

St. Andrew Bay Seagrass Monitoring - Fitzhugh

Seagrass and Water Quality Monitoring Results for the St. Andrew Bay system

Seagrass Depth and Width

Figure 1 shows the location of the permanent seagrass monitoring transects in the St. Andrew Bay system. Water samples have been collected from over 74 stations in the entire bay since 1990. The following information shows the effect of water quality on seagrass distribution in two areas of the St. Andrew Bay system: West Bay and St. Andrew Bay.

Two seagrass species, *Thalassia testudinum* and *Halodule wrightii*, were observed at almost every seagrass transect. *Syringodium filiforme* was observed at many of the sites in St. Andrew Bay while *Halophila engelmanni* was observed at only one site in West Bay.

Seagrasses in SAB grew to greater depths than seagrasses in WBARM and WBBOWL (Table 1) and there was a significant difference ($p < 0.0001$) in seagrass depth among the different areas (Table 2). The maximum depth at which seagrasses grow decreased as distance from West Pass increased, with the shallowest seagrass depths recorded for WBBOWL. Seagrass maximum depths for 2005 ranged from 1.80-2.10 m in SAB, 0.83-1.50 m in WBARM, and 0.53-1.19 m in WBBOWL.

The mean light attenuation, k , increased as distance from West Pass increased, with the highest coefficients recorded for WBBOWL, and the percent surface irradiation (%SI) reaching the seagrass canopy ranged from 24-27% among the different bays (Table 1).

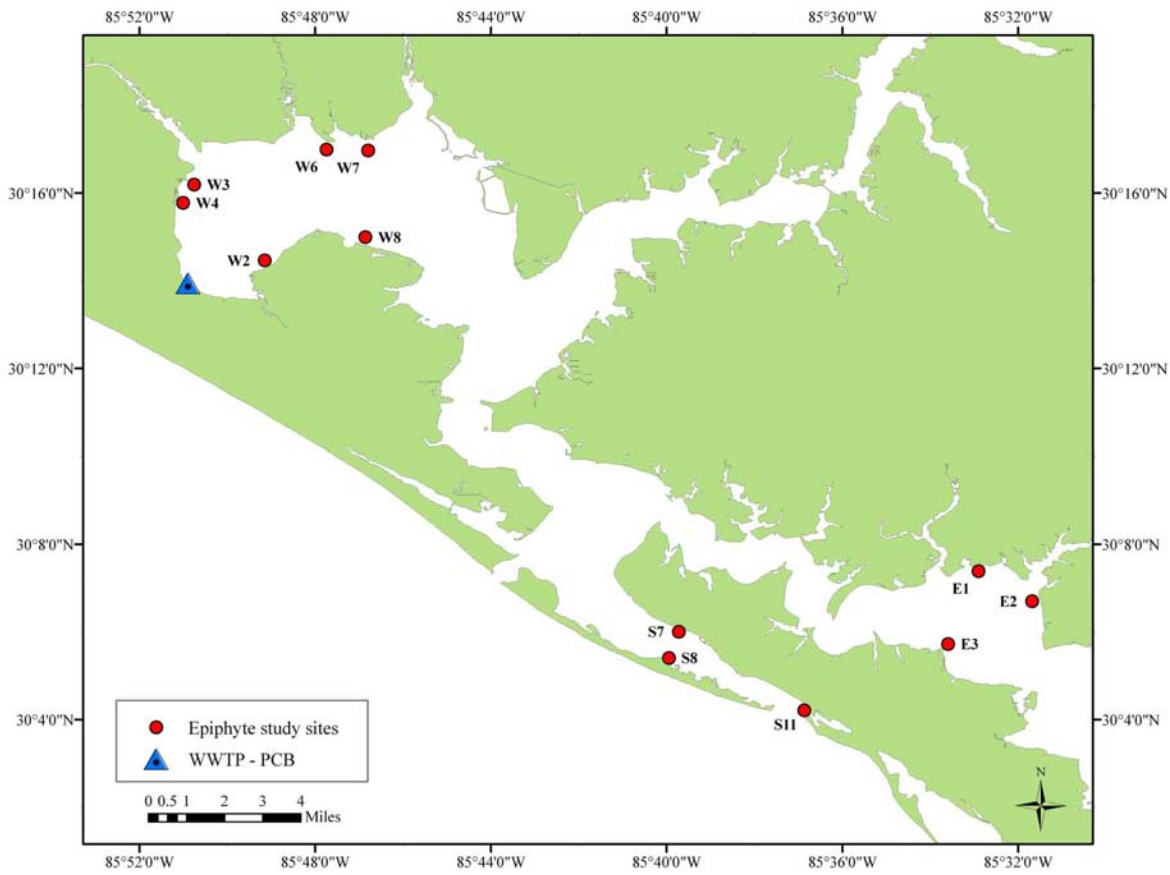
The mean width of the *Thalassia* blades in SAB was significantly greater ($p < 0.0001$, Table 3) than that in WBARM and WBBOWL. In the St. Andrew Bay system, *Thalassia testudinum* blade width was significantly different among areas.

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Water Quality

The mean values for the water quality parameters Secchi depth, DO, turbidity, salinity, pH, chlorophyll *a*, total nitrogen, and total phosphorus were significantly different ($p < 0.0001$, Table 4) among areas. The highest mean light attenuation, and subsequently the shallowest Secchi depth, was recorded for WBBOWL. The sites in this area of the St. Andrew Bay system also had the highest turbidity, chlorophyll *a*, and nitrate values along with the lowest salinity and pH values. Therefore, the decrease in seagrass depth for WBBOWL coincided with increased light attenuation, turbidity, chlorophyll *a* and nitrate concentrations.

