PROCEEDINGS

OF THE

THIRD SYMPOSIUM

ON THE

BOTANY OF THE BAHAMAS

Edited by
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DISTRIBUTION AND BIOMASS OF SEAGRASSES IN SAN SALVADOR, BAHAMAS

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ABSTRACT

Seagrasses were sampled during July, 1987, July, 1988 and December, 1988 at 11 sites around the island of San Salvador, Bahamas. Measurements of frequency, standing crop, biomass, leaf density, canopy cover, acetylene reduction, and chemical composition were determined for each seagrass species at various locations. Seagrass species occurance increased from July to December as did biomass for *Syringodium* and *Halodule*. *Thalassia* biomass during this period decreased. Low energy sites tended to have the following species frequency: *Thalassia* > *Syringodium* > *Halodule*. Higher energy sites appeared to favor the growth of *Syringodium*. Above- to below-sediment biomass ratios also increased in higher energy locations. Nitrogen fixation rates were overall higher in the phyllosphere than in the rhizosphere, but this was site/species dependent. Few significant differences were observed in tissue chemical composition among the three species or among sites. From these results specific sites were chosen for long term studies.

INTRODUCTION

Seagrasses play a major ecological role in shallow, tropical, marine ecosystems throughout the world's oceans (McRoy and Helfferich, 1977; Phillips and McRoy, 1980). These plants provide fixed carbon to other trophic levels through plant derived detritus and, to a somewhat lesser extent, direct herbivory (Ogden, 1976; Lewis, 1986). Some of the important factors which have an effect on seagrass growth include light intensity and quality (Dennison, 1987), temperature (Bulthuis, 1987), sediment nutrient status (Short, 1987), current velosity (Fonseca, 1987), and microbial interactions (Smith, 1987).

Seagrasses can exist in either monoculture or as diverse assemblages of species (Hartog, den 1970). In the shallow waters of the Bahamian Islands, the species most often encountered are: *Thalassia testudinum*, *Syringodium filiforme* and *Halodule wrightii*. These three species frequently occur in common beds, although the relative porportion of each may vary. The distribution and species composition of tropical seagrass beds may be influenced by similar factors that affect overall growth (Buesa, 1975; McMillan, 1979; Williams and McRoy, 1982; Smith et al., 1984; Short et al., 1985), but very few studies have considered a variety of physical, biological and chemical processes which may determine seagrass bed composition and assemblages.

This communication reports progress of a study begun in July, 1987 designed to determine the composition and distribution of seagrass bed assemblages around San Salvador Island and biophysiochemical factors that influence specie dynamics at selected sites.

MATERIALS AND METHODS

Sample Collection and Processing

Seagrass samples were collected in July, 1987, July, 1988 and December, 1988. Sample sites included Grahams Harbor, Rice Bay, East Beach, Barker's Point, French Bay and Pigeon Creek (see Figure 1 and Site below). In July,

