21	8.04	140.0	0.487	0.114	0.18	1.433	0.441	0.135
BR-2C	8/30/2011	12:24	26.1026	-80.0944	7.8	35.48	29.95	1.410	6.21	8.08	140.9	0.506	0.119	0.31	1.329	0.137	0.116
BR-3A	9/15/2011	8:47	26.1376	-80.0900	1.1	35.20	29.69	1.074	6.24	8.12	124.6	0.589	0.160	0.14	1.695	0.566	0.057
BR-3C	9/15/2011	8:46	26.1377	-80.0900	8.6	35.63	29.63	1.005	6.23	8.11	132.0	0.457	0.115	0.25	1.552	0.424	0.080
BR-3CX	9/15/2011	8:46	26.1377	-80.0900	8.6	35.63	29.63	1.123	6.23	8.11	132.0	N/A	N/A	0.18	1.552	0.521	0.069
BR-4A	9/15/2011	9:17	26.1605	-80.0748	1.2	35.34	29.77	0.794	6.23	8.08	135.8	0.346	0.094	0.14	2.390	0.196	0.035
BR-4AX	9/15/2011	9:17	26.1605	-80.0748	1.2	35.34	29.77	0.489	6.23	8.08	135.8	N/A	N/A	0.12	2.390	0.175	0.077
BR-4B	9/15/2011	9:15	26.1604	-80.0750	10.2	35.63	29.49	0.539	6.25	8.09	139.4	0.330	0.075	0.10	1.447	0.130	0.060
BR-4C	9/15/2011	9:14	26.1603	-80.0753	24.3	35.72	29.25	1.161	6.27	8.09	142.1	0.344	0.101	0.09	1.585	0.211	0.079
BR-5A	9/15/2011	9:02	26.1598	-80.0874	1.2	35.35	29.79	1.036	6.23	7.90	131.9	0.500	0.103	0.12	1.579	0.587	0.092
BR-5C	9/15/2011	9:01	26.1598	-80.0875	9.5	35.59	29.71	1.107	6.23	8.08	136.7	0.436	0.097	0.16	1.469	0.615	0.069
BR-6A	9/15/2011	9:35	26.1898	-80.0842	1.2	35.35	29.97	1.221	6.21	8.07	136.5	0.410	0.130	0.21	1.370	0.400	0.072
BR-6B	9/15/2011	9:34	26.1898	-80.0843	4.9	35.37	29.86	1.632	6.22	8.12	138.3	0.450	0.133	0.15	1.564	0.509	0.097
BR-6C	9/15/2011	9:33	26.1897	-80.0844	7.2	35.48	29.80	1.005	6.22	8.12	139.7	0.459	0.110	0.14	1.474	0.421	0.103
BR-7A	9/15/2011	9:51	26.2039	-80.0683	1.3	34.99	29.89	0.701	6.23	8.09	140.2	0.153	0.024	0.11	1.054	0.116	0.044
BR-7B	9/15/2011	9:50	26.2037	-80.0682	15.3	35.50	29.83	0.855	6.22	8.14	143.3	0.273	0.049	0.09	1.265	0.130	0.022
BR-7C	9/15/2011	9:49	26.2034	-80.0682	29.9	35.63	29.54	0.693	6.24	8.10	144.8	0.352	0.087	0.09	1.550	0.178	0.049
BR-8A	9/15/2011	10:10	26.2397	-80.0674	1.1	35.25	29.90	0.438	6.22	8.10	142.9	0.261	0.042	0.12	1.114	0.129	0.038
BR-8B	9/15/2011	10:10	26.2395	-80.0675	8.6	35.37	29.83	1.017	6.22	8.11	145.7	0.329	0.069	0.18	1.241	0.251	0.079
BR-8C	9/15/2011	10:09	26.2393	-80.0675	15.5	35.46	29.77	0.895	6.23	8.10	146.7	0.401	0.098	0.18	1.479	0.309	0.077
BR-9A	9/15/2011	10:23	26.2493	-80.0629	1.5	35.13	29.92	0.618	6.22	8.09	143.6	0.223	0.028	0.12	1.289	0.080	0.036
BR-9B	9/15/2011	10:22	26.2488	-80.0630	15.8	35.30	29.85	0.753	6.22	8.13	147.5	0.252	0.042	0.13	1.196	0.172	0.034
BR-9C	9/15/2011	10:21	26.2484	-80.0630	30.3	35.50	29.49	0.825	6.25	8.12	148.5	0.393	0.084	0.13	1.487	0.377	0.080
BR-10A	9/15/2011	10:48	26.2540	-80.0621	1.1	35.04	29.84	3.140	6.23	8.04	146.8	0.189	0.031	0.13	1.150	0.714	0.311
BR-10B	9/15/2011	10:47	26.2540	-80.0621	16.0	35.14	29.81	1.407	6.25	8.09	6.3	0.218	0.041	0.11	1.209	0.256	0.092
BR-10C	9/15/2011	10:46	26.2537	-80.0619	31.7	35.53	29.40	0.676	6.26	8.10	150.8	0.384	0.087	0.15	1.447	0.245	0.064
BR-11A	9/15/2011	11:09	26.2564	-80.0619	1.2	35.00	29.90	2.161	6.23	8.11	146.7	0.175	0.067	0.12	1.025	0.456	0.180
BR-11B	9/15/2011	11:08	26.2562	-80.0619	14.4	35.27	29.87	0.547	6.22	8.15	149.1	0.257	0.049	0.16	1.135	0.106	0.012

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-12BX	8/30/2011	13:29	0.221	1.230	0.028	1.748	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.69
HW-12C	8/30/2011	13:28	0.423	1.322	0.037	2.244	7.022	0.160	5.994	0.022	0.763	42.82	0.182	7.785	48.81	99.8%	21.77
HW-13A	8/30/2011	11:59	0.016	0.360	0.027	1.409	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.9%	21.58
HW-13B	8/30/2011	11:58	0.022	0.254	0.020	1.524	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
HW-13C	8/30/2011	11:58	0.372	1.474	0.040	1.435	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	108.7%	19.78
HW-14A	8/30/2011	12:48	1.731	1.228	0.140	13.536	9.251	0.248	16.560	0.054	1.404	119.50	0.302	10.655	136.06	99.8%	19.44
HW-15A	8/30/2011	12:12	0.003	0.295	0.022	1.217	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.65
HW-15AX	8/30/2011	12:12	0.021	1.163	0.016	1.101	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.65
HW-15B	8/30/2011	12:11	0.047	0.139	0.025	1.483	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.70
HW-15C	8/30/2011	12:10	0.172	0.139	0.030	1.486	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.04
BR-1A	8/30/2011	13:07	1.821	1.241	0.148	13.711	8.512	0.193	16.769	0.052	1.341	93.75	0.245	9.853	110.52	99.8%	19.36
BR-1B	8/30/2011	13:06	0.506	0.690	0.048	3.509	4.264	0.159	9.068	0.029	0.752	65.93	0.189	5.016	74.99	99.8%	21.48
BR-1C	8/30/2011	13:06	0.322	1.063	0.039	2.823	8.159	0.122	8.797	0.028	0.759	56.59	0.150	8.918	65.39	99.8%	21.51
BR-2A	8/30/2011	12:24	0.306	0.639	0.036	2.267	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.75
BR-2C	8/30/2011	12:24	0.021	1.273	0.015	1.092	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.75
BR-3A	9/15/2011	8:47	0.509	0.508	0.011	2.338	0.172	5.981	7.238	0.053	1.057	102.33	6.034	1.229	109.57	99.8%	21.63
BR-3C	9/15/2011	8:46	0.344	0.581	0.011	1.688	0.292	9.655	5.025	0.016	0.649	67.00	9.671	0.941	72.03	99.8%	21.97
BR-3CX	9/15/2011	8:46	0.452	0.602	0.002	1.852	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.97
BR-4A	9/15/2011	9:17	0.161	0.598	0.011	1.148	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.71
BR-4AX	9/15/2011	9:17	0.098	0.314	0.006	0.920	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.71
BR-4B	9/15/2011	9:15	0.070	0.409	0.001	1.134	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.03
BR-4C	9/15/2011	9:14	0.132	0.950	0.011	1.097	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.17
BR-5A	9/15/2011	9:02	0.495	0.449	0.010	1.972	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.71
BR-5C	9/15/2011	9:01	0.546	0.492	0.005	1.484	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.92
BR-6A	9/15/2011	9:35	0.328	0.821	0.011	1.419	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.65
BR-6B	9/15/2011	9:34	0.412	1.123	0.011	1.316	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.70
BR-6C	9/15/2011	9:33	0.318	0.584	0.011	1.546	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.80
BR-7A	9/15/2011	9:51	0.072	0.585	0.011	0.740	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.41
BR-7B	9/15/2011	9:50	0.108	0.725	0.011	1.137	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.81
BR-7C	9/15/2011	9:49	0.129	0.515	0.011	0.952	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.01
BR-8A	9/15/2011	10:10	0.091	0.309	0.011	1.127	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.60
BR-8B	9/15/2011	10:10	0.172	0.766	0.011	1.156	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.71
BR-8C	9/15/2011	10:09	0.232	0.586	0.011	1.693	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.81
BR-9A	9/15/2011	10:23	0.044	0.538	0.011	0.872	0.154	5.703	1.926	0.006	0.268	70.20	5.709	0.422	72.13	99.8%	21.51
BR-9B	9/15/2011	10:22	0.138	0.581	0.011	1.054	0.142	8.108	3.528	0.013	0.516	73.04	8.122	0.658	76.57	99.8%	21.65
BR-9C	9/15/2011	10:21	0.297	0.448	0.011	1.656	0.140	3.963	4.110	0.016	0.523	61.52	3.979	0.663	65.63	99.8%	21.93
BR-10A	9/15/2011	10:48	0.403	2.426	0.020	1.654	0.355	7.727	4.943	0.021	0.750	102.08	7.748	1.105	107.03	99.8%	21.46
BR-10B	9/15/2011	10:47	0.164	1.151	0.011	1.016	0.200	6.044	4.444	0.015	0.699	95.42	6.059	0.899	99.86	100.0%	21.55
BR-10C	9/15/2011	10:46	0.181	0.431	0.011	1.262	0.211	5.589	4.142	0.016	0.629	87.75	5.605	0.840	91.89	99.8%	21.98
BR-11A	9/15/2011	11:09	0.276	1.705	0.013	0.936	0.160	6.215	4.062	0.016	0.590	83.58	6.230	0.750	87.65	99.8%	21.41
BR-11B	9/15/2011	11:08	0.094	0.441	0.011	1.057	0.182	8.512	4.219	0.011	0.622	95.13	8.522	0.804	99.34	99.8%	21.62

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-11C	9/15/2011	11:06	26.2559	-80.0619	30.8	35.51	29.34	0.904	6.27	8.14	151.9	0.385	0.110	0.18	1.432	0.234	0.060
BR-12A	9/15/2011	12:21	26.2495	-80.0792	2.2	35.21	30.21	0.700	6.19	8.09	162.3	0.555	0.112	0.23	1.286	0.249	0.133
BR-12AX	9/15/2011	12:21	26.2495	-80.0792	2.2	35.21	30.21	0.265	6.19	8.09	162.3	N/A	N/A	0.27	1.286	0.150	0.115
BR-13A	9/15/2011	13:06	26.2593	-80.0830	1.6	34.55	30.21	1.034	6.22	7.76	156.1	1.307	0.435	0.49	2.255	0.455	0.165
BR-14A	9/15/2011	13:29	26.2618	-80.0855	1.3	31.39	30.27	0.832	6.31	7.99	162.5	4.206	1.068	0.83	4.776	0.469	0.215
BR-15A	9/15/2011	13:21	26.2633	-80.0832	1.7	33.83	30.19	0.598	6.24	8.01	160.0	4.105	1.072	0.87	4.863	0.241	0.167
BR-16A	9/15/2011	12:07	26.2605	-80.0732	1.6	35.27	30.24	0.318	6.19	8.10	158.1	0.472	0.097	0.23	1.257	0.195	0.107
BR-16B	9/15/2011	12:06	26.2605	-80.0733	6.4	35.51	29.81	0.620	6.22	8.14	160.0	0.440	0.092	0.20	1.314	0.178	0.084
BR-16C	9/15/2011	12:05	26.2604	-80.0735	10.7	35.56	29.64	0.515	6.24	8.13	162.4	0.479	0.103	0.28	1.429	0.217	0.113
BR-17A	9/15/2011	11:25	26.2754	-80.0637	1.1	34.78	30.02	0.640	6.23	8.12	150.7	0.676	0.167	0.23	1.585	0.237	0.120
BR-17B	9/15/2011	11:25	26.2754	-80.0637	5.7	35.11	30.02	0.947	6.21	8.15	151.7	0.471	0.103	0.20	1.585	0.163	0.069
BR-17BX	9/15/2011	11:25	26.2754	-80.0637	5.7	35.11	30.02	0.757	6.21	8.15	151.7	N/A	N/A	0.20	1.585	0.172	0.042
BR-17C	9/15/2011	11:24	26.2754	-80.0637	13.2	35.39	29.81	0.652	6.23	8.12	154.5	0.383	0.088	0.05	1.300	0.231	0.067
BR-18A	9/15/2011	11:44	26.2971	-80.0677	1.3	35.15	30.16	0.489	6.20	8.10	152.4	0.481	0.089	0.21	1.529	0.104	0.036
BR-18B	9/15/2011	11:44	26.2971	-80.0677	7.0	35.32	30.04	0.191	6.22	8.10	159.5	0.415	0.105	0.19	1.274	0.159	0.107
BR-18C	9/15/2011	11:43	26.2972	-80.0677	13.9	35.49	29.63	0.778	6.24	8.13	157.5	0.370	0.100	0.18	1.378	0.300	0.138
HW-1A	9/29/2011	15:23	25.9939	-80.0891	1.4	35.25	29.86	1.292	6.23	8.07	130.7	0.273	0.239	0.16	1.060	0.210	0.163
HW-1B	9/29/2011	15:22	25.9942	-80.0892	9.4	35.61	29.10	0.484	6.29	8.12	134.5	0.354	0.160	0.19	1.418	0.162	0.111
HW-1BX	9/29/2011	15:22	25.9942	-80.0892	9.4	35.61	29.10	0.571	6.29	8.12	134.5	N/A	N/A	0.18	1.418	0.121	0.100
HW-1C	9/29/2011	15:21	25.9945	-80.0893	17.8	35.98	28.16	0.991	6.37	8.11	136.5	0.312	0.202	0.23	1.574	0.364	0.152
HW-2A	9/29/2011	14:50	26.0125	-80.0862	1.2	35.23	29.85	0.537	6.23	8.11	131.9	0.283	0.044	0.19	1.052	0.169	0.100
HW-2B	9/29/2011	14:49	26.0128	-80.0862	11.0	35.57	29.26	5.339	6.27	8.17	133.1	0.369	0.089	0.18	1.192	0.251	0.193
HW-2C	9/29/2011	14:49	26.0130	-80.0862	20.8	36.05	27.93	0.327	6.39	8.15	134.6	0.616	0.197	0.14	2.124	0.086	0.079
HW-3A	9/29/2011	15:06	26.0135	-80.0956	1.3	35.23	29.75	1.060	6.24	8.15	133.1	0.383	0.113	0.19	1.292	0.253	0.181
HW-3B	9/29/2011	15:05	26.0137	-80.0955	6.4	35.38	29.34	0.671	6.27	8.16	135.0	0.635	0.129	0.23	1.746	0.273	0.138
HW-3C	9/29/2011	15:05	26.0137	-80.0955	15.2	35.84	28.60	1.012	6.35	8.16	138.2	0.669	0.181	0.29	1.614	0.275	0.133
HW-4A	9/29/2011	14:30	26.0163	-80.0870	1.2	35.18	29.68	2.023	6.25	8.15	128.7	0.442	0.060	0.20	1.179	0.931	0.196
HW-4B	9/29/2011	14:29	26.0163	-80.0870	8.5	35.28	29.36	7.433	6.29	8.14	133.5	0.373	0.132	0.20	1.247	4.370	0.562
HW-4C	9/29/2011	14:29	26.0166	-80.0868	16.0	36.02	28.00	0.703	6.39	8.17	134.1	0.570	0.180	0.18	1.911	0.301	0.064
HW-5A	9/29/2011	14:11	26.0232	-80.0862	1.5	35.24	29.79	0.384	6.23	7.88	122.5	0.330	0.035	0.16	1.120	0.006	0.005
HW-5B	9/29/2011	14:09	26.0234	-80.0862	11.7	35.88	28.61	0.214	6.33	8.13	125.4	0.441	0.135	0.25	1.459	0.050	0.040
HW-5C	9/29/2011	14:07	26.0237	-80.0862	19.2	36.05	27.87	0.866	6.40	8.13	126.9	0.571	0.207	0.20	2.053	0.352	0.072
HW-6A	9/29/2011	13:54	26.0235	-80.0947	1.3	35.22	29.69	0.396	6.24	8.13	115.2	0.509	0.104	0.23	1.368	0.075	0.062
HW-6B	9/29/2011	13:53	26.0236	-80.0946	6.4	35.29	29.45	0.872	6.27	8.12	116.5	0.601	0.097	0.21	1.711	0.118	0.028
HW-6BX	9/29/2011	13:53	26.0236	-80.0946	6.4	35.29	29.45	0.409	6.27	8.12	116.5	N/A	N/A	0.19	1.711	0.113	0.033
HW-6C	9/29/2011	13:53	26.0238	-80.0946	12.4	35.52	29.14	0.800	6.29	8.12	118.0	0.669	0.176	0.26	1.971	0.317	0.043
HW-7A	9/29/2011	13:27	26.0440	-80.0947	1.3	35.21	29.68	0.272	6.24	8.08	130.3	0.541	0.095	0.22	1.353	0.055	0.020
HW-7B	9/29/2011	13:27	26.0441	-80.0946	6.3	35.25	29.49	0.453	6.26	8.14	132.4	0.605	0.117	0.25	1.625	0.196	0.004
HW-7C	9/29/2011	13:26	26.0442	-80.0946	11.4	35.50	29.23	0.835	6.28	7.87	134.8	0.438	0.192	0.31	1.492	0.540	0.044
HW-8A	9/29/2011	13:38	26.0445	-80.1066	1.1	35.33	29.64	0.635	6.24	8.09	122.7	0.579	0.138	0.27	1.514	0.292	0.082
HW-8AX	9/29/2011	13:38	26.0445	-80.1066	1.1	35.33	29.64	0.801	6.24	8.09	122.7	N/A	N/A	0.28	1.514	0.193	0.058

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-11C	9/15/2011	11:06	0.174	0.670	0.011	1.097	0.186	7.875	4.143	0.013	0.670	87.58	7.888	0.856	91.73	99.8%	21.99
BR-12A	9/15/2011	12:21	0.116	0.451	0.020	1.817	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.46
BR-12AX	9/15/2011	12:21	0.035	0.115	0.013	1.511	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.46
BR-13A	9/15/2011	13:06	0.290	0.579	0.052	3.368	0.246	10.497	10.497	0.037	1.325	104.42	10.92	1.572	114.91	99.8%	20.97
BR-14A	9/15/2011	13:29	0.254	0.363	0.097	10.134	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.7%	18.59
BR-15A	9/15/2011	13:21	0.074	0.357	0.076	6.511	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	20.44
BR-16A	9/15/2011	12:07	0.088	0.123	0.016	1.678	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.50
BR-16B	9/15/2011	12:06	0.094	0.442	0.019	1.913	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.82
BR-16C	9/15/2011	12:05	0.104	0.298	0.012	1.489	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.92
BR-17A	9/15/2011	11:25	0.117	0.403	0.011	2.413	0.526	9.274	6.092	0.023	1.073	63.91	9.297	1.599	70.00	99.8%	21.21
BR-17B	9/15/2011	11:25	0.094	0.784	0.011	1.411	0.207	4.983	5.687	0.021	0.838	59.03	5.005	1.045	64.71	99.8%	21.45
BR-17BX	9/15/2011	11:25	0.130	0.585	0.011	1.377	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.45
BR-17C	9/15/2011	11:24	0.164	0.421	0.011	1.118	0.172	6.306	4.485	0.013	0.626	84.58	6.319	0.798	89.07	99.8%	21.74
BR-18A	9/15/2011	11:44	0.068	0.385	0.011	1.303	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.43
BR-18B	9/15/2011	11:44	0.052	0.032	0.016	1.727	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0%	21.60
BR-18C	9/15/2011	11:43	0.162	0.478	0.031	1.758	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.87
HW-1A	9/29/2011	15:23	0.047	1.082	0.011	0.894	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.62
HW-1B	9/29/2011	15:22	0.051	0.322	0.011	0.952	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.14
HW-1BX	9/29/2011	15:22	0.021	0.450	0.011	0.804	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.14
HW-1C	9/29/2011	15:21	0.212	0.627	0.035	2.713	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.74
HW-2A	9/29/2011	14:50	0.069	0.368	0.011	0.906	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.61
HW-2B	9/29/2011	14:49	0.058	5.088	0.091	0.832	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.06
HW-2C	9/29/2011	14:49	0.007	0.241	0.011	0.772	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.86
HW-3A	9/29/2011	15:06	0.072	0.807	0.011	1.520	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.64
HW-3B	9/29/2011	15:05	0.135	0.398	0.011	1.306	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.88
HW-3C	9/29/2011	15:05	0.142	0.737	0.011	0.913	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0%	22.48
HW-4A	9/29/2011	14:30	0.735	1.092	0.062	1.202	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.63
HW-4B	9/29/2011	14:29	3.808	3.063	0.381	2.359	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0%	21.81
HW-4C	9/29/2011	14:29	0.237	0.402	0.011	0.907	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.82
HW-5A	9/29/2011	14:11	0.001	0.378	0.011	1.509	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.63
HW-5B	9/29/2011	14:09	0.010	0.164	0.011	0.868	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.51
HW-5C	9/29/2011	14:07	0.280	0.514	0.010	1.203	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.89
HW-6A	9/29/2011	13:54	0.013	0.321	0.011	1.303	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.65
HW-6B	9/29/2011	13:53	0.090	0.754	0.011	1.119	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.78
HW-6BX	9/29/2011	13:53	0.080	0.296	0.011	1.093	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.78
HW-6C	9/29/2011	13:53	0.274	0.483	0.011	1.199	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.06
HW-7A	9/29/2011	13:27	0.035	0.217	0.011	1.042	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.65
HW-7B	9/29/2011	13:27	0.192	0.257	0.011	1.392	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.74
HW-7C	9/29/2011	13:26	0.496	0.295	0.011	1.206	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.02
HW-8A	9/29/2011	13:38	0.210	0.343	0.011	1.370	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.75
HW-8AX	9/29/2011	13:38	0.135	0.608	0.011	1.119	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.75

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-8C	9/29/2011	13:38	26.0446	-80.1065	5.3	35.34	29.58	0.660	6.25	8.13	124.2	0.605	0.150	0.30	1.826	0.211	0.071
HW-9A	9/29/2011	13:11	26.0673	-80.0851	1.4	35.24	29.76	0.245	6.24	8.13	128.6	0.276	0.079	0.24	1.189	0.061	0.051
HW-9B	9/29/2011	13:11	26.0673	-80.0851	7.7	35.30	29.43	0.334	6.27	8.14	130.7	0.549	0.121	0.23	1.641	0.104	0.004
HW-9C	9/29/2011	13:10	26.0673	-80.0851	16.4	35.60	29.01	0.647	6.30	8.13	133.4	0.483	0.122	0.20	1.625	0.316	0.016
HW-10A	9/29/2011	12:59	26.0823	-80.0846	1.5	35.20	29.77	0.816	6.24	8.08	126.9	0.431	0.123	0.20	1.375	0.078	0.020
HW-10B	9/29/2011	12:58	26.0822	-80.0845	6.9	35.25	29.46	0.299	6.27	8.13	128.5	0.382	0.174	0.19	1.520	0.067	0.043
HW-10C	9/29/2011	12:58	26.0822	-80.0845	16.4	35.48	29.22	0.594	6.28	8.12	131.1	0.299	0.167	0.17	1.448	0.290	0.048
HW-11A	9/29/2011	12:48	26.0822	-80.0949	1.5	35.26	29.74	0.431	6.24	8.12	126.3	0.205	0.137	0.17	1.313	0.108	0.093
HW-11C	9/29/2011	12:46	26.0823	-80.0950	8.4	35.32	29.51	0.498	6.26	8.14	129.3	0.341	0.124	0.21	1.328	0.162	0.051
HW-12A	9/29/2011	11:39	26.0946	-80.0959	1.6	34.76	29.59	1.017	6.27	8.02	89.3	0.521	0.157	0.30	1.725	0.537	0.229
HW-12B	9/29/2011	11:37	26.0941	-80.0954	6.5	35.00	29.56	1.206	6.28	8.04	82.3	0.449	0.193	0.23	1.622	0.481	0.093
HW-12BX	9/29/2011	11:37	26.0941	-80.0954	6.5	35.00	29.56	1.125	6.28	8.04	82.3	N/A	N/A	0.27	1.622	0.450	0.203
HW-12C	9/29/2011	11:36	26.0941	-80.0954	12.0	35.21	29.49	1.011	6.26	8.11	86.3	0.493	0.213	0.34	1.575	0.467	0.215
HW-13A	9/29/2011	12:35	26.0941	-80.0842	1.1	35.13	29.74	0.333	6.24	8.12	124.1	0.402	0.178	0.22	1.374	0.095	0.092
HW-13B	9/29/2011	12:34	26.0940	-80.0842	9.9	35.27	29.46	0.416	6.26	8.13	127.6	0.322	0.116	0.20	1.367	0.138	0.106
HW-13C	9/29/2011	12:34	26.0940	-80.0841	13.8	35.36	29.40	0.795	6.27	8.13	128.9	0.320	0.137	0.22	1.311	0.227	0.093
HW-14A	9/29/2011	11:17	26.0944	-80.1163	1.5	33.23	29.71	3.910	6.31	7.88	70.2	1.405	0.637	0.99	2.756	2.160	0.435
HW-15A	9/29/2011	12:23	26.1017	-80.0825	1.2	35.10	29.57	0.429	6.26	8.10	121.2	0.432	0.095	0.23	1.366	0.183	0.101
HW-15AX	9/29/2011	12:23	26.1017	-80.0825	1.2	35.10	29.57	0.694	6.26	8.13	121.2	N/A	N/A	0.21	1.366	0.164	0.117
HW-15B	9/29/2011	12:22	26.1017	-80.0825	9.7	35.27	29.53	0.474	6.26	8.12	124.4	0.293	0.141	0.18	1.402	0.109	0.054
HW-15C	9/29/2011	12:22	26.1016	-80.0825	18.4	35.37	29.37	0.314	6.27	8.12	125.7	0.394	0.134	0.17	1.440	0.187	0.072
BR-1A	9/29/2011	11:54	26.0935	-80.1053	1.3	33.78	29.73	2.495	6.29	7.99	115.1	1.079	0.433	0.46	2.422	1.535	0.402
BR-1B	9/29/2011	11:53	26.0935	-80.1051	9.0	34.93	29.49	0.952	6.27	8.09	116.4	0.723	0.255	0.51	1.947	0.539	0.181
BR-1C	9/29/2011	11:52	26.0935	-80.1054	12.8	34.93	29.49	1.242	6.27	8.10	119.0	0.619	0.184	0.38	2.059	0.541	0.215
BR-2A	9/29/2011	12:10	26.1029	-80.0941	1.0	34.91	29.85	0.716	6.24	7.76	114.4	0.336	0.194	0.22	1.552	0.462	0.144
BR-2C	9/29/2011	12:09	26.1029	-80.0941	5.9	35.16	29.45	0.558	6.27	8.01	116.2	0.378	0.204	0.23	1.618	0.313	0.129
BR-3A	11/17/2011	10:59	26.1376	-80.0915	1.2	34.93	25.96	1.322	6.65	8.03	169.3	0.574	0.192	0.45	1.482	0.703	0.110
BR-3C	11/17/2011	10:59	26.1376	-80.0915	7.1	35.41	25.75	0.600	6.65	8.11	170.7	0.876	0.246	0.43	2.332	0.333	0.102
BR-3CX	11/17/2011	10:59	26.1376	-80.0915	7.1	35.41	25.75	1.463	6.65	8.11	170.7	N/A	N/A	0.47	2.332	0.441	0.126
BR-4A	11/17/2011	11:21	26.1596	-80.0771	1.7	35.31	25.80	0.316	6.65	8.06	149.5	0.801	0.227	0.45	2.140	0.124	0.059
BR-4AX	11/17/2011	11:21	26.1596	-80.0771	1.7	35.31	25.80	2.676	6.65	8.06	149.5	N/A	N/A	0.39	2.140	0.437	0.144
BR-4B	11/17/2011	11:20	26.1596	-80.0768	9.6	35.45	25.81	0.835	6.44	8.13	152.8	0.719	0.205	0.31	2.130	0.189	0.157
BR-4C	11/17/2011	11:19	26.1596	-80.0768	20.2	35.64	25.97	1.664	6.64	8.14	153.8	0.414	0.214	0.21	1.652	0.236	0.076
BR-5A	11/17/2011	11:36	26.1593	-80.0889	0.7	34.80	26.08	2.083	6.64	8.08	126.2	0.450	0.187	0.62	1.745	0.842	0.097
BR-5C	11/17/2011	11:35	26.1594	-80.0888	6.0	35.47	25.80	3.295	6.65	8.13	129.0	0.506	0.196	0.31	2.603	0.820	0.118
BR-6A	11/17/2011	11:54	26.1894	-80.0853	1.3	34.91	25.94	2.228	6.67	8.06	127.4	0.543	0.206	0.96	1.537	0.787	0.108
BR-6B	11/17/2011	11:53	26.1894	-80.0853	4.4	35.45	25.88	0.000	6.66	N/A	128.5	N/A	N/A	N/A	1.851	0.000	N/A
BR-6C	11/17/2011	11:52	26.1894	-80.0853	8.1	35.50	25.82	1.904	6.64	8.12	131.3	0.431	0.243	0.32	2.024	0.759	0.059
BR-7A	11/17/2011	12:10	26.2028	-80.0691	1.2	35.01	26.10	1.044	6.63	8.09	132.4	0.600	0.240	0.43	1.762	0.364	0.150
BR-7B	11/17/2011	12:10	26.2027	-80.0690	12.9	35.53	25.93	0.724	6.63	8.13	134.5	0.508	0.181	0.29	1.921	0.093	0.018
BR-7C	11/17/2011	12:09	26.2027	-80.0689	27.0	35.73	25.93	1.696	6.62	8.12	135.5	0.191	0.137	0.22	1.459	0.528	0.125