Figure 1: Map of St. Andrew Bay, Panama City, Florida showing the location of sampling stations in WBBOWL (W2, W3, W4), WBARM (W6, W7, W8) and SAB (S7, S8).



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Table 1. Mean maximum seagrass depth (m), mean light attenuation (m^{-1}), percent surface irradiance, and species present in the St. Andrew Bay system, Panama City, Florida for 2005. Sites W2-W4 are located in WB BOWL while sites W6-W8 are located in WB ARM. Sites S7 and S8 are located in SAB.

Site	Mean max seagrass depth (m)	Mean light attenuation (m^{-1})	% surface irradiance $= (e^{-k*z}) * 100$	Species present at site
W2	0.99	1.42	25%	<i>T. testudinum</i> , <i>H. wrightii</i>
W3	0.75	1.81	26%	<i>H. wrightii</i>
W4	0.83	1.59	27%	<i>T. testudinum</i> , <i>H. wrightii</i>
W6	1.25	1.13	24%	<i>T. testudinum</i> , <i>H. wrightii</i> , <i>H. engelmanni</i>
W7	1.22	1.06	27%	<i>T. testudinum</i> , <i>H. wrightii</i>
W8	1.30	1.04	26%	<i>T. testudinum</i> , <i>H. wrightii</i>
S7	1.96	0.67	27%	<i>T. testudinum</i>
S8	1.83	0.72	27%	<i>T. testudinum</i> , <i>H. wrightii</i> , <i>S. filiforme</i>

Table 2. Mean maximum seagrass depth (m) among bays. Values are means \pm standard deviation. Letter codes indicate the results of the Student-Newman-Keuls test; areas with different letters are significantly different for mean maximum seagrass depth.

Location	Mean max seagrass depth (m) (SD)	Range (m)	N	S-N-K Comparison
WBBOWL	0.91 (0.2)	0.43-1.39	56	A
WBARM	1.14 (0.2)	0.75-1.50	50	B
SAB	1.90 (0.1)	1.77-2.10	9	C

Table 3. Mean *Thalassia* blade width (mm) among bays. Values are means \pm standard deviation. Letter codes indicate the results of the Dunn test; areas with different letters are significantly different for mean width.

Location	Mean <i>Thalassia</i> blade width (mm) (SD)	Range (mm)	N	Dunn Comparison
WBBOWL	4.1 (0.5)	2.3-5.0	104	A
WBARM	3.6 (0.3)	3.0-4.3	26	B
SAB	6.2 (0.9)	3.8-9.0	161	C

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Table 4. Mean values for water quality parameters collected between 1990 and 2006 in the St. Andrew Bay system, Florida. The deep water sites are sites identified by numbers only. Sites W1-W4 and 2.1 are located in WBBOWL. Sites W5-W8 and 2.2-2.4 are located in WBARM. Sites S5-S10 and 3.1-4.5 are located in SAB. Sites with no data, *. Letter codes indicate the results of the Student-Newman-Keuls test; areas with different letters are significantly different for that parameter.

Site	Secchi depth (m)	DO (mg/l)	Turbidity (NTU)	Salinity (ppt)	pH	Chl <i>a</i> (µg/l)	Total Nitrogen (µg/l)	Total Phosphorus (µg/l)
W1	0.76	7.1	5.1	24.6	7.9	6.2	288	21.9
W2	0.70	7.3	4.6	24.5	7.9	6.2	323	21.1
W3	0.58	7.1	7.0	23.2	7.9	6.8	352	23.9
W4	0.61	7.1	7.0	23.4	7.8	6.2	361	24.0
2.1	1.64	7.6	3.4	22.1	7.9	4.9	360	23.3
W5	1.01	6.8	4.5	24.3	8.0	4.9	365	18.6
W6	1.03	6.8	4.3	25.2	8.0	4.5	333	16.8
W7	1.01	6.4	3.8	25.3	8.0	4.3	340	17.4
W8	1.01	7.3	4.2	25.8	8.0	3.9	362	15.4
2.2	1.86	7.5	2.4	22.9	7.9	4.2	312	15.5
2.3	1.86	7.1	2.8	24.1	8.0	4.1	299	13.6
2.4	2.53	7.3	1.8	24.1	8.0	3.3	289	12.6
S5	2.38	6.4	0.9	30.2	8.1	0.9	*	*
S6	1.74	6.3	0.9	30.1	8.0	0.8	*	*
S7	2.53	6.6	0.9	30.5	8.2	0.8	*	*
S8	1.68	6.5	0.8	30.3	8.1	0.8	*	*
S9	1.62	6.5	1.5	31.3	8.0	1.2	*	*
S10	1.14	6.6	1.2	31.1	8.2	1.1	*	*
3.1	3.23	7.1	1.1	25.9	8.1	2.5	260	11.6
3.2	3.87	6.8	1.0	28.6	8.2	2.2	248	20.1
3.3	3.29	7.1	1.1	27.0	8.2	3.0	297	21.6
3.6	4.12	6.9	0.9	29.9	8.2	1.6	260	24.5
3.7	5.09	6.9	1.0	31.8	8.2	1.5	260	20.0
4.5	2.47	6.6	1.5	26.2	8.1	3.9	322	38.2
WB BOWL	A	A	A	A	A	A	A	A
WB ARM	B	A	B	B	B	B	B	B
SAB	C	B	C	C	C	C	C	A
Site	Secchi depth (m)	DO (mg/l)	Turbidity (NTU)	Salinity (ppt)	pH	Chl <i>a</i> (µg/l)	Total Nitrogen (µg/l)	Total Phosphorus (µg/l)