Project Update: October 2013

Nine field trips realized to verify the viability of the use of side scan sonar to estimate the abundance of the Antillean manatee on the estuary.

33 days on board, realized during the field trips.

1. One partial data bank of the Antillean manatee acoustic repertoire.

2. Utilization of hydrophone and digital recorder on 13 days on board;

3. 11 hours and 36 minutes of manatee vocalization recordings;

4. One partial diagnostic about the feasibility of using the manatee sound repertoire to estimate abundance.

5. One partial data bank georeferenced from the anthropic activities in the study area.

6. Four anthropic activities found (salt marsh, shrimp farm, fishing activities and urbanization).
7. One partial report of the threats and human impacts identified and characterized.

8. Nine samples of water collected during the field trips to toxicology analyses.

9. Nine samples of sediment collected during the field trips to toxicology analyses.

10. Nine samples of sediment collected in three different points during the field trips to chemistry analyses.

11. One partial report produced with the description of the manatee habitat use on the estuary.

12. One partial data bank georeferenced of the areas with food and freshwater sources. Five areas identified with the presence of food. None freshwater source found until this moment.

13. One partial list with the species of plants and algae available for the manatee feeding on the estuary. Four collections realized through diving. Seven species and two genus identified until the present moment.

Field Trips

Table 1: Field trips realized, dates and source of the financial support.

Field trips realized		
Field trip number	**Date**	**Financial support**
1	September, 30 to October, 06, 2012	FBPN
2	January, 14 to 19, 2013	FBPN
3	March, 03 to 08, 2013	FBPN
4	April, 14 to 19, 2013	RUFFORD
5	April, 28 to May, 02, 2013	RUFFORD
6	May, 12 to 17, 2013	FBPN
7	June, 02 to 07, 2013	FBPN
8	June, 16 to 21, 2013	FBPN
9	August, 25 to 30, 2013	RUFFORD

Activities

Activity 1: Verify the viability of the use of sidescan sonar to estimate the abundance of the Antillean manatee on the estuary

Figure 1. Boarding outputs.

Figure 2. Study area with the stretches established

Table 2. Stretchs of the study area, kilometers traveled and area in Km^2 of each stretch.

	Stretchs	**Km travelled (mean)**	**Area in Km^2**
Stretch I	I – Bar River	25,3	7,3
Stretch II	II – Ubatuba River	4,0	1,5
Stretch III	III – Carpina River	5,5	1,0

Table 3 shows the stretches travelled in each trip, the time the team left (**Hs**), the time of the arrival (**Hc**), beginning (**Hi**) of collecting data, end (**Hf**), sampling effort (**EA**) and average speed (**VM**).

Table 3: Dates of the outputs and stretches travelled.

Day	Stretches	Hs	Hi	Hf	Hc	EA	VM
March, 04	I	5h40	6h35	9h40	10h30	3h05	
March, 05	I	5h40	6h22	10h34	11h	4h12	
March, 07	I	5h40	6h14	10h48	11h30	4h34	
March, 08	I	5h40	7h02	9h40	10h30	2h38	
April, 15	I	5h40	6h42	10h06	10h30	3h24	
April, 16	I	5h40	6h26	7h40	9h30	1h14	
April, 17	I	5h40	6h38	11h	11h05	4h22	
April, 18	I	5h40	6h39	10h	10h05	3h21	
April, 19	I	5h40	6h26	9h35	9h45	3h09	
April, 29	II e III	5h40	6h57	9h42	10h30	2h45	
April, 30	II e III	5h40	6h12	8h35	9h20	2h23	
May, 01	I	5h40	6h25	8h	9h	1h45	
May, 02	I, II e III	5h40	6h20	9h32	10h05	3h12	
May, 13	II e III	5h40	6h37	10h17	10h23	3h40	6,5km/h
May, 14	II e III	5h40	6h17	9h26	9h30	3h09	
May, 15	I	5h40	6h23	10h36	10h40	4h13	
May, 16	I, II e III	5h40	6h20	9h22	9h25	3h02	
May, 17	III	5h40	7h10	10h45	11h30	3h35	
June, 03	II e III	5h40	6h20	9h25	10h15	3h05	
June, 04	I	5h40	6h20	9h05	9h30	2h45	
June, 05	II e III	5h40	6h05	10h15	10h20	4h10	
June, 06	II e III	5h40	6h17	8h30	10h35	2h13	
June, 07	II e III	5h40	6h02	9h16	10h00	3h14	
June, 17	II e III	5h40	6h24	8h46	9h15	2h22	
June, 18	II e III	5h40	6h12	7h46	10h20	1h34	
June, 19	II e III	5h40	6h15	7h40	10h40	1h25	