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-8C	9/29/2011	13:38	0.140	0.449	0.011	1.434	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.78
HW-9A	9/29/2011	13:11	0.010	0.184	0.011	0.843	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.64
HW-9B	9/29/2011	13:11	0.100	0.230	0.011	0.962	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.80
HW-9C	9/29/2011	13:10	0.300	0.331	0.011	1.202	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.16
HW-10A	9/29/2011	12:59	0.058	0.738	0.052	1.144	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.61
HW-10B	9/29/2011	12:58	0.024	0.232	0.038	1.177	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.75
HW-10C	9/29/2011	12:58	0.242	0.304	0.011	1.506	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.00
HW-11A	9/29/2011	12:48	0.015	0.323	0.043	1.171	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.66
HW-11C	9/29/2011	12:46	0.111	0.336	0.030	1.032	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.79
HW-12A	9/29/2011	11:39	0.308	0.480	0.037	3.632	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.34
HW-12B	9/29/2011	11:37	0.388	0.725	0.057	2.589	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0%	21.53
HW-12BX	9/29/2011	11:37	0.247	0.675	0.065	4.099	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0%	21.53
HW-12C	9/29/2011	11:36	0.252	0.544	0.037	1.835	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.71
HW-13A	9/29/2011	12:35	0.003	0.238	0.035	1.873	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.57
HW-13B	9/29/2011	12:34	0.032	0.278	0.034	1.382	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.77
HW-13C	9/29/2011	12:34	0.134	0.568	0.036	1.229	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.85
HW-14A	9/29/2011	11:17	1.725	1.750	0.184	11.947	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	20.15
HW-15A	9/29/2011	12:23	0.082	0.246	0.023	1.951	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.60
HW-15AX	9/29/2011	12:23	0.047	0.530	0.026	1.820	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.60
HW-15B	9/29/2011	12:22	0.055	0.365	0.022	1.372	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.74
HW-15C	9/29/2011	12:22	0.115	0.127	0.025	1.372	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.87
BR-1A	9/29/2011	11:54	1.133	0.960	0.127	9.027	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	20.56
BR-1B	9/29/2011	11:53	0.358	0.413	0.039	3.152	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.50
BR-1C	9/29/2011	11:52	0.326	0.701	0.049	3.211	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.50
BR-2A	9/29/2011	12:10	0.318	0.254	0.026	3.170	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.37
BR-2C	9/29/2011	12:09	0.184	0.245	0.025	2.160	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.69
BR-3A	11/17/2011	10:59	0.593	0.619	0.040	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.67
BR-3C	11/17/2011	10:59	0.231	0.267	0.038	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.09
BR-3CX	11/17/2011	10:59	0.315	1.022	0.036	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.09
BR-4A	11/17/2011	11:21	0.065	0.192	0.015	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.01
BR-4AX	11/17/2011	11:21	0.293	2.239	0.043	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.01
BR-4B	11/17/2011	11:20	0.032	0.646	0.038	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	96.7%	23.11
BR-4C	11/17/2011	11:19	0.160	1.428	0.032	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.1%	23.20
BR-5A	11/17/2011	11:36	0.745	1.241	0.031	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.53
BR-5C	11/17/2011	11:35	0.702	2.475	0.044	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.13
BR-6A	11/17/2011	11:54	0.679	1.441	0.035	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.1%	22.66
BR-6B	11/17/2011	11:53	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.1%	23.08
BR-6C	11/17/2011	11:52	0.700	1.145	0.040	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.14
BR-7A	11/17/2011	12:10	0.214	0.680	0.021	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.68
BR-7B	11/17/2011	12:10	0.075	0.631	0.028	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.13
BR-7C	11/17/2011	12:09	0.403	1.168	0.038	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.28

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-8A	11/17/2011	12:59	26.2379	-80.0690	1.7	35.15	26.05	0.903	6.63	8.06	139.8	0.599	0.196	0.58	3.199	0.328	0.069
BR-8B	11/17/2011	12:58	26.2377	-80.0688	9.5	35.58	25.94	3.211	6.64	8.13	144.5	0.347	0.167	0.26	1.568	0.519	0.073
BR-8C	11/17/2011	12:58	26.2377	-80.0688	18.3	35.59	25.94	1.175	6.63	8.14	145.4	0.332	0.166	0.19	1.608	0.352	0.082
BR-9A	11/17/2011	13:14	26.2477	-80.0636	1.4	34.95	26.22	5.232	6.62	8.12	141.9	0.579	0.239	0.38	1.578	0.489	0.075
BR-9B	11/17/2011	13:13	26.2476	-80.0635	14.9	35.65	26.01	1.134	6.61	8.15	145.3	0.304	0.136	0.21	1.592	0.245	0.080
BR-9C	11/17/2011	13:13	26.2476	-80.0633	29.6	35.70	25.97	1.270	6.62	8.14	146.5	0.246	0.159	0.16	1.593	0.385	0.088
BR-10A	11/17/2011	13:37	26.2514	-80.0621	3.0	35.42	26.01	6.193	6.62	8.13	137.2	0.341	0.147	0.30	1.564	2.193	0.626
BR-10B	11/17/2011	13:35	26.2509	-80.0621	18.3	35.67	25.99	0.439	6.62	8.14	141.0	0.280	0.131	0.17	1.919	0.324	0.114
BR-10C	11/17/2011	13:34	26.2510	-80.0620	34.5	35.73	25.97	1.846	6.62	8.14	141.4	0.206	0.161	0.20	1.482	0.674	0.266
BR-11A	11/17/2011	14:02	26.2553	-80.0629	1.3	35.13	26.03	5.298	6.63	8.03	138.1	0.553	0.141	0.35	1.790	1.440	0.428
BR-11B	11/17/2011	14:00	26.2552	-80.0626	16.0	35.64	25.99	1.745	6.62	8.04	141.4	0.308	0.139	0.17	2.333	0.351	0.151
BR-11C	11/17/2011	13:59	26.2551	-80.0625	31.2	35.72	25.98	0.730	6.62	8.03	142.2	0.224	0.160	0.18	1.549	0.318	0.041
BR-12A	11/17/2011	15:35	26.2497	-80.0797	1.3	33.51	26.45	1.638	6.65	8.04	139.6	1.163	0.515	0.94	3.318	0.262	0.241
BR-12AX	11/17/2011	15:35	26.2497	-80.0797	1.3	33.51	26.45	1.456	6.65	8.04	139.6	N/A	N/A	0.98	3.318	0.191	0.170
BR-13A	11/17/2011	15:23	26.2600	-80.0833	1.3	32.44	26.41	1.232	6.69	8.04	144.6	1.868	0.676	1.40	4.635	0.197	0.176
BR-14A	11/17/2011	15:15	26.2619	-80.0851	1.7	29.85	26.24	2.259	6.81	8.04	143.8	3.151	1.318	1.69	7.199	0.442	0.250
BR-15A	11/17/2011	15:08	26.2633	-80.0835	1.2	33.87	26.38	2.528	6.64	8.03	151.9	0.561	0.167	1.35	4.747	0.371	0.254
BR-16A	11/17/2011	14:47	26.2608	-80.0743	1.2	35.31	26.12	1.196	6.62	8.06	150.2	0.597	0.163	0.32	1.576	0.083	0.062
BR-16B	11/17/2011	14:47	26.2608	-80.0742	6.4	35.48	25.86	0.646	6.64	8.11	152.8	0.666	0.243	0.28	2.593	0.106	0.085
BR-16C	11/17/2011	14:46	26.2608	-80.0741	9.8	35.48	25.85	0.573	6.64	8.11	152.4	0.722	0.265	0.34	2.585	0.074	0.053
BR-17A	11/17/2011	14:35	26.2754	-80.0649	1.8	35.09	26.07	1.510	6.65	8.08	157.5	0.759	0.224	0.37	2.118	0.451	0.148
BR-17B	11/17/2011	14:34	26.2754	-80.0649	9.7	35.44	25.86	0.880	6.64	8.14	158.1	0.583	0.179	0.25	2.340	0.321	0.113
BR-17BX	11/17/2011	14:34	26.2754	-80.0649	9.7	35.44	25.86	1.031	6.64	8.14	158.1	N/A	N/A	0.52	2.340	0.293	0.137
BR-17C	11/17/2011	14:34	26.2754	-80.0648	17.7	35.58	25.90	1.391	6.63	8.13	160.3	0.469	0.164	0.24	1.904	0.074	0.053
BR-18A	11/17/2011	14:21	26.2983	-80.0689	1.3	35.04	26.43	1.100	6.59	8.02	140.0	0.548	0.205	0.45	1.997	0.685	0.201
BR-18B	11/17/2011	14:20	26.2982	-80.0688	6.8	35.50	25.91	0.652	6.63	8.08	142.2	0.567	0.191	0.35	1.825	0.498	0.118
BR-18C	11/17/2011	14:20	26.2981	-80.0687	11.4	35.53	25.88	1.519	6.63	8.06	143.4	0.426	0.217	0.39	2.019	0.620	0.151
HW-1A	11/30/2011	9:12	25.9951	-80.0886	1.6	35.73	25.51	5.429	6.67	8.06	215.8	0.656	0.276	0.39	1.950	0.215	0.194
HW-1B	11/30/2011	9:12	25.9952	-80.0886	9.1	35.74	25.51	0.776	6.67	8.12	220.0	0.697	0.248	0.56	2.141	0.130	0.109
HW-1BX	11/30/2011	9:12	25.9952	-80.0886	9.1	35.74	25.51	1.384	6.67	8.12	220.0	N/A	N/A	0.35	2.141	0.139	0.118
HW-1C	11/30/2011	9:11	25.9952	-80.0887	18.2	35.74	25.51	1.626	6.67	8.11	222.5	0.648	0.308	0.38	2.148	0.119	0.098
HW-2A	11/30/2011	9:28	26.0142	-80.0857	1.4	35.76	25.69	1.896	6.65	7.99	196.8	0.542	0.185	0.34	1.669	0.106	0.085
HW-2B	11/30/2011	9:27	26.0143	-80.0857	12.0	35.78	25.69	0.795	6.65	8.09	200.6	0.537	0.236	0.33	2.031	0.092	0.071
HW-2C	11/30/2011	9:27	26.0143	-80.0858	24.6	35.62	25.00	2.698	6.73	8.09	203.1	0.631	0.235	0.36	2.024	0.103	0.082
HW-3A	11/30/2011	9:41	26.0148	-80.0942	1.6	35.70	25.31	1.485	6.69	8.03	196.1	0.718	0.246	0.38	1.789	0.113	0.092
HW-3B	11/30/2011	9:41	26.0149	-80.0943	8.5	35.68	25.24	1.700	6.70	8.10	198.0	0.765	0.254	0.43	2.420	0.061	0.040
HW-3C	11/30/2011	9:40	26.0149	-80.0943	17.2	35.57	24.74	3.894	6.76	8.12	201.4	0.792	0.296	0.40	2.263	0.114	0.093
HW-4A	11/30/2011	9:59	26.0190	-80.0858	1.7	35.75	25.71	6.757	6.65	8.10	183.0	0.569	0.251	0.35	1.725	1.872	0.536
HW-4B	11/30/2011	9:56	26.0193	-80.0860	12.2	35.77	25.68	1.808	6.65	8.08	189.3	0.593	0.199	0.37	2.100	0.076	0.055
HW-4C	11/30/2011	9:56	26.0193	-80.0860	24.3	35.48	24.54	0.541	6.79	8.11	190.3	0.615	0.273	0.52	2.004	0.072	0.051
HW-5A	11/30/2011	10:13	26.0241	-80.0854	1.3	35.77	25.70	1.276	6.64	7.77	189.2	0.508	0.161	0.27	1.627	0.118	0.097

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-8A	11/17/2011	12:59	0.259	0.575	0.052	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.80
BR-8B	11/17/2011	12:58	0.446	2.692	0.037	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.0%	23.16
BR-8C	11/17/2011	12:58	0.270	0.823	0.033	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.17
BR-9A	11/17/2011	13:14	0.414	4.743	0.015	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.60
BR-9B	11/17/2011	13:13	0.165	0.889	0.018	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.19
BR-9C	11/17/2011	13:13	0.297	0.885	0.026	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.25
BR-10A	11/17/2011	13:37	1.567	4.000	0.142	1.283	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.02
BR-10B	11/17/2011	13:35	0.210	0.115	0.020	0.065	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.21
BR-10C	11/17/2011	13:34	0.408	1.172	0.061	1.885	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.27
BR-11A	11/17/2011	14:02	1.012	3.858	0.086	0.878	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.79
BR-11B	11/17/2011	14:00	0.200	1.394	0.025	0.616	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.20
BR-11C	11/17/2011	13:59	0.277	0.412	0.023	0.388	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.26
BR-12A	11/17/2011	15:35	0.021	1.376	0.075	4.147	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.45
BR-12AX	11/17/2011	15:35	0.021	1.265	0.056	3.883	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.45
BR-13A	11/17/2011	15:23	0.021	1.035	0.077	5.242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	20.66
BR-14A	11/17/2011	15:15	0.192	1.817	0.099	7.448	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	18.77
BR-15A	11/17/2011	15:08	0.117	2.157	0.084	7.544	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.73
BR-16A	11/17/2011	14:47	0.021	1.113	0.027	1.648	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.91
BR-16B	11/17/2011	14:47	0.021	0.540	0.028	1.369	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.11
BR-16C	11/17/2011	14:46	0.021	0.499	0.019	1.465	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.12
BR-17A	11/17/2011	14:35	0.303	1.059	0.036	1.038	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.1%	22.75
BR-17B	11/17/2011	14:34	0.208	0.559	0.019	0.783	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.08
BR-17BX	11/17/2011	14:34	0.156	0.738	0.026	0.285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.08
BR-17C	11/17/2011	14:34	0.021	1.317	0.030	1.551	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.18
BR-18A	11/17/2011	14:21	0.484	0.415	0.023	0.408	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	22.60
BR-18B	11/17/2011	14:20	0.380	0.154	0.024	0.466	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.11
BR-18C	11/17/2011	14:20	0.469	0.899	0.038	0.281	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.15
HW-1A	11/30/2011	9:12	0.021	5.214	0.066	1.559	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.42
HW-1B	11/30/2011	9:12	0.021	0.646	0.024	0.068	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.42
HW-1BX	11/30/2011	9:12	0.021	1.245	0.021	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.42
HW-1C	11/30/2011	9:11	0.021	1.507	0.026	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.42
HW-2A	11/30/2011	9:28	0.021	1.790	0.026	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38
HW-2B	11/30/2011	9:27	0.021	0.703	0.020	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.39
HW-2C	11/30/2011	9:27	0.021	2.595	0.019	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.50
HW-3A	11/30/2011	9:41	0.021	1.372	0.017	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
HW-3B	11/30/2011	9:41	0.021	1.639	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
HW-3C	11/30/2011	9:40	0.021	3.780	0.026	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.54
HW-4A	11/30/2011	9:59	1.336	4.885	0.171	0.127	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.36
HW-4B	11/30/2011	9:56	0.021	1.732	0.021	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.39
HW-4C	11/30/2011	9:56	0.021	0.469	0.018	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.53
HW-5A	11/30/2011	10:13	0.021	1.158	0.027	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-5B	11/30/2011	10:13	26.0242	-80.0855	12.5	35.77	25.67	1.778	6.65	8.08	192.9	0.613	0.211	0.34	2.062	0.082	0.061
HW-5C	11/30/2011	10:12	26.0242	-80.0855	27.0	35.58	24.73	2.630	6.76	8.08	194.3	0.607	0.267	0.49	2.176	0.094	0.073
HW-6A	11/30/2011	10:27	26.0242	-80.0948	1.5	35.76	25.51	3.612	6.67	8.00	191.2	0.609	0.223	0.34	1.521	0.104	0.083
HW-6B	11/30/2011	10:26	26.0243	-80.0948	8.3	35.75	25.46	1.768	6.67	8.13	193.9	0.623	0.205	0.36	2.008	0.073	0.052
HW-6BX	11/30/2011	10:26	26.0243	-80.0948	8.3	35.75	25.46	0.715	6.67	8.13	193.9	N/A	N/A	0.40	2.008	0.072	0.051
HW-6C	11/30/2011	10:25	26.0244	-80.0948	14.4	35.58	24.56	4.010	6.78	7.78	196.0	0.706	0.275	0.43	2.012	0.081	0.060
HW-7A	11/30/2011	10:44	26.0446	-80.0940	1.3	35.66	25.27	1.330	6.70	8.02	188.5	0.843	0.266	0.45	1.982	0.087	0.066
HW-7B	11/30/2011	10:44	26.0447	-80.0941	7.0	35.72	25.33	4.520	6.69	8.10	191.3	0.810	0.243	0.32	2.065	0.097	0.076
HW-7C	11/30/2011	10:43	26.0449	-80.0941	12.7	35.65	24.79	2.015	6.75	8.11	194.3	0.677	0.257	0.34	2.009	0.139	0.118
HW-8A	11/30/2011	10:57	26.0453	-80.1059	1.3	35.50	24.42	5.461	6.80	8.05	190.8	0.513	0.227	0.46	1.600	0.674	0.205
HW-8AX	11/30/2011	10:57	26.0453	-80.1059	1.3	35.50	24.42	3.796	6.80	8.11	190.8	N/A	N/A	0.37	1.600	0.533	0.176
HW-8C	11/30/2011	10:56	26.0454	-80.1059	4.3	35.50	24.41	2.780	6.80	8.11	191.3	0.477	0.201	0.32	1.852	0.618	0.165
HW-9A	11/30/2011	11:20	26.0676	-80.0844	1.3	35.64	25.53	3.165	6.67	7.91	184.0	0.647	0.197	0.40	1.653	0.133	0.112
HW-9B	11/30/2011	11:19	26.0677	-80.0845	12.1	35.78	25.70	5.504	6.64	8.00	187.8	0.665	0.214	0.33	2.179	0.134	0.113
HW-9C	11/30/2011	11:19	26.0677	-80.0845	23.8	35.78	25.52	4.419	6.67	8.03	189.4	0.614	0.266	0.42	2.099	0.111	0.090
HW-10A	11/30/2011	11:35	26.0820	-80.0842	1.4	35.35	25.32	4.948	6.70	8.08	179.2	0.655	0.210	0.48	1.814	0.158	0.137
HW-10B	11/30/2011	11:34	26.0821	-80.0843	9.0	35.77	25.73	5.900	6.64	8.10	182.1	0.594	0.199	0.33	2.024	0.121	0.100
HW-10C	11/30/2011	11:34	26.0822	-80.0844	18.3	35.77	25.72	3.722	6.64	8.11	184.0	0.460	0.174	0.29	1.851	0.107	0.086
HW-11A	11/30/2011	11:46	26.0817	-80.0952	1.3	35.53	25.50	3.532	6.68	7.79	164.5	0.538	0.156	0.41	1.606	0.115	0.094
HW-11C	11/30/2011	11:45	26.0819	-80.0952	7.4	35.70	25.59	1.499	6.66	8.07	166.3	0.625	0.231	0.33	1.978	0.117	0.096
HW-12A	11/30/2011	14:15	26.0937	-80.0953	1.5	35.66	25.33	1.395	6.69	8.03	181.0	0.738	0.220	0.51	1.786	0.097	0.076
HW-12B	11/30/2011	14:14	26.0935	-80.0954	6.7	35.61	25.18	1.709	6.71	8.04	183.9	0.676	0.172	0.36	1.992	0.060	0.039
HW-12BX	11/30/2011	14:14	26.0935	-80.0954	6.7	35.61	25.18	1.305	6.71	8.04	183.9	N/A	N/A	0.41	1.992	0.058	0.037
HW-12C	11/30/2011	14:13	26.0935	-80.0955	14.8	35.60	25.09	1.118	6.72	8.05	186.2	0.698	0.236	0.37	1.984	0.066	0.045
HW-13A	11/30/2011	14:26	26.0946	-80.0837	1.4	35.72	25.77	2.593	6.64	8.09	172.4	0.655	0.168	0.36	1.828	0.048	0.027
HW-13B	11/30/2011	14:25	26.0947	-80.0837	6.7	35.75	25.76	2.268	6.64	8.10	174.0	0.588	0.195	0.31	2.066	0.048	0.027
HW-13C	11/30/2011	14:24	26.0947	-80.0837	15.2	35.80	25.72	1.755	6.64	8.12	176.4	0.605	0.241	0.37	2.214	0.049	0.028
HW-14A	11/30/2011	13:49	26.0943	-80.1150	1.7	33.41	24.75	4.744	6.84	8.00	190.2	1.662	0.469	1.41	3.865	2.675	0.343
HW-15A	11/30/2011	12:02	26.1020	-80.0824	1.5	35.75	25.73	3.124	6.64	8.08	167.9	0.589	0.196	0.31	1.491	0.079	0.058
HW-15AX	11/30/2011	12:02	26.1020	-80.0824	1.5	35.75	25.73	0.000	6.64	8.13	167.9	N/A	N/A	0.28	1.491	0.000	N/A
HW-15B	11/30/2011	12:01	26.1021	-80.0824	10.5	35.76	25.71	4.586	6.64	8.13	169.9	0.606	0.217	0.32	1.907	0.056	0.035
HW-15C	11/30/2011	11:59	26.1022	-80.0824	19.9	35.80	25.74	0.987	6.40	8.13	171.8	0.536	0.213	0.31	1.859	0.035	0.014
BR-1A	11/30/2011	14:01	26.0934	-80.1054	1.4	33.22	24.79	5.938	6.85	7.93	175.2	1.615	0.570	1.13	3.415	3.215	0.457
BR-1B	11/30/2011	14:00	26.0934	-80.1053	6.8	35.13	25.06	1.725	6.74	8.02	179.6	0.942	0.322	0.59	2.614	0.433	0.129
BR-1C	11/30/2011	13:59	26.0935	-80.1053	14.5	35.46	24.73	2.917	6.77	8.06	181.7	0.642	0.230	0.64	1.835	0.179	0.121
BR-2A	11/30/2011	12:13	26.1022	-80.0941	1.3	35.69	25.42	1.775	6.68	8.05	159.6	0.651	0.227	0.30	1.706	0.076	0.055
BR-2C	11/30/2011	12:13	26.1024	-80.0941	7.0	35.69	25.40	0.618	6.68	8.11	159.9	0.604	0.202	0.37	1.983	0.053	0.032
BR-3A	1/5/2012	14:33	26.1374	-80.0902	1.2	36.11	23.31	3.080	6.91	8.16	168.8	0.376	0.105	0.20	1.413	1.152	0.162
BR-3C	1/5/2012	14:32	26.1376	-80.0903	7.1	36.07	23.27	3.110	6.92	8.16	169.4	0.412	0.104	0.20	1.925	0.178	0.031
BR-3CX	1/5/2012	14:32	26.1376	-80.0903	7.1	36.07	23.27	3.296	6.92	8.18	169.4	N/A	N/A	0.22	1.925	0.252	0.050
BR-4A	1/5/2012	14:19	26.1590	-80.0753	1.2	36.10	23.44	4.775	6.89	8.13	165.3	0.497	0.183	0.19	1.664	0.329	0.080