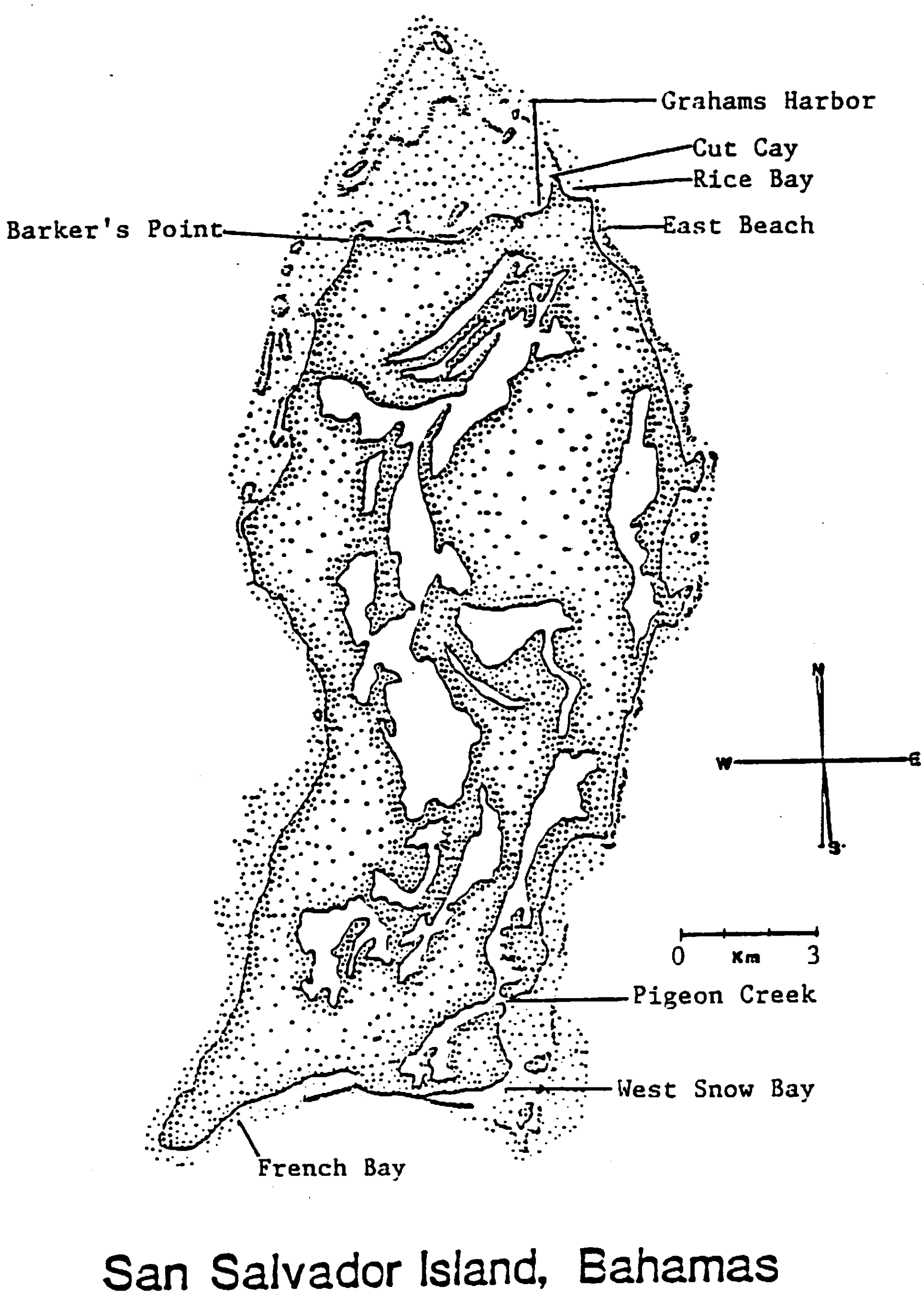

Fig. 1. Map of San Salvador, Bahamas showing sample sites.

1987 only above sediment portions of the seagrasses were collected. This was performed by establishing a marked transect line through the grass beds, and randomly dropping three 0.02 m^2 quadrants every two meters. Seagrasses falling within the quadrant were then cut with sissors at the sediment level and placed in marked bags. Samples taken July and December, 1988 were similarly obtained except that root-rhizome material was also extracted from the beds to a depth of about 15 cm with a trowel.

All grass samples were immediately returned to the laboratory and (with exception of samples used for acetylene reduction) were acid washed in approximately 0.1 N HCl. Plants were sorted into species and root-rhizomes were separated from the stem-leaves (1988 samples). Canopy cover was estimated by measuring the longest leaf for each species in a sample (December, 1988) or by measuring all leaf lengths from separate transects (July, 1987, 1988). Samples were then dried in an oven at 80°C for 48 h after which dry weights were determined.