Table 4: Summary of the effort made.

Field Trips	9
Boarding outputs	33
Boarding hours	135
Effective hours of boarding effort	97h26min
Hidrophone recording hours	
11h36miNumber of images generated with the side scan sonar	2.261
Covered area	10 Km^2
Total Kilometers travelled by boat	480 Km

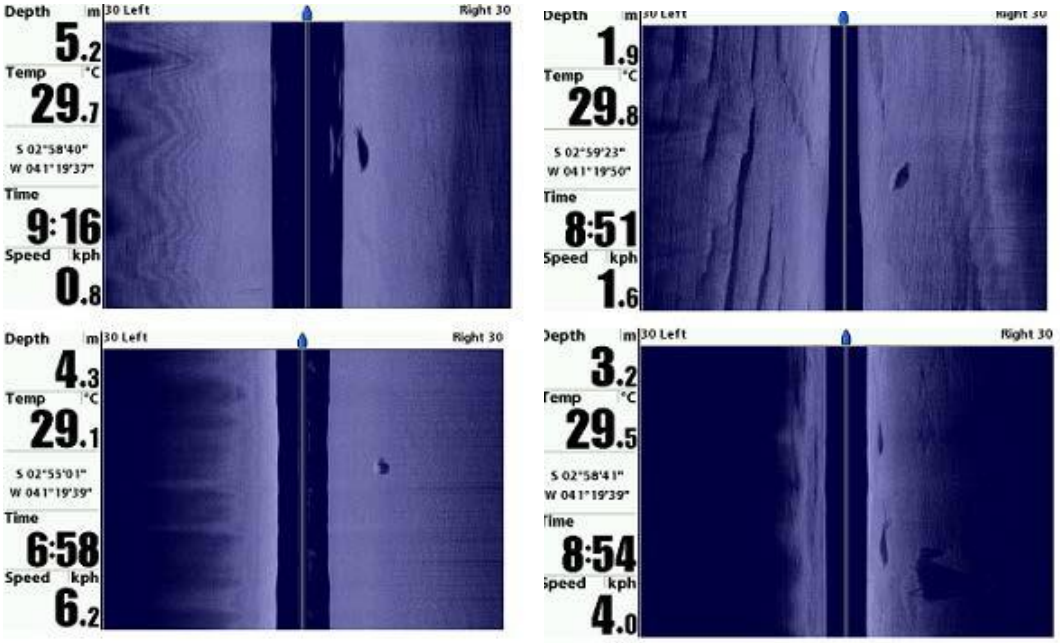

Figure 3. Some images from the Antillean manatee, captured with the side scan sonar.

Activity 2: Describe the sound repertoire of the Antillean manatee on the estuary, checking the feasibility of using this tool to estimate abundance.

Up to the present, we have a total of **11 hours and 36 minutes** of recordings. First we go through the whole section with the engine and side scan sonar running and after finishing the stretch, we turn off the engine and side scan sonar and put the hydrophone inside the water (**Fig. 4**). After that we start the recordings.