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-5B	11/30/2011	10:13	0.021	1.696	0.013	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.39
HW-5C	11/30/2011	10:12	0.021	2.536	0.029	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.55
HW-6A	11/30/2011	10:27	0.021	3.508	0.103	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
HW-6B	11/30/2011	10:26	0.021	1.695	0.010	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.44
HW-6BX	11/30/2011	10:26	0.021	0.643	0.004	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.44
HW-6C	11/30/2011	10:25	0.021	3.929	0.017	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.60
HW-7A	11/30/2011	10:44	0.021	1.243	0.012	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.44
HW-7B	11/30/2011	10:44	0.021	4.423	0.085	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.47
HW-7C	11/30/2011	10:43	0.021	1.876	0.050	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.58
HW-8A	11/30/2011	10:57	0.469	4.787	0.080	0.669	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.58
HW-8AX	11/30/2011	10:57	0.357	3.263	0.074	0.530	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.58
HW-8C	11/30/2011	10:56	0.453	2.162	0.085	0.912	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.59
HW-9A	11/30/2011	11:20	0.021	3.032	0.014	0.445	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.34
HW-9B	11/30/2011	11:19	0.021	5.370	0.011	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.39
HW-9C	11/30/2011	11:19	0.021	4.308	0.023	BDL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.44
HW-10A	11/30/2011	11:35	0.021	4.790	0.031	2.195	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.19
HW-10B	11/30/2011	11:34	0.021	5.779	0.015	0.278	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.37
HW-10C	11/30/2011	11:34	0.021	3.615	0.025	0.660	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.38
HW-11A	11/30/2011	11:46	0.021	3.417	0.015	2.814	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.26
HW-11C	11/30/2011	11:45	0.021	1.382	0.013	1.799	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.36
HW-12A	11/30/2011	14:15	0.021	1.298	0.025	2.224	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.41
HW-12B	11/30/2011	14:14	0.021	1.649	0.015	2.219	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
HW-12BX	11/30/2011	14:14	0.021	1.247	0.013	2.269	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.43
HW-12C	11/30/2011	14:13	0.021	1.052	0.017	2.250	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.45
HW-13A	11/30/2011	14:26	0.021	2.545	0.011	1.778	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.32
HW-13B	11/30/2011	14:25	0.021	2.220	0.011	1.554	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.35
HW-13C	11/30/2011	14:24	0.021	1.706	0.011	1.351	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.39
HW-14A	11/30/2011	13:49	2.332	2.069	0.162	15.192	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.91
HW-15A	11/30/2011	12:02	0.021	3.045	0.012	1.986	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.35
HW-15AX	11/30/2011	12:02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.35
HW-15B	11/30/2011	12:01	0.021	4.530	0.005	1.560	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.37
HW-15C	11/30/2011	11:59	0.021	0.952	0.011	1.365	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	96.1%	23.39
BR-1A	11/30/2011	14:01	2.758	2.723	0.195	17.012	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	21.75
BR-1B	11/30/2011	14:00	0.304	1.292	0.061	4.952	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.11
BR-1C	11/30/2011	13:59	0.058	2.738	0.048	3.050	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.46
BR-2A	11/30/2011	12:13	0.021	1.699	0.020	1.868	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.41
BR-2C	11/30/2011	12:13	0.021	0.565	0.012	1.881	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.42
BR-3A	1/5/2012	14:33	0.990	1.928	0.010	1.122	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.38
BR-3C	1/5/2012	14:32	0.147	2.932	0.014	1.104	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.37
BR-3CX	1/5/2012	14:32	0.202	3.044	0.015	1.054	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.37
BR-4A	1/5/2012	14:19	0.249	4.446	0.062	1.391	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
BR-4AX	1/5/2012	14:19	26.1590	-80.0753	1.2	36.10	23.44	2.042	6.89	8.14	165.3	N/A	N/A	0.18	1.664	0.225	0.037
BR-4B	1/5/2012	14:18	26.1591	-80.0753	12.0	36.10	23.43	1.927	6.90	8.14	167.0	0.489	0.164	0.55	2.469	0.151	0.036
BR-4C	1/5/2012	14:17	26.1592	-80.0754	23.7	36.09	23.05	1.629	6.94	8.15	168.6	0.490	0.158	0.18	2.090	0.235	0.050
BR-5A	1/5/2012	14:05	26.1593	-80.0885	1.2	36.11	23.26	1.883	6.92	8.15	165.5	0.407	0.104	0.20	1.952	0.150	0.031
BR-5C	1/5/2012	14:04	26.1594	-80.0885	6.6	36.11	23.21	2.633	6.92	8.16	166.0	0.366	0.089	0.24	1.744	0.222	0.045
BR-6A	1/5/2012	13:46	26.1888	-80.0850	1.2	36.11	23.25	2.235	6.92	8.13	161.1	0.353	0.091	0.19	1.521	0.302	0.098
BR-6B	1/5/2012	13:45	26.1889	-80.0850	3.4	36.11	23.22	3.170	6.92	8.16	161.3	0.380	0.091	0.26	1.683	0.476	0.151
BR-6C	1/5/2012	13:44	26.1891	-80.0849	7.1	36.09	22.89	1.864	6.96	8.16	162.3	0.430	0.099	0.22	1.843	0.238	0.077
BR-7A	1/5/2012	13:29	26.2021	-80.0671	1.2	36.10	23.40	3.504	6.90	8.15	158.1	0.545	0.139	0.19	1.786	0.451	0.100
BR-7B	1/5/2012	13:26	26.2023	-80.0674	15.9	36.10	23.42	2.718	6.90	8.19	161.4	0.486	0.181	0.15	2.161	0.425	0.080
BR-7C	1/5/2012	13:25	26.2024	-80.0675	31.0	36.09	23.30	2.640	6.91	7.89	162.4	0.528	0.153	0.16	2.311	0.379	0.086
BR-8A	1/5/2012	13:07	26.2373	-80.0684	1.3	36.09	23.43	4.785	6.90	8.16	150.8	0.392	0.123	0.17	1.481	0.483	0.163
BR-8B	1/5/2012	13:06	26.2374	-80.0684	7.5	36.09	23.35	2.015	6.91	8.19	151.1	0.407	0.104	0.21	1.629	0.463	0.152
BR-8C	1/5/2012	13:05	26.2376	-80.0683	15.3	36.11	22.80	1.936	6.97	8.20	152.6	0.453	0.129	0.22	1.783	0.376	0.074
BR-9A	1/5/2012	12:52	26.2470	-80.0615	1.4	36.08	23.49	4.101	6.89	8.18	153.6	0.383	0.102	0.18	1.377	0.649	0.271
BR-9B	1/5/2012	12:50	26.2472	-80.0616	16.9	36.11	23.53	7.454	6.88	8.20	156.0	0.432	0.105	0.14	1.960	0.601	0.124
BR-9C	1/5/2012	12:49	26.2474	-80.0618	32.9	36.11	23.47	5.633	6.89	8.20	155.9	0.448	0.142	0.14	1.968	0.353	0.083
BR-10A	1/5/2012	12:30	26.2516	-80.0623	1.6	35.49	23.48	30.753	6.91	8.16	155.0	0.418	0.112	0.24	0.879	6.267	2.333
BR-10B	1/5/2012	12:29	26.2516	-80.0620	16.5	36.11	23.49	9.099	6.89	8.20	158.5	0.392	0.129	0.17	1.912	0.466	0.122
BR-10C	1/5/2012	12:28	26.2516	-80.0619	32.6	36.10	23.18	3.280	6.93	8.20	159.7	0.396	0.130	0.18	1.983	0.362	0.106
BR-11A	1/5/2012	11:56	26.2545	-80.0604	1.4	36.11	23.47	1.811	6.89	8.17	175.7	0.393	0.118	0.14	1.503	0.321	0.067
BR-11B	1/5/2012	11:55	26.2546	-80.0605	18.3	36.11	23.50	1.367	6.89	8.18	179.9	0.398	0.124	0.15	1.872	0.336	0.076
BR-11C	1/5/2012	11:54	26.2546	-80.0606	37.7	36.11	23.33	2.680	6.91	8.19	181.9	0.358	0.125	0.44	1.701	0.478	0.080
BR-12A	1/5/2012	9:21	26.2501	-80.0787	1.4	35.54	21.64	1.750	7.14	8.14	150.6	0.547	0.281	0.41	2.151	0.636	0.125
BR-12AX	1/5/2012	9:21	26.2501	-80.0787	1.4	35.54	21.64	8.919	7.14	8.13	150.6	N/A	N/A	0.44	2.151	0.948	0.183
BR-13A	1/5/2012	9:41	26.2594	-80.0832	1.4	35.48	21.55	2.732	7.16	8.13	158.1	0.517	0.353	0.59	1.840	0.674	0.110
BR-14A	1/5/2012	9:52	26.2618	-80.0853	1.6	33.43	21.02	7.814	7.31	8.02	165.6	0.880	0.562	0.59	3.041	2.597	0.252
BR-15A	1/5/2012	9:58	26.2633	-80.0833	1.5	34.02	20.31	4.077	7.38	8.04	165.9	1.029	0.606	0.80	2.786	1.243	0.182
BR-16A	1/5/2012	10:17	26.2606	-80.0733	1.4	36.12	23.12	6.080	6.93	8.14	167.1	0.359	0.107	0.17	1.318	0.440	0.102
BR-16B	1/5/2012	10:16	26.2606	-80.0733	4.7	36.12	23.12	2.162	6.93	8.16	167.9	0.367	0.104	0.14	1.481	0.331	0.068
BR-16C	1/5/2012	10:15	26.2606	-80.0733	8.7	36.09	23.04	4.009	6.94	8.18	171.9	0.393	0.131	0.27	1.602	0.225	0.063
BR-17A	1/5/2012	10:32	26.2750	-80.0638	1.7	36.11	23.40	7.989	6.90	8.16	158.5	0.400	0.107	0.16	1.478	0.463	0.102
BR-17B	1/5/2012	10:31	26.2752	-80.0639	8.0	36.09	23.02	4.638	6.95	7.92	159.9	0.426	0.149	0.31	1.732	0.911	0.266
BR-17BX	1/5/2012	10:31	26.2752	-80.0639	8.0	36.09	23.02	4.236	6.95	7.92	159.9	N/A	N/A	0.15	1.732	0.472	0.158
BR-17C	1/5/2012	10:30	26.2754	-80.0641	17.3	36.09	22.82	5.197	6.97	8.15	162.1	0.480	0.139	0.18	2.084	0.435	0.166
BR-18A	1/5/2012	10:51	26.2976	-80.0677	1.3	36.11	23.17	1.465	6.93	8.16	155.0	0.489	0.105	0.19	1.383	0.277	0.078
BR-18B	1/5/2012	10:50	26.2977	-80.0678	4.8	36.12	23.08	2.677	6.94	8.15	155.0	0.372	0.112	0.19	1.507	0.304	0.074
BR-18C	1/5/2012	10:49	26.2978	-80.0679	9.9	36.12	23.00	1.664	6.95	8.14	156.9	0.370	0.114	0.16	1.518	0.237	0.090
HW-1A	1/12/2012	8:18	25.9955	-80.0892	1.1	36.05	22.94	2.924	6.96	8.12	135.8	0.803	0.322	N/A	2.668	0.731	0.091
HW-1B	1/12/2012	8:17	25.9955	-80.0893	9.5	36.02	22.66	1.507	6.99	8.14	136.6	1.155	0.468	0.39	3.622	0.590	0.070
HW-1BX	1/12/2012	8:17	25.9955	-80.0893	9.5	36.02	22.66	1.889	6.99	8.14	136.6	N/A	N/A	0.33	3.622	0.510	0.072

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
BR-4AX	1/5/2012	14:19	0.188	1.817	0.034	1.283	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34
BR-4B	1/5/2012	14:18	0.115	1.776	0.023	0.955	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34
BR-4C	1/5/2012	14:17	0.185	1.394	0.009	1.154	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.44
BR-5A	1/5/2012	14:05	0.119	1.733	0.003	0.968	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.40
BR-5C	1/5/2012	14:04	0.177	2.411	0.017	1.135	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.42
BR-6A	1/5/2012	13:46	0.204	1.933	0.009	1.111	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.40
BR-6B	1/5/2012	13:45	0.325	2.694	0.011	1.264	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.41
BR-6C	1/5/2012	13:44	0.161	1.626	0.015	1.120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.50
BR-7A	1/5/2012	13:29	0.351	3.053	0.010	1.126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.35
BR-7B	1/5/2012	13:26	0.345	2.293	0.027	1.243	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34
BR-7C	1/5/2012	13:25	0.293	2.261	0.013	1.273	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.37
BR-8A	1/5/2012	13:07	0.320	4.302	0.024	1.274	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.33
BR-8B	1/5/2012	13:06	0.311	1.552	0.021	1.329	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.36
BR-8C	1/5/2012	13:05	0.302	1.560	0.036	1.362	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.54
BR-9A	1/5/2012	12:52	0.378	3.452	0.046	1.464	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.31
BR-9B	1/5/2012	12:50	0.477	6.853	0.059	2.188	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.31
BR-9C	1/5/2012	12:49	0.270	5.280	0.018	1.178	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.33
BR-10A	1/5/2012	12:30	3.934	24.486	0.409	4.603	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.86
BR-10B	1/5/2012	12:29	0.344	8.633	0.035	1.690	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.33
BR-10C	1/5/2012	12:28	0.256	2.918	0.025	1.282	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.41
BR-11A	1/5/2012	11:56	0.254	1.490	0.014	1.235	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.33
BR-11B	1/5/2012	11:55	0.260	1.031	0.036	1.205	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.32
BR-11C	1/5/2012	11:54	0.398	2.202	0.062	1.503	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.38
BR-12A	1/5/2012	9:21	0.511	1.114	0.091	3.833	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.46
BR-12AX	1/5/2012	9:21	0.765	7.971	0.132	4.365	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.46
BR-13A	1/5/2012	9:41	0.564	2.058	0.084	3.724	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.44
BR-14A	1/5/2012	9:52	2.345	5.217	0.301	15.523	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.05
BR-15A	1/5/2012	9:58	1.061	2.834	0.235	7.694	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.70
BR-16A	1/5/2012	10:17	0.338	5.640	0.057	1.477	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.45
BR-16B	1/5/2012	10:16	0.263	1.831	0.022	1.621	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.45
BR-16C	1/5/2012	10:15	0.162	3.784	0.018	1.267	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.46
BR-17A	1/5/2012	10:32	0.361	7.526	0.066	2.255	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.36
BR-17B	1/5/2012	10:31	0.645	3.727	0.096	2.470	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.46
BR-17BX	1/5/2012	10:31	0.314	3.764	0.057	1.310	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.46
BR-17C	1/5/2012	10:30	0.269	4.762	0.030	1.416	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.52
BR-18A	1/5/2012	10:51	0.199	1.188	0.027	1.355	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.43
BR-18B	1/5/2012	10:50	0.230	2.373	0.043	1.343	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.46
BR-18C	1/5/2012	10:49	0.147	1.427	0.015	1.252	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.49
HW-1A	1/12/2012	8:18	0.640	2.193	0.063	1.478	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.45
HW-1B	1/12/2012	8:17	0.520	0.917	0.034	0.834	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-1BX	1/12/2012	8:17	0.438	1.379	0.036	0.740	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-1C	1/12/2012	8:16	25.9954	-80.0893	18.4	36.00	22.57	2.142	7.01	8.15	136.8	1.165	0.404	0.38	3.831	0.610	0.085
HW-2A	1/12/2012	8:35	26.0152	-80.0860	1.7	36.06	23.24	1.837	6.92	8.11	123.9	0.475	0.207	0.23	1.948	0.687	0.073
HW-2B	1/12/2012	8:34	26.0151	-80.0860	12.6	36.05	23.05	2.266	6.94	8.12	125.6	0.604	0.227	0.24	2.493	0.756	0.121
HW-2C	1/12/2012	8:33	26.0150	-80.0860	25.3	36.04	22.94	2.493	6.96	8.07	125.8	0.661	0.258	0.26	2.578	0.841	0.116
HW-3A	1/12/2012	8:49	26.0132	-80.0949	1.5	36.00	22.62	1.753	7.00	8.02	134.8	1.099	0.392	0.37	2.872	0.512	0.097
HW-3B	1/12/2012	8:48	26.0133	-80.0949	7.9	36.00	22.62	2.717	7.00	8.07	136.4	1.099	0.409	0.32	3.209	0.559	0.073
HW-3C	1/12/2012	8:47	26.0135	-80.0949	16.2	36.01	22.63	2.715	7.00	8.05	137.8	0.918	0.389	0.33	2.741	0.682	0.145
HW-4A	1/12/2012	9:12	26.0193	-80.0859	2.5	35.86	23.11	13.422	6.94	8.04	137.8	0.614	0.213	0.30	2.197	2.897	0.670
HW-4B	1/12/2012	9:09	26.0197	-80.0857	11.4	36.06	23.06	3.776	6.94	8.08	142.0	0.649	0.227	0.22	2.345	0.692	0.146
HW-4C	1/12/2012	9:08	26.0196	-80.0857	23.2	36.03	22.85	1.768	6.97	8.09	142.1	0.810	0.308	0.28	2.951	0.744	0.144
HW-5A	1/12/2012	9:33	26.0245	-80.0865	1.1	36.00	23.11	4.229	6.94	8.09	148.6	0.621	0.213	0.28	2.231	1.180	0.210
HW-5B	1/12/2012	9:31	26.0244	-80.0864	7.1	36.04	22.94	2.847	6.96	8.13	151.5	0.722	0.235	0.25	2.402	0.807	0.135
HW-5C	1/12/2012	9:31	26.0244	-80.0864	19.7	36.05	22.88	2.569	6.96	8.12	154.3	0.657	0.260	0.28	2.348	0.820	0.175
HW-6A	1/12/2012	9:46	26.0234	-80.0947	1.6	36.04	22.76	2.750	7.00	8.14	153.7	0.803	0.293	0.28	2.186	0.486	0.041
HW-6B	1/12/2012	9:45	26.0234	-80.0947	8.3	36.04	22.73	1.311	6.98	8.15	150.4	0.749	0.324	0.31	2.947	0.508	0.088
HW-6BX	1/12/2012	9:45	26.0234	-80.0947	8.3	36.04	22.73	1.604	6.98	8.15	150.4	N/A	N/A	0.30	2.947	0.442	0.099
HW-6C	1/12/2012	9:42	26.0238	-80.0945	13.8	36.04	22.73	2.813	6.98	8.15	153.2	0.735	0.273	0.31	2.689	0.559	0.127
HW-7A	1/12/2012	10:02	26.0439	-80.0948	1.2	36.07	22.90	1.518	6.96	8.07	147.6	0.635	0.196	0.26	1.873	0.439	0.068
HW-7B	1/12/2012	10:01	26.0441	-80.0947	4.9	36.07	22.83	1.257	6.97	8.08	148.7	0.668	0.218	0.22	2.435	0.424	0.080
HW-7C	1/12/2012	10:00	26.0442	-80.0947	9.0	36.07	22.80	1.775	6.97	8.09	149.4	0.601	0.204	0.31	2.447	0.546	0.068
HW-8A	1/12/2012	10:14	26.0444	-80.1064	1.4	36.16	22.63	3.068	6.99	8.09	148.5	0.247	0.106	0.19	1.348	0.504	0.066
HW-8AX	1/12/2012	10:14	26.0444	-80.1064	1.4	36.16	22.63	1.995	6.99	8.09	148.5	N/A	N/A	0.21	1.348	0.283	0.056
HW-8C	1/12/2012	10:13	26.0445	-80.1063	5.0	36.16	22.48	2.704	7.01	8.11	149.6	0.244	0.119	0.00	1.442	0.625	0.074
HW-9A	1/12/2012	10:39	26.0673	-80.0866	1.5	36.06	23.21	2.992	6.92	8.14	145.5	0.569	0.197	0.22	1.633	0.635	0.066
HW-9B	1/12/2012	10:36	26.0668	-80.0863	8.7	36.07	23.00	2.793	6.97	8.13	149.7	0.669	0.232	0.29	2.176	0.692	0.083
HW-9C	1/12/2012	10:34	26.0668	-80.0863	16.3	36.08	22.76	2.745	6.98	8.11	150.8	0.664	0.230	0.22	2.330	1.078	0.130
HW-10A	1/12/2012	10:55	26.0835	-80.0855	1.7	36.06	23.26	1.738	6.92	8.12	146.2	0.452	0.148	0.21	2.244	0.563	0.079
HW-10B	1/12/2012	10:54	26.0834	-80.0854	7.1	36.06	23.14	1.783	6.93	8.15	149.5	0.579	0.187	0.18	1.934	0.626	0.064
HW-10C	1/12/2012	10:53	26.0832	-80.0854	14.1	36.06	23.12	2.725	6.93	7.90	150.8	0.541	0.221	0.13	2.153	0.558	0.055
HW-11A	1/12/2012	11:06	26.0817	-80.0960	1.7	35.89	22.69	1.600	6.99	8.11	147.9	0.680	0.247	0.29	1.879	0.659	0.106
HW-11C	1/12/2012	11:04	26.0819	-80.0957	6.1	36.06	22.77	2.130	6.98	8.15	149.3	0.681	0.217	0.29	2.277	0.673	0.081
HW-12A	1/12/2012	11:23	26.0939	-80.0960	1.7	35.97	22.81	2.211	6.98	8.15	152.1	0.597	0.173	0.26	2.110	0.653	0.134
HW-12B	1/12/2012	11:22	26.0939	-80.0959	6.4	36.04	22.85	1.853	6.97	8.15	153.5	0.484	0.169	0.26	2.068	0.695	0.123
HW-12BX	1/12/2012	11:22	26.0939	-80.0959	6.4	36.04	22.85	1.208	6.97	8.15	153.5	N/A	N/A	0.27	2.068	0.528	0.118
HW-12C	1/12/2012	11:21	26.0940	-80.0958	15.3	36.06	22.84	2.634	6.97	8.15	155.6	0.699	0.205	0.26	2.029	0.739	0.117
HW-13A	1/12/2012	11:40	26.0950	-80.0834	1.3	36.06	23.35	1.489	6.91	8.15	150.8	0.487	0.148	0.20	1.852	0.476	0.105
HW-13B	1/12/2012	11:39	26.0949	-80.0834	7.5	36.06	23.27	2.740	6.92	8.13	153.0	0.546	0.175	0.22	2.132	0.635	0.072
HW-13C	1/12/2012	11:37	26.0947	-80.0834	16.4	36.06	23.06	2.064	6.94	8.11	155.7	0.577	0.232	0.25	2.198	0.599	0.106
HW-14A	1/12/2012	12:30	26.0945	-80.1154	1.0	34.92	22.73	3.550	7.03	8.09	143.5	0.678	0.355	0.45	2.403	1.117	0.162
HW-15A	1/12/2012	11:51	26.1030	-80.0831	1.3	36.06	23.32	2.296	6.91	8.12	151.2	0.551	0.144	0.17	2.061	0.690	0.021
HW-15AX	1/12/2012	11:51	26.1030	-80.0831	1.3	36.06	23.32	1.820	6.91	8.12	151.2	N/A	N/A	0.25	2.061	0.470	0.005

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-1C	1/12/2012	8:16	0.525	1.532	0.040	0.987	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.53
HW-2A	1/12/2012	8:35	0.614	1.150	0.064	1.852	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.37
HW-2B	1/12/2012	8:34	0.635	1.510	0.077	2.307	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.42
HW-2C	1/12/2012	8:33	0.725	1.652	0.070	1.619	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.45
HW-3A	1/12/2012	8:49	0.415	1.241	0.035	0.938	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-3B	1/12/2012	8:48	0.486	2.158	0.082	0.995	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-3C	1/12/2012	8:47	0.537	2.033	0.036	0.853	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-4A	1/12/2012	9:12	2.227	10.525	0.333	3.675	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.26
HW-4B	1/12/2012	9:09	0.546	3.084	0.057	1.336	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.42
HW-4C	1/12/2012	9:08	0.600	1.024	0.057	1.280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.47
HW-5A	1/12/2012	9:33	0.970	3.049	0.124	2.395	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.36
HW-5B	1/12/2012	9:31	0.672	2.040	0.061	1.795	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.44
HW-5C	1/12/2012	9:31	0.645	1.749	0.061	1.400	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.47
HW-6A	1/12/2012	9:46	0.445	2.264	0.032	0.970	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.1%	24.50
HW-6B	1/12/2012	9:45	0.420	0.803	0.035	1.192	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-6BX	1/12/2012	9:45	0.343	1.162	0.027	0.916	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-6C	1/12/2012	9:42	0.432	2.254	0.034	0.926	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-7A	1/12/2012	10:02	0.371	1.079	0.027	0.889	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.48
HW-7B	1/12/2012	10:01	0.344	0.833	0.028	1.031	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.50
HW-7C	1/12/2012	10:00	0.478	1.229	0.032	1.025	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-8A	1/12/2012	10:14	0.438	2.564	0.059	1.657	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.63
HW-8AX	1/12/2012	10:14	0.227	1.712	0.036	1.276	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.63
HW-8C	1/12/2012	10:13	0.551	2.079	0.078	2.530	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.67
HW-9A	1/12/2012	10:39	0.569	2.357	0.061	1.843	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.38
HW-9B	1/12/2012	10:36	0.609	2.101	0.048	1.693	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100.1%	24.45
HW-9C	1/12/2012	10:34	0.948	1.667	0.091	3.271	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.53
HW-10A	1/12/2012	10:55	0.484	1.175	0.063	2.001	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.36
HW-10B	1/12/2012	10:54	0.562	1.157	0.053	2.033	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.40
HW-10C	1/12/2012	10:53	0.503	2.167	0.060	1.582	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.41
HW-11A	1/12/2012	11:06	0.553	0.941	0.054	2.529	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.41
HW-11C	1/12/2012	11:04	0.592	1.457	0.044	1.576	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.51
HW-12A	1/12/2012	11:23	0.519	1.558	0.063	2.660	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.43
HW-12B	1/12/2012	11:22	0.572	1.158	0.072	2.828	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.47
HW-12BX	1/12/2012	11:22	0.410	0.680	0.042	1.360	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.47
HW-12C	1/12/2012	11:21	0.622	1.895	0.035	1.057	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.49
HW-13A	1/12/2012	11:40	0.371	1.013	0.052	1.860	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34
HW-13B	1/12/2012	11:39	0.563	2.105	0.080	2.373	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.36
HW-13C	1/12/2012	11:37	0.493	1.465	0.050	1.648	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.42
HW-14A	1/12/2012	12:30	0.955	2.433	0.115	6.247	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.66
HW-15A	1/12/2012	11:51	0.669	1.606	0.048	1.879	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34
HW-15AX	1/12/2012	11:51	0.465	1.350	0.052	1.884	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.34

Station	Date Local	Time Local	Lat °N	Long °W	Depth m	Sal psu	Temp °C	DIN µM	O_2 Sat mg/L	pH Units	ORP mV	Chl-a µg/L	Phae µg/L	TSS mg/L	Turb NTU	N+N µM	NO_2 µM
HW-15B	1/12/2012	11:50	26.1029	-80.0831	9.4	36.06	23.06	1.262	6.94	8.15	153.2	0.640	0.210	0.16	2.222	0.532	0.102
HW-15C	1/12/2012	11:49	26.1027	-80.0831	18.5	36.07	22.83	2.949	6.97	8.12	155.1	0.679	0.263	0.22	2.261	0.829	0.131
BR-1A	1/12/2012	12:20	26.0937	-80.1052	1.5	35.15	22.61	2.701	7.03	8.07	141.9	0.731	0.351	0.67	2.455	0.861	0.094
BR-1B	1/12/2012	12:19	26.0937	-80.1053	6.6	35.88	22.81	2.234	6.98	8.12	143.8	0.607	0.232	0.38	2.002	0.510	0.108
BR-1C	1/12/2012	12:18	26.0938	-80.1053	14.0	36.00	22.83	2.846	6.97	8.13	145.1	0.591	0.206	0.28	2.212	0.519	0.065
BR-2A	1/12/2012	12:03	26.1020	-80.0945	1.1	35.97	22.92	2.193	6.96	8.11	157.0	0.877	0.240	0.26	2.256	0.502	0.082
BR-2C	1/12/2012	12:02	26.1021	-80.0943	7.8	36.06	22.89	2.309	6.96	8.14	158.5	0.635	0.190	0.31	2.055	0.543	0.127

Station	Date Local	Time Local	NO_3 µM	NH_4 µM	PO_4 µM	Si µM	TDN µM	TDP µM	PC µM	PP µM	PN µM	DOC µM	TP µM	TN µM	TC µM	DO %	Density kg/m^3
HW-15B	1/12/2012	11:50	0.430	0.730	0.050	1.568	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.43
HW-15C	1/12/2012	11:49	0.698	2.120	0.070	2.285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.50
BR-1A	1/12/2012	12:20	0.767	1.840	0.073	4.241	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	23.88
BR-1B	1/12/2012	12:19	0.402	1.724	0.045	2.032	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.37
BR-1C	1/12/2012	12:18	0.454	2.327	0.044	1.637	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.45
BR-2A	1/12/2012	12:03	0.420	1.691	0.059	2.381	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.40
BR-2C	1/12/2012	12:02	0.416	1.766	0.054	1.967	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	99.8%	24.48

Appendix 4:

