Project Update: September 2011

For the project: Monitoring of mangrove forest quality in the Pacific Slope of Guatemala.

Water quality analysis:
Water surveys are being conducted approximately every 3 weeks, at eight sampling points:

Fig. 1

1. Papaturro 13°54'06.5" N; 90°26'03.9" W
2. Piquique 13°53'15.2" N; 90°25'01.2" W
3. El Cebollito 13°53'20.5" N; 90°25'03.9" W
4. Castano 13°52'20.3" N; 90°24'32.2" W
5. El Salado 13°52'15.9" N; 90°24'33.7" W
6. Las Mananitas 13°52'15.9" N; 90°24'33.7" W
7. El Rosario 13°52'15.9" N; 90°24'33.7" W
8. El Chapeton 13°52'13.9" N; 90°24'33.7" W

Abiotic Factors

Abiotic factors as measured and recorded with the data logger in every transect. The following results are averaged results of all measurements.

Sampling point	Temperature °C	pH	OD%	Salinity ppt
Papaturro	28,07	6,99	39,32	12,67
Piquique	28,5	7,03	34,2	12,81
El Cebollito	28,47	7,01	33,78	16,10
Castano	28,55	7,17	38,9	18,79
El Salado	28,62	7,19	39,93	20,97
Las Mananitas	28,82	7,26	43,78	21,42
El Rosario	28,89	7,48	36,98	22,66
El Chapeton	28,79	7,50	59,1	11,52

Table 1

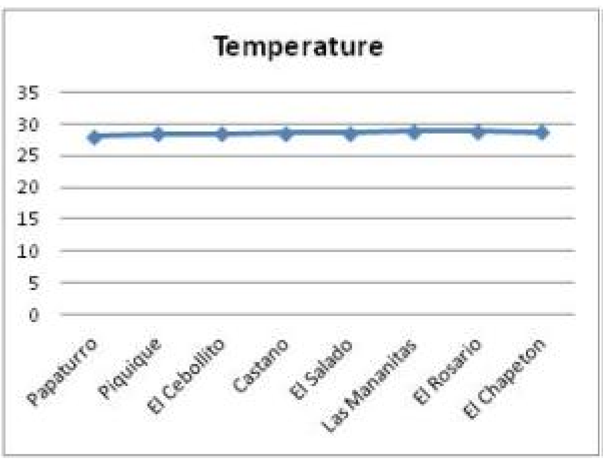

Fig. 2

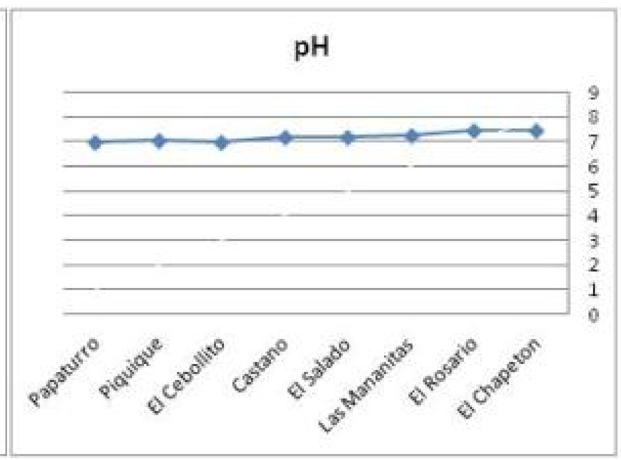

Fig.3

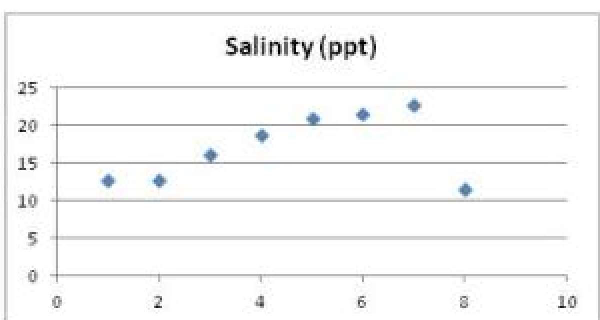

Fig. 4

Data analysis:

Water temperature:

Temperature (Fig. 2) is an important limiting factor in determining the distribution of plant and animal species. It has a significant effect upon water quality and it influences the amount of dissolved oxygen in water, the rate of photosynthesis by plants, and the sensitivity of living things to toxic wastes and diseases[1]. Very high temperatures are not favorable as leaves of mangroves are sensitive to temperature and their photosynthetic capacity gets reduced, falling to zero at leaf temperatures of 38-40°C, as against the optimum leaf temperature for photosynthesis which is 28-32°C (Clough et al., l982;Andrews et al., l984). [2]

Increased water temperature also decreases the availability of dissolved oxygen, amplifies the stress caused to organisms by toxic compounds, and enhances algal and bacterial growth rates. By law, the temperature for warm water fisheries shall not exceed 31.7 °C.[4]

pH

pH (Fig. 3) is a measure of the acidity or alkalinity of a solution. pH measurements are made on a scale from 0 (very acidic) to 14 (very alkaline), 7 is neutral. The pH of ocean water is relatively constant, generally falling between 7.8—8.3. Brackish waters, estuarine waters and harbors and areas of industrial contamination can show differences from the pH of ocean water.[1] Water pH across the transects was very close to that expected of sea water. pH values between 7 and 8 are optimal for supporting a diverse aquatic ecosystem.[2]

Water salinity

Salinity (Fig. 4) is the total of all the salts dissolved in water and it is measured in parts per thousand (ppt). The salinity of ocean water is 35 parts per thousand. The salinity within the estuary where the river meets the sea can range from 0 to 35 ppt depending on the input of freshwater into the system and mixing of sea water due to tidal influence. Salinity greatly influences the distribution of plants and animals depending upon the amount of salinity they can tolerate.[2]

Salinity within the mangroves environment is influenced by the frequency of inundation by tides and frequency of flooding with brackish waters after periods of heavy rain. Frequency of inundation by salt water is the single most significant factor in determining distribution of vegetation across the gradient from mangroves through the saltmarsh.[1] The species most tolerant of frequent inundation by salt water are the red mangrove and gray mangrove.