Acetylene Reduction and Chemical Composition

Nitrogen fixation measurement were made on the July, 1988 samples using the acetylene reduction method of Hardy et al. (1968) and Steward et al. (1967) as modified by Smith and Hayasaka (1982). Acetylene (5 ml) were added to 50 ml syringes containing the seagrass samples. Subsamples were removed every two hours, for six hours and held in evacuated capped test tubes until analyzed. Analysis of evolved ethylene was made on a gas chromatograph equipped with a flame ionization detector and Poropak R column. The amount of ethylene produced was calculated based on the percentage of ethylene produced compared with acetylene remaining over time. This was converted to rates of ethylene evolution per hour and expressed on a sample gram dry weight basis.

For seagrass chemical composition, replicated tissue samples were combined, ground to pass in a 20-mesh (841 μm sieve) Wiley mill, and then redried. Samples of 1.000 ± 0.003 g were then dry ashed at 500°C for 4 hours and analyzed for P, K, Ca, Mg, Zn, Mn, Fe, Cu and B using either inductive-coupled plasma spectrophotometry (ICP) or atomic absorption spectrophotometry (AA) as described by the Council on Soil Testing and Plant Analysis (1974). Nitrogen was determined by Kjeldahl analysis (Brenner, 1965).

Statisical comparisons were made using SAS (SAS Institute Inc., Box 8000, Cary, NC 27511) or Ecological Analysis (Oakleaf Systems, P.O. Box 472, Decorah, IA 52101).

Site Descriptions

Grahams Harbor. This site was sampled each time. One particular bed, approximately 50 m offshore, was chosen for long-term monitoring. During July, 1987, both the 'dock' and 'low-energy' sites were a continuous bed, consisting of all three seagrass species. The July and December, 1988, samples were from the 'low-energy' section of the bed. This site is protected from oceanic currents by fringing reefs and the bed is approximately 3 m in depth at mean low tide. The 'Cut Cay' site is also in Grahams Harbor, but is approximately 1.5 m in depth at mean low tide (MLT). This site was about 50 m from a shallow eroded cut through the North Point peninsula and therefore was more influenced by tidal currents channeled through the cut. This site was sampled December, 1988.

Rice Bay. This site was east of Grahams Harbor and located at the northeast corner of the island. Rice Bay is protected by fringing reefs ,but is much more heavily impacted by North Atlantic currents and storm surges. The seagrass bed was surrounded by patch reefs which augmented the higher current velocity by channeling waters over the bed. Depth was approx. 6 to 8 m at MLT. This site was sampled July and December, 1988.

East Beach. This was the least protected, highest energy, site of all. Two beds, a *Syringodium* dominated and *Thalassia* dominated bed, were selected for sampling. Both beds were bordered by patch reefs. This site was sampled July and December, 1988. The sampling depth was about 8 m at MLT.

Barker's Point. This site was located at the northwestern corner of the island. All three species were found at this site although *Thalassia* dominated. Sampling was only during December, 1988. The bed was approximately 70 m west of the point. Current velocities were greater than Grahams Harbor but less than Rice Bay or East Beach. The sampling depth was about 3 m at MLT.

French Bay. Two beds were sampled at this site in July, 1988. One bed was leeward of a series of patch reefs at a depth of about 10 m at MLT, approximately 80 m offshore. A shallow

Table 1. Frequency of Seagrass Occurance Among Sampled Beds in San Salvador, Bahamas (July, 1988).

Site	Number of Quadrants	% Containing Thalassia	%Containing Syringodium	% Containing Halodule
Grahams Harbor	39	97	77	44
Rice Bay	36	22	100	8
French Bay (shallow)	24	75	79	0
French Bay (deep)	18	100	89	0
West Snow Bay	42	100	55	7
East Beach (T. bed)	16	100	19	0
East Beach (S. bed)	24	33	96	0
Total	199			
Average per site		75	74	8

bed (less than 2 m) was also sampled about 20 m offshore. This site is near the southwestern corner of the island.

West Snow Bay. This site was sampled July, 1988. The bed was approximately 40 to 50 m offshore and was relatively low-energy and shallow, about 2 m in depth at MLT.