The recordings are being sent to the Dr. Renata Sousa-Lima, expert in bioacoustics and member of the team of the current Project, who owns the license of the program "Raven Pro" of the *Cornell Lab of Ornithology* which is required for analysis of these vocalizations.

Figure 4. Field team recording the Antillean manatee vocalizations.

Activity 3: Identify the threats and the human impacts on the Antillean manatee on the estuary.

During the field trips realized, there were identified five threats: fishing activities, boat traffic, shrimp farming, saltworks and urbanization (**Table 5**).

Table 5: Threats identified on the study area and their possible anthropic impacts.

Threats	Anthropic impacts (possibles)
Fishing	Bycatch; Destruction of feeding areas; Collision; Pollution (Solid waste left by the fishermen – plastic bags, remains of fishing nets and ropes, oil from the motorboats, contamination by trace elements, derived from anti fouling paints that the fishermen uses to paint their boats);
Boats Traffic	Running over/collision; Pollution (oil from the motorboats, paints that
Shrimp farms	Expulsion from the living area, through the habitat loss; Pollution and
Saltworks	Expulsion from the living area, through the habitat loss; Pollution and
Urbanization	Expulsion from the living area, through the habitat loss; Pollution and

During the boat trips, all the anthropic activities were marked on the GPS (**Figs. 5 and 6**).

Figure 5. Threats related to habitat loss identified on the study area

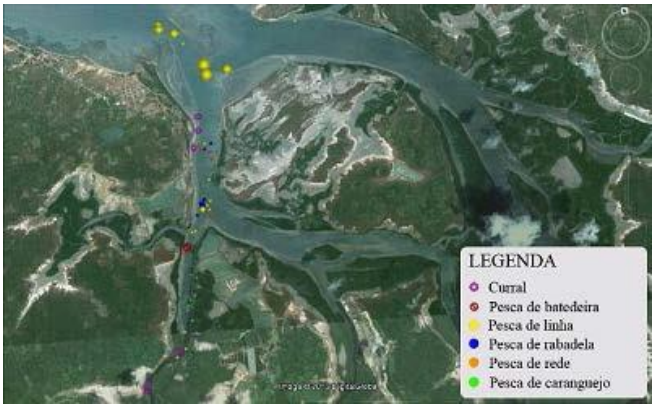

Figure 6. Threats related to fishing activities identified on the study area.

Activity 4: Identify and monitor the environmental quality of the estuary, through estuary water and sediments analysis.

Nine samples of water and sediment were collected for analysis (**Table 6, Figs. 7, 8 and 9**).

Table 6: Waypoints (latitude and longitude) of the water and sediment samples collected in the study

Size oficors:
• Up to 3 boats; • from 4 to 6 boats; from 7 to10 boats; more than 10 boats.

SEDIMENT				WATER			
SAMPLE	WP	LATITUDE	SAMPLE	SAMPLE	WP	LATITUDE	SAMPLE
1	1944	S02°59.338	1	1	41	S02°57'18.0"	W041°19'07.7"
2	1946	S02°59.153	2	2	42	S02°57'29.0"	W041°19'16.5"
3	1947	S02°59.027	3	3	43	S02°57'40.8"	W041°19'21.7"
4	2010	S02°58.621	4	4	44	S02°59'12.3"	W041°19'38.1"
5	2012	S02°58.419	5	5	45	S02°57'55.2"	W041°19'27.5"
6	2015	S02°58.306	6	6	46	S02°57'52.3"	W041°19'27.4"
7	2016	S02°57.963	7	7	2152	S02°59.347'	W041°19.754'
8	2068	S02°58.281	8	8	2156	S02°58.407'	W041°19.565'
9	2069	S02°58.057	9	9	2157	S02°58.063'	W041°19.477'

Figure 7. Location of the water and sediment samples collected

Figure 8. Water samples collections during the period.

Figure 9. Sediment samples collections during the period.

