Keaton Beach Urchin Survey updates

Keaton Beach

Updates from June 2023

Big Bend Seagrasses Aquatic Preserves

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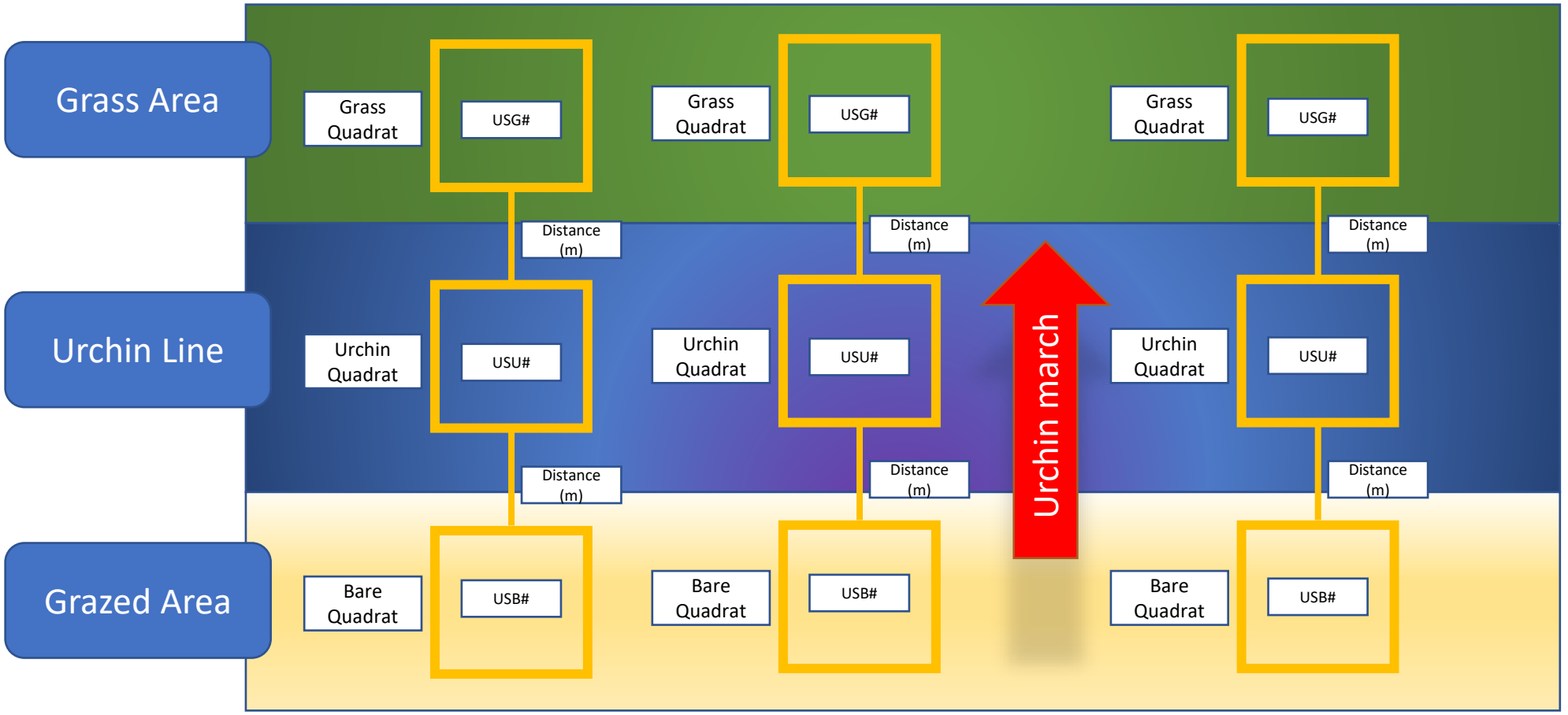
GPS coordinates taken while following the urchin line on 8 February 2023. The line extends from each end, staff had limited time to follow the full length. Aerial mapping is proposed to obtain better imagery. Urchin line is orange, green markers are continuous seagrass monitoring stations used yearly by BBSAP. Marked path is approximately 4 kilometers.

Original Survey Design

“tri-mix” method



April Survey Sites Length

Survey site 7 total transect length: 13m
USU07 placed at 6m mark

Only one tri-mix completed in April due to high winds limiting number of field days.