Pigeon Creek. A shallow bed (less than 1 m) was sampled in July, 1987 and December, 1988. The shallow bed had received sediment from the outflow of Pigeon Creek and seemed to be in a transitional state. This bed was about 40 m offshore. In December, a deeper (2.5 m) site that had not received the sediment inpact was also sampled. This site was about 100 m offshore.

RESULTS

The occurance of seagrass species within the beds was not homogeneous in most cases during the July 1988 sampling period (Table 1). Most sites were dominated by *Thalassia*, although Rice Bay and East Beach (S. bed) were dominated by *Syringodium*. *Halodule* was found in only three of the seven sites and in two of these, it was only a minor component. Among all seven sites, *Thalassia* existed in dual beds with *Syringodium* and each species was found in three-quarters of all quadrants taken, *Halodule* was found in only eight percent while *Thalassia* and *Syringodium* occurred in approximately 75% of all quadrants.

All three species increased in occurance between the July and December sampling (Table 2) and the overall distribution was more homogeneous although some specific sites were dominated by either *Thalassia* or *Syringodium*. Among the sites sampled in both July and December, 1988, an increase in occurance of about 25% was observed from all quadrants taken from common beds (Figure 2). The percent change in all sites, after normalization for differences in number of quadrants per site, was greatest for *Halodule* (18%) and least for *Thalassia* (8%).

Biomass measurements (Table 3 and 4) indicated specific species distributions associated with the energy levels of various sites. For

Table 2. Frequency of Seagrass Occurance among Sampled Beds in San Salvador, Bahamas (December, 1988).

Site	Number of Quadants	% Thalassia	% Syringodium	% Halodule
Grahams Harbor	29	100	100	79
Grahams Harbor (cut)	36	100	100	53
Rice Bay	16	89	100	56
East Beach (T-bed)	9	100	100	0
East Beach (S-bed)	12	67	100	0
Barkers Point	18	100	83	22
Pigeon Creek (shallow)	9	100	100	0
Pigeon Creek (deep)	9	100	11	0
Total	146			
Average per site		83	87	26

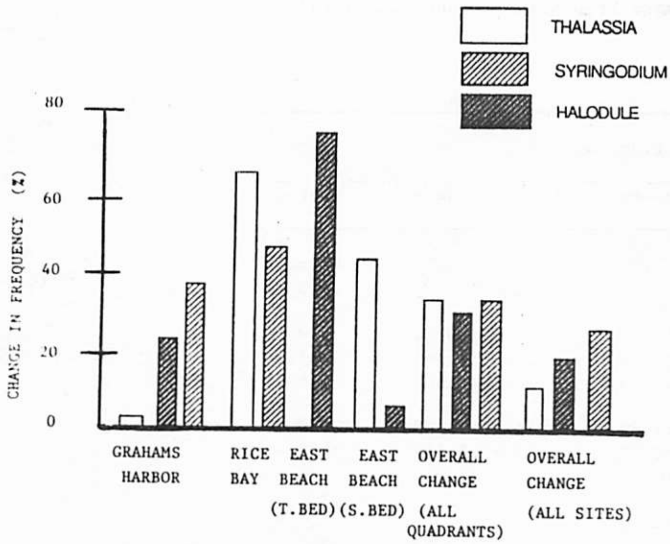

Fig. 2. Percent Change in Frequency of Seagrass Secies Occurance from July to December, 1988 in Common Beds.

example, in low-energy shallow sites (Grahams Harbor, West Snow Bay, Pigeon Creek, Barkers Point and the shallow site of French Bay) the dominant seagrass was *Thalassia.* The dominant species varied between *Thalassia* and *Syringodium* among the higher energy sites.

Also, root-rhizome material accounted for a greater proportion of the total biomass in lower-energy sites than in high energy sites. This was particularly apparent at French Bay, where deep and shallow sites had a similar biomass, but the distribution of above and below sediment tissue varied significantly. Nevertheless, biomass, species, and plant-part profiles around the island as a whole, were similar to the profiles of low-energy sites. *Thalassia* biomass was generally greater in sites from the south side of the island compared to north-side sites.

