



Snapshot Water Quality Monitoring Day 2010. O'ahu, Ko'olaupoko, He'eia State Park

Background

HOK is a non-profit community organization whose mission is to: *protect ocean health by restoring the 'āina, mauka to makai*. The mission is achieved through three programs: 1. Community interaction and education (e.g. snapshot days), 2. On-the-ground restoration projects and 3. Project effectiveness monitoring (e.g. how effective was the restoration project at improving water quality?).

On Saturday March 6, 2010 Hui o Ko'olaupoko (HOK) hosted the second 2010 Snapshot Water Quality Monitoring Day in the Ko'olaupoko area. For this event, HOK staff and volunteers monitored the waters of Kāne'ohē Bay and He'eia Stream from the shoreline at He'eia State Park. The main objectives of the event were to engage the community in water quality monitoring, provide background information regarding water quality problems and collect a discrete amount of data to compare overtime (temporally) with future data. The parameters monitored for this event included: temperature, turbidity, salinity, dissolved oxygen, pH and enterococcus bacteria.

Based on the nature of a “snapshot” event, it is difficult to determine definitively the overall health of the location monitored. To have a greater understanding of water quality, more samples would have to be collected over a longer period of time. For example, the turbidity and enterococcus levels collected on this date were higher than the state standards; however, these data were only based on one sampling event. Additionally, pH and other sampling parameters could change based on conditions such as rain events and the amount of non-point source pollution entering the water body.

This data will be used by HOK to help inform the public about water quality, pique the interest of island residents and provide a forum for education regarding non-point source pollutants.

Protocols

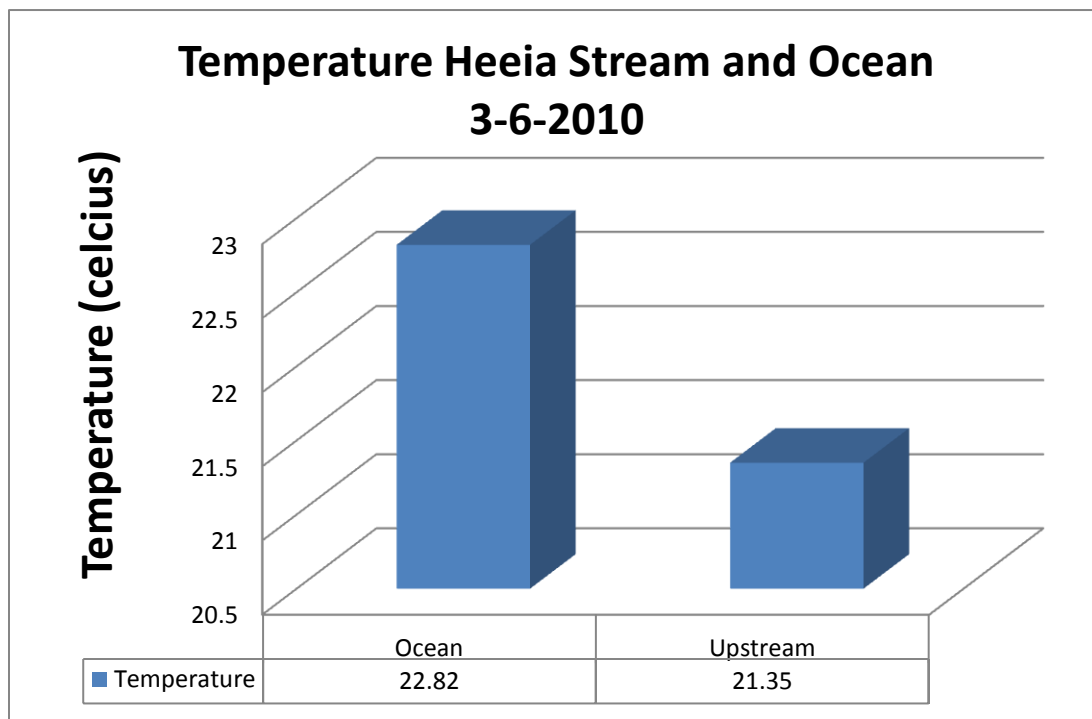
Protocols for the event were flexible enough to allow the various volunteers to participate in the event and use different equipment and techniques.