May Survey Sites Length

Survey site 8 total transect length: 26m.
USU08 placed at 13m mark

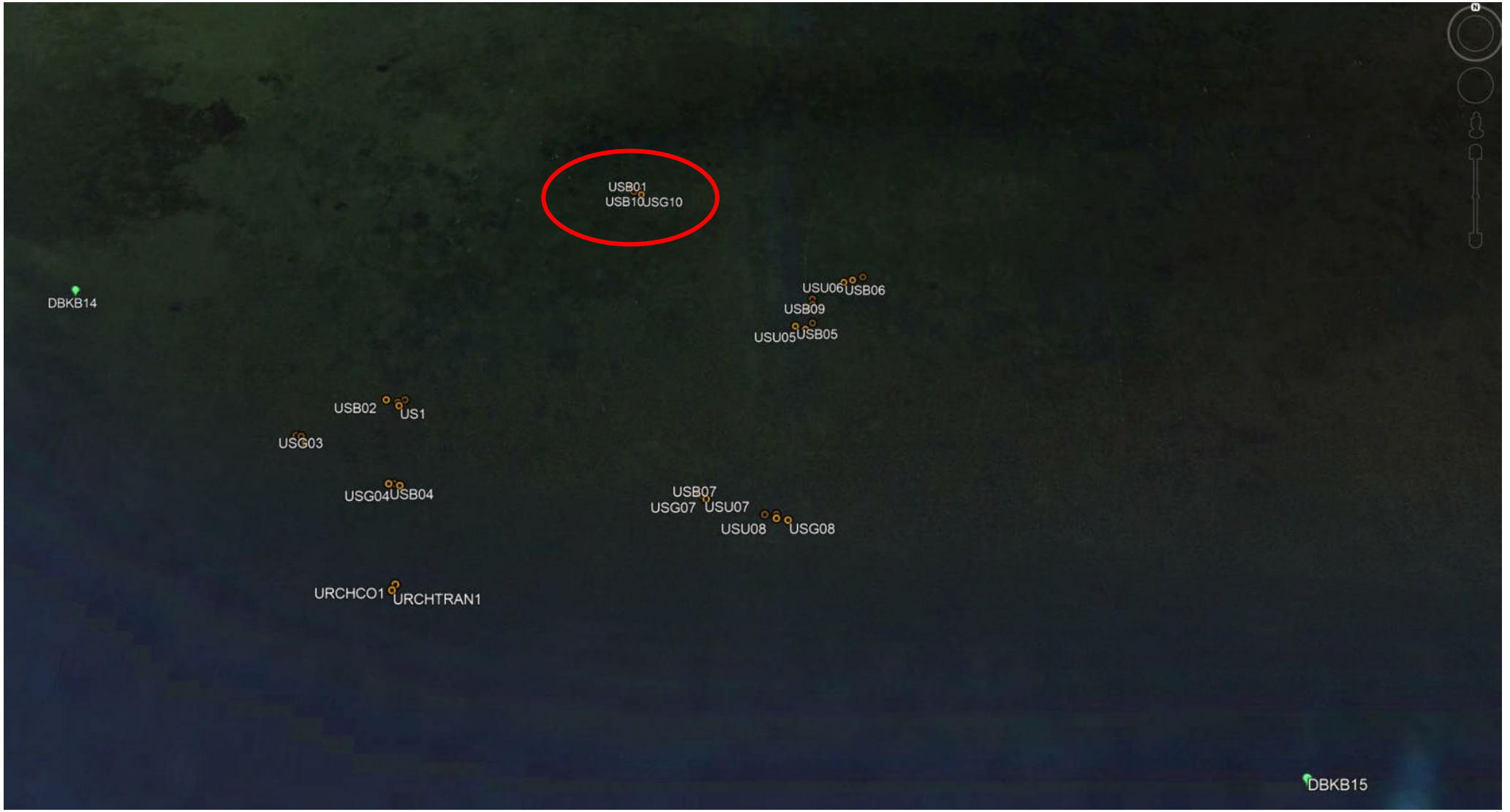
Survey site 9 total transect length: 16m.
USU09 placed at 8m mark

Survey site 10 total transect length: 21m.
USU10 placed at 11m mark

Site 10 was placed based on the coordinates of the original February site 01 sampling event.

Urchin survey sites labeled. USG11 is now the furthest survey inland.

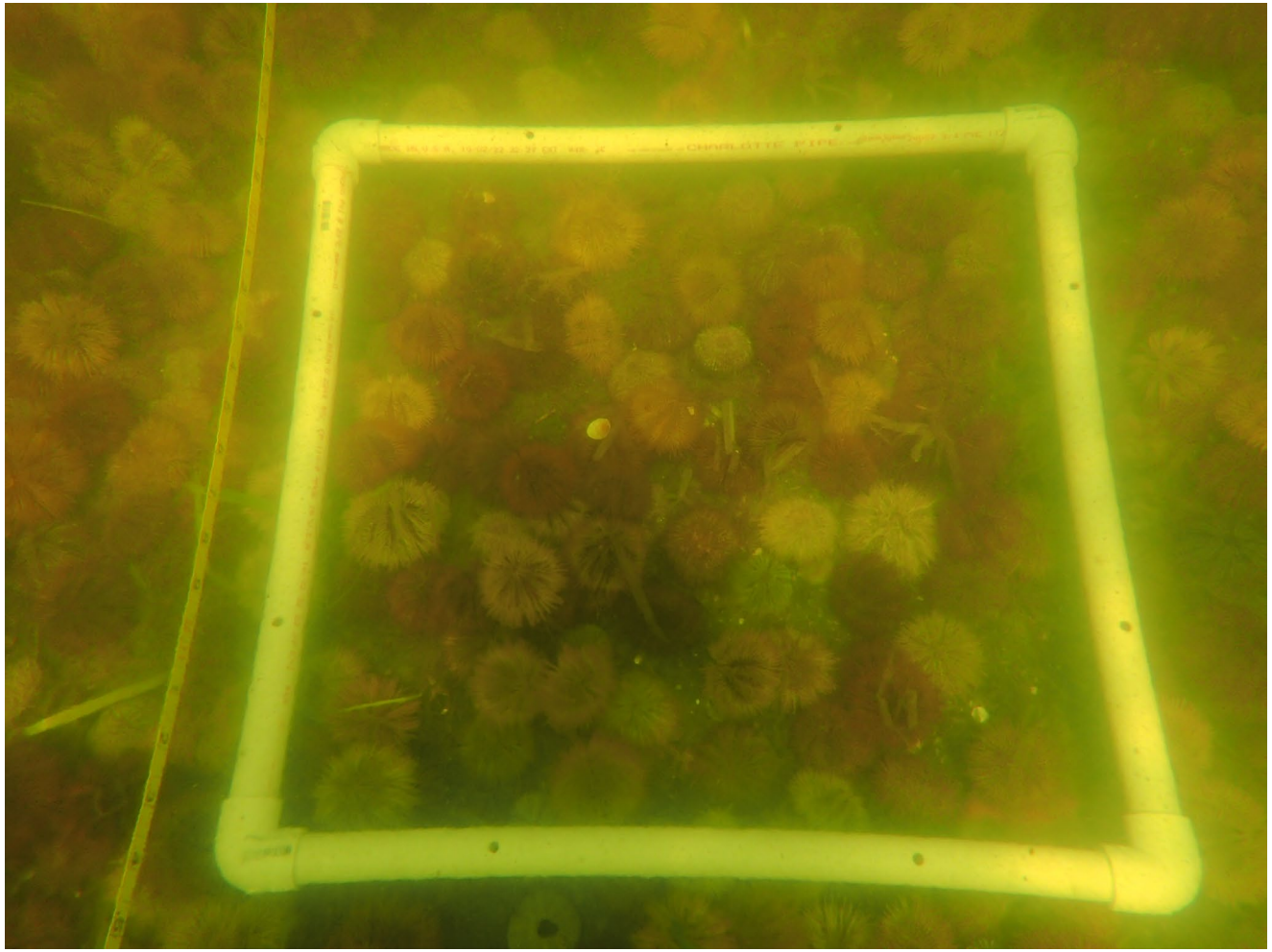
June site added in,it was found inland from USU08. The distance between USU07 (April) and USU08 (May) is 0.08km and the distance from USU08 to USU11 (June) is 0.07km. It appears that line is moving slowly forward at a similar rate between months.