Changes in overall biomass from July to December among sites sampled both times were greatest for *Halodule* which exhibited increases

Table 3. Seagrass Standing Crop and Biomass from Sites around San Salvador, Bahamas in (July, 1988).

		g dry wt. m^{-2}		
Site	Plant	Stem-leaves	Root-Rhizomes	Total
Grahams Harbor	Thalassia	18.00±2.50	79.00±15.5	97.00
	Syringodium	4.20±0.65	15.25±2.85	19.45
	Halodule	2.05±0.40	4.20±0.95	6.25
Rice Bay	Thalassia	2.00±0.80	3.00±1.70	5.00
	Syringodium	32.85±7.00	80.50±14.30	113.35
	Halodule	1.30±1.50	2.00±1.75	3.30
East Beach (Syringodium bed)	Thalassia	36.05±16.00	14.10±7.05	50.15
	Syringodium	179.25±24.30	176.90±21.10	356.15
East Beach (Thalassia bed)	Thalassia	229.00±40.15	357.40±83.2	586.40
	Syringodium	1.15±1.15	6.45±3.90	7.60
French Bay (shallow)	Thalassia	96.50±15.5	268.50±3.50	365.0
	Syringodium	9.15±2.50	16.80±3.90	25.95
French Bay (deep)	Thalassia	181.50±28.50	141.00±37.50	322.50
	Syringodium	17.25±3.25	29.50±6.60	46.75
West Snow Bay	Thalassia	46.10±6.80	336.15±42.70	382.25
	Syringodium	3.10±0.45	11.60±3.50	14.70
	Halodule	0.35±0.20	0.35±0.20	0.70
Mean All Quadrants	Thalassia	64.43	162.37	226.98
	Syringodium	31.79	46.55	78.34
	Halodule	0.71	1.26	1.97
Mean Per Site	Thalassia	86.86	172.47	259.33
	Syringodium	35.28	48.14	83.42
	Halodule	0.53	0.93	1.46

Table 4. Seagrass Standing Crop and Biomass from Sites around San Salvador, Bahamas in (December, 1988).

		g dry wt m^{-2}		
Site	Plant	Stem-leaves	Root-Rhizomes	Total
Grahams Harbor	Thalassia	29.05±3.25	122.55±16.70	151.60
	Syringodium	4.75±0.50	21.55±2.70	26.30
	Halodule	2.55±0.50	16.50±3.00	19.05
Grahams Harbor (Cut Cay)	Thalassia	44.30±3.85	105.50±10.50	149.80
	Syringodium	10.35±1.20	20.95±2.30	31.30
	Halodule	1.90±0.55	4.90±1.50	6.80
Rice Bay	Thalassia	20.90±4.80	48.45±12.90	69.35
	Syringodium	62.50±8.40	94.95±9.55	157.45
	Halodule	3.10±0.95	8.45±2.90	11.55
East Beach (Syringodium bed)	Thalassia	35.00±8.50	8.95±5.15	43.95
	Syringodium	166.10±16.15	116.45±12.50	282.55
East Beach (Thalassia bed)	Thalassia	72.95±13.55	25.05±10.95	98.00
	Syringodium	37.55±8.10	37.80±7.25	75.35
Barkers Point	Thalassia	31.95±5.35	157.15±18.20	189.10
	Syringodium	3.15±0.70	8.75±1.80	11.90
	Halodule	0.25±0.15	0.65±0.30	0.90
Pigeon Creek (shallow)	Thalassia	69.65±8.95	423.65±43.60	493.30
	Syringodium	4.10±1.10	14.05±3.00	18.15
Pigeon Creek (deep)	Thalassia	222.15±26.70	598.60±87.20	820.75
Mean All Quadrants	Thalassia	48.28	149.84	198.12
	Syringodium	26.95	55.27	82.22
	Halodule	1.31	6.97	8.28
Mean Per Site	Thalassia	65.74	186.24	251.98
	Syringodium	36.06	39.32	75.38
	Halodule	0.98	3.81	4.79

of over 200 percent in both Grahams Harbor and Rice Bay (Table 5). There was also an overall increase in *Syringodium* biomass (less than 10 percent), but a decrease in *Thalassia* biomass (almost 50 percent).

