

Lab 2: **Field Trip: Hydrographic *in-situ* measurements, water and plankton sampling**

Introduction

Field studies are an important and integral part of any course in marine biology and oceanography. Field studies allow to observe organisms in their natural environment and to study the interaction of organisms and their abiotic environment. For biological oceanography, field trips are the major task to obtain the samples needed to address our scientific questions. Since all organisms interact not only with other organisms but also with their abiotic environment, any sampling of specimens for ecological studies should include key abiotic parameters as well.

In this class, we will perform field sampling of the water and plankton communities in nearby locations to familiarize you with the general sampling procedures in plankton ecology. We will sample three stations with different abiotic (hydrographic) characteristics. During the subsequent classes, we will analyze the collected samples for these stations for their hydrography, nutrient concentrations, plankton concentration and plankton composition. After all samples are analyzed and data collected, we should be able to compare the plankton communities at the different stations, address differences in these plankton communities and relate these differences to the hydro-chemical conditions of the three stations. The field trip and the three subsequent classes, thus, present a research unit into the study of South Florida coastal plankton communities. The final lab report shall, therefore, include the data of the field trip and the subsequent classes and discuss the results from our field study in the broad context.

Safety Instructions for Boat Trips

All participants in the field trip aboard the pontoon boat must be able to swim. Non-swimmers or students otherwise handicapped or unable to swim cannot go out. Students are expected to sign a liability waiver for FIU prior to the field trip (FIU regulation). All participants are expected to be familiar with the following safety regulations:

- All students aboard have to wear life preservers all the time.
- Wear solid shoes with rubber sole for safety reasons; no open shoes, no flip-flops or other loose shoes, no leather sole, no bare feet aboard; remember that shoes might get wet aboard, so don't bring your Sunday shoes!
- NEVER sit on the reeling!
- Bring rain gear along in case a thunderstorm comes up unexpectedly. Also be aware that waves might come into the boat; so wear cloths that can get wet.
- Bring sun glasses and a hat to protect your eyes and brain from the sun
- Bring sun blocker at least 15+
- Bring at least one quart of water (only water counts, no juice or soda!)
- Operate any equipment only if you are familiar with the equipment and only after the skipper has explicitly allowed deploying equipment (otherwise lines are easily entangled in the prop, destroying the prop and leaving us rowing back home).
- Prior to deploying any equipment overboard, make sure lines are secured to the boat to prevent loss of equipment.
- If interested, you might bring your photo camera and/or binocular. But make sure you have watertight storage for them.

Sampling Procedures

For the Biscayne Bay field study, participating students will be grouped into 3-4 research teams responsible for sampling and data analysis of one station each. We will visit 3 stations: Biscayne Bay/Oleta River Park close to the FIU-BBC campus; a station outside the Bay, ca. 3.5 miles offshore of Haulover Inlet termed "Deep Station" (350 ft water depth, blue water); Maule Lake, a shallow low-salinity lake connected to the Intracoastal Waterway. Visiting "Deep Station" depends on suitable weather conditions.

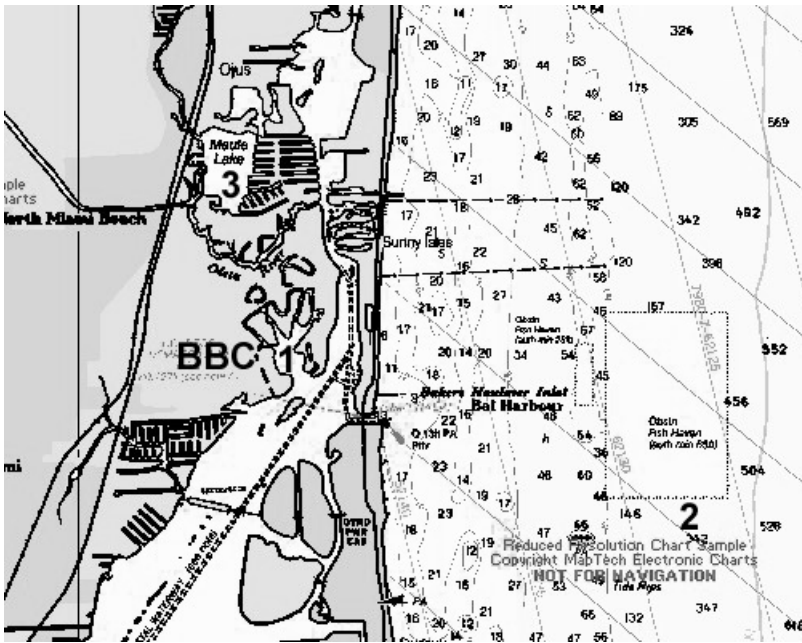


Fig. 1: Location of field trip sampling stations:
 #1 – Biscayne Bay Oleta River Park (moderately marine, shallow coastal water);
 #2 – “Deep Station” 4 miles off Haulover Inlet (fully marine, blue water);
 #3 – Maule Lake (low salinity brackish, shallow lake with high turbidity).