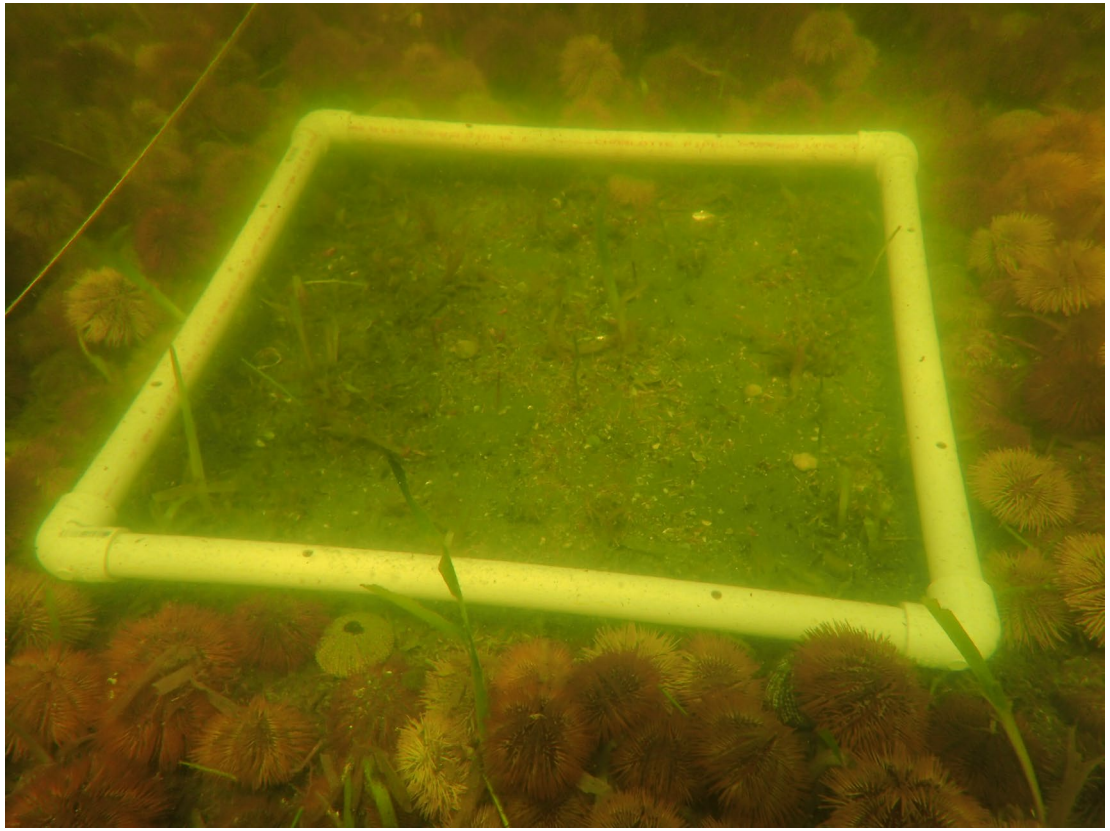
Another view of the previous slide. In the red circle is site USU01 and we completed USU10 (May) at the same coordinates to track any changes in that area.

Urchin Survey Quad 11

USU11
GPS:29.8041, -83.6218
Date: 06/30/2023



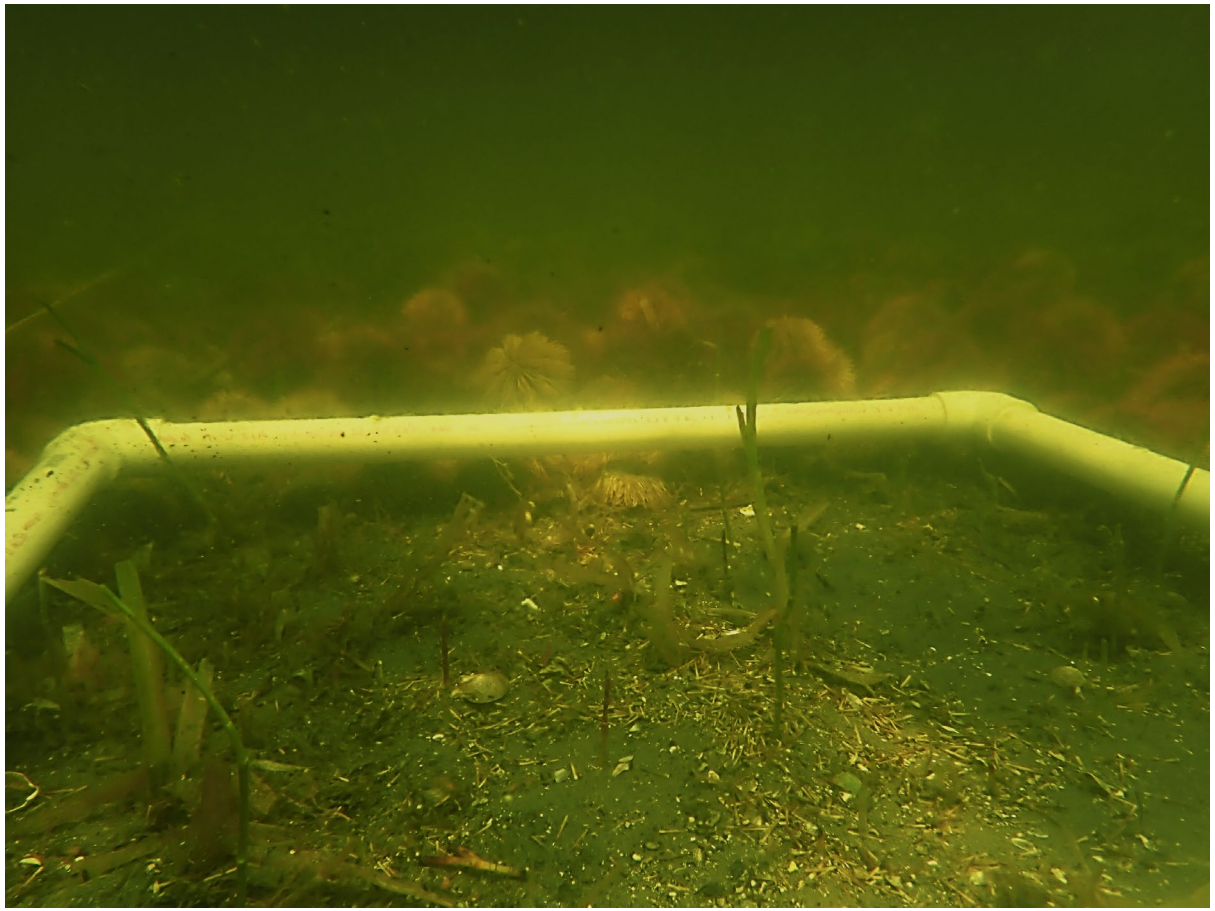
Full quad (0.25m^2)