Microbiology Data

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Nov BR7A	**11/10/2010**	0	0	2	0	0	10.0	0.0	0.0
Nov BR7B	**11/10/2010**						0.0		
Nov BR7C	**11/10/2010**	0	0	4	0	0	0.0		
Nov BR9A	**11/10/2010**	64	41	2131	8	0	0.0		
Nov BR9B	**11/10/2010**						0.0		
Nov BR9C	**11/10/2010**	0	2	45	0	0	0.0		
Nov BR10A	**11/10/2010**	737	1138	66584	46	7	0.0		
Nov BR10B	**11/10/2010**	914	516	31429	9	5	0.0		
Nov BR10C	**11/10/2010**	0	0	29	0	5	0.0		
Nov BR11A	**11/10/2010**	0	0	11	0	0	0.0		
Nov BR11B	**11/10/2010**						0.0		
Nov BR11C	**11/10/2010**	0	0	14	0	0	0.0		
Nov BR13A	**11/10/2010**	2	0	559	6	0	0.0		
Nov BR14A	**11/10/2010**	3	3	842	13	9	10.0		
Nov BR15A	**11/10/2010**	3	3	789	10	0	10.0		
Nov HW2A	**11/2/2010**	0	2	54	0	0	0.0	0.0	0.0
Nov HW2B	**11/2/2010**						0.0		
Nov HW2C	**11/2/2010**	0	2	64	0	0	0.0		
Nov HW4A	**11/2/2010**	1782	908	70784	323	31	10.0		
Nov HW4B	**11/2/2010**	45	19	724	6	0	0.0		
Nov HW4C	**11/2/2010**	0	3	194	4	9	0.0		
Nov HW5A	**11/2/2010**	78	28	2125	10	0	0.0		
Nov HW5B	**11/2/2010**						0.0		
Nov HW5C	**11/2/2010**	5	1	30	5	0	0.0		
Nov HW9A	**11/2/2010**	0	2	42	0	0	0.0		
Nov HW9B	**11/2/2010**						0.0		
Nov HW9C	**11/2/2010**	2	0	116	0	0	0.0		
Nov HW14A	**11/2/2010**	48	31	1409	11	7	20.0		
Nov BR1A	**11/2/2010**	21	25	291	7	5	31.0		
Nov BR1B	**11/2/2010**						0.0		
Nov BR1C	**11/2/2010**	3	0	55	0	1	0.0		
Dec BR7A	**12/1/2010**	0	0	4477	9	98	0.0		
Dec BR7B	**12/1/2010**						0.0		
Dec BR7C	**12/1/2010**	1	0	8676	4	620	0.0		
Dec BR9A	**12/1/2010**	4	0	9339	3	428	0.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Nov BR7A	**11/10/2010**	0	0	2	0	0	10.0	0.0	0.0
Nov BR7B	**11/10/2010**	▨	▨	▨	▨	▨	0.0		
Nov BR7C	**11/10/2010**	0	0	4	0	0	0.0		
Nov BR9A	**11/10/2010**	64	41	2131	8	0	0.0		
Nov BR9B	**11/10/2010**	▨	▨	▨	▨	▨	0.0		
Nov BR9C	**11/10/2010**	0	2	45	0	0	0.0		
Nov BR10A	**11/10/2010**	737	1138	66584	46	7	0.0		
Nov BR10B	**11/10/2010**	914	516	31429	9	5	0.0		
Nov BR10C	**11/10/2010**	0	0	29	0	5	0.0		
Nov BR11A	**11/10/2010**	0	0	11	0	0	0.0		
Nov BR11B	**11/10/2010**	▨	▨	▨	▨	▨	0.0		
Nov BR11C	**11/10/2010**	0	0	14	0	0	0.0		
Nov BR13A	**11/10/2010**	2	0	559	6	0	0.0		
Nov BR14A	**11/10/2010**	3	3	842	13	9	10.0		
Nov BR15A	**11/10/2010**	3	3	789	10	0	10.0		
Nov HW2A	**11/2/2010**	0	2	54	0	0	0.0	0.0	0.0
Nov HW2B	**11/2/2010**	▨	▨	▨	▨	▨	0.0		
Nov HW2C	**11/2/2010**	0	2	64	0	0	0.0		
Nov HW4A	**11/2/2010**	1782	908	70784	323	31	10.0		
Nov HW4B	**11/2/2010**	45	19	724	6	0	0.0		
Nov HW4C	**11/2/2010**	0	3	194	4	9	0.0		
Nov HW5A	**11/2/2010**	78	28	2125	10	0	0.0		
Nov HW5B	**11/2/2010**	▨	▨	▨	▨	▨	0.0		
Nov HW5C	**11/2/2010**	5	1	30	5	0	0.0		
Nov HW9A	**11/2/2010**	0	2	42	0	0	0.0		
Nov HW9B	**11/2/2010**	▨	▨	▨	▨	▨	0.0		
Nov HW9C	**11/2/2010**	2	0	116	0	0	0.0		
Nov HW14A	**11/2/2010**	48	31	1409	11	7	20.0		
Nov BR1A	**11/2/2010**	21	25	291	7	5	31.0		
Nov BR1B	**11/2/2010**	▨	▨	▨	▨	▨	0.0		
Nov BR1C	**11/2/2010**	3	0	55	0	1	0.0		
Dec BR7A	**12/1/2010**	0	0	4477	9	98	0.0		
Dec BR7B	**12/1/2010**	▨	▨	▨	▨	▨	0.0		
Dec BR7C	**12/1/2010**	1	0	8676	4	620	0.0		
Dec BR9A	**12/1/2010**	4	0	9339	3	428	0.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Jan BR11B	**1/27/2011**	▨	▨	▨	▨	▨	0.0		
Jan BR11C	**1/27/2011**	39	26	1773	4	16	0.0		
Jan BR13A	**1/27/2011**	0	0	614	4	33	0.0		
Jan BR14A	**1/27/2011**	3	3	400	5	0	10.0		
Jan BR15A	**1/27/2011**	2	3	395	1	4	0.0		
Feb BR7A	**2/16/2011**	73	22	1173	17	5	0.0	2.6	0.9
Feb BR7B	**2/16/2011**	▨	▨	▨	▨	▨	30.0		
Feb BR7C	**2/16/2011**	0	5	203	1	15	0.0		
Feb BR9A	**2/16/2011**	195	114	13423	21	16	10.0		
Feb BR9B	**2/16/2011**	▨	▨	▨	▨	▨	20.0		
Feb BR9C	**2/16/2011**	4	0	117	0	71	10.0		
Feb BR10A	**2/16/2011**	438	266	24880	17	22	10.0		
Feb BR10B	**2/16/2011**	11	3	347	1	0	31.0		
Feb BR10C	**2/16/2011**	4	4	376	21	0	10.0		
Feb BR11A	**2/16/2011**	0	0	36	0	0	0.0		
Feb BR11B	**2/16/2011**	▨	▨	▨	▨	▨	0.0		
Feb BR11C	**2/16/2011**	5	0	183	17	42	0.0		
Feb BR13A	**2/16/2011**	64	38	8964	1	73	20.0		
Feb BR14A	**2/16/2011**	59	46	6087	21	72	31.0		
Feb BR15A	**2/16/2011**	65	40	4449	0	479	10.0		
Feb HW2A	**2/3/2011**	54	50	4683	35	44	0.0	1.9	2.9
Feb HW2B	**2/3/2011**	▨	▨	▨	▨	▨	0.0		
Feb HW2C	**2/3/2011**	69	36	4381	42	29	0.0		
Feb HW4A	**2/3/2011**	20	14	1617	16	11	0.0		
Feb HW4B	**2/3/2011**	33	21	2239	19	114	0.0		
Feb HW4C	**2/3/2011**	44	43	3879	38	150	0.0		
Feb HW5A	**2/3/2011**	47	51	3271	11	111	0.0		
Feb HW5B	**2/3/2011**	▨	▨	▨	▨	▨	0.0		
Feb HW5C	**2/3/2011**	59	39	3670	15	0	0.0		
Feb HW9A	**2/3/2011**	3	1	102	0	9	0.0		
Feb HW9B	**2/3/2011**	▨	▨	▨	▨	▨	0.0		
Feb HW9C	**2/3/2011**	22	15	1726	14	13	0.0		
Feb HW14A	**2/3/2011**	66	36	5765	38	39	30.0		
Feb BR1A	**2/3/2011**	58	34	4540	23	63	10.0		
Feb BR1B	**2/3/2011**	▨	▨	▨	▨	▨	0.0		
Feb BR1C	**2/3/2011**	4	5	823	6	39	0.0		
Mar HW2A	**3/10/2011**	124	73	19943	26	0	0.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Mar HW2B	**3/10/2011**	▨	▨	▨	▨	▨	0.0	0.9	0.0
Mar HW2C	**3/10/2011**	12	7	1035	3	16	0.0		
Mar HW4A	**3/10/2011**	60	41	3984	22	22	0.0		
Mar HW4B	**3/10/2011**	52	36	8607	17	0	0.0		
Mar HW4C	**3/10/2011**	0	0	149	1	2	0.0		
Mar HW5A	**3/10/2011**	90	69	10764	28	25	20.0		
Mar HW5B	**3/10/2011**	▨	▨	▨	▨	▨	0.0		
Mar HW5C	**3/10/2011**	55	5	520	1	41	10.0		
Mar HW9A	**3/10/2011**	na	na	na	na	na	0.0		
Mar HW9B	**3/10/2011**	▨	▨	▨	▨	▨	0.0		
Mar HW9C	**3/10/2011**	na	na	na	na	na	0.0		
Mar HW14A	**3/10/2011**	1	171	3812	50	73	0.0		
Mar BR1A	**3/10/2011**	9	33	388	21	0	0.0		
Mar BR1B	**3/10/2011**	▨	▨	▨	▨	▨	0.0		
Mar BR1C	**3/10/2011**	289	0	29261	1	37	0.0		
Apr BR7A	**4/13/2011**	0	0	27	1	362	0.0	0.0	0.0
Apr BR7B	**4/13/2011**	▨	▨	▨	▨	▨	0.0		
Apr BR7C	**4/13/2011**	5	6	156	0	39	0.0		
Apr BR9A	**4/13/2011**	0	0	15	2	92	0.0		
Apr BR9B	**4/13/2011**	▨	▨	▨	▨	▨	0.0		
Apr BR9C	**4/13/2011**	6	0	104	0	104	0.0		
Apr BR10A	**4/13/2011**	2583	1819	132935	90	43	0.0		
Apr BR10B	**4/13/2011**	198	136	8357	8	40	10.0		
Apr BR10C	**4/13/2011**	7	3	266	3	0	0.0		
Apr BR11A	**4/13/2011**	912	583	43527	67	27	0.0		
Apr BR11B	**4/13/2011**	▨	▨	▨	▨	▨	0.0		
Apr BR11C	**4/13/2011**	6	1	355	3	0	10.0		
Apr BR13A	**4/13/2011**	239	164	3373	65	16	41.0		
Apr BR14A	**4/13/2011**	3	4	1481	7	49	20.0		
Apr BR15A	**4/13/2011**	36	20	3227	11	12	31.0		
Apr HW2A	**4/19/2011**	52	30	2917	7	0	0.0	1.8	2.6
Apr HW2B	**4/19/2011**	▨	▨	▨	▨	▨	0.0		
Apr HW2C	**4/19/2011**	5	0	142	1	0	0.0		
Apr HW4A	**4/19/2011**	343	248	35536	56	10	0.0		
Apr HW4B	**4/19/2011**	33	21	3662	7	0	0.0		
Apr HW4C	**4/19/2011**	1	0	209	1	0	0.0		
Apr HW5A	**4/19/2011**	324	185	28748	43	8	0.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Apr HW5B	**4/19/2011**						0.0		
Apr HW5C	**4/19/2011**	4	3	252	0	0	10.0		
Apr HW9A	**4/19/2011**	10	3	370	0	0	0.0		
Apr HW9B	**4/19/2011**						0.0		
Apr HW9C	**4/19/2011**	7	6	5	1	0	0.0		
Apr HW14A	**4/19/2011**	72	35	4624	30	0	0.0		
Apr BR1A	**4/19/2011**	44	16	3066	14	0	0.0		
Apr BR1B	**4/19/2011**						0.0		
Apr BR1C	**4/19/2011**	24	11	1221	10	12	0.0		
May BR7A	**5/4/2011**	10	14	466	3	28	0.0		
May BR7B	**5/4/2011**						0.0		
May BR7C	**5/4/2011**	3	10	386	4	89	0.0		
May BR9A	**5/4/2011**	0	0	8	0	30	0.0		
May BR9B	**5/4/2011**						1.0		
May BR9C	**5/4/2011**	7	4	203	3	999	0.0		
May BR10A	**5/4/2011**	3	0	21	0	1761	0.0	3.0	0.0
May BR10B	**5/4/2011**	8	5	377	2	139	0.0		
May BR10C	**5/4/2011**	5	8	439	6	4102	0.0		
May BR11A	**5/4/2011**	3	5	201	4	3444	1.0		
May BR11B	**5/4/2011**						0.0		
May BR11C	**5/4/2011**	13	34	861	6	2368	0.0		
May BR13A	**5/4/2011**	22	33	1189	11	8360	0.0		
May BR14A	**5/4/2011**	22	51	1282	11	8772	0.0		
May BR15A	**5/4/2011**	6	17	829	3	8499	5.2		
May HW2A	**5/19/2011**	7	4	1931	5	0	7.4		
May HW2B	**5/19/2011**						2.0		
May HW2C	**5/19/2011**	0	0	675	3	18	0.0		
May HW4A	**5/19/2011**	85	30	19721	87	16	4.1	3.0	0.0
May HW4B	**5/19/2011**	0	0	774	35	11	4.1		
May HW4C	**5/19/2011**	0	0	1131	18	11	0.0		
May HW5A	**5/19/2011**	0	0	284	n/a	13	7.5		
May HW5B	**5/19/2011**						1.0		
May HW5C	**5/19/2011**	0	0	460	4	3	4.1		
May HW9A	**5/19/2011**	0	0	268	3	0	2.0		
May HW9B	**5/19/2011**						3.1		
May HW9C	**5/19/2011**	0	0	85	2	0	6.3		
May HW14A	**5/19/2011**	36	15	20943	42	6	5.2		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
May BR1A	**5/19/2011**	0	1	2354	5	12	2.0		
May BR1B	**5/19/2011**	▨	▨	▨	▨	▨	1.0		
May BR1C	**5/19/2011**	8	8	1578	6	0	2.0		
Jun BR7A	**6/23/2011**	26	10	3156	17	11	0.0	0.0	0.0
Jun BR7B	**6/23/2011**	▨	▨	▨	▨	▨	0.0		
Jun BR7C	**6/23/2011**	0	0	436	0	0	0.0		
Jun BR9A	**6/23/2011**	5	1	1138	0	11	0.0		
Jun BR9B	**6/23/2011**	▨	▨	▨	▨	▨	0.0		
Jun BR9C	**6/23/2011**	0	1	459	0	7	0.0		
Jun BR10A	**6/23/2011**	6	2	1041	6	9	0.0		
Jun BR10B	**6/23/2011**	7	2	1073	1	8	0.0		
Jun BR10C	**6/23/2011**	0	0	727	2	40	0.0		
Jun BR11A	**6/23/2011**	16	1	1913	9	10	0.0		
Jun BR11B	**6/23/2011**	▨	▨	▨	▨	▨	0.0		
Jun BR11C	**6/23/2011**	6	n/a	455	3	11	0.0		
Jun BR13A	**6/23/2011**	68	24	9322	5	9	0.0		
Jun BR14A	**6/23/2011**	5	2	5315	21	10	0.0		
Jun BR15A	**6/23/2011**	3	1	1692	5	9	0.0		
Jul BR7A	**7/13/2011**	4	5	1368	4	7	0.0	na	na
Jul BR7B	**7/13/2011**	▨	▨	▨	▨	▨	0.0		
Jul BR7C	**7/13/2011**	14	8	2828	8	15	0.0		
Jul BR9A	**7/13/2011**	13	9	3605	8	25	0.0		
Jul BR9B	**7/13/2011**	▨	▨	▨	▨	▨	0.0		
Jul BR9C	**7/13/2011**	na	na	na	na	na	0.0		
Jul BR10A	**7/13/2011**	10	4	927	1	14	0.0		
Jul BR10B	**7/13/2011**	10	4	1728	3	8	0.0		
Jul BR10C	**7/13/2011**	8	1	2262	6	11	0.0		
Jul BR11A	**7/13/2011**	41	12	5984	12	10	0.0		
Jul BR11B	**7/13/2011**	▨	▨	▨	▨	▨	0.0		
Jul BR11C	**7/13/2011**	17	3	2691	0	9	0.0		
Jul BR13A	**7/13/2011**	14	1	7506	12	15	0.0		
Jul BR14A	**7/13/2011**	4	1	4389	41	14	0.0		
Jul BR15A	**7/13/2011**	17	8	14176	20	8	0.0		
Jul HW2A	**7/6/2011**	62	65	3134	13	74	0.0	0.9	1.8
Jul HW2B	**7/6/2011**	▨	▨	▨	▨	▨	0.0		
Jul HW2C	**7/6/2011**	17	14	1033	7	312	0.0		
Jul HW4A	**7/6/2011**	793	655	46250	77	708	20.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Jul HW4B	**7/6/2011**	30	24	1771	16	1575	0.0		
Jul HW4C	**7/6/2011**	8	6	528	4	83	0.0		
Jul HW5A	**7/6/2011**	77	69	3727	8	112	0.0		
Jul HW5B	**7/6/2011**						0.0		
Jul HW5C	**7/6/2011**	8	4	263	2	10	0.0		
Jul HW9A	**7/6/2011**	20	25	925	11	69	10.0		
Jul HW9B	**7/6/2011**						0.0		
Jul HW9C	**7/6/2011**	6	9	474	6	436	0.0		
Jul HW14A	**7/6/2011**	14	19	2126	144	252	20.0		
Jul BR1A	**7/6/2011**	13	6	422	73	139	30.0		
Jul BR1B	**7/6/2011**						0.0		
Jul BR1C	**7/6/2011**	4	0	201	6	116	0.0		
Aug HW2A	**8/11/2011**	31	8	7736	17	7	0.0	0.0	0.0
Aug HW2B	**8/11/2011**						0.0		
Aug HW2C	**8/11/2011**	4	3	1732	9	7	0.0		
Aug HW4A	**8/11/2011**	153	69	41962	55	1	0.0		
Aug HW4B	**8/11/2011**	96	38	29330	44	16	0.0		
Aug HW4C	**8/11/2011**	5	8	3571	10	11	0.0		
Aug HW5A	**8/11/2011**	368	175	84351	145	8	0.0		
Aug HW5B	**8/11/2011**						0.0		
Aug HW5C	**8/11/2011**	16	5	5700	11	11	0.0		
Aug HW9A	**8/11/2011**	78	30	8386	60	12	0.0		
Aug HW9B	**8/11/2011**						0.0		
Aug HW9C	**8/11/2011**	12	5	3176	38	10	0.0		
Aug HW14A	**8/11/2011**	20	6	7852	121	13	30.0		
Aug BR1A	**8/11/2011**	14	9	8659	89	0	20.0		
Aug BR1B	**8/11/2011**						0.0		
Aug BR1C	**8/11/2011**	29	16	2804	24	19	0.0		
Aug BR7A	**8/17/2011**	0	0	103	5	0	0.0	0.0	1.9
Aug BR7B	**8/17/2011**						0.0		
Aug BR7C	**8/17/2011**	0	0	363	1	1	10.0		
Aug BR9A	**8/17/2011**	0	0	118	7	6	0.0		
Aug BR9B	**8/17/2011**						0.0		
Aug BR9C	**8/17/2011**	5	1	1097	0	9	30.0		
Aug BR10A	**8/17/2011**	2527	1088	588593	123	1	0.0		
Aug BR10B	**8/17/2011**	20	8	4228	6	8	0.0		
Aug BR10C	**8/17/2011**	3	1	448	2	15	0.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Aug BR11A	**8/17/2011**	0	0	99	1	21	0.0		
Aug BR11B	**8/17/2011**						0.0		
Aug BR11C	**8/17/2011**	20	5	2669	5	0	0.0		
Aug BR13A	**8/17/2011**	n/a	n/a	3399	4	8	10.0		
Aug BR14A	**8/17/2011**	n/a	2	8924	0	16	0.0		
Aug BR15A	**8/17/2011**	0	2	18056	0	1	20.0		
Aug HW2A	**8/30/2011**	23	9	1861	19	1620	0.0	0.0	0.0
Aug HW2B	**8/30/2011**						0.0		
Aug HW2C	**8/30/2011**	2	1	207	3	1260	0.0		
Aug HW4A	**8/30/2011**	137	109	8444	53	18463	10.0		
Aug HW4B	**8/30/2011**	13	13	917	18	920	0.0		
Aug HW4C	**8/30/2011**	2	0	264	0	350	20.0		
Aug HW5A	**8/30/2011**	11	8	613	14	139617	0.0		
Aug HW5B	**8/30/2011**						0.0		
Aug HW5C	**8/30/2011**	9	2	292	9	1079	0.0		
Aug HW9A	**8/30/2011**	0	2	139	2	285	0.0		
Aug HW9B	**8/30/2011**						0.0		
Aug HW9C	**8/30/2011**	3	3	288	2	912	0.0		
Aug HW14A	**8/30/2011**	6	17	720	12	3599	0.0		
Aug BR1A	**8/30/2011**	11	7	554	21	1683	0.0		
Aug BR1B	**8/30/2011**						0.0		
Aug BR1C	**8/30/2011**	0	0	138	3	21568	20.0		
Sep BR7A	**9/15/2011**	0	0	5	1	246	0.0	0.0	0.0
Sep BR7B	**9/15/2011**						0.0		
Sep BR7C	**9/15/2011**	1	0	80	1	635	41.0		
Sep BR9A	**9/15/2011**	1	0	16	0	1355	30.0		
Sep BR9B	**9/15/2011**						0.0		
Sep BR9C	**9/15/2011**	2	2	76	0	443	0.0		
Sep BR10A	**9/15/2011**	431	441	19254	22	182	0.0		
Sep BR10B	**9/15/2011**	115	90	4236	8	1146	0.0		
Sep BR10C	**9/15/2011**	13	8	548	2	774	30.0		
Sep BR11A	**9/15/2011**	171	154	6211	15	1147	0.0		
Sep BR11B	**9/15/2011**						0.0		
Sep BR11C	**9/15/2011**	3	2	116	2	436	30.0		
Sep BR13A	**9/15/2011**	1	0	801	1	2438	31.0		
Sep BR14A	**9/15/2011**	3	2	721	34	7240	0.0		
Sep BR15A	**9/15/2011**	0	0	465	2	3307	20.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Sep HW2A	**9/29/2011**	7	4	263	2	21	0.0	0.0	2.8
Sep HW2B	**9/29/2011**	▨	▨	▨	▨	▨	0.0		
Sep HW2C	**9/29/2011**	1	0	78	0	17	0.0		
Sep HW4A	**9/29/2011**	17	24	782	11	45	0.0		
Sep HW4B	**9/29/2011**	40	55	2243	35	37	0.0		
Sep HW4C	**9/29/2011**	4	1	123	3	n/a	0.0		
Sep HW5A	**9/29/2011**	0	0	14	0	40	0.0		
Sep HW5B	**9/29/2011**	▨	▨	▨	▨	▨	0.0		
Sep HW5C	**9/29/2011**	2	2	62	0	33	0.0		
Sep HW9A	**9/29/2011**	1	0	17	0	41	0.0		
Sep HW9B	**9/29/2011**	▨	▨	▨	▨	▨	0.0		
Sep HW9C	**9/29/2011**	0	0	90	0	18	0.0		
Sep HW14A	**9/29/2011**	3	3	337	2	30	20.0		
Sep BR1A	**9/29/2011**	3	7	296	6	44	0.0		
Sep BR1B	**9/29/2011**	▨	▨	▨	▨	▨	0.0		
Sep BR1C	**9/29/2011**	0	2	101	0	128	20.0		
Nov BR7A	**11/17/2011**	2	0	29	0	55	0.0	0.0	0.0
Nov BR7B	**11/17/2011**	▨	▨	▨	▨	▨	0.0		
Nov BR7C	**11/17/2011**	0	0	3	0	0	0.0		
Nov BR9A	**11/17/2011**	0	1	26	0	0	0.0		
Nov BR9B	**11/17/2011**	▨	▨	▨	▨	▨	0.0		
Nov BR9C	**11/17/2011**	0	0	0	0	0	0.0		
Nov BR10A	**11/17/2011**	342	244	12538	33	0	0.0		
Nov BR10B	**11/17/2011**	0	0	29	0	14	0.0		
Nov BR10C	**11/17/2011**	0	0	14	0	0	0.0		
Nov BR11A	**11/17/2011**	178	0	3694	8	6	0.0		
Nov BR11B	**11/17/2011**	▨	▨	▨	▨	▨	0.0		
Nov BR11C	**11/17/2011**	0	1	9	3	0	0.0		
Nov BR13A	**11/17/2011**	0	2	1800	6	42	0.0		
Nov BR14A	**11/17/2011**	1	2	3101	6	43	0.0		
Nov BR15A	**11/17/2011**	3	4	2174	37	50	10.0		
Nov HW2A	**11/30/2011**	12	42	303	8	0	0.0	0.0	0.0
Nov HW2B	**11/30/2011**	▨	▨	▨	▨	▨	0.0		
Nov HW2C	**11/30/2011**	3	1	69	5	0	10.0		
Nov HW4A	**11/30/2011**	57	0	2690	19	24	10.0		
Nov HW4B	**11/30/2011**	3	2	48	2	22	0.0		
Nov HW4C	**11/30/2011**	2	1	25	3	0	10.0		

Table 1. Microbiological results from monthly sampling cruises.

Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Nov HW5A	**11/30/2011**	3	3	110	0	9	0.0		
Nov HW5B	**11/30/2011**	▨	▨	▨	▨	▨	0.0		
Nov HW5C	**11/30/2011**	2	1	36	3	0	20.0		
Nov HW9A	**11/30/2011**	3	4	97	0	0	0.0		
Nov HW9B	**11/30/2011**	▨	▨	▨	▨	▨	0.0		
Nov HW9C	**11/30/2011**	2	3	68	3	0	10.0		
Nov HW14A	**11/30/2011**	19	9	869	24	6	52.0		
Nov BR1A	**11/30/2011**	16	7	823	13	15	0.0		
Nov BR1B	**11/30/2011**	▨	▨	▨	▨	▨	0.0		
Nov BR1C	**11/30/2011**	1	0	24	0	0	0.0		
Jan BR7A	**1/5/2012**	2	7	114	2	0	0.0	0.0	20.1
Jan BR7B	**1/5/2012**	▨	▨	▨	▨	▨	0.0		
Jan BR7C	**1/5/2012**	0	0	324	3	0	10.0		
Jan BR9A	**1/5/2012**	33	12	121	6	0	0.0		
Jan BR9B	**1/5/2012**	▨	▨	▨	▨	▨	0.0		
Jan BR9C	**1/5/2012**	0	0	1151	0	0	0.0		
Jan BR10A	**1/5/2012**	1406	40380	438532	207	29	0.0		
Jan BR10B	**1/5/2012**	6	37	5127	0	0	0.0		
Jan BR10C	**1/5/2012**	8	247	4481	6	0	0.0		
Jan BR11A	**1/5/2012**	5	63	992	82	13	0.0		
Jan BR11B	**1/5/2012**	▨	▨	▨	▨	▨	0.0		
Jan BR11C	**1/5/2012**	0	0	3627	13	0	0.0		
Jan BR13A	**1/5/2012**	720	1054	3988	16	92	20.0		
Jan BR14A	**1/5/2012**	23	600	89244	43	740	20.0		
Jan BR15A	**1/5/2012**	16	988	8056	19	107	41.0		
Jan HW2A	**1/12/2012**	143	111	8612	5	42	0.0	0.0	1.0
Jan HW2B	**1/12/2012**	▨	▨	▨	▨	▨	0.0		
Jan HW2C	**1/12/2012**	8	19	69	0	0	0.0		
Jan HW4A	**1/12/2012**	2658	25800	4437	424	432	20.0		
Jan HW4B	**1/12/2012**	180	1350	166	115	77	10.0		
Jan HW4C	**1/12/2012**	92	2997	260	52	0	51.0		
Jan HW5A	**1/12/2012**	370	1513	611	124	91	0.0		
Jan HW5B	**1/12/2012**	▨	▨	▨	▨	▨	10.0		
Jan HW5C	**1/12/2012**	140	557	917	8	0	0.0		
Jan HW9A	**1/12/2012**	33	15	393	62	0	0.0		
Jan HW9B	**1/12/2012**	▨	▨	▨	▨	▨	0.0		
Jan HW9C	**1/12/2012**	0	2	878	18	0	0.0		

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Sample Event/Site	Sample Date	Human-Specific Bacteroidales qPCR "Kildare BacHum-UCD" GE/100 mL	Human Specific Bacteroidales qPCR "EPA HF183" GE/100 mL	Total Bacteroidales qPCR "EPA enBac3" GE/100 mL	Total Enterococci qPCR "EPA Entero1" GE/100 mL	Dog-Specific Bacteroides qPCR "AOML DogBact" TSC/100 mL	Viable/Culturable Enterococci by IDEXX EnteroLert (using 1:10 dilution) MPN/100 mL	Cryptosporidium Cysts by EPA Method 1623 Cysts/100 L	Giardia Oocysts by EPA Method 1623 Cysts/100 L
Jan HW14A	**1/12/2012**	51	1027	200	33	177	41.0		
Jan BR1A	**1/12/2012**	51	5873	39	28	0	0.0		
Jan BR1B	**1/12/2012**	▨	▨	▨	▨	▨	0.0		
Jan BR1C	**1/12/2012**	6	9	82	7	0	10.0		

Notes:

na = sample data not available (sample not collected due to adverse field conditions or sample lost/damaged during processing).