Participants noted information on local weather conditions: slightly rippled ocean conditions, partly cloudy skies, limited rainfall within the previous 24 hours and no precipitation during the event. During the monitoring, low tide of 0.17 feet occurred at approximately 12:13 pm at Mokuoloe, Kaneohe Bay. Each group then collected water in a three-gallon bucket from either a location approximately 60 meters upstream or within Kāneʻohe Bay near the mouth of Heʻeia Stream (about 20 meters from shore in shallow water). Participants then analyzed the various parameters from these samples. Each group collected data for temperature, salinity, pH and dissolved oxygen with the YSI 556. A Hach 2100P Turbidimeter was used for determining turbidity. Additionally, for educational and comparison purposes, thermometers, CHEMetric kits and pH strips were also used to obtain secondary readings for temperature, dissolved oxygen, and pH respectively.

Results

The results from the different methods were very similar across all parameters. The average ocean temperature (from two samples) was 22.82° Celsius (73.08° Fahrenheit) and the average stream temperature (from four samples) was 21.35° Celsius (70.43° Fahrenheit) (see Chart #1).

Chart #1: Temperature



Salinity from ocean samples averaged 18.63 (parts per thousand (ppt)) and upstream samples averaged 17.08 ppt. These readings are represented in Chart #2. The salinity readings are very standard for this stream mouth/bay environment and can be compared to other environments in Chart #3.

Chart #2: Salinity

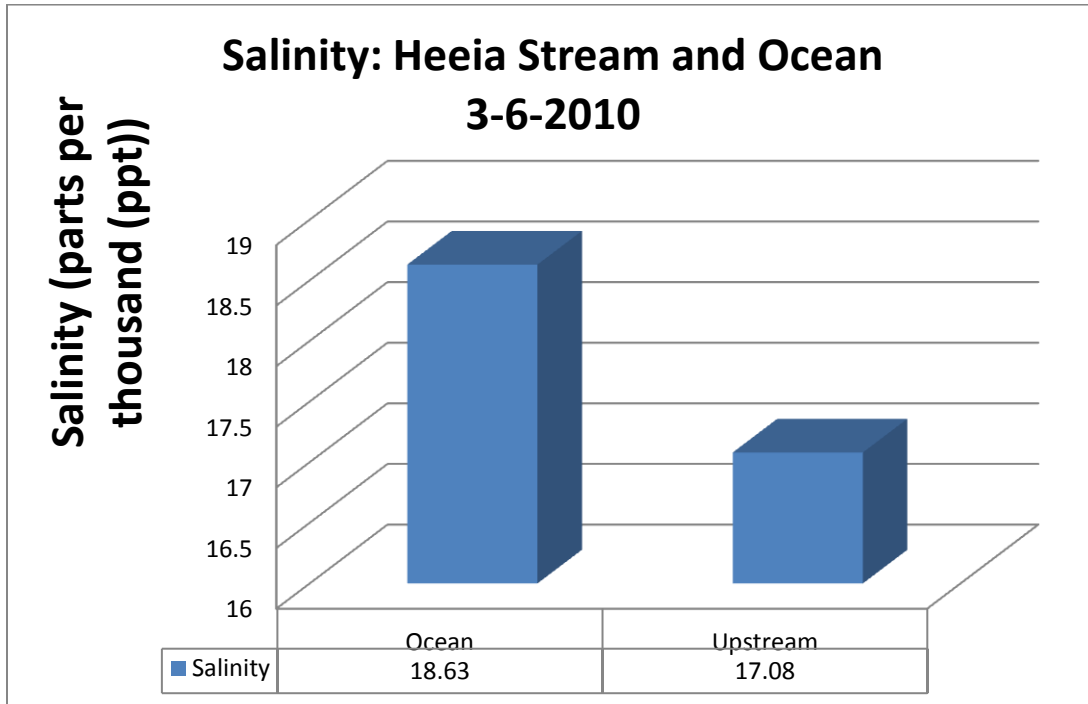
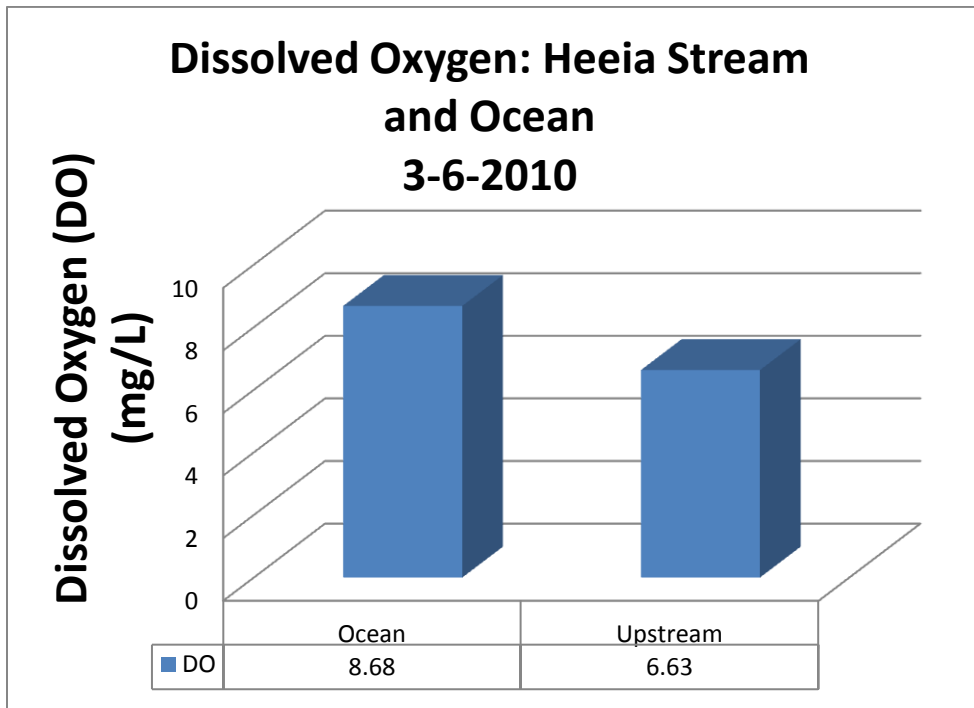