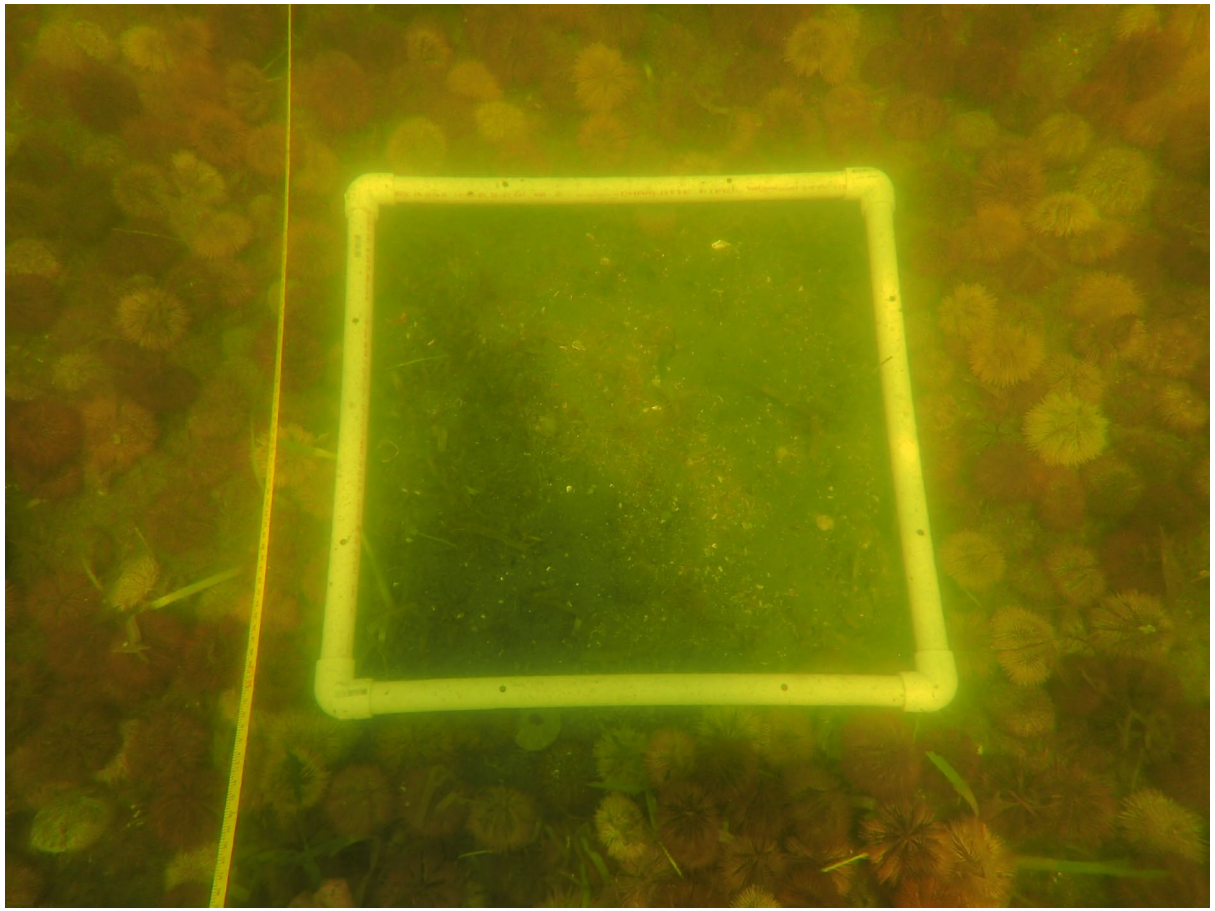
Grass after urchins removed for measurements

Urchin Survey Quad 11

USU11
GPS:29.8041, -83.6218
Date: 06/30/2023



Grass in USU11



Urchin density in area around USU11

Urchin Survey Quad 11

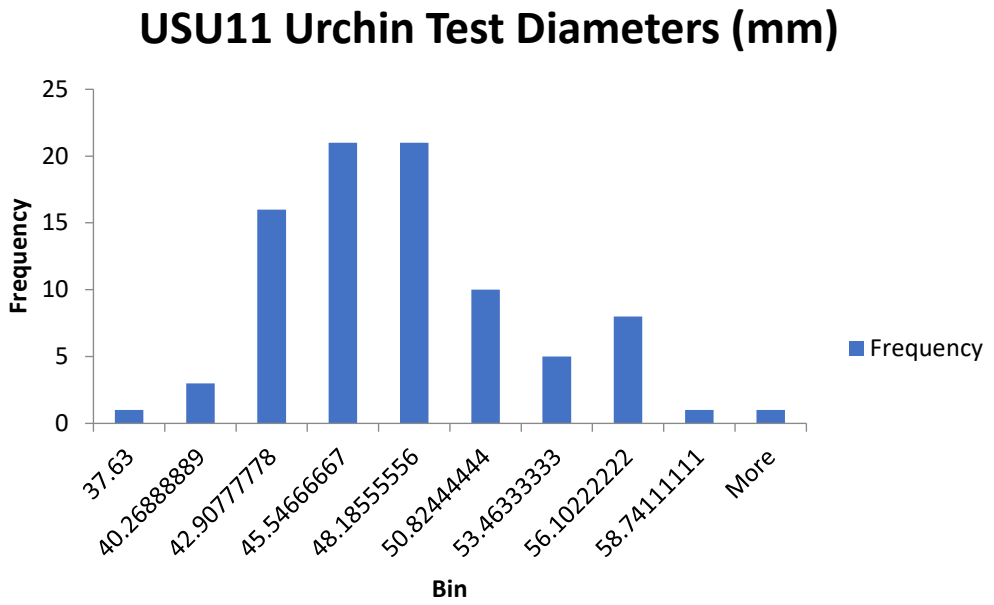
USU11
GPS:29.8041, -83.6218
Date: 06/30/2023