Syringodium leaf density was greatest in high-energy sites, as were longest leaf measurements for both *Syringodium* and *Thalassia* (Table 6). Leaf density was approximately double for *Thalassia* in Pigeon Creek compared with other sites. Leaf density was somewhat similar among the Grahams Harbor sites.

Table 5. Percent Change in Total Biomass from July to December, 1988 in Common Beds.

	Percent Change in g dry wt m^{-2}		
Site	Thalassia	Syringodium	Halodule
Grahams Harbor	+56.29	+35.22	+204.80
Rice Bay	+1287.00	+38.95	+250.00
East Beach (Thalassia bed)	-83.29	+891.45	------
East Beach (Syringodium bed)	-12.36	-20.67	------
Overall Change (all quadrants)	-65.46	+9.56	+248.51
Overall Change (all sites)	-49.13	+9.18	+229.03

Table 6. Leaf Density and Canopy Cover (Longest Leaf Measurement) (July, 1988).

Site	Genus	Number of Leaves m^{-2}	Mean Longest Leaf (cm)
Grahams Harbor (July, 1988)	Thalassia	434.5±21.5	12.35±0.56
	Syringodium	450.0±37.5	9.58±0.54
	Halodule	357.0±36.0	8.55±0.49
Grahams Harbor	Thalassia	319.5±40.5	19.12±0.87
	Syringodium	448.5±52.5	-----
	Halodule	465.5±88.5	-----
Grahams Harbor (Cut Cay)	Thalassia	425.0±34.5	19.26±0.55
	Syringodium	675.0±87.0	-----
	Halodule	209.5±59.0	-----
Rice Bay	Thalassia	158.5±31.0	27.39±2.18
	Syringodium	1969.5±214.5	25.91±1.31
	Halodule	219.5±58.0	-----
East Beach (Syringodium bed)	Thalassia	72.0±21.0	36.92±1.76
	Syringodium	3691.5±375.5	30.97±1.10
East Beach (Thalassia bed)	Thalassia	233.5±44.0	28.50±2.27
	Syringodium	1033.5±146.0	19.81±1.40
Barkers Point	Thalassia	558.5±62.5	12.71±0.60
	Syringodium	316.5±54.5	10.20±0.78
	Halodule	47.0±28.5	-----
Pigeon Creek (shallow)	Thalassia	1178.0±94.0	12.70±0.41
	Syringodium	572.0±116.0	-----
Pigeon Creek (deep)	Thalassia	1183.5±125.0	21.88±1.69

Table 7. Mean Acetylene Reduction Rates Associated with Seagrasses from San Salvador, Bahamas (July, 1988).

Site	Genus	Part	average[1] nmoles C_2H_2 h gdw^{-1}	(S.E.)[1]
Grahams Harbor	Thalassia	Stem-Leaves	1250	(798)
		Root-Rhizomes	2190	(1661)
	Syringodium	Stem-Leaves	1750	(203)
		Root-Rhizomes	815	(195)
	Halodule	Plant	2706	(688)
Rice Bay	Thalassia	Stem-Leaves	1599	(205)
		Root-Rhizomes	534	(60)
	Syringodium	Stem-Leaves	1248	(96)
		Root-Rhizomes	261	(16)
	Halodule	Stem-Leaves	1458	(212)
		Root-Rhizomes	1174	(98)
French Bay (shallow)	Thalassia	Stem-Leaves	1565	(277)
		Root-Rhizomes	580	(128)
	Syringodium	Stem-Leaves	861	(251)
		Root-Rhizomes	1532	(697)
French Bay (deep)	Thalassia	Stem-Leaves	770	(63)
		Root-Rhizomes	1039	(393)
	Syringodium	Stem-Leaves	1449	(97)
		Root-Rhizomes	961	(184)
West Snow Bay	Thalassia	Stem-Leaves	357	(51)
		Root-Rhizomes	452	(26)
	Syringodium	Stem-Leaves	4849	(719)
		Root-Rhizomes	1549	(367)
East Beach (Thalassia Bed)	Thalassia	Stem-Leaves	1804	(1131)
		Root-Rhizomes	2564	(1693)
	Syringodium	Stem-Leaves	1635	(42)
East Beach (Syrigodium Bed)	Thalassia	Stem-Leaves	25337	(23498)
		Root-Rhizomes	364	(42)
	Syringodium	Stem-Leaves	709	(97)
		Root-Rhizomes	4710	(3824)