Chart # 3: Salinity comparisons

<u>Fresh Water</u>	<u>Brackish water</u>	<u>Saline water</u>
< 0.5 ppt	0.5 – 30 ppt	30 – 50 ppt

Dissolved Oxygen (D.O.) (see Chart #4) was very consistent from other near shore/beach environments Hui o Ko‘olaupoko has monitored in the past. The average ocean D.O. for this event was 8.68 mg/L and the average stream mouth D.O. reading was 6.63 mg/L.

Chart #4: Dissolved Oxygen



For pH, data were very consistent with other past monitoring efforts. Chart #5 below helps illustrate pH of everyday items. pH in ocean waters should be 8 pH units, the average at this sampling event was 8.05 (for 2 ocean samples) and 7.62 (for 4 upstream samples) (see Chart #6). The State of Hawaii criteria for pH in embayment areas is 8.0 pH units.

Chart #5: pH ranges

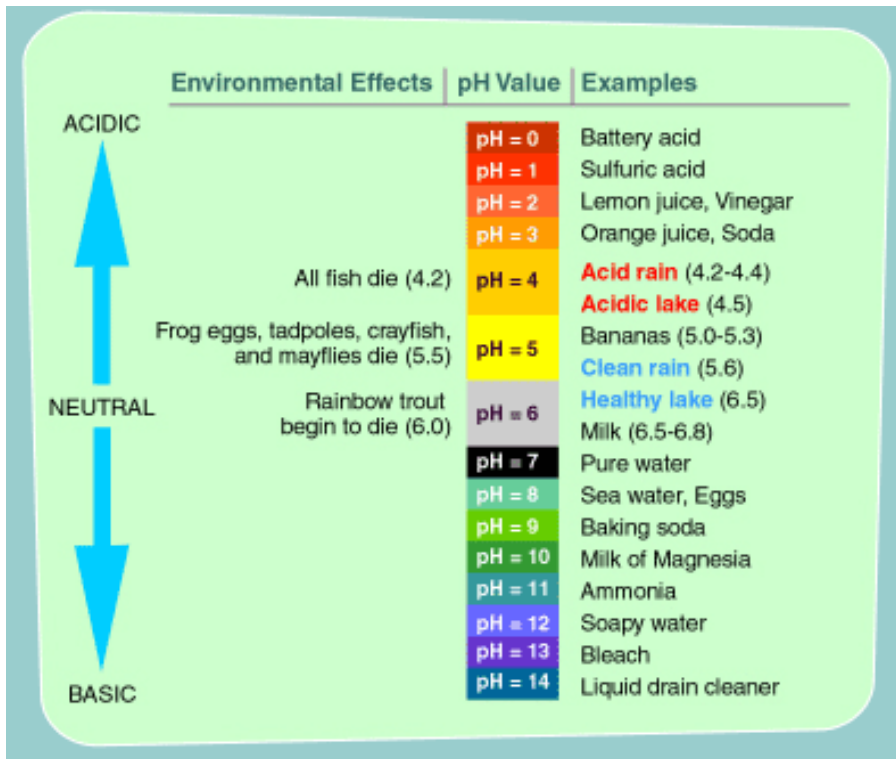
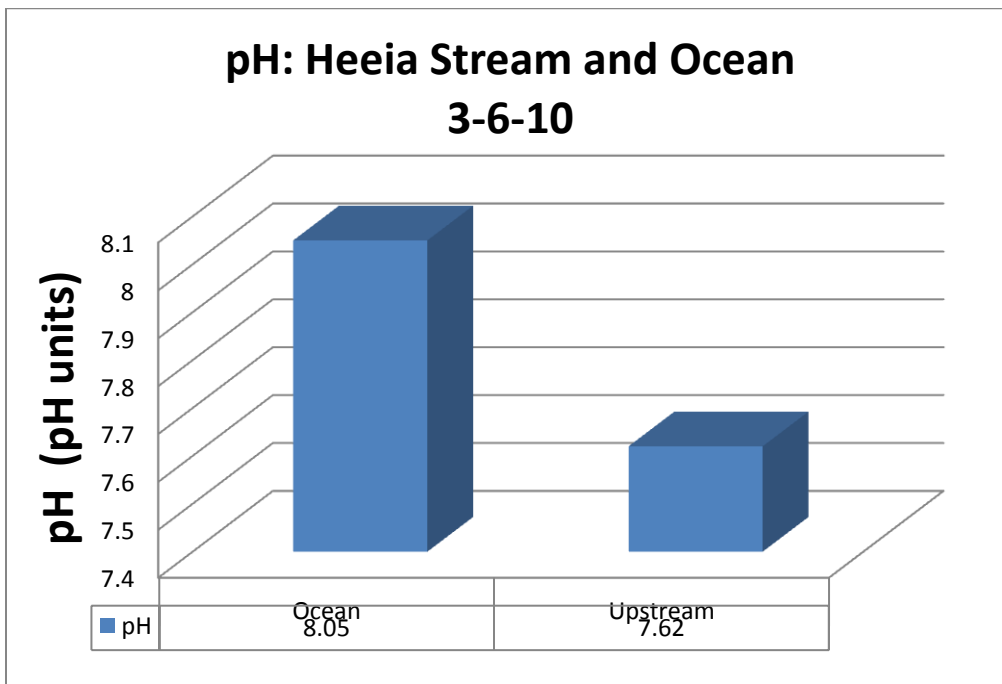


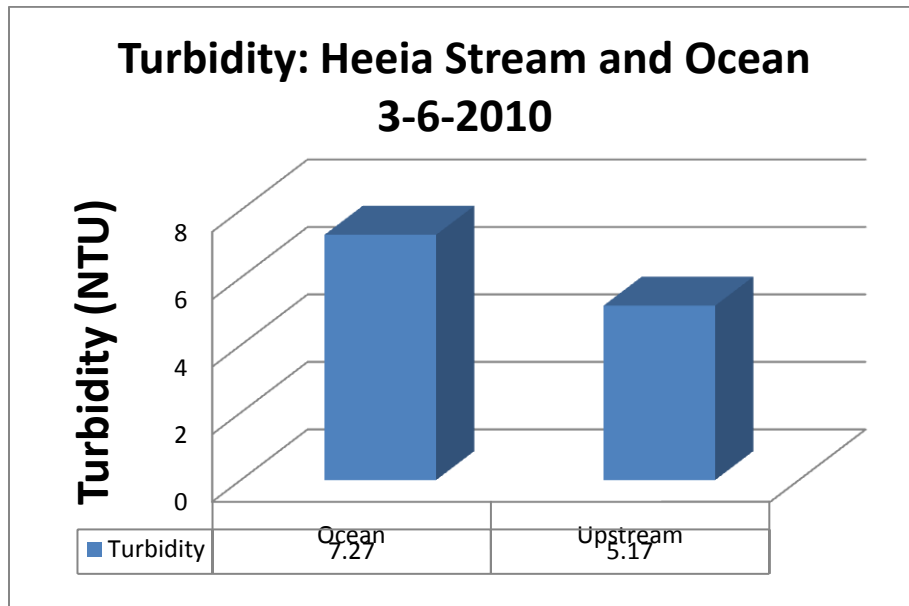
Chart # 6: pH



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Turbidity averaged 7.27 NTUs (nephelometer turbidity units) for the ocean samples and 5.17 for the upstream samples (see Chart #7). The State of Hawaii turbidity criteria for in Kāne‘ohe Bay is 0.4 NTU. This data notes levels higher than the criteria; however, recent rainfall, changing tides and slightly choppy ocean conditions may contribute to increased turbidity.