Date	Site Name	Type	SPECIES	PERCENT_COVER	Canopy Height (cm)	Canopy Height (cm)	Canopy Height (cm)	URCHINS	SCALLOPS	GRASS_ALGAE	TOTAL_SAV_PERCENT_COVER	TOTAL_GRASS_PERCENT	TOTAL_MACROALGAE_PERCENT	EPIPHYTE_DENSITY	SEDIMENT_TYPE	Rhizomes
6/30/2023	USU11	Urchin	SFIL	3	130	45	73	88	0	Grass	5	5	0	Clean	Sand Mud Shell	Yes
6/30/2023	USU11	Urchin	TTES	2	152	98	42			Grass						

Temp	DO (mg/L/)	Salinity	pH
29.7	7.37	27.75	8.03

Mean diameter (mm)	46.40195
Standard deviation	4.781977
Range	23.75
Minimum diameter (mm)	37.63
Maximum diameter (mm)	61.38
Total Urchin Count	87

Note: urchin diameter measured transversally, test to test



Sample sites US07,US08,and US11

Fig. 1

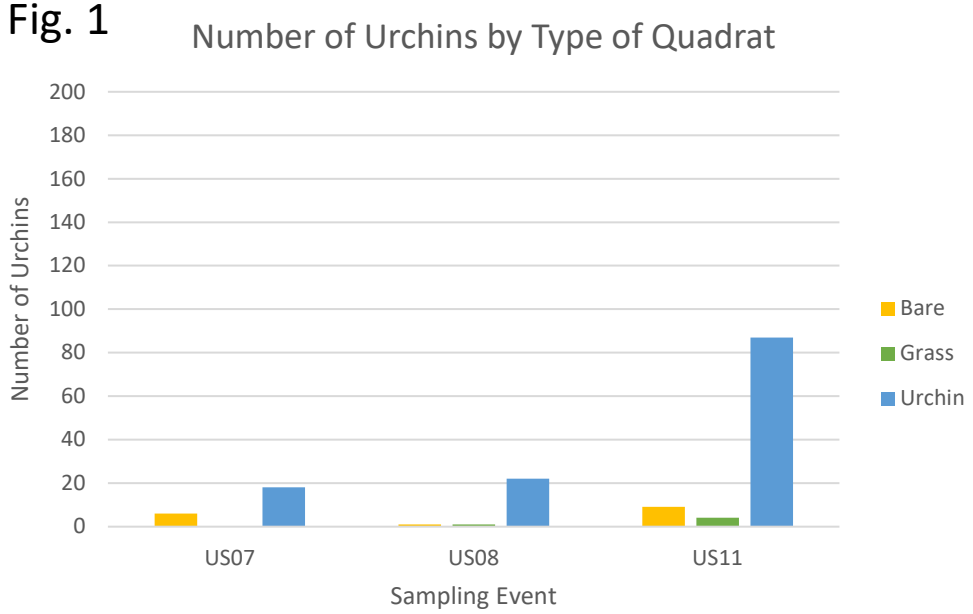


Fig. 2

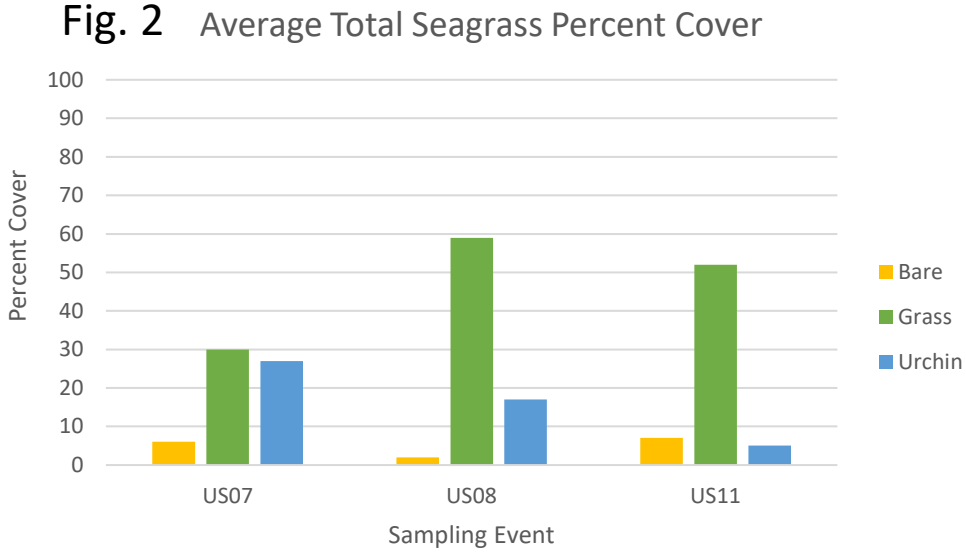


Figure 1: Urchins present in each quadrat at time of sampling event. USU11 (June) had the most urchins present in any quad. Figure 2: Total seagrass percent cover for each quadrat, US07 had the lowest grass coverage, US08 had the most coverage for Grass and Urchin, US11 had the highest percent cover for Bare. Figure 3: Average canopy height of all seagrass species present in quadrat. Figure 4: comparing the frequency of urchin diameters between sites, USU11 had the most urchins out of the three urchin quads with 87 in the quad, USU08 had the largest range in size, 31.74mm between the minimum-34.73mm and maximum-66.47.