[1] Each average and standard error (S.E.) were calculated from between 5 to 1 observations.

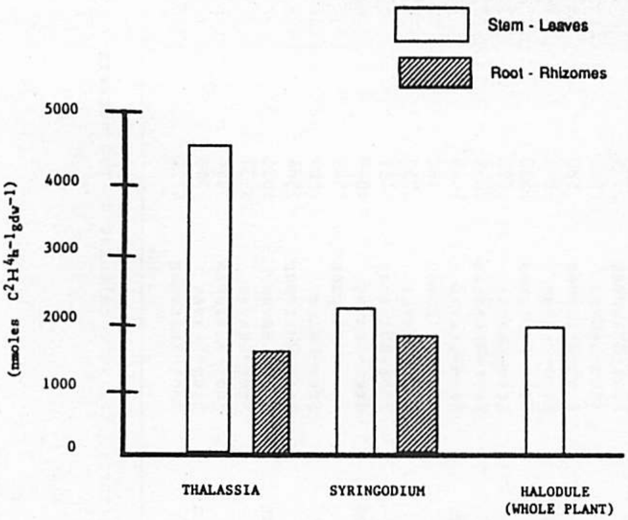

Fig. 3. Overall C_2H_2 Reduction Associated with Seagrasses in San Salvador, Bahamas (Sampling dates included in means).

Acetylene reduction measurement varied from a low of 261 nmoles gdw^{-1} for *Syringodium* root-rhizomes in Rice Bay to a high of 25,337 nmoles gdw^{-1} for *Thalassia* stem-leaves in East Beach (Table 7). No particular trend was noticed except that overall, stem-leaves appeared to exhibit higher rates than root-rhizomes (Figure 3).

The chemical composition of seagrasses from San Salvador (Table 8 and 9) fell within previously reported ranges (Short et al, 1985). Percentage carbon was lower for *Syringodium* than the other species and potassium concentrations varied for *Syringodium* depending on the site (Table 8). Zinc concentrations were higher for *Halodule* over other species (Table 9). An analysis of variance showed that the only statistically significant differences in tissue chemical composition were: *Syringodium* was significantly lower in percentage carbon than the other species (Table 10), and *Halodule* had a significantly higher concentration of zinc (Table 11).

Analysis of Variance of tissue chemistry among the two sites in Grahams Harbor and one in Pigeon Creek indicated a significant increase in tissue nitrogen associated with plants growing near the dock (Table 12). Also, at the Grahams Harbor low-energy site, phosphorus, potassium, and magnesium concentrations were significantly lower than most other sites.

DISCUSSION

In the carbonate sediments of San Salvador, *Thalassia* tends to occur more frequently and with greater biomass in shallow low-energy sites, than either *Syringodium* or *Halodule*. Whereas *Syringodium* exhibits greater frequency, biomass and leaf density in deeper, higher-energy sites.

Table 8. Selected Nutrient Composition (% ash-free dry weight) of Seagrass Leaves (July, 1987).

Species	Location		C	S	P	K
Halodule	Grahams Harbor (low energy)	1.42[1]	35.37	0.32	ND[2]	ND
	Pigeon Creek	1.64	37.98	0.54	0.054	2.06
Syringodium	Grahams Harbor (dock)	1.57	32.67	0.33	0.059	2.77
	Grahams Harbor (low energy)	1.37	31.38	0.22	0.047	0.98
	Pigeon Creek	1.27	32.19	0.72	0.065	1.70
Thalassia	Grahams Harbor (dock)	1.91	35.65	0.16	0.055	2.36
	Pigeon Creek	1.63	35.94	0.25	0.059	2.16

[1] Values represent means of three observations.