For all qPCR assays: Minimum detection limit (MDL) = 0.5 target copies per reaction and reliable detection limit (RDL) = 10 target copies per reaction. Water samples for qPCR were 1000 mL purified into 100 µL eluted DNA extracts, with a reaction template DNA of 2 µL of sample extract per reaction. Thus, theoretical Lower Limit of Quantification (LLOQ) for these FACE samples based upon the reliable detection limit (RDL) = 50 target copies per 100 mL of water sample. Any "0"s for qPCR data should be considered Non-Detect" ("ND"), i.e., below detection—PCR amplification signal never crossed the Cycle Threshold. Any qPCR samples below 50 GE or 50 TSC per 100 mL should be considered as "Detected But Not Quantified" ("DNQ"), because although the instrument assigned a value from the standard curve, that value is below the theoretical LLOQ, as based upon the RDL. If one wishes to base the LLOQ upon the MDL instead of the RDL, then only qPCR values below the MDL-based LLOQ (2.5 GE or 2.5 TSC per 100mL) should be considered as "DNQ".

Results in the viable enterococci column that are over regulatory limits of 30 cells/100 mL have been shaded in red.

Values for human Bacteroidales over 100 cells/100 mL or total Bacteroidales over 10,000 cells/100 mL are shaded in red to denote they are substantially elevated.

Table 2. The abundant taxa (≥1%) across all samples based on 454 pyrosequencing of bacterial community DNA.

Taxon ID	BR7CApr (%)	BR7CJuly (%)	BR7CNov (%)	BR7CJan (%)	BR10AApr (%)	BR10AJuly (%)	BR10ANov (%)	BR10AJan (%)	BR10BApr (%)	BR10BJuly (%)
Other bacteria	5.40	1.64	3.98	2.01	4.93	1.01	3.98	3.88	3.33	1.52
Family Flavobacteriaceae_other	5.40	3.76	2.68	7.42	3.24	2.59	2.19	2.94	3.06	2.74
Prochlorococcus	25.19	25.25	11.36	5.72	19.03	22.26	16.53	8.83	17.62	20.73
Other Alphaproteobacteria	6.17	5.99	3.08	4.79	4.96	6.56	4.13	3.41	8.67	5.49
Family Rhodobacteraceae;g_Other	2.57	3.22	1.70	2.78	1.81	4.54	2.57	1.47	3.14	4.88
Other Gammaprotoebacteria	4.88	5.19	3.12	2.32	5.03	8.07	2.81	2.72	6.18	6.10
G_Candidatus Partiera	8.74	6.27	5.28	3.71	6.60	7.69	5.59	4.32	10.37	10.06

Taxon ID	BR10BNov (%)	BR10BJan (%)	BR10CApr (%)	BR10CJuly (%)	BR10CNov (%)	BR10CJan (%)	BR14AApr (%)	BR14AJuly (%)	BR14ANov (%)	BR14AJan (%)
Other bacteria	2.71	3.22	4.05	1.48	3.86	2.58	4.26	3.98	3.34	5.09
Family Flavobacteriaceae_other	1.51	3.24	4.05	2.60	3.08	1.56	7.86	9.57	6.01	6.82
Prochlorococcus	15.22	10.69	25.49	19.17	9.40	11.64	7.63	6.83	3.47	3.68
Other Alphaproteobacteria	5.50	3.52	5.92	8.17	3.89	4.02	2.49	1.48	3.07	3.44
Family Rhodobacteraceae;g_Other	2.54	1.59	2.93	4.64	1.56	1.80	12.25	10.87	19.89	12.91
Other Gammaprotoebacteria	2.89	2.54	5.11	5.90	5.76	2.31	3.02	2.98	6.94	5.00
G_Candidatus Partiera	6.56	6.15	9.51	6.00	5.93	5.91	5.75	2.30	3.74	5.41

Taxon ID	HW4AApr (%)	HW4AJuly (%)	HW4ANov (%)	HW4CApr (%)	HW4CJuly (%)	HW4CNov (%)	HW9AApr (%)	HW9AJuly (%)	HW9ANov (%)	HW9AJan (%)
Other bacteria	3.74	3.29	4.88	4.38	2.82	4.30	2.78	3.97	4.30	3.62
Family Flavobacteriaceae_other	3.64	3.75	3.34	4.50	5.78	8.95	7.23	3.46	2.72	9.76
Prochlorococcus	17.57	29.54	24.56	23.70	27.99	20.19	22.03	20.70	32.18	12.37
Other Alphaproteobacteria	6.10	6.62	4.40	4.36	5.56	2.34	5.91	8.69	4.07	4.35
Family Rhodobacteraceae;g_Other	3.84	2.49	2.25	2.44	3.04	8.66	3.88	3.86	3.64	4.88
Other Gammaprotoebacteria	5.25	4.49	2.91	5.27	5.82	3.10	5.23	5.17	3.57	3.56
G_Candidatus Partiera	7.60	5.75	5.01	9.26	6.15	7.92	11.65	6.98	6.83	8.47

Table 3. BLAST alignment similarity scores for detected Enterobacteriaceae, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q Start	Q End	S Start	S End	E-Value	Bit Score	Name
PART I: Enterobacteriaceae												
# Query: denovo105 BR7CJan_13198												
denovo105	gi|507148159|ref|NR_102966.1|	98.88	268	1	2	1	268	778	513	1.00E-130	462	Pantoea vagans C9-1
denovo105	gi|343201252|ref|NR_041978.1|	98.88	268	1	2	1	268	741	476	1.00E-130	462	Pantoea agglomerans strain DSM 3493
denovo105	gi|343201248|ref|NR_041974.1|	98.88	268	1	2	1	268	766	501	1.00E-130	462	Erwinia mallotivora strain DSM 4565
denovo105	gi|507148176|ref|NR_102983.1|	98.51	268	2	2	1	268	787	522	1.00E-129	459	Raoultella ornithinolytica B6
denovo105	gi|343202452|ref|NR_042748.1|	98.51	268	2	2	1	268	765	500	1.00E-129	459	Erwinia papayae strain CFBP 11606
denovo105	gi|343206207|ref|NR_044799.1|	98.51	268	2	2	1	268	776	511	1.00E-129	459	Raoultella ornithinolytica strain CIP 103
denovo105	gi|343206387|ref|NR_044979.1|	98.51	268	2	2	1	268	758	493	1.00E-129	459	Erwinia psidii strain LMG 7034
denovo105	gi|507148013|ref|NR_102820.1|	98.13	268	3	2	1	268	778	513	6.00E-128	453	Erwinia billingiae Eb661 strain Eb661
denovo105	gi|444439425|ref|NR_074740.1|	98.13	268	3	2	1	268	778	513	6.00E-128	453	Pantoea ananatis AJ13355
denovo105	gi|343198849|ref|NR_043883.1|	98.13	268	3	2	1	268	679	414	6.00E-128	453	Pantoea dispersa strain LMG2603
# Query: denovo185 BR10AJuly_10419												
denovo185	gi|485099113|ref|NR_102509.1|	95.94	271	11	0	1	271	778	508	1.00E-123	439	Serratia marcescens WW4 strain
denovo185	gi|343205898|ref|NR_044385.1|	95.94	271	11	0	1	271	779	509	1.00E-123	439	Serratia nematodiphila strain DZ0503SBS1
denovo185	gi|310975022|ref|NR_036886.1|	95.94	271	11	0	1	271	779	509	1.00E-123	439	Serratia marcescens subsp. sakuensis
denovo185	gi|507147995|ref|NR_102802.1|	95.57	271	12	0	1	271	785	515	2.00E-122	435	Cronobacter turicensis z3032
denovo185	gi|485099094|ref|NR_102490.1|	95.57	271	12	0	1	271	785	515	2.00E-122	435	Cronobacter sakazakii ATCC BAA-894
denovo185	gi|343205686|ref|NR_044062.1|	95.57	271	12	0	1	271	690	420	2.00E-122	435	Cronobacter dublinensis subsp. dublinensis
denovo185	gi|343205685|ref|NR_044061.1|	95.57	271	12	0	1	271	735	465	2.00E-122	435	Cronobacter turicensis z3032
denovo185	gi|343205682|ref|NR_044058.1|	95.57	271	12	0	1	271	730	460	2.00E-122	435	Cronobacter dublinensis subsp. lausanensis
denovo185	gi|343205681|ref|NR_044057.1|	95.57	271	12	0	1	271	693	423	2.00E-122	435	Cronobacter dublinensis subsp. lactaridi
denovo185	gi|219857252|ref|NR_024883.1|	95.57	271	12	0	1	271	750	480	2.00E-122	435	Kluyvera georgiana strain ATCC 51603
# Query: denovo310 HW4AApr_163774												
denovo310	gi|343205684|ref|NR_044060.1|	94.46	271	15	0	1	271	734	464	4.00E-118	421	Cronobacter malonaticus strain E825
denovo310	gi|343198931|ref|NR_044076.1|	94.46	271	15	0	1	271	758	488	4.00E-118	421	Cronobacter sakazakii strain ATCC 29544
denovo310	gi|343204194|ref|NR_043750.1|	94.46	271	15	0	1	271	705	435	4.00E-118	421	Morganella psychrotolerans strain U2/3
denovo310	gi|219857408|ref|NR_024996.1|	94.46	271	15	0	1	271	768	498	4.00E-118	421	Raoultella planticola strain ATCC 33531
denovo310	gi|219878430|ref|NR_025569.1|	94.46	271	15	0	1	271	758	488	4.00E-118	421	Escherichia albertii strain Albert 19982
denovo310	gi|507148171|ref|NR_102978.1|	94.1	271	16	0	1	271	782	512	4.00E-117	417	Providencia stuartii MRSN 2154 strain MRSN
denovo310	gi|444439593|ref|NR_074908.1|	94.1	271	16	0	1	271	784	514	4.00E-117	417	Escherichia blattae DSM 4481 strain DSM
denovo310	gi|265678788|ref|NR_029093.1|	94.1	271	16	0	1	271	786	516	4.00E-117	417	Photorhabdus asymbiotica subsp. australis
denovo310	gi|219878195|ref|NR_025334.1|	94.1	271	16	0	1	271	752	482	4.00E-117	417	Obesumbacterium proteus strain 42
denovo310	gi|343206140|ref|NR_044729.1|	93.73	271	17	0	1	271	785	515	5.00E-116	414	Hafnia alvei

Table 3. BLAST alignment similarity scores for detected Enterobacteriaceae, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART I: Enterobacteriaceae												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q Start	Q End	S Start	S End	E-Value	Bit Score	Name
# Query: denovo5652 BR7CJan_4266												
denovo5652	gi|507148175|ref|NR_102982.1|	91.25	240	1	16	1	240	787	568	6.00E-77	284	Klebsiella oxytoca KCTC 1686 strain KCTC
denovo5652	gi|507147987|ref|NR_102794.1|	91.25	240	1	16	1	240	783	564	6.00E-77	284	Enterobacter cloacae subsp. cloacae ATCC
denovo5652	gi|343201062|ref|NR_041749.1|	91.25	240	1	16	1	240	768	549	6.00E-77	284	Klebsiella oxytoca strain ATCC 13182
denovo5652	gi|265678607|ref|NR_028912.1|	91.25	240	1	16	1	240	754	535	6.00E-77	284	Enterobacter cloacae strain 279-56
denovo5652	gi|343201009|ref|NR_041696.1|	91.25	240	1	16	1	240	768	549	6.00E-77	284	Salmonella enterica subsp. arizonae strain
denovo5652	gi|485099097|ref|NR_102493.1|	90.83	240	2	16	1	240	787	568	8.00E-76	280	Enterobacter aerogenes KCTC 2190 strain
denovo5652	gi|444439670|ref|NR_074985.1|	90.83	240	2	16	1	240	785	566	8.00E-76	280	Salmonella enterica subsp. enterica
denovo5652	gi|444439620|ref|NR_074935.1|	90.83	240	2	16	1	240	784	565	8.00E-76	280	Salmonella enterica subsp. enterica
denovo5652	gi|444439619|ref|NR_074934.1|	90.83	240	2	16	1	240	784	565	8.00E-76	280	Salmonella enterica subsp. enterica
denovo5652	gi|444439598|ref|NR_074913.1|	90.83	240	2	16	1	240	782	563	8.00E-76	280	Klebsiella pneumoniae subsp. pneumoniae
# Query: denovo615 HW14AJan_21157												
denovo615	gi|485099113|ref|NR_102509.1|	95.57	271	12	0	1	271	778	508	2.00E-122	435	Serratia marcescens WW4 strain WW4
denovo615	gi|343205898|ref|NR_044385.1|	95.57	271	12	0	1	271	779	509	2.00E-122	435	Serratia nematodiphila strain DZ0503SBS1
denovo615	gi|310975022|ref|NR_036886.1|	95.57	271	12	0	1	271	779	509	2.00E-122	435	Serratia marcescens subsp. sakuensis
denovo615	gi|507147995|ref|NR_102802.1|	95.2	271	13	0	1	271	785	515	7.00E-121	430	Cronobacter turicensis z3032
denovo615	gi|485099094|ref|NR_102490.1|	95.2	271	13	0	1	271	785	515	7.00E-121	430	Cronobacter sakazakii ATCC BAA-894
denovo615	gi|343205686|ref|NR_044062.1|	95.2	271	13	0	1	271	690	420	7.00E-121	430	Cronobacter dublinensis subsp. dublinensis
denovo615	gi|343205685|ref|NR_044061.1|	95.2	271	13	0	1	271	735	465	7.00E-121	430	Cronobacter turicensis z3032 strain z3032
denovo615	gi|343205682|ref|NR_044058.1|	95.2	271	13	0	1	271	730	460	7.00E-121	430	Cronobacter dublinensis subsp. lausanensis
denovo615	gi|343205681|ref|NR_044057.1|	95.2	271	13	0	1	271	693	423	7.00E-121	430	Kluyvera georgiana strain ATCC 51603
denovo615	gi|219857252|ref|NR_024883.1|	95.2	271	13	0	1	271	750	480	7.00E-121	430	Cronobacter dublinensis subsp. lactaridi

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens

PART II: Vibrio												
Query ID	**Subject ID**	**% Identity**	**Alignment Length**	**Mismatches**	**Gap Opens**	**Q Start**	**Q End**	**S Start**	**S End**	**E-Value**	**Bit Score**	**Name**
# Query: 2021 BR7CNov_5447												
2021	gi|507148169|ref|NR_102976.1|	99.63	271	1	0	1	271	788	518	4.00E-137	484	Vibrio harveyi ATCC BAA-1116
2021	gi|470467847|ref|NR_074196.1|	99.63	271	1	0	1	271	793	523	4.00E-137	484	Vibrio parahaemolyticus RIMD 2210633
2021	gi|265678914|ref|NR_029222.1|	99.63	271	1	0	1	271	793	523	4.00E-137	484	Vibrio campbellii strain 40
2021	gi|343205096|ref|NR_043858.1|	99.63	271	1	0	1	271	789	519	4.00E-137	484	Vibrio sinaloensis strain CAIM 797
2021	gi|219878352|ref|NR_025491.1|	99.63	271	1	0	1	271	768	498	4.00E-137	484	Vibrio hepatarius strain LMG 20362
2021	gi|343201355|ref|NR_042081.1|	99.63	271	1	0	1	271	768	498	4.00E-137	484	Vibrio rotiferianus strain :LMG 21460
2021	gi|219878339|ref|NR_025478.1|	99.63	271	1	0	1	271	768	498	4.00E-137	484	Vibrio xuii strain R-15052
2021	gi|219878338|ref|NR_025477.1|	99.63	271	1	0	1	271	768	498	4.00E-137	484	Vibrio brasiliensis strain LMG 20546
2021	gi|219878337|ref|NR_025476.1|	99.63	271	1	0	1	271	768	498	4.00E-137	484	Vibrio neptunius strain LMG 20536
2021	gi|343201396|ref|NR_042122.1|	99.63	271	1	0	1	271	762	492	4.00E-137	484	Vibrio ichthyoenteri ATCC 700023
# Query: 3875 BR10CNov_7725												
3875	gi|343200995|ref|NR_041682.1|	100	271	0	0	1	271	691	421	9.00E-139	489	Photobacterium iliopiscarium strain ATCC 517
3875	gi|343198611|ref|NR_043067.1|	100	271	0	0	1	271	760	490	9.00E-139	489	Photobacterium kishitanii strain pjapo.1.1 1
3875	gi|343198554|ref|NR_042852.1|	100	271	0	0	1	271	754	484	9.00E-139	489	Photobacterium leiognathi strai
3875	gi|265678945|ref|NR_029253.1|	100	271	0	0	1	271	793	523	9.00E-139	489	Photobacterium profundum strain DSJ4
3875	gi|310975079|ref|NR_036943.1|	99.63	271	1	0	1	271	793	523	4.00E-137	484	Photobacterium aplysiae strain GMD509
3875	gi|343202750|ref|NR_043188.1|	99.63	271	1	0	1	271	763	493	4.00E-137	484	Photobacterium frigidiphilum strain SL13
3875	gi|343202588|ref|NR_042964.1|	99.63	271	1	0	1	271	779	509	4.00E-137	484	Photobacterium indicum strain MBIC3157
3875	gi|253680754|ref|NR_028002.1|	99.63	271	1	0	1	271	695	425	4.00E-137	484	Photobacterium phosphoreum strain Kluyver
3875	gi|310974959|ref|NR_036823.1|	99.26	271	2	0	1	271	758	488	5.00E-136	480	Enterovibrio calviensis strain RE35F/12
3875	gi|343201054|ref|NR_041741.1|	98.15	271	5	0	1	271	760	490	1.00E-131	466	Photobacterium aquimaris strain LC2-065
# Query: 4197 BR7CJuly_6178												
4197	gi|219878436|ref|NR_025575.1|	99.63	271	1	0	1	271	768	498	4.00E-137	484	Vibrio fortis strain CAIM 629
4197	gi|343201317|ref|NR_042043.1|	99.63	271	1	0	1	271	789	519	4.00E-137	484	Listonella pelagia strain CECT 4202
4197	gi|444439574|ref|NR_074889.1|	98.89	271	3	0	1	271	784	514	2.00E-134	475	Vibrio vulnificus CMCP6 strain CMCP6
4197	gi|310975024|ref|NR_036888.1|	98.89	271	3	0	1	271	778	508	2.00E-134	475	Vibrio vulnificus strain 324
4197	gi|507148169|ref|NR_102976.1|	98.52	271	4	0	1	271	788	518	2.00E-133	471	Vibrio harveyi ATCC BAA-1116
4197	gi|470467847|ref|NR_074196.1|	98.52	271	4	0	1	271	793	523	2.00E-133	471	Vibrio parahaemolyticus RIMD 2210633
4197	gi|265678914|ref|NR_029222.1|	98.52	271	4	0	1	271	793	523	2.00E-133	471	Vibrio campbellii strain 40
4197	gi|343199007|ref|NR_044304.1|	98.52	271	4	0	1	271	776	506	2.00E-133	471	Vibrio breoganii strain LMG 23858
4197	gi|343205654|ref|NR_044018.1|	98.52	271	4	0	1	271	748	478	2.00E-133	471	Vibrio inusitatus strain RW14
4197	gi|343205096|ref|NR_043858.1|	98.52	271	4	0	1	271	789	519	2.00E-133	471	Vibrio sinaloensis strain CAIM 797

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens

PART II: Vibrio												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q Start	Q End	S Start	S End	E-Value	Bit Score	Name
# Query: 5083 HW4CApr_185898												
5083	gi|444439675|ref|NR_074990.1|	91.54	272	21	2	1	271	795	525	1.00E-105	379	Vibrio fischeri ES114 strain ES114
5083	gi|444439532|ref|NR_074847.1|	91.54	272	21	2	1	271	778	508	1.00E-105	379	Aliivibrio salmonicida LFI1238
5083	gi|265679036|ref|NR_029344.1|	91.54	272	21	2	1	271	791	521	1.00E-105	379	Vibrio pectenicida strain Ifremer A365
5083	gi|343201406|ref|NR_042132.1|	91.54	272	21	2	1	271	715	445	1.00E-105	379	Aliivibrio logei strain NCIMB 2252
5083	gi|265678947|ref|NR_029255.1|	91.54	272	21	2	1	271	793	523	1.00E-105	379	Vibrio fischeri strain 398
5083	gi|470467046|ref|NR_074153.1|	91.18	272	22	2	1	271	777	507	1.00E-104	376	Vibrio anguillarum 775 strain 775
5083	gi|444439638|ref|NR_074953.1|	91.18	272	22	2	1	271	788	518	1.00E-104	376	Vibrio splendidus LGP32 strain LGP32
5083	gi|343199085|ref|NR_044520.1|	91.18	272	22	2	1	271	787	517	1.00E-104	376	Vibrio gallaecicus strain CECT 7244
5083	gi|343205919|ref|NR_044417.1|	91.18	272	22	2	1	271	742	472	1.00E-104	376	Vibrio areninigrae strain J74
5083	gi|343205697|ref|NR_044079.1|	91.18	272	22	2	1	271	777	507	1.00E-104	376	Vibrio gigantis strain CAIM 25
# Query: 6999 BR7CNov_13407												
6999	gi|265678727|ref|NR_029032.1|	91.88	271	22	0	1	271	783	513	7.00E-109	390	Vibrio ponticus strain 69
6999	gi|507148170|ref|NR_102977.1|	91.51	271	23	0	1	271	788	518	3.00E-107	385	Vibrio furnissii NCTC 11218
6999	gi|265679036|ref|NR_029344.1|	91.51	271	23	0	1	271	791	521	3.00E-107	385	Vibrio pectenicida strain Ifremer A365
6999	gi|343199085|ref|NR_044520.1|	91.51	271	23	0	1	271	787	517	3.00E-107	385	Vibrio gallaecicus strain CECT 7244
6999	gi|343199042|ref|NR_044396.1|	91.51	271	23	0	1	271	768	498	3.00E-107	385	Vibrio sp. cn83 strain cn83
6999	gi|343205697|ref|NR_044079.1|	91.51	271	23	0	1	271	777	507	3.00E-107	385	Vibrio gigantis strain CAIM 25
6999	gi|343205696|ref|NR_044078.1|	91.51	271	23	0	1	271	775	505	3.00E-107	385	Vibrio crassostreae strain CAIM 1405
6999	gi|219878436|ref|NR_025575.1|	91.51	271	23	0	1	271	768	498	3.00E-107	385	Vibrio fortis strain CAIM 629
6999	gi|219878341|ref|NR_025480.1|	91.51	271	23	0	1	271	768	498	3.00E-107	385	Vibrio chagasii strain R-3712
6999	gi|219878408|ref|NR_025547.1|	91.51	271	23	0	1	271	768	498	3.00E-107	385	Vibrio pomeroyi strain CAIM 578
# Query: 7634 HW9CJan_16415												
7634	gi|219846534|ref|NR_026126.1|	88.66	238	13	10	4	241	789	566	4.00E-74	275	Vibrio nigripulchritudo strain 164
7634	gi|507148170|ref|NR_102977.1|	88.24	238	14	10	4	241	785	562	4.00E-73	271	Vibrio furnissii NCTC 11218
7634	gi|444439574|ref|NR_074889.1|	88.24	238	14	10	4	241	781	558	4.00E-73	271	Vibrio vulnificus CMCP6
7634	gi|310975024|ref|NR_036888.1|	88.24	238	14	10	4	241	775	552	4.00E-73	271	Vibrio vulnificus strain 324
7634	gi|310975203|ref|NR_037067.1|	88.24	238	14	10	4	241	785	562	4.00E-73	271	Vibrio furnissii strain 9119-82
7634	gi|310974926|ref|NR_036790.1|	88.24	238	14	10	4	241	776	553	4.00E-73	271	Vibrio fluvialis strain VL 5125
7634	gi|219846537|ref|NR_026129.1|	87.82	238	15	10	4	241	790	567	5.00E-72	268	Vibrio tubiashii strain Milford 74
7634	gi|507148169|ref|NR_102976.1|	87.82	238	15	10	4	241	785	562	2.00E-71	266	Vibrio harveyi ATCC BAA-1116
7634	gi|470467847|ref|NR_074196.1|	87.82	238	15	10	4	241	790	567	2.00E-71	266	Vibrio parahaemolyticus RIMD 2210633
7634	gi|265678950|ref|NR_029258.1|	87.82	238	15	10	4	241	797	574	2.00E-71	266	Vibrio metschnikovii strain Fowl

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens

PART II: Vibrio												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q Start	Q End	S Start	S End	E-Value	Bit Score	Name
# Query: 7814 HW9CApr_18469												
7814	gi|444439574|ref|NR_074889.1|	87.72	228	17	11	1	228	784	568	2.00E-65	246	Vibrio vulnificus CMCP6
7814	gi|310975024|ref|NR_036888.1|	87.72	228	17	11	1	228	778	562	2.00E-65	246	Vibrio vulnificus strain 324
7814	gi|507148169|ref|NR_102976.1|	87.28	228	18	11	1	228	788	572	8.00E-64	241	Vibrio harveyi ATCC BAA-1116
7814	gi|470467847|ref|NR_074196.1|	87.28	228	18	11	1	228	793	577	8.00E-64	241	Vibrio parahaemolyticus RIMD 2210633
7814	gi|265678914|ref|NR_029222.1|	87.28	228	18	11	1	228	793	577	8.00E-64	241	Vibrio campbellii strain 40
7814	gi|343205096|ref|NR_043858.1|	87.28	228	18	11	1	228	789	573	8.00E-64	241	Vibrio sinaloensis strain CAIM 797
7814	gi|219878352|ref|NR_025491.1|	87.28	228	18	11	1	228	768	552	8.00E-64	241	Vibrio hepatarius strain LMG 20362
7814	gi|343201355|ref|NR_042081.1|	87.28	228	18	11	1	228	768	552	8.00E-64	241	Vibrio rotiferianus strain :LMG 21460
7814	gi|219878339|ref|NR_025478.1|	87.28	228	18	11	1	228	768	552	8.00E-64	241	Vibrio xuii strain R-15052
7814	gi|219878338|ref|NR_025477.1|	87.28	228	18	11	1	228	768	552	8.00E-64	241	Vibrio brasiliensis strain LMG 20546