Fig. 3

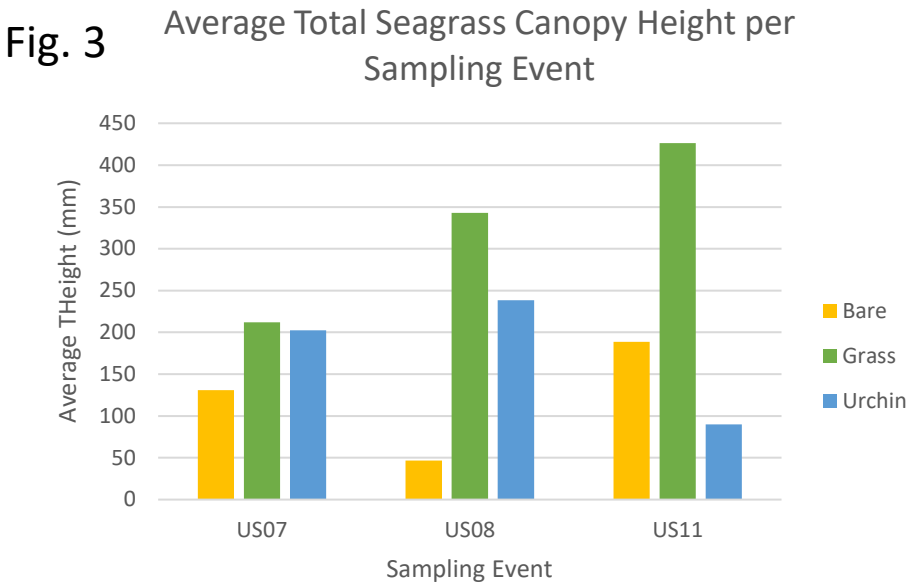
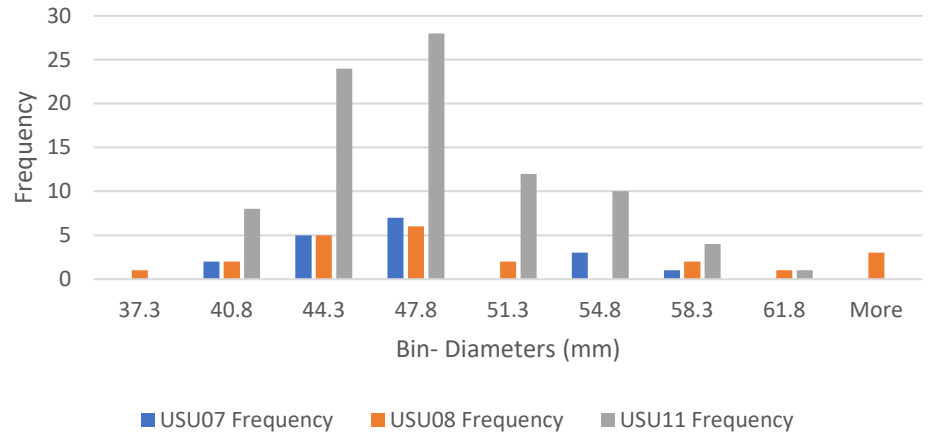


Fig. 4



Test	USU07	USU08	USU11
Mean	46.15944	48.34636	46.40195
Standard Deviation	4.880685	8.738806	4.781977
Range	17.54	31.74	23.75
Minimum	38.77	34.73	37.63
Maximum	56.31	66.47	61.38
Count	18	22	87

Urchin quads by the numbers

	Measured Test-Test	
	survey site	data
most urchins	USU04	196 urchins
widest range	USU04	34.56
smallest standard deviation	USU05	4.501674
largest average diameter (mm)	USU08	48.34636
smallest average diameter (mm)	USU06	40.01729
largest maximum diameter (mm)	USU04	68.25
smallest minimum diameter (mm)	USU06	31.5

	Measured spine-spine	
	survey site	data
widest range	USU02	42.68
smallest standard deviation	USU01	4.946864523
largest average diameter (mm)	USU03	66.64226415
smallest average diameter (mm)	USU02	55.82704403
largest maximum diameter (mm)	USU03	86.55
smallest minimum diameter (mm)	USU02	43.85

Test-test vs Spine-spine measurements

Location	Urchin_spine (mm)	Urchin_test (mm)	difference
USU04	57.95	40.01	17.94
USU04	74.15	54.36	19.79
USU04	62.11	48.06	14.05
USU04	67.29	48.81	18.48
USU04	65.86	45.61	20.25
USU04	65.5	49.42	16.08
USU04	64.71	49.08	15.63
USU04	64.57	45.59	18.98
USU04	65.68	47.61	18.07
USU04	60.25	46.01	14.24