DO%

Dissolved oxygen (Table 1) is measured as a % of saturation. Oxygen concentrations are low in areas where there is decomposition of large amounts of organic material. Water with high levels of dissolved oxygen is most likely to support a diversity of aquatic organisms. Dissolved oxygen is essential to all aquatic plants and animals. Temperature affects the oxygen holding capacity of water. As temperature increases, the amount of dissolved oxygen increases. DO is a critical water quality parameter for characterizing the health of an aquatic ecosystem. It is a measurement of oxygen dissolved in water which is available to fish and other aquatic life. The DO content of water results from the photosynthetic and respiratory activities of the flora and fauna in the system, and the mixing of atmospheric oxygen with waters through wind and stream current action.[2]

The ideal dissolved oxygen concentration for many fish is between 7 and 9 mg/l. A level below 3 mg/l is stressful to most vertebrates and other forms of aquatic life.[3]

Bird monitoring:

Bird observations are being conducted on regular basis by team members (Fig. 6) and volunteers (Fig. 5) coming to ARCAS, who are trained in bird watching. Immobile counts or short distance counts are conducted most of the times.

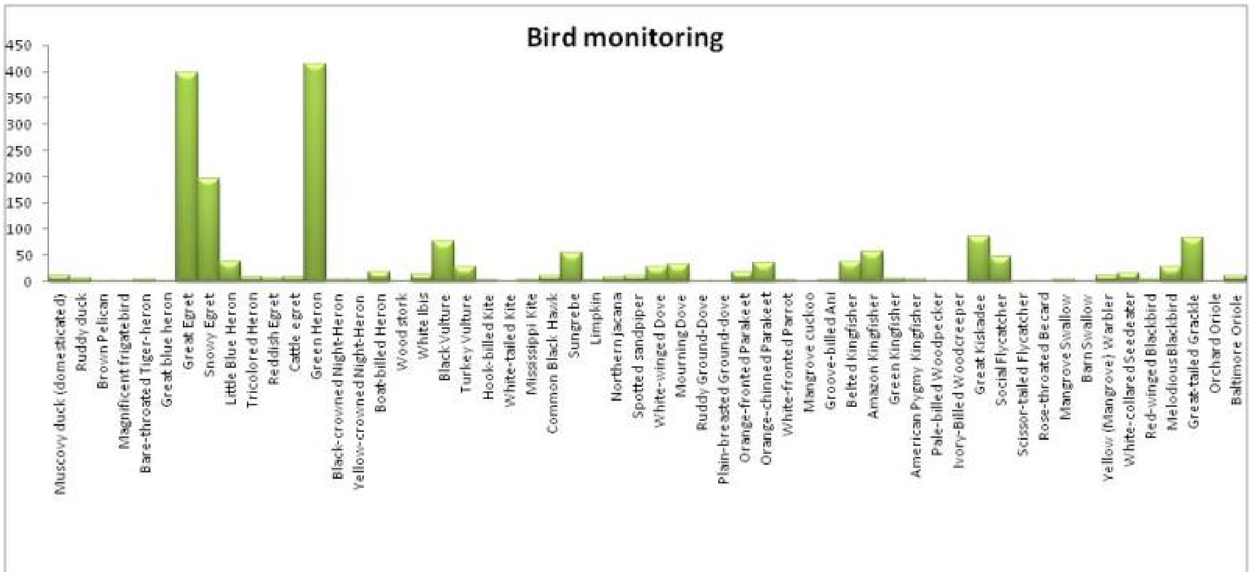


Fig. 5


Fig. 6


Fig. 7

Mangrove forest mass monitoring

4 different plots have been marked (Fig. 8). First one covered mostly by red mangrove (*Rhizophora mangle*) trees, second by white mangroves (*Laguncularia racemosa*), third by black mangrove (*Avicenia germinans*), and fourth by young mangrove of mixed species.

Each plot has a rectangular shape and is 400 square meters wide (20m x 20m). On each square/plot all mangrove trees have been measured (Fig. 9 and Fig. 10) - height, diameter, tree bark thickness and all abnormal or dead trees have been reported.

Tree measurements are being taken every 3-4 months to estimate average growth rates of each mangrove species.

Fig. 8

Fig. 9

Fig. 10

Environmental education

Environmental education classes has been prepared and conducted in four local primary schools. Classes were dedicated to bird species living in mangrove ecosystem and benefits coming from eco-tourism and bird watching. Children were also playing educative games (Fig. 13) using different names of mangrove birds.

Additionally a mural was painted on one of local schools (Fig.11).

Fig. 11

Fig. 12

Fig. 13

Fig. 14

1 - NSW Department of Education and Training Mt Kembla Environmental Education Centre
2 - Ecology and Environment of Mangrove Ecosystems Prof. K. Kathiresan. Centre of Advanced Study in Marine Biology Annamalai University
3 - http://bcn.boulder.co.us/basin/data/NEW/info/DO.html
4 - http://www.uwgb.edu/watershed/data/monitoring/temperature.htm