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

Part III: Bacillales

Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q Start	Q End	S Start	S End	E-value	Bit Score	Name
# Query: denovo1723 HW9CNov_116482												
denovo1723	gi|507148055|ref|NR_102862.1|	99.63	270	1	0	1	270	772	503	1.00E-136	482	Brevibacillus brevis NBRC 100599
denovo1723	gi|343200837|ref|NR_041524.1|	99.63	270	1	0	1	270	752	483	1.00E-136	482	Brevibacillus brevis strain NBRC 15304
denovo1723	gi|343198443|ref|NR_041836.1|	99.63	270	1	0	1	270	752	483	1.00E-136	482	Brevibacillus invocatus strain LMG 18962
denovo1723	gi|343200296|ref|NR_040983.1|	99.63	270	1	0	1	270	751	482	1.00E-136	482	Brevibacillus agri strain DSM 6348
denovo1723	gi|343200292|ref|NR_040979.1|	99.63	270	1	0	1	270	750	481	1.00E-136	482	Brevibacillus formosus strain DSM 9885
denovo1723	gi|343199069|ref|NR_044485.1|	99.26	270	2	0	1	270	758	489	2.00E-135	479	Brevibacillus panacihumi strain DCY35
denovo1723	gi|343200297|ref|NR_040984.1|	99.26	270	2	0	1	270	750	481	2.00E-135	479	Brevibacillus limnophilus strain DSM 6472
denovo1723	gi|265678826|ref|NR_029131.1|	98.89	270	3	0	1	270	773	504	2.00E-134	475	Brevibacillus borstelensis strain Logan
denovo1723	gi|219857194|ref|NR_024822.1|	98.89	270	3	0	1	270	765	496	7.00E-134	473	Brevibacillus borstelensis strain DSM 6347
denovo1723	gi|343200295|ref|NR_040982.1|	98.89	270	3	0	1	270	750	481	7.00E-134	473	Brevibacillus reuszeri strain DSM 9887
# Query: denovo1951 BR10BJan_13618												
denovo1951	gi|343202353|ref|NR_042639.1|	97.96	245	1	3	1	245	781	541	7.00E-115	410	[Brevibacterium] frigoritolerans strain
denovo1951	gi|343205668|ref|NR_044037.1|	97.96	245	1	3	1	245	760	520	7.00E-115	410	Bacillus coahuilensis m4-4 strain
denovo1951	gi|343201357|ref|NR_042083.1|	97.96	245	1	3	1	245	765	525	7.00E-115	410	Bacillus sp. LMG 20238
denovo1951	gi|343201410|ref|NR_042136.1|	97.96	245	1	3	1	245	774	534	7.00E-115	410	Bacillus simplex strain DSM 1321
denovo1951	gi|343205762|ref|NR_044170.1|	97.55	245	2	3	1	245	770	530	3.00E-113	405	Bacillus butanolivorans strain K9
denovo1951	gi|219857180|ref|NR_024808.1|	97.55	245	2	3	1	245	759	519	3.00E-113	405	Bacillus vietnamensis strain 15-1
denovo1951	gi|343202631|ref|NR_043015.1|	97.14	245	3	3	1	245	764	524	4.00E-112	401	Bacillus litoralis strain SW-211
denovo1951	gi|219857652|ref|NR_025241.1|	97.14	245	3	3	1	245	766	526	4.00E-112	401	Bacillus aquimaris strain TF-12
denovo1951	gi|219857651|ref|NR_025240.1|	97.14	245	3	3	1	245	765	525	4.00E-112	401	Bacillus marisflavi strain TF-11
denovo1951	gi|219846552|ref|NR_026144.1|	97.14	245	3	3	1	245	764	524	4.00E-112	401	Bacillus halmapalus strain DSM 8723
# Query: denovo2837 BR7CJan_1386												
denovo2837	gi|507148055|ref|NR_102862.1|	96.65	239	0	8	1	239	772	542	8.00E-102	367	Brevibacillus brevis NBRC 100599
denovo2837	gi|343200837|ref|NR_041524.1|	96.65	239	0	8	1	239	752	522	8.00E-102	367	Brevibacillus brevis strain NBRC 15304
denovo2837	gi|343198443|ref|NR_041836.1|	96.65	239	0	8	1	239	752	522	8.00E-102	367	Brevibacillus invocatus strain LMG 18962
denovo2837	gi|343200296|ref|NR_040983.1|	96.65	239	0	8	1	239	751	521	8.00E-102	367	Brevibacillus agri strain DSM 6348
denovo2837	gi|343200292|ref|NR_040979.1|	96.65	239	0	8	1	239	750	520	8.00E-102	367	Brevibacillus formosus strain DSM 9885
denovo2837	gi|343199069|ref|NR_044485.1|	95.82	239	2	7	1	239	758	528	3.00E-100	361	Brevibacillus panacihumi strain DCY35
denovo2837	gi|343200297|ref|NR_040984.1|	95.82	239	2	7	1	239	750	520	3.00E-100	361	Brevibacillus borstelensis strain DSM 6347
denovo2837	gi|219857194|ref|NR_024822.1|	95.4	239	3	7	1	239	765	535	4.00E-99	358	Brevibacillus limnophilus strain DSM 6472
denovo2837	gi|343200295|ref|NR_040982.1|	95.82	239	2	8	1	239	750	520	4.00E-99	358	Brevibacillus reuszeri strain DSM 9887
denovo2837	gi|343200294|ref|NR_040981.1|	95.82	239	2	8	1	239	750	520	4.00E-99	358	Brevibacillus parabrevis strain IFO 12334

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

Part III: Bacillales												
Query ID	**Subject ID**	**% Identity**	**Alignment Length**	**Mismatches**	**Gap Opens**	**Q Start**	**Q End**	**S Start**	**S End**	**E-value**	**Bit Score**	**Name**
# Query: denovo3290 HW4CApr_16710												
denovo3290	gi|485099103|ref|NR_102499.1|	98.89	271	3	0	1	271	789	519	2.00E-134	475	Staphylococcus warneri SG1
denovo3290	gi|444439685|ref|NR_075000.1|	98.89	271	3	0	1	271	793	523	2.00E-134	475	Staphylococcus aureus subsp. aureus N315
denovo3290	gi|444439680|ref|NR_074995.1|	98.89	271	3	0	1	271	793	523	2.00E-134	475	Staphylococcus epidermidis RP62A
denovo3290	gi|444439679|ref|NR_074994.1|	98.89	271	3	0	1	271	793	523	2.00E-134	475	Staphylococcus haemolyticus JCSC1435
denovo3290	gi|444439610|ref|NR_074925.1|	98.89	271	3	0	1	271	785	515	2.00E-134	475	Staphylococcus aureus subsp. aureus JH1
denovo3290	gi|444439553|ref|NR_074868.1|	98.89	271	3	0	1	271	785	515	2.00E-134	475	Staphylococcus lugdunensis HKU09-01 strain
denovo3290	gi|310975143|ref|NR_037007.1|	98.89	271	3	0	1	271	793	523	2.00E-134	475	Staphylococcus aureus subsp. aureus
denovo3290	gi|343200636|ref|NR_041323.1|	98.89	271	3	0	1	271	758	488	2.00E-134	475	Staphylococcus hominis subsp. novobiosepticu
denovo3290	gi|343198638|ref|NR_043146.1|	98.89	271	3	0	1	271	766	496	2.00E-134	475	Staphylococcus simiae CCM 7213
denovo3290	gi|219856850|ref|NR_024669.1|	98.89	271	3	0	1	271	785	515	2.00E-134	475	Staphylococcus pasteuri strain ATCC51129
# Query: denovo4388 HW4AApr_189348												
denovo4388	gi|219856848|ref|NR_024667.1|	97.05	271	8	0	2	272	785	515	7.00E-128	453	Staphylococcus kloosii strain ATCC 43959
denovo4388	gi|219856845|ref|NR_024664.1|	97.05	271	8	0	2	272	785	515	7.00E-128	453	Staphylococcus arlettae strain ATCC 43957
denovo4388	gi|444439684|ref|NR_074999.1|	96.68	271	9	0	2	272	792	522	3.00E-126	448	Staphylococcus saprophyticus
denovo4388	gi|343200637|ref|NR_041324.1|	96.68	271	9	0	2	272	757	487	3.00E-126	448	Staphylococcus saprophyticus subsp. bovis
denovo4388	gi|310975189|ref|NR_037053.1|	96.68	271	9	0	2	272	772	502	3.00E-126	448	Staphylococcus succinus strain SB72
denovo4388	gi|310975182|ref|NR_037046.1|	96.68	271	9	0	2	272	785	515	3.00E-126	448	Staphylococcus cohnii subsp. urealyticus
denovo4388	gi|265678365|ref|NR_028667.1|	96.68	271	9	0	2	272	788	518	3.00E-126	448	Staphylococcus succinus subsp. succinus
denovo4388	gi|310975043|ref|NR_036907.1|	96.68	271	9	0	2	272	767	497	3.00E-126	448	Staphylococcus xylosus strain KL 162
denovo4388	gi|310975039|ref|NR_036903.1|	96.68	271	9	0	2	272	767	497	3.00E-126	448	Staphylococcus gallinarum strain VIII1
denovo4388	gi|310975038|ref|NR_036902.1|	96.68	271	9	0	2	272	767	497	3.00E-126	448	Staphylococcus cohnii subsp. cohnii
# Query: denovo6204 BR10ANov_4883												
denovo6204	gi|219846252|ref|NR_025842.1|	99.63	271	1	0	1	271	763	493	4.00E-137	484	Bacillus firmus strain IAM 12464
denovo6204	gi|444439608|ref|NR_074923.1|	98.15	271	5	0	1	271	786	516	1.00E-131	466	Bacillus licheniformis DSM 13 = ATCC 14580
denovo6204	gi|343200954|ref|NR_041641.1|	98.15	271	5	0	1	271	765	495	1.00E-131	466	Bacillus azotoformans strain NBRC 15712
denovo6204	gi|219857542|ref|NR_025130.1|	98.15	271	5	0	1	271	764	494	1.00E-131	466	Bacillus sonorensis strain NRRL B-23154
denovo6204	gi|265678407|ref|NR_028709.1|	97.79	271	6	0	1	271	761	491	1.00E-130	462	Bacillus siralis strain 171544
denovo6204	gi|343199097|ref|NR_044546.1|	97.79	271	6	0	1	271	784	514	1.00E-130	462	Bacillus nealsonii strain DSM 15077
denovo6204	gi|224581445|ref|NR_027227.1|	97.79	271	6	0	1	271	777	507	1.00E-130	462	Bacillus infernus strain TH-23
denovo6204	gi|343204294|ref|NR_043762.1|	97.79	271	6	0	1	271	764	494	1.00E-130	462	Bacillus thioparans strain BMP-1
denovo6204	gi|343200588|ref|NR_041275.1|	97.79	271	6	0	1	271	786	516	1.00E-130	462	Bacillus boroniphilus strain T-15Z
denovo6204	gi|343198686|ref|NR_043268.1|	97.79	271	6	0	1	271	745	475	1.00E-130	462	Bacillus idriensis strain SMC 4352-2

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	**Subject ID**	**% Identity**	**Alignment Length**	**Mismatches**	**Gap Opens**	**Q start**	**Q End**	**S Start**	**S End**	**E-value**	**Bit Score**	**Name**
# Query: denovo1046 BR14AApr_158439												
denovo1046	gi|343200752|ref|NR_041439.1|	92.66	259	12	7	3	260	740	488	1.00E-98	356	Sulfurimonas paralvinellae strain GO25
denovo1046	gi|444304027|ref|NR_074451.1|	91.89	259	14	7	3	260	751	499	7.00E-96	347	Sulfurimonas autotrophica DSM 16294
denovo1046	gi|265678341|ref|NR_028643.1|	91.89	259	14	7	3	260	745	493	7.00E-96	347	Sulfurimonas autotrophica DSM 16294
denovo1046	gi|470466633|ref|NR_074133.1|	89.19	259	21	7	3	260	737	485	1.00E-86	316	Helicobacter pametensis strain B9A Seymour
denovo1046	gi|253680771|ref|NR_028019.1|	88.03	259	24	7	3	260	743	491	3.00E-82	302	Helicobacter pullorum NCTC 12824
denovo1046	gi|343198604|ref|NR_043053.1|	88.03	259	24	7	3	260	735	483	3.00E-82	302	Campylobacter mucosalis strain ATCC 43264
denovo1046	gi|343203094|ref|NR_043607.1|	88.03	259	24	7	3	260	728	476	3.00E-82	302	Hydrogenimonas thermophila strain EP1-55-1%
denovo1046	gi|219857183|ref|NR_024811.1|	88.03	259	24	7	3	260	748	496	3.00E-82	302	Campylobacter concisus 13826 strain
denovo1046	gi|470467110|ref|NR_074156.1|	87.64	259	25	7	3	260	755	503	3.00E-81	298	Helicobacter brantae strain MIT 04-9366
denovo1046	gi|343198830|ref|NR_043799.1|	87.64	259	25	7	3	260	736	484	3.00E-81	298	Sulfurimonas denitrificans DSM 1251
# Query: denovo1231 HW4AApr_48813												
denovo1231	gi|444304079|ref|NR_074503.1|	96.31	271	10	0	1	271	760	490	3.00E-125	444	Sulfurovum sp. NBC37-1 strain NBC37-
denovo1231	gi|219857174|ref|NR_024802.1|	96.31	271	10	0	1	271	734	464	3.00E-125	444	Sulfurovum lithotrophicum strain 42BKT
denovo1231	gi|444439559|ref|NR_074874.1|	90.77	271	25	0	1	271	777	507	1.00E-104	376	Nitratiruptor sp. SB155-2
denovo1231	gi|444304006|ref|NR_074430.1|	90.77	271	25	0	1	271	756	486	1.00E-104	376	Nitratifractor salsuginis DSM 16511
denovo1231	gi|343200752|ref|NR_041439.1|	90.77	271	25	0	1	271	742	472	1.00E-104	376	Sulfurimonas paralvinellae strain GO25
denovo1231	gi|343200337|ref|NR_041024.1|	90.77	271	25	0	1	271	736	466	1.00E-104	376	Nitratifractor salsuginis DSM 16511
denovo1231	gi|219857183|ref|NR_024811.1|	90.04	271	27	0	1	271	750	480	7.00E-102	367	Hydrogenimonas thermophila strain EP1-55-1%
denovo1231	gi|470466633|ref|NR_074133.1|	89.3	271	29	0	1	271	739	469	4.00E-99	358	Sulfurimonas denitrificans DSM 1251
denovo1231	gi|444304027|ref|NR_074451.1|	89.3	271	29	0	1	271	753	483	4.00E-99	358	Sulfurimonas autotrophica DSM 16294
denovo1231	gi|265678341|ref|NR_028643.1|	89.3	271	29	0	1	271	747	477	4.00E-99	358	Sulfurimonas autotrophica DSM 16294
# Query: denovo1232 BR14AJan_3239												
denovo1232	gi|444304079|ref|NR_074503.1|	97.79	271	6	0	1	271	760	490	1.00E-130	462	Sulfurovum sp. NBC37-1 strain NBC37-1
denovo1232	gi|219857174|ref|NR_024802.1|	97.79	271	6	0	1	271	734	464	1.00E-130	462	Sulfurovum lithotrophicum strain 42BKT
denovo1232	gi|444439559|ref|NR_074874.1|	90.04	271	27	0	1	271	777	507	7.00E-102	367	Nitratiruptor sp. SB155-2
denovo1232	gi|444304006|ref|NR_074430.1|	89.3	271	29	0	1	271	756	486	4.00E-99	358	Nitratifractor salsuginis DSM 16511
denovo1232	gi|343200337|ref|NR_041024.1|	89.3	271	29	0	1	271	736	466	4.00E-99	358	Nitratifractor salsuginis DSM 16511
denovo1232	gi|507148066|ref|NR_102873.1|	87.45	271	34	0	1	271	756	486	1.00E-92	336	Arcobacter nitrofigilis DSM 7299
denovo1232	gi|219857183|ref|NR_024811.1|	87.45	271	34	0	1	271	750	480	1.00E-92	336	Hydrogenimonas thermophila strain EP1-55-1%
denovo1232	gi|219846316|ref|NR_025906.1|	87.45	271	34	0	1	271	760	490	1.00E-92	336	Arcobacter nitrofigilis strain CI
denovo1232	gi|470466633|ref|NR_074133.1|	87.08	271	35	0	1	271	739	469	5.00E-91	331	Sulfurimonas denitrificans DSM 1251
denovo1232	gi|343198830|ref|NR_043799.1|	87.08	271	35	0	1	271	738	468	5.00E-91	331	Helicobacter brantae strain MIT 04-9366
# Query: denovo1322 HW4AApr_137866												
denovo1322	gi|219857183|ref|NR_024811.1|	93.36	271	18	0	1	271	750	480	2.00E-114	408	Hydrogenimonas thermophila strain EP1-55-1%
denovo1322	gi|343202397|ref|NR_042683.1|	92.25	271	21	0	1	271	753	483	5.00E-110	394	Campylobacter lari subsp. concheus
denovo1322	gi|444304131|ref|NR_074555.1|	91.88	271	22	0	1	271	761	491	7.00E-109	390	Campylobacter lari RM2100
denovo1322	gi|343198598|ref|NR_043034.1|	91.88	271	22	0	1	271	716	446	7.00E-109	390	Campylobacter lari subsp. lari strain

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q start	Q End	S Start	S End	E-value	Bit Score	Name
denovo1322	gi|343200705|ref|NR_041392.1|	91.88	271	22	0	1	271	676	406	7.00E-109	390	Sulfurospirillum cavolei str
denovo1322	gi|444439559|ref|NR_074874.1|	91.14	271	24	0	1	271	777	507	3.00E-106	381	Nitratiruptor sp. SB155-2
denovo1322	gi|444304126|ref|NR_074550.1|	91.14	271	24	0	1	271	761	491	3.00E-106	381	Campylobacter jejuni subsp. jejuni
denovo1322	gi|343203089|ref|NR_043602.1|	91.14	271	24	0	1	271	732	462	3.00E-106	381	Campylobacter upsaliensis strain CCUG 14913
denovo1322	gi|343203086|ref|NR_043599.1|	91.14	271	24	0	1	271	732	462	3.00E-106	381	Campylobacter jejuni subsp. doylei
denovo1322	gi|343201123|ref|NR_041834.1|	91.14	271	24	0	1	271	732	462	3.00E-106	381	Campylobacter jejuni strain NCTC 11351
# Query: denovo1502 HW14AApr_166531												
denovo1502	gi|343198490|ref|NR_041918.1|	87.08	271	35	0	1	271	716	446	5.00E-91	331	Arcobacter halophilus strain LA31B
denovo1502	gi|507148066|ref|NR_102873.1|	86.72	271	36	0	1	271	756	486	7.00E-90	327	Arcobacter nitrofigilis DSM 7299
denovo1502	gi|219846316|ref|NR_025906.1|	86.72	271	36	0	1	271	760	490	7.00E-90	327	Arcobacter nitrofigilis strain CI
denovo1502	gi|219846389|ref|NR_025980.1|	86.03	272	36	2	1	271	778	508	1.00E-85	313	Piscirickettsia salmonis strain LF-89
denovo1502	gi|444304149|ref|NR_074573.1|	85.24	271	40	0	1	271	760	490	2.00E-84	309	Arcobacter butzleri RM4018
denovo1502	gi|444304143|ref|NR_074567.1|	85.24	271	40	0	1	271	760	490	2.00E-84	309	Arcobacter butzleri ED-1
denovo1502	gi|343198599|ref|NR_043035.1|	85.24	271	40	0	1	271	714	444	2.00E-84	309	Arcobacter butzleri strain ATCC 49616
denovo1502	gi|343206046|ref|NR_044625.1|	84.87	271	41	0	1	271	750	480	7.00E-83	304	Arcobacter skirrowii
denovo1502	gi|343199098|ref|NR_044549.1|	84.87	271	41	0	1	271	747	477	7.00E-83	304	Arcobacter mytili LMG 24559
denovo1502	gi|343198988|ref|NR_044256.1|	84.5	271	42	0	1	271	717	447	9.00E-82	300	Robiginitomaculum antarcticum strain IMCC319
# Query: denovo1640 HW4AApr_18919												
denovo1640	gi|444304027|ref|NR_074451.1|	94.1	271	16	0	1	271	753	483	5.00E-117	417	Sulfurimonas autotrophica DSM 16294
denovo1640	gi|265678341|ref|NR_028643.1|	94.1	271	16	0	1	271	747	477	5.00E-117	417	Sulfurimonas autotrophica DSM 16294
denovo1640	gi|343200752|ref|NR_041439.1|	93.73	271	17	0	1	271	742	472	2.00E-115	412	Sulfurimonas paralvinellae strain GO25
denovo1640	gi|470466633|ref|NR_074133.1|	93.36	271	18	0	1	271	739	469	2.00E-114	408	Sulfurimonas denitrificans DSM 1251
denovo1640	gi|219857183|ref|NR_024811.1|	91.14	271	24	0	1	271	750	480	3.00E-106	381	Hydrogenimonas thermophila strain EP1-55-1%
denovo1640	gi|219857508|ref|NR_025096.1|	90.41	271	26	0	1	271	721	451	2.00E-103	372	Helicobacter canadensis strain NLEP-16143
denovo1640	gi|507148122|ref|NR_102929.1|	90.04	271	27	0	1	271	748	478	7.00E-102	367	Sulfurospirillum barnesii SES-3
denovo1640	gi|343198830|ref|NR_043799.1|	90.04	271	27	0	1	271	738	468	7.00E-102	367	Helicobacter brantae strain MIT 04-9366
denovo1640	gi|253680771|ref|NR_028019.1|	90.04	271	27	0	1	271	745	475	7.00E-102	367	Helicobacter pametensis strain B9A Seymour
denovo1640	gi|343198604|ref|NR_043053.1|	90.04	271	27	0	1	271	737	467	7.00E-102	367	Helicobacter pullorum NCTC 12824
# Query: denovo1923 BR10BJan_5883												
denovo1923	gi|343206046|ref|NR_044625.1|	93.36	271	18	0	1	271	750	480	2.00E-114	408	Arcobacter skirrowii
denovo1923	gi|444304149|ref|NR_074573.1|	92.99	271	19	0	1	271	760	490	1.00E-112	403	Arcobacter butzleri RM4018
denovo1923	gi|444304143|ref|NR_074567.1|	92.99	271	19	0	1	271	760	490	1.00E-112	403	Arcobacter butzleri ED-1
denovo1923	gi|343199098|ref|NR_044549.1|	93.38	272	16	2	1	271	747	477	1.00E-112	403	Arcobacter mytili LMG 24559
denovo1923	gi|343198599|ref|NR_043035.1|	92.99	271	19	0	1	271	714	444	1.00E-112	403	Arcobacter butzleri strain ATCC 49616
denovo1923	gi|343201492|ref|NR_042218.1|	92.99	271	19	0	1	271	725	455	1.00E-112	403	Arcobacter cibarius strain : LMG 21996
denovo1923	gi|219846315|ref|NR_025905.1|	92.99	271	19	0	1	271	760	490	1.00E-112	403	Arcobacter cryaerophilus strain A 169/B
denovo1923	gi|507148066|ref|NR_102873.1|	92.25	271	21	0	1	271	756	486	5.00E-110	394	Arcobacter nitrofigilis DSM 7299
denovo1923	gi|343198490|ref|NR_041918.1|	92.65	272	18	2	1	271	716	446	5.00E-110	394	Arcobacter halophilus strain LA31B
denovo1923	gi|219846316|ref|NR_025906.1|	91.88	271	22	0	1	271	760	490	7.00E-109	390	Arcobacter nitrofigilis strain CI

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	**Subject ID**	**% Identity**	**Alignment Length**	**Mismatches**	**Gap Opens**	**Q start**	**Q End**	**S Start**	**S End**	**E-value**	**Bit Score**	**Name**
# Query: denovo1971 HW14AJan_16142												
denovo1971	gi|343203094|ref|NR_043607.1|	82.77	267	46	0	1	267	730	464	4.00E-74	275	Campylobacter mucosalis strain ATCC 43264
denovo1971	gi|470467110|ref|NR_074156.1|	82.02	267	48	0	1	267	757	491	2.00E-71	266	Campylobacter concisus 13826
denovo1971	gi|343203091|ref|NR_043604.1|	82.02	267	48	0	1	267	731	465	2.00E-71	266	Campylobacter concisus strain ATCC 33237
denovo1971	gi|343203090|ref|NR_043603.1|	82.02	267	48	0	1	267	870	604	2.00E-71	266	Campylobacter curvus strain ATCC 35224
denovo1971	gi|343200336|ref|NR_041023.1|	82.02	267	48	0	1	267	739	473	2.00E-71	266	Nitratiruptor tergarcus DSM 16512
denovo1971	gi|219857183|ref|NR_024811.1|	82.02	267	48	0	1	267	750	484	2.00E-71	266	Hydrogenimonas thermophila strain EP1-55-1%
denovo1971	gi|444304006|ref|NR_074430.1|	81.65	267	49	0	1	267	756	490	8.00E-70	260	Nitratifractor salsuginis DSM 16511
denovo1971	gi|343200337|ref|NR_041024.1|	81.65	267	49	0	1	267	736	470	8.00E-70	260	Nitratifractor salsuginis DSM 16511
denovo1971	gi|444303975|ref|NR_074398.1|	81.27	267	50	0	1	267	750	484	1.00E-68	257	Sulfuricurvum kujiense DSM 16994
denovo1971	gi|219846348|ref|NR_025939.1|	81.27	267	50	0	1	267	741	475	1.00E-68	257	Helicobacter muridarum strain ST1
# Query: denovo2202 BR14AApr_154312												
denovo2202	gi|343200752|ref|NR_041439.1|	91.14	271	24	0	1	271	742	472	3.00E-106	381	Sulfurimonas paralvinellae strain GO25
denovo2202	gi|444304027|ref|NR_074451.1|	89.67	271	28	0	1	271	753	483	9.00E-101	363	Sulfurimonas autotrophica DSM 16294
denovo2202	gi|265678341|ref|NR_028643.1|	89.67	271	28	0	1	271	747	477	9.00E-101	363	Sulfurimonas autotrophica DSM 16294
denovo2202	gi|343199098|ref|NR_044549.1|	89.3	271	29	0	1	271	747	477	4.00E-99	358	Arcobacter mytili LMG 24559 strain F2075
denovo2202	gi|470466633|ref|NR_074133.1|	88.93	271	30	0	1	271	739	469	5.00E-98	354	Sulfurimonas denitrificans DSM 1251
denovo2202	gi|219857183|ref|NR_024811.1|	88.93	271	30	0	1	271	750	480	5.00E-98	354	Hydrogenimonas thermophila strain EP1-55-1%
denovo2202	gi|343198830|ref|NR_043799.1|	88.19	271	32	0	1	271	738	468	2.00E-95	345	Helicobacter brantae strain MIT 04-9366
denovo2202	gi|343198490|ref|NR_041918.1|	88.19	271	32	0	1	271	716	446	2.00E-95	345	Arcobacter halophilus strain LA31B
denovo2202	gi|219857508|ref|NR_025096.1|	88.19	271	32	0	1	271	721	451	2.00E-95	345	Helicobacter canadensis strain NLEP-16143
denovo2202	gi|444304079|ref|NR_074503.1|	87.82	271	33	0	1	271	760	490	1.00E-93	340	Sulfurovum sp. NBC37-1
# Query: denovo2269 HW4AApr_51957												
denovo2269	gi|444303975|ref|NR_074398.1|	99.63	271	1	0	1	271	750	480	4.00E-137	484	Sulfuricurvum kujiense DSM 16994
denovo2269	gi|507148122|ref|NR_102929.1|	87.45	271	34	0	1	271	748	478	1.00E-92	336	Sulfurospirillum barnesii SES-3
denovo2269	gi|470466633|ref|NR_074133.1|	87.08	271	35	0	1	271	739	469	5.00E-91	331	Sulfurimonas denitrificans DSM 1251
denovo2269	gi|219846816|ref|NR_026408.1|	87.08	271	35	0	1	271	730	460	5.00E-91	331	Sulfurospirillum arcachonense strain F1F6
denovo2269	gi|444303955|ref|NR_074378.1|	86.72	271	36	0	1	271	748	478	7.00E-90	327	Sulfurospirillum deleyianum DSM 6946
denovo2269	gi|343202397|ref|NR_042683.1|	86.72	271	36	0	1	271	753	483	7.00E-90	327	Campylobacter lari subsp. concheus
denovo2269	gi|219846830|ref|NR_026422.1|	86.72	271	36	0	1	271	728	458	7.00E-90	327	Sulfurospirillum deleyianum strain Spirillum
denovo2269	gi|444304131|ref|NR_074555.1|	86.35	271	37	0	1	271	761	491	3.00E-88	322	Campylobacter lari RM2100
denovo2269	gi|444304126|ref|NR_074550.1|	86.35	271	37	0	1	271	761	491	3.00E-88	322	Campylobacter jejuni subsp. jejuni
denovo2269	gi|343202398|ref|NR_042684.1|	86.35	271	37	0	1	271	749	479	3.00E-88	322	Campylobacter peloridis strain : LMG 23910
# Query: denovo270 BR10AApr_192824												
denovo270	gi|444304149|ref|NR_074573.1|	88.46	182	17	4	1	180	760	581	2.00E-57	219	Arcobacter butzleri RM4018
denovo270	gi|444304143|ref|NR_074567.1|	88.46	182	17	4	1	180	760	581	2.00E-57	219	Arcobacter butzleri ED-1
denovo270	gi|343198599|ref|NR_043035.1|	88.46	182	17	4	1	180	714	535	2.00E-57	219	Arcobacter butzleri strain ATCC 49616
denovo270	gi|219846315|ref|NR_025905.1|	88.46	182	17	4	1	180	760	581	2.00E-57	219	Arcobacter cryaerophilus strain A 169/B