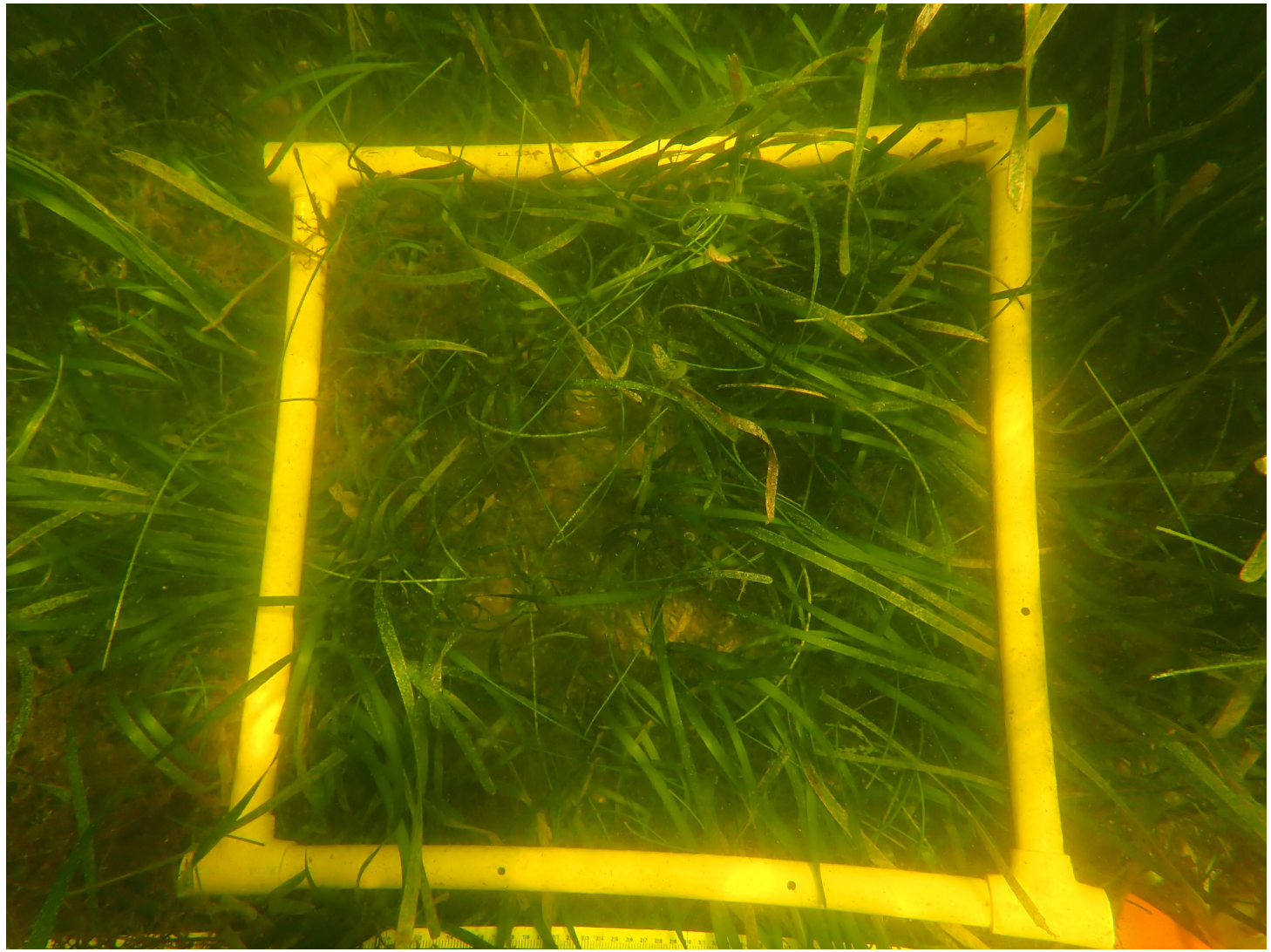
Average	17.351
St.Dev	2.104692
ST.err	0.701564
Av.Dev	1.8808

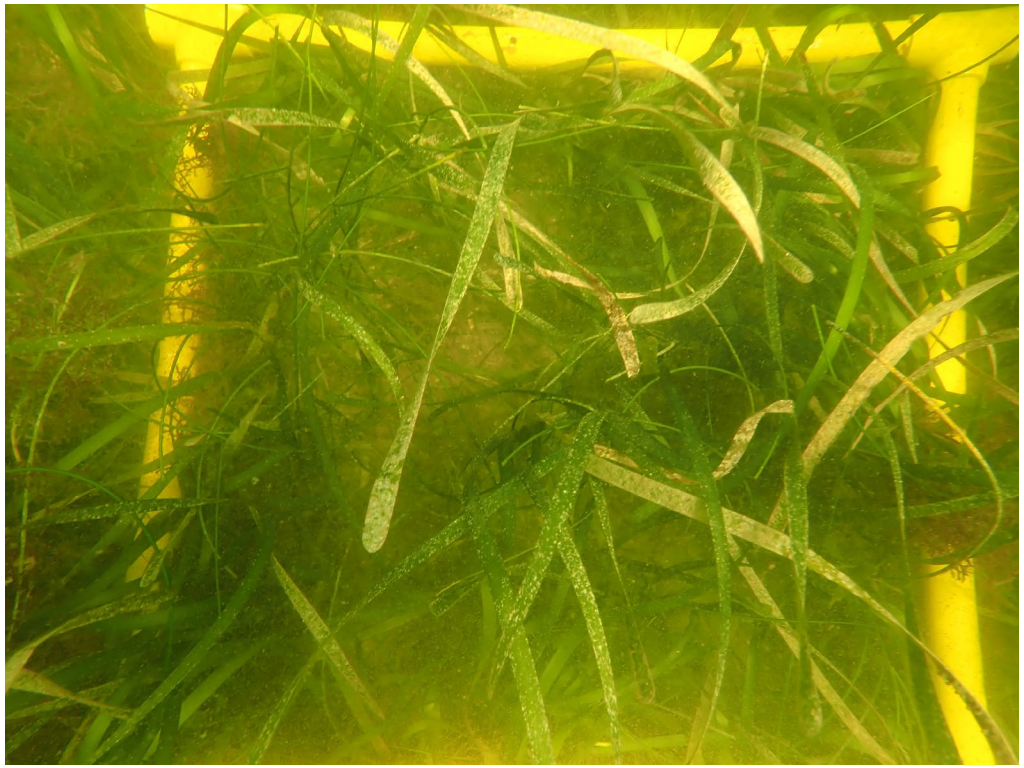
During the February surveys, urchins were measured spine to spine. For best science practices this was changed to test-test measurements in march. We measured 10 urchins both ways to see if we could figure out a way to adjust the February urchin measurements. The difference was found between the two measurements and descriptive statistics performed. They were similar in ranges, so individual spine size was estimated by halving the difference. The sample size is small and the urchins recorded at USU4 were similar in size so this method was not utilized since it would not be representative. Including it here if anyone is interested. Will try to collect more spine measurements in the future.

difference	estimated spine
17.94	8.97
19.79	9.895
14.05	7.025
18.48	9.24
20.25	10.125
16.08	8.04
15.63	7.815
18.98	9.49
18.07	9.035
14.24	7.12
Average	8.6755
St.Dev	1.052346
ST.err	0.350782
Av.Dev	0.9404