[2] ND - not done.

Table 9. Selected Macro- and Micro-nutrient Composition of Seagrass Leaves (July, 1987).

Species	Location	Ca	Mg [1]	Fe [2]	Zn [2]	B [2]
<u>Halodule</u>	Pigeon Creek	0.46 [3]	0.63	81	90	85
<u>Syringodium</u>	Grahams Harbor (dock)	0.30	0.48	110	57	69
	Grahams Harbor (low energy)	0.86	0.32	79	15	109
	Pigeon Creek	0.99	0.41	89	49	95
<u>Thalassia</u>	Grahams Harbor (dock)	1.50	0.56	56	10	106
	Pigeon Creek	1.78	0.58	67	13	121

[1] % Ash-free dry weight.

[2] ppm

[3] Values represent means of three observations.

Table 10. Leaf Nutrient Composition (%AFDW) of three Seagrass Species (July, 1987).

Genus	N	C	S	P	K
Thalassia	1.75A [1]	35.82A	0.21A	0.058A	2.24A
Halodule	1.53AB	36.68A	0.43A	0.054A	2.06A
Syringodium	1.39A	32.01B	0.44A	0.57A	1.54A

[1] Means with the same letter are not significantly different according to Duncan's Multiple Range Test ($P < 0.05$).

Table 11. Leaf Nutrient Composition (% AFDW) of three Seagrass Species (Jul 1987).

Genus	Ca [1]	Mg [1]	Fe [2]	Zn [2]	B [2]
Thalassia	1.68A [3]	0.58A	63A	12B	115A
Halodule	0.46A	0.63A	81A	90A	85A
Syringodium	0.83A	0.39A	88A	36B	96A

[1] %AFDW

[2] ppm

[3] Means with in a column followed by the same letter are not significantly different according to Duncan's Multiple Range test ($P < 0.05$).

Table 12. Seagrass Nutrient Composition (%AFDW) at Different Sites (July, 1987).

Site	N	C	S	P	K
Grahams Harbor (dock)	1.83A [1]	34.99A	0.19A	0.56AB	2.42
Grahams Harbor (low energy)	1.39B	32.38A	0.25A	0.046B	0.98
Pigeon Creek	1.55B	35.23A	0.38A	0.060A	2.05

[1] Means within a column followed by the same letter are not significantly different according to Duncan's Multiple Range Test ($P < 0.05$).

Table 13. Seagrass Leaf Nutrient Composition among Different Sites (July, 1987).

Site	Ca[1]	Mg[1]	Fe[2]	Zn[2]	B[2]
Grahams Harbor (dock)	1.33A[3]	0.55A	64A	17A	98A
Grahams Harbor (low energy)	0.86A	0.32B	79A	15A	110A
Pigeon Creek	1.52A	0.55A	73A	26A	110A

[1]%AFDW

[2]ppm

[3]Means within a column followed by the same letter are not significantly different according to Duncan's Multiple Range Test ($P < 0.05$).

All species, particularly *Halodule*, exhibited an increase in growth between the period of July and December. We believe this is due to normal seasonal variation. Seagrass population fluctuations appeared less predictable in deeper, high-energy areas, perhaps due to the influence of currents having a greater effect on growth than normal seasonal variation.

Below to above ground biomass ratios were higher in low-energy areas (Tables 3 and 4). This may indicate that microbial sediments nutrient transformations may be more important in low-energy areas. This also indicates that nutrient extraction from the water column may be of greater significance in high-energy areas.

Although a few species-site differences were observed relating to nitrogen fixation and tissue chemistry (Tables 7, 8 and 9), no trend was observed in these parameters that would indicate a significant role in determining seagrass distribution.

Studies are continuing on seagrass distribution and growth in San Salvador in order to understand seasonal and long-term fluctuations of these species in carbonate sediments and the effects that various environmental influences may play in modifying seagrass populations.

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