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q start	Q End	S Start	S End	E-value	Bit Score	Name
denovo270	gi|343206046|ref|NR_044625.1|	87.29	181	21	2	1	180	750	571	3.00E-56	215	Arcobacter skirrowii
denovo270	gi|343201492|ref|NR_042218.1|	87.91	182	18	4	1	180	725	546	3.00E-56	215	Arcobacter cibarius strain
denovo270	gi|219846316|ref|NR_025906.1|	85.16	182	23	4	1	180	760	581	1.00E-49	194	Arcobacter nitrofigilis strain CI
denovo270	gi|507148066|ref|NR_102873.1|	85.16	182	23	4	1	180	756	577	3.00E-49	192	Arcobacter nitrofigilis DSM 72
denovo270	gi|444304272|ref|NR_074698.1|	82.97	182	27	4	1	180	773	594	9.00E-44	174	Ignavibacterium album JCM 16511
denovo270	gi|343199098|ref|NR_044549.1|	82.42	182	28	4	1	180	747	568	1.00E-42	170	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo2713 HW4AApr_38258												
denovo2713	gi|444304149|ref|NR_074573.1|	87.31	268	34	0	4	271	757	490	5.00E-91	331	Arcobacter butzleri RM4018
denovo2713	gi|444304143|ref|NR_074567.1|	87.31	268	34	0	4	271	757	490	5.00E-91	331	Arcobacter butzleri ED-1
denovo2713	gi|343198599|ref|NR_043035.1|	87.31	268	34	0	4	271	711	444	5.00E-91	331	Arcobacter butzleri strain ATCC 49616
denovo2713	gi|343198439|ref|NR_041825.1|	87.31	268	34	0	4	271	733	466	5.00E-91	331	Helicobacter marmotae strain MIT 98-6070
denovo2713	gi|219846316|ref|NR_025906.1|	86.94	268	35	0	4	271	757	490	7.00E-90	327	Arcobacter nitrofigilis strain CI
denovo2713	gi|507148066|ref|NR_102873.1|	86.94	268	35	0	4	271	753	486	2.00E-89	325	Arcobacter nitrofigilis DSM 7299
denovo2713	gi|219846315|ref|NR_025905.1|	86.94	268	35	0	4	271	757	490	2.00E-89	325	Arcobacter cryaerophilus strain A 169/B
denovo2713	gi|343201492|ref|NR_042218.1|	86.57	268	36	0	4	271	722	455	3.00E-88	322	Arcobacter cibarius strain : LMG 21996
denovo2713	gi|507148104|ref|NR_102911.1|	86.62	269	34	2	4	271	734	467	1.00E-86	316	Helicobacter hepaticus ATCC 51449
denovo2713	gi|343199098|ref|NR_044549.1|	86.19	268	37	0	4	271	744	477	1.00E-86	316	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo2970 BR10AApr_20056												
denovo2970	gi|343200336|ref|NR_041023.1|	83.86	254	37	2	1	252	739	488	5.00E-72	268	Nitratiruptor tergarcus DSM 16512
denovo2970	gi|444304006|ref|NR_074430.1|	82.54	252	44	0	1	252	756	505	1.00E-68	257	Nitratifractor salsuginis DSM 16511
denovo2970	gi|343200337|ref|NR_041024.1|	82.54	252	44	0	1	252	736	485	1.00E-68	257	Nitratifractor salsuginis DSM 16511
denovo2970	gi|343198829|ref|NR_043798.1|	82.14	252	45	0	1	252	736	485	4.00E-67	251	Helicobacter anseris strain MIT 04-9362
denovo2970	gi|219857575|ref|NR_025163.1|	82.14	252	45	0	1	252	771	520	4.00E-67	251	Desulfonatronum thiodismutans strain MLF1
denovo2970	gi|265678863|ref|NR_029169.1|	81.75	252	46	0	1	252	744	493	5.00E-66	248	Helicobacter mustelae strain R85-13-6
denovo2970	gi|343202397|ref|NR_042683.1|	82.68	254	40	4	1	252	753	502	2.00E-65	246	Campylobacter lari subsp. concheus
denovo2970	gi|343200335|ref|NR_041022.1|	82.21	253	43	2	1	252	721	470	2.00E-65	246	Thioreductor micantisoli BKB25Ts-Y
denovo2970	gi|219857183|ref|NR_024811.1|	82.68	254	40	4	1	252	750	499	2.00E-65	246	Hydrogenimonas thermophila strain EP1-55-1%
denovo2970	gi|507148104|ref|NR_102911.1|	81.35	252	47	0	1	252	737	486	2.00E-64	242	Helicobacter hepaticus ATCC 51449
# Query: denovo3035 HW14AJan_126084												
denovo3035	gi|444304079|ref|NR_074503.1|	94.46	271	15	0	1	271	760	490	4.00E-118	421	Sulfurovum sp. NBC37-1
denovo3035	gi|219857174|ref|NR_024802.1|	94.46	271	15	0	1	271	734	464	4.00E-118	421	Sulfurovum lithotrophicum strain 42BKT
denovo3035	gi|444439559|ref|NR_074874.1|	90.04	271	27	0	1	271	777	507	7.00E-102	367	Nitratiruptor sp. SB155-2
denovo3035	gi|444304006|ref|NR_074430.1|	90.04	271	27	0	1	271	756	486	7.00E-102	367	Nitratifractor salsuginis DSM 16511
denovo3035	gi|343200337|ref|NR_041024.1|	90.04	271	27	0	1	271	736	466	7.00E-102	367	Nitratifractor salsuginis DSM 16511
denovo3035	gi|343200336|ref|NR_041023.1|	88.93	271	30	0	1	271	739	469	5.00E-98	354	Nitratiruptor tergarcus DSM 16512
denovo3035	gi|470466633|ref|NR_074133.1|	87.82	271	33	0	1	271	739	469	1.00E-93	340	Sulfurimonas denitrificans DSM 1251
denovo3035	gi|219857183|ref|NR_024811.1|	87.45	271	34	0	1	271	750	480	1.00E-92	336	Hydrogenimonas thermophila strain EP1-55-1%
denovo3035	gi|444304027|ref|NR_074451.1|	87.08	271	35	0	1	271	753	483	5.00E-91	331	Sulfurimonas autotrophica DSM 16294
denovo3035	gi|343200752|ref|NR_041439.1|	87.08	271	35	0	1	271	742	472	5.00E-91	331	Sulfurimonas paralvinellae strain GO25

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q start	Q End	S Start	S End	E-value	Bit Score	Name
# Query: denovo3293 HW4AApr_19434												
denovo3293	gi|444304079|ref|NR_074503.1|	93.36	271	18	0	1	271	760	490	2.00E-114	408	Sulfurovum sp. NBC37-1
denovo3293	gi|219857174|ref|NR_024802.1|	93.36	271	18	0	1	271	734	464	2.00E-114	408	Sulfurovum lithotrophicum strain 42BKT
denovo3293	gi|444304006|ref|NR_074430.1|	89.3	271	29	0	1	271	756	486	4.00E-99	358	Nitratifractor salsuginis DSM 16511
denovo3293	gi|343200337|ref|NR_041024.1|	89.3	271	29	0	1	271	736	466	4.00E-99	358	Nitratifractor salsuginis DSM 16511
denovo3293	gi|444439559|ref|NR_074874.1|	87.08	271	35	0	1	271	777	507	5.00E-91	331	Nitratiruptor sp. SB155-2
denovo3293	gi|343200336|ref|NR_041023.1|	85.24	271	40	0	1	271	739	469	2.00E-84	309	Nitratiruptor tergarcus DSM 16512
denovo3293	gi|343198490|ref|NR_041918.1|	85.66	272	37	2	1	271	716	446	6.00E-84	307	Arcobacter halophilus strain LA31B
denovo3293	gi|219846316|ref|NR_025906.1|	84.87	271	41	0	1	271	760	490	2.00E-83	306	Arcobacter nitrofigilis strain CI
denovo3293	gi|507148066|ref|NR_102873.1|	84.87	271	41	0	1	271	756	486	7.00E-83	304	Arcobacter nitrofigilis DSM 7299
denovo3293	gi|470466633|ref|NR_074133.1|	85.29	272	38	2	1	271	739	469	7.00E-83	304	Sulfurimonas denitrificans DSM 1251
# Query: denovo3342 BR10AApr_138519												
denovo3342	gi|343201492|ref|NR_042218.1|	94.14	273	13	3	1	272	725	455	7.00E-115	410	Arcobacter cibarius strain : LMG 21996
denovo3342	gi|219846315|ref|NR_025905.1|	94.14	273	13	3	1	272	760	490	7.00E-115	410	Arcobacter cryaerophilus strain A 169/B
denovo3342	gi|444304149|ref|NR_074573.1|	93.41	273	15	3	1	272	760	490	4.00E-112	401	Arcobacter butzleri RM4018
denovo3342	gi|444304143|ref|NR_074567.1|	93.41	273	15	3	1	272	760	490	4.00E-112	401	Arcobacter butzleri ED-1
denovo3342	gi|343198599|ref|NR_043035.1|	93.41	273	15	3	1	272	714	444	4.00E-112	401	Arcobacter butzleri strain ATCC 49616
denovo3342	gi|343206046|ref|NR_044625.1|	93.04	273	16	3	1	272	750	480	2.00E-110	396	Arcobacter skirrowii
denovo3342	gi|507148066|ref|NR_102873.1|	90.48	273	23	3	1	272	756	486	3.00E-101	365	Arcobacter nitrofigilis DSM 7299
denovo3342	gi|219846316|ref|NR_025906.1|	90.48	273	23	3	1	272	760	490	3.00E-101	365	Arcobacter nitrofigilis strain CI
denovo3342	gi|343198490|ref|NR_041918.1|	90.51	274	21	5	1	272	716	446	1.00E-99	360	Arcobacter halophilus strain LA31B
denovo3342	gi|343199098|ref|NR_044549.1|	89.74	273	25	3	1	272	747	477	1.00E-98	356	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo3417 BR10AApr_174104												
denovo3417	gi|444304027|ref|NR_074451.1|	90.77	271	25	0	1	271	753	483	1.00E-104	376	Sulfurimonas autotrophica DSM 16294
denovo3417	gi|265678341|ref|NR_028643.1|	90.77	271	25	0	1	271	747	477	1.00E-104	376	Sulfurimonas autotrophica DSM 16294
denovo3417	gi|343200752|ref|NR_041439.1|	90.41	271	26	0	1	271	742	472	2.00E-103	372	Sulfurimonas paralvinellae strain GO25
denovo3417	gi|470466633|ref|NR_074133.1|	89.67	271	28	0	1	271	739	469	9.00E-101	363	Sulfurimonas denitrificans DSM 1251
denovo3417	gi|219857183|ref|NR_024811.1|	88.19	271	32	0	1	271	750	480	2.00E-95	345	Hydrogenimonas thermophila strain EP1-55-1%
denovo3417	gi|507148122|ref|NR_102929.1|	87.82	271	33	0	1	271	748	478	1.00E-93	340	Sulfurospirillum barnesii SES-3
denovo3417	gi|219857508|ref|NR_025096.1|	87.82	271	33	0	1	271	721	451	1.00E-93	340	Helicobacter canadensis strain NLEP-16143
denovo3417	gi|444304079|ref|NR_074503.1|	87.45	271	34	0	1	271	760	490	1.00E-92	336	Sulfurovum sp. NBC37-1
denovo3417	gi|444303975|ref|NR_074398.1|	87.45	271	34	0	1	271	750	480	1.00E-92	336	Sulfuricurvum kujiense DSM 16994
denovo3417	gi|343198830|ref|NR_043799.1|	87.45	271	34	0	1	271	738	468	1.00E-92	336	Helicobacter brantae strain MIT 04-9366
# Query: denovo4455 HW14AJan_103651												
denovo4455	gi|219846316|ref|NR_025906.1|	93.51	262	14	3	1	262	760	502	8.00E-108	387	Arcobacter nitrofigilis strain CI
denovo4455	gi|507148066|ref|NR_102873.1|	93.51	262	14	3	1	262	756	498	3.00E-107	385	Arcobacter nitrofigilis DSM 7299
denovo4455	gi|219846315|ref|NR_025905.1|	93.51	262	14	3	1	262	760	502	3.00E-107	385	Arcobacter cryaerophilus strain A 169/B
denovo4455	gi|343201492|ref|NR_042218.1|	93.13	262	15	3	1	262	725	467	3.00E-106	381	Arcobacter cibarius strain : LMG 21996

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q start	Q End	S Start	S End	E-value	Bit Score	Name
denovo4455	gi|343206046|ref|NR_044625.1|	92.37	262	17	3	1	262	750	492	2.00E-103	372	Arcobacter skirrowii
denovo4455	gi|343198490|ref|NR_041918.1|	92.37	262	17	3	1	262	716	458	2.00E-103	372	Arcobacter halophilus strain LA31B
denovo4455	gi|444304149|ref|NR_074573.1|	91.98	262	18	3	1	262	760	502	7.00E-102	367	Arcobacter butzleri RM4018
denovo4455	gi|444304143|ref|NR_074567.1|	91.98	262	18	3	1	262	760	502	7.00E-102	367	Arcobacter butzleri ED-1
denovo4455	gi|343198599|ref|NR_043035.1|	91.98	262	18	3	1	262	714	456	7.00E-102	367	Arcobacter butzleri strain ATCC 49616
denovo4455	gi|343199098|ref|NR_044549.1|	90.46	262	22	3	1	262	747	489	2.00E-96	349	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo4474 HW14ANov_40859												
denovo4474	gi|343200752|ref|NR_041439.1|	91.88	271	22	0	1	271	742	472	7.00E-109	390	Sulfurimonas paralvinellae strain GO25
denovo4474	gi|219857183|ref|NR_024811.1|	91.14	271	24	0	1	271	750	480	3.00E-106	381	Hydrogenimonas thermophila strain EP1-55-1%
denovo4474	gi|444304027|ref|NR_074451.1|	90.41	271	26	0	1	271	753	483	2.00E-103	372	Sulfurimonas autotrophica DSM 162
denovo4474	gi|265678341|ref|NR_028643.1|	90.41	271	26	0	1	271	747	477	2.00E-103	372	Sulfurimonas autotrophica DSM 16294
denovo4474	gi|470466633|ref|NR_074133.1|	90.04	271	27	0	1	271	739	469	7.00E-102	367	Sulfurimonas denitrificans DSM 1251
denovo4474	gi|444303975|ref|NR_074398.1|	90.04	271	27	0	1	271	750	480	7.00E-102	367	Sulfuricurvum kujiense DSM 16994
denovo4474	gi|219857508|ref|NR_025096.1|	90.04	271	27	0	1	271	721	451	7.00E-102	367	Helicobacter canadensis strain NLEP-16143
denovo4474	gi|219846482|ref|NR_026074.1|	90.04	271	27	0	1	271	719	449	7.00E-102	367	Helicobacter rodentium strain MIT 95-1707
denovo4474	gi|470467110|ref|NR_074156.1|	89.67	271	28	0	1	271	757	487	9.00E-101	363	Campylobacter concisus 13826
denovo4474	gi|444304079|ref|NR_074503.1|	89.67	271	28	0	1	271	760	490	9.00E-101	363	Sulfurovum sp. NBC37-1
# Query: denovo4622 BR10BApr_62236												
denovo4622	gi|265678468|ref|NR_028771.1|	98.52	271	4	0	1	271	757	487	2.00E-133	471	Sulfurospirillum halorespirans strain PCE-M2
denovo4622	gi|343206276|ref|NR_044868.1|	98.52	271	4	0	1	271	728	458	2.00E-133	471	Sulfurospirillum multivorans strain K
denovo4622	gi|343206214|ref|NR_044806.1|	97.42	271	7	0	1	271	684	414	2.00E-129	459	Sulfurospirillum arsenophilum strain MIT-13
denovo4622	gi|444303955|ref|NR_074378.1|	95.94	271	11	0	1	271	748	478	1.00E-123	439	Sulfurospirillum deleyianum DSM 6946
denovo4622	gi|219846830|ref|NR_026422.1|	95.94	271	11	0	1	271	728	458	1.00E-123	439	Sulfurospirillum deleyianum
denovo4622	gi|507148122|ref|NR_102929.1|	95.2	271	13	0	1	271	748	478	7.00E-121	430	Sulfurospirillum barnesii SES-3
denovo4622	gi|343200705|ref|NR_041392.1|	94.83	271	14	0	1	271	676	406	9.00E-120	426	Sulfurospirillum cavolei strain Phe91
denovo4622	gi|265678390|ref|NR_028692.1|	93.8	274	13	3	1	271	752	480	2.00E-114	408	Sulfurospirillum barnesii SES-3
denovo4622	gi|219846816|ref|NR_026408.1|	92.99	271	19	0	1	271	730	460	1.00E-112	403	Sulfurospirillum arcachonense strain F1F6
denovo4622	gi|219857183|ref|NR_024811.1|	91.18	272	22	2	1	271	750	480	1.00E-104	376	Hydrogenimonas thermophila strain EP1-55-1%
# Query: denovo4754 HW14ANov_30739												
denovo4754	gi|343200752|ref|NR_041439.1|	91.08	269	23	1	3	270	740	472	5.00E-104	374	ref|NR_041439.1| Sulfurimonas paralvinellae strain GO25
denovo4754	gi|444303975|ref|NR_074398.1|	89.59	269	27	1	3	270	748	480	1.00E-98	356	Sulfuricurvum kujiense DSM 16994
denovo4754	gi|444304027|ref|NR_074451.1|	89.22	269	28	1	3	270	751	483	6.00E-97	351	Sulfurimonas autotrophica DSM 16294
denovo4754	gi|265678341|ref|NR_028643.1|	89.22	269	28	1	3	270	745	477	6.00E-97	351	Sulfurimonas autotrophica DSM 16294
denovo4754	gi|219846816|ref|NR_026408.1|	88.85	269	29	1	3	270	728	460	7.00E-96	347	Sulfurospirillum arcachonense strain F1F6
denovo4754	gi|253680771|ref|NR_028019.1|	87.73	269	32	1	3	270	743	475	2.00E-91	333	Helicobacter pametensis strain B9A Seymour
denovo4754	gi|343198604|ref|NR_043053.1|	87.73	269	32	1	3	270	735	467	2.00E-91	333	Helicobacter pullorum NCTC 12824
denovo4754	gi|219857183|ref|NR_024811.1|	87.73	269	32	1	3	270	748	480	2.00E-91	333	Hydrogenimonas thermophila strain EP1-55-1%

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q start	Q End	S Start	S End	E-value	Bit Score	Name
denovo4754	gi|343200705|ref|NR_041392.1|	87.36	269	33	1	3	270	674	406	2.00E-90	329	Sulfurospirillum cavolei strain Phe91
denovo4754	gi|507148122|ref|NR_102929.1|	86.99	269	34	1	3	270	746	478	8.00E-89	324	Sulfurospirillum barnesii SES-3 strain
# Query: denovo4819 HW4AApr_32269												
denovo4819	gi|343199098|ref|NR_044549.1|	97.35	264	5	2	1	264	747	486	5.00E-123	437	Arcobacter mytili LMG 24559 strain F2075
denovo4819	gi|343198490|ref|NR_041918.1|	95.83	264	9	2	1	264	716	455	1.00E-117	419	Arcobacter halophilus strain LA31B
denovo4819	gi|507148066|ref|NR_102873.1|	94.32	264	13	2	1	264	756	495	4.00E-112	401	Arcobacter nitrofigilis DSM 7299
denovo4819	gi|444304149|ref|NR_074573.1|	94.32	264	13	2	1	264	760	499	4.00E-112	401	Arcobacter butzleri RM4018
denovo4819	gi|444304143|ref|NR_074567.1|	94.32	264	13	2	1	264	760	499	4.00E-112	401	Arcobacter butzleri ED-1
denovo4819	gi|343198599|ref|NR_043035.1|	94.32	264	13	2	1	264	714	453	4.00E-112	401	Arcobacter butzleri strain ATCC 49616
denovo4819	gi|219846316|ref|NR_025906.1|	93.94	264	14	2	1	264	760	499	4.00E-111	398	Arcobacter cryaerophilus strain A 169/B
denovo4819	gi|219846315|ref|NR_025905.1|	93.56	264	15	2	1	264	760	499	2.00E-109	392	Arcobacter cibarius strain : LMG 21996
denovo4819	gi|343201492|ref|NR_042218.1|	92.8	264	17	2	1	264	725	464	1.00E-106	383	Arcobacter skirrowii
denovo4819	gi|343206046|ref|NR_044625.1|	92.42	264	18	2	1	264	750	489	1.00E-105	379	Arcobacter nitrofigilis strain CI
# Query: denovo4829 HW4AApr_40465												
denovo4829	gi|343201492|ref|NR_042218.1|	98.89	271	2	1	1	270	725	455	2.00E-133	471	Arcobacter cibarius strain : LMG 21996
denovo4829	gi|219846315|ref|NR_025905.1|	98.89	271	2	1	1	270	760	490	2.00E-133	471	Arcobacter cryaerophilus strain A 169/B
denovo4829	gi|444304149|ref|NR_074573.1|	97.79	271	5	1	1	270	760	490	2.00E-129	459	Arcobacter butzleri RM4018
denovo4829	gi|444304143|ref|NR_074567.1|	97.79	271	5	1	1	270	760	490	2.00E-129	459	Arcobacter butzleri ED-1
denovo4829	gi|343206046|ref|NR_044625.1|	97.79	271	5	1	1	270	750	480	2.00E-129	459	Arcobacter skirrowii
denovo4829	gi|343198599|ref|NR_043035.1|	97.79	271	5	1	1	270	714	444	2.00E-129	459	Arcobacter butzleri strain ATCC 49616
denovo4829	gi|507148066|ref|NR_102873.1|	94.1	271	15	1	1	270	756	486	6.00E-116	414	Arcobacter nitrofigilis DSM 7299
denovo4829	gi|219846316|ref|NR_025906.1|	94.1	271	15	1	1	270	760	490	6.00E-116	414	Arcobacter nitrofigilis strain CI
denovo4829	gi|343198490|ref|NR_041918.1|	92.62	271	19	1	1	270	716	446	2.00E-110	396	Arcobacter halophilus strain LA31B
denovo4829	gi|343199098|ref|NR_044549.1|	92.25	271	20	1	1	270	747	477	7.00E-109	390	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo5335 HW14AJan_79486												
denovo5335	gi|444304149|ref|NR_074573.1|	94.83	271	14	0	1	271	760	490	9.00E-120	426	Arcobacter butzleri RM4018
denovo5335	gi|444304143|ref|NR_074567.1|	94.83	271	14	0	1	271	760	490	9.00E-120	426	Arcobacter butzleri ED-1
denovo5335	gi|343198599|ref|NR_043035.1|	94.83	271	14	0	1	271	714	444	9.00E-120	426	Arcobacter butzleri strain ATCC 49616
denovo5335	gi|219846316|ref|NR_025906.1|	94.46	271	15	0	1	271	760	490	1.00E-118	423	Arcobacter nitrofigilis strain CI
denovo5335	gi|507148066|ref|NR_102873.1|	94.46	271	15	0	1	271	756	486	4.00E-118	421	Arcobacter nitrofigilis DSM 7299
denovo5335	gi|219846315|ref|NR_025905.1|	94.1	271	16	0	1	271	760	490	5.00E-117	417	Arcobacter cryaerophilus strain A 169/B
denovo5335	gi|343201492|ref|NR_042218.1|	93.73	271	17	0	1	271	725	455	2.00E-115	412	Arcobacter cibarius strain : LMG 21996
denovo5335	gi|343198490|ref|NR_041918.1|	93.36	271	18	0	1	271	716	446	2.00E-114	408	Arcobacter halophilus strain LA31B
denovo5335	gi|343206046|ref|NR_044625.1|	92.99	271	19	0	1	271	750	480	1.00E-112	403	Arcobacter skirrowii
denovo5335	gi|343199098|ref|NR_044549.1|	92.25	271	21	0	1	271	747	477	5.00E-110	394	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo5478 BR14AJan_41286												
denovo5478	gi|470466633|ref|NR_074133.1|	98.14	269	5	0	3	271	737	469	1.00E-130	462	Sulfurimonas denitrificans DSM 1251
denovo5478	gi|343200752|ref|NR_041439.1|	97.03	269	8	0	3	271	740	472	8.00E-127	450	Sulfurimonas paralvinellae strain GO25