Activity 5: Describe the variables (biotic, physiographic and physicochemical), that influence the spatial and temporal distribution of manatees on the estuary

During the second semester of the project the field team recorded the presence of manatees in all stretchs (I, II and III). The stretch where the animals were found and where efforts were focused was III (Carpina river), followed by I (Bar river) and II (Ubatuba river). The option to increase the effort in the stretch III gave up the need to optimize the encounters with animals to obtain sufficient data for the study to estimate abundance. Although other variables have to be studied more deeply, the main characteristic of phrases that may be influencing the presence of animals is the predominance of food banks. Environmental variables collected to date were: salinity, depth, turbidity (Figure 10) and the water temperature. All data were planned and will be analyzed together to map the characteristics of the places chosen by the animals.

Figure 10. Measurement of water turbidity using Secchi disc.

Activity 6: Identify food availability for the Antillean manatee on the estuary and collect manatee faeces to analyze the food items

Table 7: Location of feeding areas (banks algae and seagrass).

Stretch	Waypoint	Latitude	Longitude	Type of food
I	1622	02º55'43"S	041º19'01"O	algae/seagrass
I	1623	02º55'44"S	041º19'02"O	algae/ seagrass
III	1929	02º58'16"S	041º19'39"O	seagrass
III	1983	02º57'42"S	041º19'30"O	seagrass
III	2068	02º58'17"S	041º19'40"O	algae / seagrass

During the field trips conducted in March, April, May and June 2013 were identified five (05) areas with banks of algae and seagrass (Table 7 and Figure 11). The area of the seagrass bank, located next to a corral disabled and an asset at the end the stretch III, was found with marks pectoral fins of animals that fed there (manatees rely with the pectoral fins on the substrate while are feeding). Already banks of algae were found near two large sand banks (also called regionally "crôas") that are exposed at low tide in tidal moon (full and new). All feeding areas found in this period contained in the Carpina river.

Figure 11. Map with the location of algae and seagrass banks (green points) identified in study area.

During the field trips conducted in the months of March, April, May and June 2013, were collected 13 faecal samples of manatee (Figure 12). At first, the faeces be analyzed looking for small fragments of vegetation. Is still under discussion viability and the ability to perform biomolecular analysis for full identification of the items vegetables. The samples are stored in the Laboratory of Macroalgae at the Institute of Marine Sciences (LABOMAR) in the Federal University of Ceará, as is still discuss the best means of analysis.

Figure 12. Three (03) faecal samples of manatee found drifting in the same day and near the place where the animals were sighted in stretch I (bar river)

During the field trips conducted in March, May and June 2013 were Samples of submerged vegetation (Figure 13). With the help of the researcher and algae specialist, biologist Pedro Bastos - Macroalgae Laboratory of the Institute of Marine Sciences (LABOMAR) Federal University of Ceará, seven (07) species were identified and two distinct genus. Until now have been identified: two (02) genus of brown algae, three (03) species of red algae and (08) species of green algae (Table 8).

Figure 13. Diving, submerged vegetation collection, sorting and storage of vegetable items collected.

Table 8: List of species/genus of algae identified.

Brown Algae	Red Algae	Green Algae
Padina sp. (G)	*Gracilaria sp. (G)*	*Caulerpa mexicana (E)*
Dictyota sp. (G)	*Hypnea musciformis (E)*	*Caulerpa prolifera (E)*
	Osmundaria obtusiloba	*Caulerpa sertularioides (E)*
		Codium sp. (G)
		Ulva fasciata (E)
		Solieria filiformis (E)
		Acantophora muscoides (E)

New species / genus identified	TYPE	Level of identification
Padina sp.	BROWN	(G) genus (E) species
Dictyota sp.	BROWN	
Osmundaria obtusiloba	RED	
Caulerpa mexicana	GREEN	
Caulerpa prolifera	GREEN	
Caulerpa sertularioides	GREEN	
Ulva fasciata	GREEN	
Solieria filiformis	GREEN	
Acantophora muscoides	GREEN	