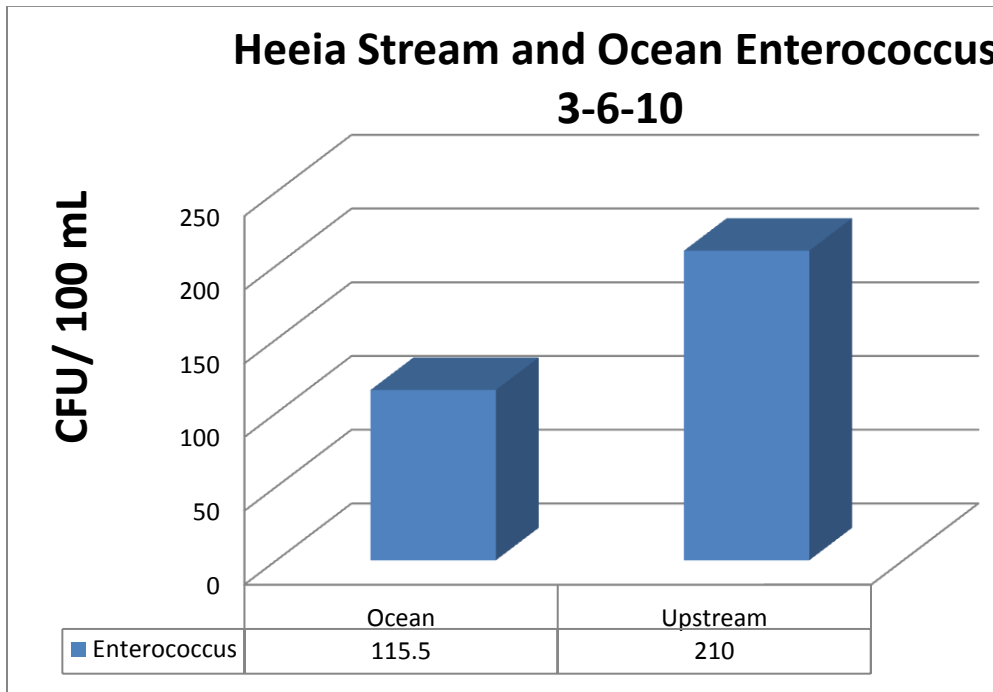
Chart # 7: Turbidity



Lastly, enterococcus bacteria samples were collected from the same locations as the other parameters. For the ocean water, two samples were taken and for the upstream area, 3 samples were taken. The state standard for enterococcus bacteria in marine recreation waters shall not exceed 7 CFU (Colony Forming Units) per 100 milliliters of water. To determine this, a minimum of five samples need to be taken over the course of 25-30 days. The 3 stream samples resulted in 187, 213, 231 CFU's and ocean samples were 100 & 131CFU's.

Enterococcus is an indicator bacteria and does not differentiate between human and animals regarding the source. The high enterococcus counts likely result from a combination of factors. One source of the bacteria could have originated from human sources such as leaky septic systems. A second source could have originated from dogs, cats, mongoose, pigs or birds residing in the area, whose fecal matter may be washed in to the streams and near shore areas during rain events, such as the rainfall the night prior to the monitoring day. Additionally, a warm water source can cause bacteria to multiply and show up in significant numbers.

Chart #8: Enterococcus



Summary

Overall, these data are consistent with past data collected by HOK. More data needs to be collected, particularly for enterococcus to establish good baseline data and see changes over time. However, for this particular “snapshot” in time, the marine and upstream areas sampled for water quality appears to be healthy.

HOK consistently seeks funds (private, state and federal) to continue monitoring water quality and works as closely as possible with the State of Hawai‘i to share data. For future snapshot monitoring days, volunteers will be invited again to participate and learn about local water quality.

Acknowledgements

HOK would like to thank all the volunteers who participated and Surfrider Foundation, O‘ahu Chapter for the use of the Idexx machine to process enterococcus samples.