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	**Subject ID**	**% Identity**	**Alignment Length**	**Mismatches**	**Gap Opens**	**Q start**	**Q End**	**S Start**	**S End**	**E-value**	**Bit Score**	**Name**
denovo5478	gi|444304027|ref|NR_074451.1|	96.28	269	10	0	3	271	751	483	4.00E-124	441	Sulfurimonas autotrophica DSM 16294
denovo5478	gi|265678341|ref|NR_028643.1|	96.28	269	10	0	3	271	745	477	4.00E-124	441	Sulfurimonas autotrophica DSM 16294
denovo5478	gi|219857183|ref|NR_024811.1|	91.82	269	22	0	3	271	748	480	8.00E-108	387	Hydrogenimonas thermophila strain EP1-55-1%
denovo5478	gi|265678468|ref|NR_028771.1|	89.96	269	27	0	3	271	755	487	9.00E-101	363	Sulfurospirillum halorespirans strain PCE-M2
denovo5478	gi|343206276|ref|NR_044868.1|	89.96	269	27	0	3	271	726	458	9.00E-101	363	Sulfurospirillum multivorans strain K
denovo5478	gi|219846816|ref|NR_026408.1|	89.59	269	28	0	3	271	728	460	1.00E-99	360	Sulfurospirillum arcachonense strain F1F6
denovo5478	gi|444304131|ref|NR_074555.1|	89.22	269	29	0	3	271	759	491	5.00E-98	354	Campylobacter lari RM2100
denovo5478	gi|343198598|ref|NR_043034.1|	89.22	269	29	0	3	271	714	446	5.00E-98	354	Campylobacter lari subsp. lari
# Query: denovo6050 HW4AApr_113470												
denovo6050	gi|444304027|ref|NR_074451.1|	97.42	271	7	0	1	271	753	483	5.00E-129	457	Sulfurimonas autotrophica DSM 16294
denovo6050	gi|343200752|ref|NR_041439.1|	97.42	271	7	0	1	271	742	472	5.00E-129	457	Sulfurimonas paralvinellae strain GO25
denovo6050	gi|265678341|ref|NR_028643.1|	97.42	271	7	0	1	271	747	477	5.00E-129	457	Sulfurimonas autotrophica DSM 16294
denovo6050	gi|470466633|ref|NR_074133.1|	95.57	271	12	0	1	271	739	469	2.00E-122	435	Sulfurimonas denitrificans DSM 1251
denovo6050	gi|219857183|ref|NR_024811.1|	91.14	271	24	0	1	271	750	480	3.00E-106	381	Hydrogenimonas thermophila strain EP1-55-1%
denovo6050	gi|343198830|ref|NR_043799.1|	88.93	271	30	0	1	271	738	468	5.00E-98	354	Helicobacter brantae strain MIT 04-9366
denovo6050	gi|253680771|ref|NR_028019.1|	88.93	271	30	0	1	271	745	475	5.00E-98	354	Helicobacter pametensis strain B9A Seymour
denovo6050	gi|343198604|ref|NR_043053.1|	88.93	271	30	0	1	271	737	467	5.00E-98	354	Helicobacter pullorum NCTC 12824
denovo6050	gi|343198603|ref|NR_043052.1|	88.93	271	30	0	1	271	736	466	5.00E-98	354	Helicobacter canis strain ATCC 51401
denovo6050	gi|444303961|ref|NR_074384.1|	88.56	271	31	0	1	271	744	474	2.00E-96	349	Helicobacter cinaedi PAGU611
# Query: denovo6155 BR10AApr_60794												
denovo6155	gi|507148066|ref|NR_102873.1|	88.93	271	29	1	1	270	756	486	6.00E-97	351	Arcobacter nitrofigilis DSM 7299
denovo6155	gi|444304149|ref|NR_074573.1|	88.93	271	29	1	1	270	760	490	6.00E-97	351	Arcobacter butzleri RM4018
denovo6155	gi|444304143|ref|NR_074567.1|	88.93	271	29	1	1	270	760	490	6.00E-97	351	Arcobacter butzleri ED-1
denovo6155	gi|343198599|ref|NR_043035.1|	88.93	271	29	1	1	270	714	444	6.00E-97	351	Arcobacter butzleri strain ATCC 49616
denovo6155	gi|343201492|ref|NR_042218.1|	88.93	271	29	1	1	270	725	455	6.00E-97	351	Arcobacter cibarius strain : LMG 21996
denovo6155	gi|219846315|ref|NR_025905.1|	88.93	271	29	1	1	270	760	490	6.00E-97	351	Arcobacter cryaerophilus strain A 169/B
denovo6155	gi|219846316|ref|NR_025906.1|	88.93	271	29	1	1	270	760	490	6.00E-97	351	Arcobacter nitrofigilis strain CI
denovo6155	gi|343206046|ref|NR_044625.1|	87.08	271	34	1	1	270	750	480	7.00E-90	327	Arcobacter skirrowii
denovo6155	gi|343199098|ref|NR_044549.1|	87.08	271	34	1	1	270	747	477	7.00E-90	327	Arcobacter mytili LMG 24559 strain F2075
denovo6155	gi|343199039|ref|NR_044392.1|	87.91	273	28	5	1	270	778	508	2.00E-89	325	Marinobacter lacisalsi strain FP2.5
# Query: denovo6544 HW4AJuly_11884												
denovo6544	gi|444304149|ref|NR_074573.1|	95.57	271	12	0	1	271	760	490	2.00E-122	435	Arcobacter butzleri RM4018
denovo6544	gi|444304143|ref|NR_074567.1|	95.57	271	12	0	1	271	760	490	2.00E-122	435	Arcobacter butzleri ED-1
denovo6544	gi|343198599|ref|NR_043035.1|	95.57	271	12	0	1	271	714	444	2.00E-122	435	Arcobacter butzleri strain ATCC 49616
denovo6544	gi|219846315|ref|NR_025905.1|	94.83	271	14	0	1	271	760	490	9.00E-120	426	Arcobacter cryaerophilus strain A 169/B
denovo6544	gi|219846316|ref|NR_025906.1|	94.46	271	15	0	1	271	760	490	1.00E-118	423	Arcobacter nitrofigilis strain CI
denovo6544	gi|507148066|ref|NR_102873.1|	94.46	271	15	0	1	271	756	486	4.00E-118	421	Arcobacter nitrofigilis DSM 7299
denovo6544	gi|343201492|ref|NR_042218.1|	94.46	271	15	0	1	271	725	455	4.00E-118	421	Arcobacter cibarius strain : LMG 21996
denovo6544	gi|343206046|ref|NR_044625.1|	93.73	271	17	0	1	271	750	480	2.00E-115	412	Arcobacter skirrowii

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	**Subject ID**	**% Identity**	**Alignment Length**	**Mismatches**	**Gap Opens**	**Q start**	**Q End**	**S Start**	**S End**	**E-value**	**Bit Score**	**Name**
denovo6544	gi|343199098|ref|NR_044549.1|	93.73	271	17	0	1	271	747	477	2.00E-115	412	Arcobacter mytili
denovo6544	gi|343198490|ref|NR_041918.1|	93.73	271	17	0	1	271	716	446	2.00E-115	412	Arcobacter halophilus strain LA31B
# Query: denovo7124 BR14AJan_26250												
denovo7124	gi|507148066|ref|NR_102873.1|	90.73	248	19	2	1	246	756	511	4.00E-93	338	Arcobacter nitrofigilis DSM 7299
denovo7124	gi|219846316|ref|NR_025906.1|	90.32	248	20	2	1	246	760	515	4.00E-92	334	Arcobacter nitrofigilis strain CI
denovo7124	gi|343198490|ref|NR_041918.1|	89.52	248	22	2	1	246	716	471	2.00E-89	325	Arcobacter halophilus strain LA31B
denovo7124	gi|343206046|ref|NR_044625.1|	89.2	250	23	2	1	248	750	503	8.00E-89	324	Arcobacter skirrowii
denovo7124	gi|219846315|ref|NR_025905.1|	88.8	250	24	2	1	248	760	513	1.00E-87	320	Arcobacter cryaerophilus
denovo7124	gi|444304149|ref|NR_074573.1|	88.71	248	24	2	1	246	760	515	1.00E-86	316	Arcobacter butzleri RM4018
denovo7124	gi|444304143|ref|NR_074567.1|	88.71	248	24	2	1	246	760	515	1.00E-86	316	Arcobacter butzleri ED-1
denovo7124	gi|343198599|ref|NR_043035.1|	88.71	248	24	2	1	246	714	469	1.00E-86	316	Arcobacter butzleri strain ATCC 49616
denovo7124	gi|343201492|ref|NR_042218.1|	88.4	250	25	2	1	248	725	478	4.00E-86	315	Arcobacter cibarius strain : LMG 21996
denovo7124	gi|343199098|ref|NR_044549.1|	87.5	248	27	2	1	246	747	502	3.00E-82	302	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo7142 HW4AApr_24866												
denovo7142	gi|444303975|ref|NR_074398.1|	95.45	198	2	7	1	198	750	560	5.00E-79	291	Sulfuricurvum kujiense DSM 16994
denovo7142	gi|470466633|ref|NR_074133.1|	82.32	198	28	7	1	198	739	549	9.00E-44	174	Sulfurimonas denitrificans DSM 1251
denovo7142	gi|343202397|ref|NR_042683.1|	83.33	186	25	6	1	186	753	574	9.00E-44	174	Campylobacter lari subsp. concheus
denovo7142	gi|219846816|ref|NR_026408.1|	83.33	186	25	6	1	186	730	551	9.00E-44	174	Sulfurospirillum arcachonense strain F1F6
denovo7142	gi|507148122|ref|NR_102929.1|	81.82	198	29	7	1	198	748	558	1.00E-42	170	Sulfurospirillum barnesii SES-3
denovo7142	gi|444304126|ref|NR_074550.1|	82.8	186	26	6	1	186	761	582	1.00E-42	170	Campylobacter jejuni subsp. jejuni NCTC 1116
denovo7142	gi|343202398|ref|NR_042684.1|	82.8	186	26	6	1	186	749	570	1.00E-42	170	Campylobacter peloridis strain : LMG 23910
denovo7142	gi|343198826|ref|NR_043784.1|	82.8	186	26	6	1	186	709	530	1.00E-42	170	Campylobacter cuniculorum LMG 24588
denovo7142	gi|343203089|ref|NR_043602.1|	82.8	186	26	6	1	186	732	553	1.00E-42	170	Campylobacter upsaliensis strain CCUG 14913
denovo7142	gi|343203086|ref|NR_043599.1|	82.8	186	26	6	1	186	732	553	1.00E-42	170	Campylobacter jejuni subsp. doylei
# Query: denovo7281 HW4AApr_286												
denovo7281	gi|444303955|ref|NR_074378.1|	97.07	273	3	4	1	273	748	481	1.00E-124	443	Sulfurospirillum deleyianum DSM 6946
denovo7281	gi|219846830|ref|NR_026422.1|	97.07	273	3	4	1	273	728	461	1.00E-124	443	Sulfurospirillum deleyianum
denovo7281	gi|507148122|ref|NR_102929.1|	96.34	273	5	4	1	273	748	481	6.00E-122	434	Sulfurospirillum barnesii SES-3
denovo7281	gi|343200705|ref|NR_041392.1|	95.97	273	6	4	1	273	676	409	7.00E-121	430	Sulfurospirillum cavolei strain Phe91
denovo7281	gi|265678390|ref|NR_028692.1|	94.93	276	5	7	1	273	752	483	2.00E-115	412	Sulfurospirillum barnesii SES-3
denovo7281	gi|265678468|ref|NR_028771.1|	92.67	273	15	4	1	273	757	490	2.00E-108	389	Sulfurospirillum halorespirans strain PCE-M2
denovo7281	gi|343206276|ref|NR_044868.1|	92.67	273	15	4	1	273	728	461	2.00E-108	389	Sulfurospirillum multivorans strain
denovo7281	gi|343206214|ref|NR_044806.1|	91.58	273	18	4	1	273	684	417	1.00E-104	376	Sulfurospirillum arsenophilum
denovo7281	gi|219846816|ref|NR_026408.1|	89.78	274	21	6	1	273	730	463	7.00E-96	347	Sulfurospirillum arcachonense strain F1F6
denovo7281	gi|219857183|ref|NR_024811.1|	87.96	274	26	6	1	273	750	483	2.00E-89	325	Hydrogenimonas thermophila strain EP1-55-1%
# Query: denovo7526 BR10ANov_1838												
denovo7526	gi|343199098|ref|NR_044549.1|	93.36	271	18	0	1	271	747	477	2.00E-114	408	Arcobacter mytili LMG 24559 strain F2075
denovo7526	gi|444304149|ref|NR_074573.1|	92.25	271	21	0	1	271	760	490	5.00E-110	394	Arcobacter butzleri RM4018

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria												
Query ID	**Subject ID**	**% Identity**	**Alignment Length**	**Mismatches**	**Gap Opens**	**Q start**	**Q End**	**S Start**	**S End**	**E-value**	**Bit Score**	**Name**
denovo7526	gi|444304143|ref|NR_074567.1|	92.25	271	21	0	1	271	760	490	5.00E-110	394	Arcobacter butzleri ED-1
denovo7526	gi|343198599|ref|NR_043035.1|	92.25	271	21	0	1	271	714	444	5.00E-110	394	Arcobacter butzleri strain ATCC 49616
denovo7526	gi|343198490|ref|NR_041918.1|	92.25	271	21	0	1	271	716	446	5.00E-110	394	Arcobacter halophilus strain LA31B
denovo7526	gi|507148066|ref|NR_102873.1|	91.88	271	22	0	1	271	756	486	7.00E-109	390	Arcobacter nitrofigilis DSM 7299
denovo7526	gi|219846316|ref|NR_025906.1|	91.88	271	22	0	1	271	760	490	7.00E-109	390	Arcobacter nitrofigilis strain CI
denovo7526	gi|219846315|ref|NR_025905.1|	90.77	271	25	0	1	271	760	490	1.00E-104	376	Arcobacter cryaerophilus strain A 169/B
denovo7526	gi|343201492|ref|NR_042218.1|	90.41	271	26	0	1	271	725	455	2.00E-103	372	Arcobacter cibarius strain : LMG 21996
denovo7526	gi|219857183|ref|NR_024811.1|	90.41	271	26	0	1	271	750	480	2.00E-103	372	Hydrogenimonas thermophila strain EP1-55-1%
# Query: denovo7705 BR10BApr_162243												
denovo7705	gi|219846315|ref|NR_025905.1|	97.89	190	4	0	1	190	760	571	2.00E-89	325	Arcobacter cryaerophilus strain A 169/B
denovo7705	gi|343201492|ref|NR_042218.1|	97.37	190	5	0	1	190	725	536	1.00E-87	320	Arcobacter cibarius strain : LMG 21996
denovo7705	gi|444304149|ref|NR_074573.1|	96.84	190	6	0	1	190	760	571	1.00E-86	316	Arcobacter butzleri RM4018
denovo7705	gi|444304143|ref|NR_074567.1|	96.84	190	6	0	1	190	760	571	1.00E-86	316	Arcobacter butzleri ED-1
denovo7705	gi|343198599|ref|NR_043035.1|	96.84	190	6	0	1	190	714	525	1.00E-86	316	Arcobacter butzleri strain ATCC 49616
denovo7705	gi|343206046|ref|NR_044625.1|	95.79	190	8	0	1	190	750	561	6.00E-84	307	Arcobacter skirrowii
denovo7705	gi|219846316|ref|NR_025906.1|	93.16	190	13	0	1	190	760	571	2.00E-77	286	Arcobacter nitrofigilis strain CI
denovo7705	gi|507148066|ref|NR_102873.1|	93.16	190	13	0	1	190	756	567	7.00E-77	284	Arcobacter nitrofigilis DSM 7299
denovo7705	gi|343198490|ref|NR_041918.1|	92.11	190	15	0	1	190	716	527	4.00E-74	275	Arcobacter halophilus strain LA31B
denovo7705	gi|343199098|ref|NR_044549.1|	91.58	190	16	0	1	190	747	558	4.00E-73	271	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo7873 BR10AJan_5621												
denovo7873	gi|343201492|ref|NR_042218.1|	95.94	271	11	0	1	271	725	455	1.00E-123	439	Arcobacter cibarius strain : LMG 21996
denovo7873	gi|219846315|ref|NR_025905.1|	95.94	271	11	0	1	271	760	490	1.00E-123	439	Arcobacter cryaerophilus strain A 169/B
denovo7873	gi|219846316|ref|NR_025906.1|	95.2	271	13	0	1	271	760	490	2.00E-121	432	Arcobacter nitrofigilis strain CI
denovo7873	gi|507148066|ref|NR_102873.1|	95.2	271	13	0	1	271	756	486	7.00E-121	430	Arcobacter nitrofigilis DSM 7299
denovo7873	gi|343206046|ref|NR_044625.1|	95.2	271	13	0	1	271	750	480	7.00E-121	430	Arcobacter skirrowii
denovo7873	gi|444304149|ref|NR_074573.1|	94.46	271	15	0	1	271	760	490	4.00E-118	421	Arcobacter butzleri RM4018
denovo7873	gi|444304143|ref|NR_074567.1|	94.46	271	15	0	1	271	760	490	4.00E-118	421	Arcobacter butzleri ED-1
denovo7873	gi|343198599|ref|NR_043035.1|	94.46	271	15	0	1	271	714	444	4.00E-118	421	Arcobacter butzleri strain ATCC 49616
denovo7873	gi|343198490|ref|NR_041918.1|	92.99	271	19	0	1	271	716	446	1.00E-112	403	Arcobacter halophilus strain LA31B
denovo7873	gi|343199098|ref|NR_044549.1|	90.77	271	25	0	1	271	747	477	1.00E-104	376	Arcobacter mytili LMG 24559 strain F2075
# Query: denovo8402 HW9ANov_3809												
denovo8402	gi|470466633|ref|NR_074133.1|	91.34	277	16	6	3	279	737	469	2.00E-103	372	Sulfurimonas denitrificans DSM 1251
denovo8402	gi|343200752|ref|NR_041439.1|	90.25	277	19	6	3	279	740	472	4.00E-99	358	Sulfurimonas paralvinellae strain GO25
denovo8402	gi|444304027|ref|NR_074451.1|	88.81	277	23	6	3	279	751	483	1.00E-93	340	Sulfurimonas autotrophica DSM 16294
denovo8402	gi|219857183|ref|NR_024811.1|	88.81	277	23	6	3	279	748	480	1.00E-93	340	Hydrogenimonas thermophila strain EP1-55-1%
denovo8402	gi|265678341|ref|NR_028643.1|	88.81	277	23	6	3	279	745	477	1.00E-93	340	Sulfurimonas autotrophica DSM 16294
denovo8402	gi|343203091|ref|NR_043604.1|	87.73	277	26	6	3	279	729	461	7.00E-90	327	Campylobacter concisus strain ATCC 33237
denovo8402	gi|470467110|ref|NR_074156.1|	87.36	277	27	6	3	279	755	487	3.00E-88	322	Campylobacter concisus 13826 strain 13826
denovo8402	gi|343203094|ref|NR_043607.1|	87.36	277	27	6	3	279	728	460	3.00E-88	322	Campylobacter mucosalis strain ATCC 43264

Table 3. BLAST alignment similarity scores for detected Enterobacteracea, Vibrio, Bacillales, and Epsilonproteobacteria sequences, including potential pathogens.

PART IV: Epsilonproteobacteria

Query ID	Subject ID	% Identity	Alignment Length	Mismatches	Gap Opens	Q start	Q End	S Start	S End	E-value	Bit Score	Name
denovo8402	gi|265678468|ref|NR_028771.1|	87	277	28	6	3	279	755	487	3.00E-87	318	Sulfurospirillum halorespirans strain PCE-M2.
denovo8402	gi|343206276|ref|NR_044868.1|	87	277	28	6	3	279	726	458	3.00E-87	318	Sulfurospirillum multivorans strain K
# Query: denovo8487 HW14AJan_34337												
denovo8487	gi|444304079|ref|NR_074503.1|	94.1	271	16	0	1	271	760	490	5.00E-117	417	Sulfurovum sp. NBC37-1 strain NBC37-1
denovo8487	gi|219857174|ref|NR_024802.1|	94.1	271	16	0	1	271	734	464	5.00E-117	417	Sulfurovum lithotrophicum strain 42BKT
denovo8487	gi|507148066|ref|NR_102873.1|	90.41	271	26	0	1	271	756	486	2.00E-103	372	Arcobacter nitrofigilis DSM 7299
denovo8487	gi|219846316|ref|NR_025906.1|	90.41	271	26	0	1	271	760	490	2.00E-103	372	Arcobacter nitrofigilis strain CI
denovo8487	gi|343198490|ref|NR_041918.1|	89.3	271	29	0	1	271	716	446	4.00E-99	358	Arcobacter halophilus strain LA31B
denovo8487	gi|343201492|ref|NR_042218.1|	88.19	271	32	0	1	271	725	455	2.00E-95	345	Arcobacter cibarius strain : LMG 21996
denovo8487	gi|219846315|ref|NR_025905.1|	88.19	271	32	0	1	271	760	490	2.00E-95	345	Arcobacter cryaerophilus strain A 169/B
denovo8487	gi|444304149|ref|NR_074573.1|	87.82	271	33	0	1	271	760	490	1.00E-93	340	Arcobacter butzleri RM4018
denovo8487	gi|444304143|ref|NR_074567.1|	87.82	271	33	0	1	271	760	490	1.00E-93	340	Arcobacter butzleri ED-1
denovo8487	gi|343206046|ref|NR_044625.1|	87.82	271	33	0	1	271	750	480	1.00E-93	340	Arcobacter skirrowii
# Query: denovo8627 BR14AJan_30066												
denovo8627	gi|444304149|ref|NR_074573.1|	93.12	276	13	4	1	275	760	490	1.00E-111	399	Arcobacter butzleri RM4018
denovo8627	gi|444304143|ref|NR_074567.1|	93.12	276	13	4	1	275	760	490	1.00E-111	399	Arcobacter butzleri ED-1
denovo8627	gi|343199098|ref|NR_044549.1|	93.12	276	13	4	1	275	747	477	1.00E-111	399	Arcobacter mytili LMG 24559 strain F2075
denovo8627	gi|343198599|ref|NR_043035.1|	93.12	276	13	4	1	275	714	444	1.00E-111	399	Arcobacter butzleri strain ATCC 49616
denovo8627	gi|343198490|ref|NR_041918.1|	93.12	276	13	4	1	275	716	446	1.00E-111	399	Arcobacter halophilus strain LA31B
denovo8627	gi|219846315|ref|NR_025905.1|	92.39	276	15	4	1	275	760	490	7.00E-109	390	Arcobacter cibarius strain : LMG 21996
denovo8627	gi|343201492|ref|NR_042218.1|	91.67	276	17	4	1	275	725	455	3.00E-106	381	Arcobacter cryaerophilus strain A 169/B
denovo8627	gi|507148066|ref|NR_102873.1|	91.3	276	18	4	1	275	756	486	4.00E-105	378	Arcobacter nitrofigilis DSM 7299
denovo8627	gi|219846316|ref|NR_025906.1|	91.3	276	18	4	1	275	760	490	4.00E-105	378	Arcobacter nitrofigilis strain CI
denovo8627	gi|343206046|ref|NR_044625.1|	90.94	276	19	4	1	275	750	480	2.00E-103	372	Arcobacter skirrowii

Table 4. Microbiological results from the Hollywood dye tracer cruise (HYTEX), July 9, 2012.

Site Name	CTD Cast Number	Distance from Outfall	Live Enterococci (MF plate count) CFU/100 mL Surface	Live Enterococci (MF plate count) CFU/100 mL Middle	Live Enterococci (MF plate count) CFU/100 mL Bottom	Total Enterococci (Entero1A qPCR) GEU/100 mL Surface	Total Enterococci (Entero1A qPCR) GEU/100 mL Middle	Total Enterococci (Entero1A qPCR) GEU/100 mL Bottom
HTX-HW-Boil	bucket	0.11	20	0	0	82	21	4
HTX-P1T1	1	0.62	0	0	0	8	0	0
HTX-P1T2	2	1.05	0	0	0	21	5	0
HTX-P1T3	3	1.37	2	0	0	6	0	12
HTX-P1T4	4	1.82	0	0	0	0	2	0
HTX-P1T6	6	2.29	0	0	0	0	0	2
HTX-P1T5	5	2.36	0	0	0	3	12	2

Site Name	CTD Cast Number	Distance from Outfall	Total Bacteroidales (GenBac3 qPCR) GEU/100 mL Surface	Total Bacteroidales (GenBac3 qPCR) GEU/100 mL Middle	Total Bacteroidales (GenBac3 qPCR) GEU/100 mL Bottom
HTX-HW-Boil	bucket	0.11	37355	2318	711
HTX-P1T1	1	0.62	37310	876	312
HTX-P1T2	2	1.05	2916	1012	799
HTX-P1T3	3	1.37	474	370	893
HTX-P1T4	4	1.82	139	138	77
HTX-P1T6	6	2.29	97	68	114
HTX-P1T5	5	2.36	320	441	68

Site Name	CTD Cast Number	Distance from Outfall	Human Bacteroidales (BacHum-UCD qPCR) GEU/100 mL Surface	Human Bacteroidales (BacHum-UCD qPCR) GEU/100 mL Middle	Human Bacteroidales (BacHum-UCD qPCR) GEU/100 mL Bottom	Human Bacteroidales (HF183 qPCR) GEU/100 mL Surface	Human Bacteroidales (HF183 qPCR) GEU/100 mL Surface	Human Bacteroidales (HF183 qPCR) GEU/100mL Surface
HTX-HW-Boil	bucket	0.11	891	37	12	797	22	6
HTX-P1T1	1	0.62	62	3	7	67	0	4
HTX-P1T2	2	1.05	18	3	0	12	0	0
HTX-P1T3	3	1.37	4	0	0	0	0	0
HTX-P1T4	4	1.82	0	0	0	2	0	0
HTX-P1T6	6	2.29	4	2	0	3	2	7
HTX-P1T5	5	2.36	0	0	0	5	0	0

Table 5. Microbiological results from the first Broward dye tracer cruise (BOTEX1), November 7, 2012.

Site Name	CTD Cast Number	Distance from Outfall (km)	Relative Direction from Outfall	Sucralose ng/L	Live Enterococci (MF plate count) CFU/100 mL	Total Enterococci (Entero1A qPCR) GEU/100 mL	Total Bacteroidales (GenBac3 qPCR) GEU/100 mL	Human Bacteroidales (BacHum-UCD qPCR) GEU/100 mL	Human Bacteroidales (HF183 qPCR) GEU/100 mL
Predye-P1-BOIL	bucket 1	0.09	NE	280	2	261	46921	2725	2358
P1-BOIL	bucket 2	0.09	NE	270	5	196	38330	1820	1088
BR1	1	0.37	E-NE	170	0	69	17752	799	703
BR2	2	0.31	NE	na	0	18	15193	21	112
BR3	3	0.5	NE	44	0	17	2804	39	22
BR4	4	0.4	E-NE	59	0	20	3173	13	21
BR5	5	0.26	E-SE	170	1	67	20955	476	312
BR6-BOIL	6	0.02	E	470	12	588	85413	6615	7003
BR7	7	0.19	SE	100	0	218	29614	391	361
BR8	8	0.29	SE	96	0	101	8087	200	273
BR9	9	0.46	S-SE	110	0	43	27111	33	51
BR10	10	0.36	S	100	0	71	18812	65	102
BR11	11	0.18	S-SW	85	0	174	13964	97	93
BR12	12	0.61	S-SE	56	0	12	2622	12	20

Table 6. Microbiological results from the second Broward dye tracer cruise (BOTEX2), November 28, 2012.

Site Name	CTD Cast Number	Distance from Outfall (km)	Relative Direction from Outfall	Sucralose ng/L	Live Enterococci (MF plate count) CFU/100 mL	Total Enterococci (Entero1A qPCR) GEU/100 mL	Total Bacteroidales (GenBac3 qPCR) GEU/100 mL	Human Bacteroidales (BacHum-UCD qPCR) GEU/100 mL	Human Bacteroidales (HF183 qPCR) GEU/100 mL
BR1	1	0.17	NE	69	0	632	6281	535	600
BR2-BOIL	2	0.02	NE	630	0	897	9356	844	803
BR3	3	0.4	NE	52	3	247	5209	214	286
BR4	4	-0.22	S-SW	44	0	111	4204	221	193
BR5	5	0.61	NE	68	0	300	4112	91	61
BR6	6	0.67	NE	79	0	183	2831	108	69
BR7	7	0.1	NE	310	0	717	8004	780	666
BR8-BOIL	8	0.01	SE	870	4	1627	10420	911	537
BR9	9	0.54	N-NE	120	0	620	7388	647	609
BR10	10	0.79	N	61	0	93	2285	28	47
BR11	11	1	N-NW	10	0	21	906	0	18
BR12	12	1.18	N-NW	na	0	0	791	0	0
BR13	13	-0.26	S-SW	na	o	18	670	11	16
BR14	14	-0.16	S	na	0	423	2540	314	407
BR15	15	-0.42	SW	na	0	0	603	0	0
BR16	16	0.055	N	na	0	571	1879	83	99

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