Fig. 5: YSI multiprobe sensor (temperature, salinity, oxygen)



Fig. 2: FIU pontoon research boat, 32' fiber glass with two 40 HP Honda outboard engines

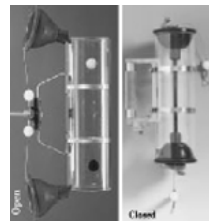


Fig. 3: Nansen-type water sampler, open and closed



Fig. 4: Apstein plankton net

Before deploying any instrument, make sure the skipper has positioned the boat properly and has allowed sampling. Deploy all equipment only to the port (left) side of the boat, and only one equipment at a time.

Have your station log ready to take note of all measurements. Notes shall only be made by pencil, because your sheet may become wet, and ink or ball pen is washed out.

At first, note time and station name on your sampling log; read the station location from the GPS satellite navigation system and note in your log. Then measure water temperature, salinity, and oxygen content with an YSI probe. Make sure the Plexiglas transportation vial is removed and the protective cage mounted over the probe. Lower the probe to the surface and let equilibrate until readings stabilize. Note the readings for temperature, salinity, oxygen concentration (mg l^{-1}), and oxygen saturation (%). Lower the probe another meter (by marks on the lowering line), wait for readings to stabilize and take readings. Continue hydrographic measurements down to 1 meter above the bottom (see water depth reading on boat's console) or end of the 20 m sampling line (“Deep Station”) and take notes of all readings. When completed, turn the YSI meter off and store the probe in a bucket with seawater for the next station.

Water samples from the surface will be taken by a bucket. Throw the bucket out of the port side of the boat towards the bow, let it fill half with water and bring it back into the boat. Fill the provided sample bottles and use the rest of the sampled water in the bucket for the storage of the YSI probe. At “Deep Station”, we will also sample water from 20 m depth to evaluate the difference in the plankton communities at the ocean surface and at greater depth. The 20 m sample will be taken by a Nansen-type water sampler (Fig. 3). Lower the water sampler to sampling depth, then release the messenger weight from the boat. The messenger weight will hit the release mechanism of the water sampler, which will close on both sides. Pull the sampler back into the boat; fill your sample into provided sampling bottles.

Deploy the 20 μm plankton net with a sample bottle attached to the end. The plankton net will be towed for ten min by slowly moving the boat in circles. Watch the net at all times and inform the skipper immediately if the net comes close to the boat props. After 10 min, pull the net back into the boat and fill the net sample into a storage bottle. Wash the net without the end bucket 2-3 times by dipping into the water. Also wash the end bucket and re-attach it to the end of the net for the next deployment.

Sample Handling after the Boat Trip

To preserve the samples for further analyses in the next classes, several procedures must be applied directly after the cruise. The first procedure is to label all your bottles with your group number or station number. All subsequent handling will be performed in the instructor's research lab, AC-II 350.

For storage, the plankton net sample will be amended with 10 ml for 37% formaldehyde and stored in the dark refrigerator at 4°C.

From your water sample, fill 200 ml into the provided 250 ml plastic bottles, label bottle with group and station number and sampling date, and place bottle into -20°C freezer. These bottles will serve for nutrient analyses in the next class. Samples will be thawed by the instructor prior to the next class.

From your water sample, fill 40 ml into a Falcon plastic centrifuge tube with blue lid. Add 4 ml formaldehyde, shake smoothly, and store in the dark refrigerator at 4°C in the provided tube rack. These samples will serve for later flow cytometric analysis and fluorescence microscopy.

From your water sample, fill another 50 ml into a Falcon plastic centrifuge tube with blue lid. Add 2 ml of Lugol's iodine solution, shake smoothly, and store with the formaldehyde-fixed sample at 4°C. These samples will be used for the inverted microscope (Utermöhl counting). The instructors will use these samples to prepare the Utermöhl settling chambers 24 hrs prior to the phytoplankton class, so that your samples are ready to be inspected and counted with the inverted microscope in the class.

From your water sample, measure 500 ml in a cylinder and filter on 25 mm diameter Whatman GF/F glass fiber filter. Use the 6-fold PVC filtration manifold and fill approximately 150 ml into the filtration funnel. The vacuum on the pump gauge shall not read more than -300 mbar to prevent cell damage during filtration (which can lead to underestimation of phytoplankton chlorophyll). Refill the funnel before the filter runs dry. Let the filter run dry at the end of filtration. Under applied vacuum, lift the GF/F filter carefully with forceps and place filter on the bottom of a 20 ml glass scintillation vial with the filtered sample up. Close vial and store in the freezer at -20°C until chlorophyll extraction in a later class. Make sure again that all your vials and tubes are properly labeled, using labeling tape and ball pen.