Urchin Survey Grass Quad

USG11
GPS: 29.80408, -83.6217
Date: 06/30/2023





Urchin Survey Grass Quad

USG11
GPS: 29.80408, -83.6217
Date: 06/30/2023

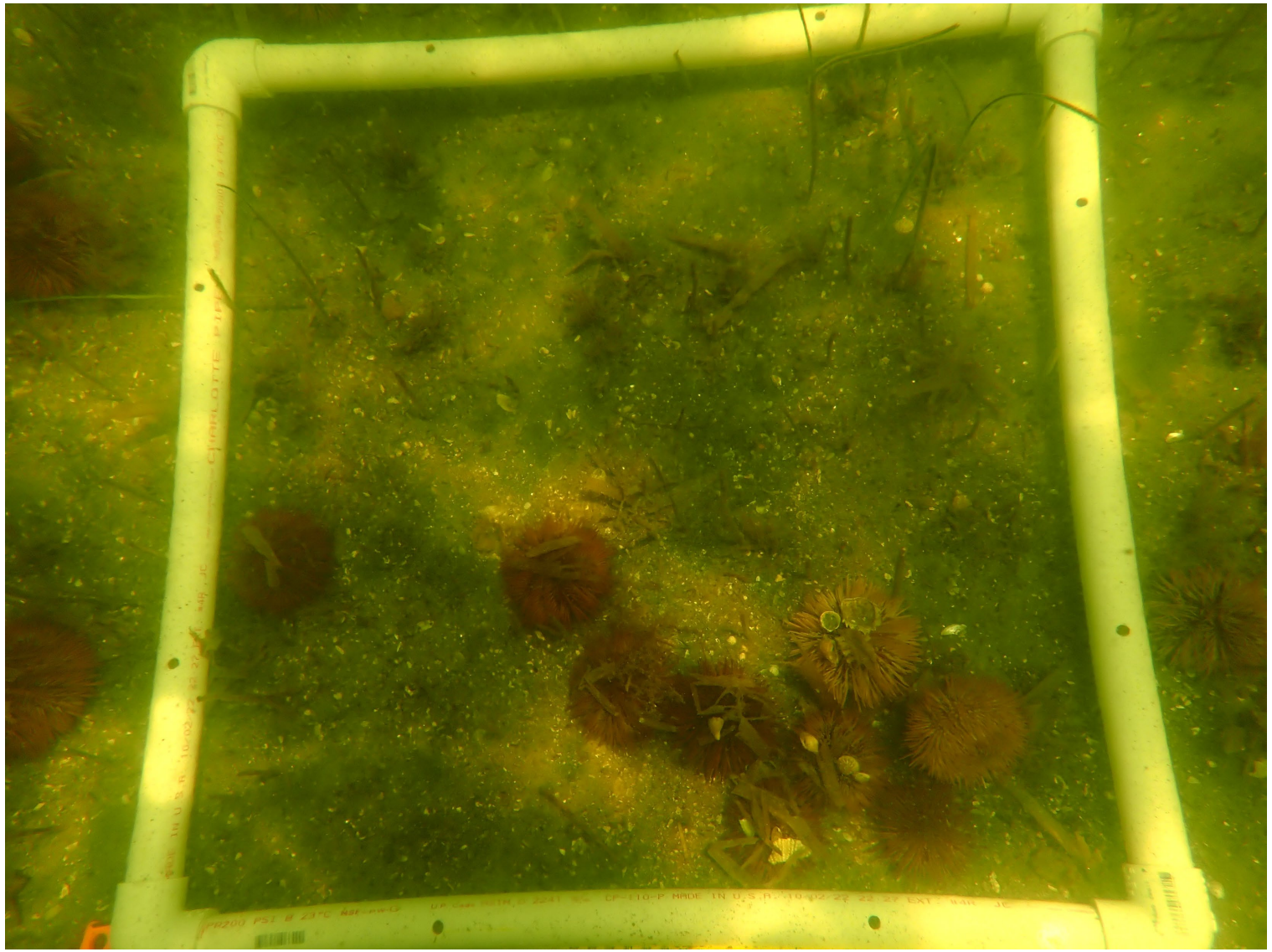
Data

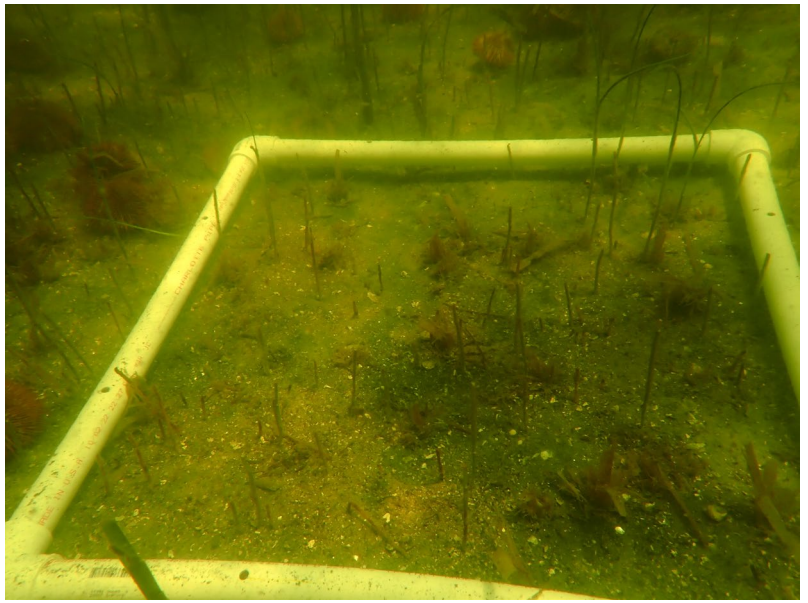
Date	Site Name	Type	SPECIES	PERCENT_COVER	Canopy Height (cm)	Canopy Height (cm)	Canopy Height (cm)	URCHINS	SCALLOPS	GRASS_ALGAE	TOTAL_SAV_PERCENT_COVER	TOTAL_GRASS_PERCENT	TOTAL_MACROALGAE_PERCENT	EPIPHYTE_DENSITY	SEDIMENT_TYPE	Rhizomes
6/30/2023	USG11	Grass	TTES	25	340	498	368	4	0	Grass	52	50	2	Light	Sand Mud Shell	Yes
6/30/2023	USG11	Grass	SFIL	25	335	507	511			Grass						
6/30/2023	USG11	Grass	HINC	2						Algae						
6/30/2023	USG11	Grass	Drift	20												

Temp	DO (mg/L/)	Salinity	pH
29.7	7.37	27.75	8.03

Urchin Survey Bare Quad

USB11
GPS:29.80411, -83.6218
Date: 06/30/2023





Urchin Survey Bare Quad

USB11
GPS:29.80411, -83.6218
Date: 06/30/2023

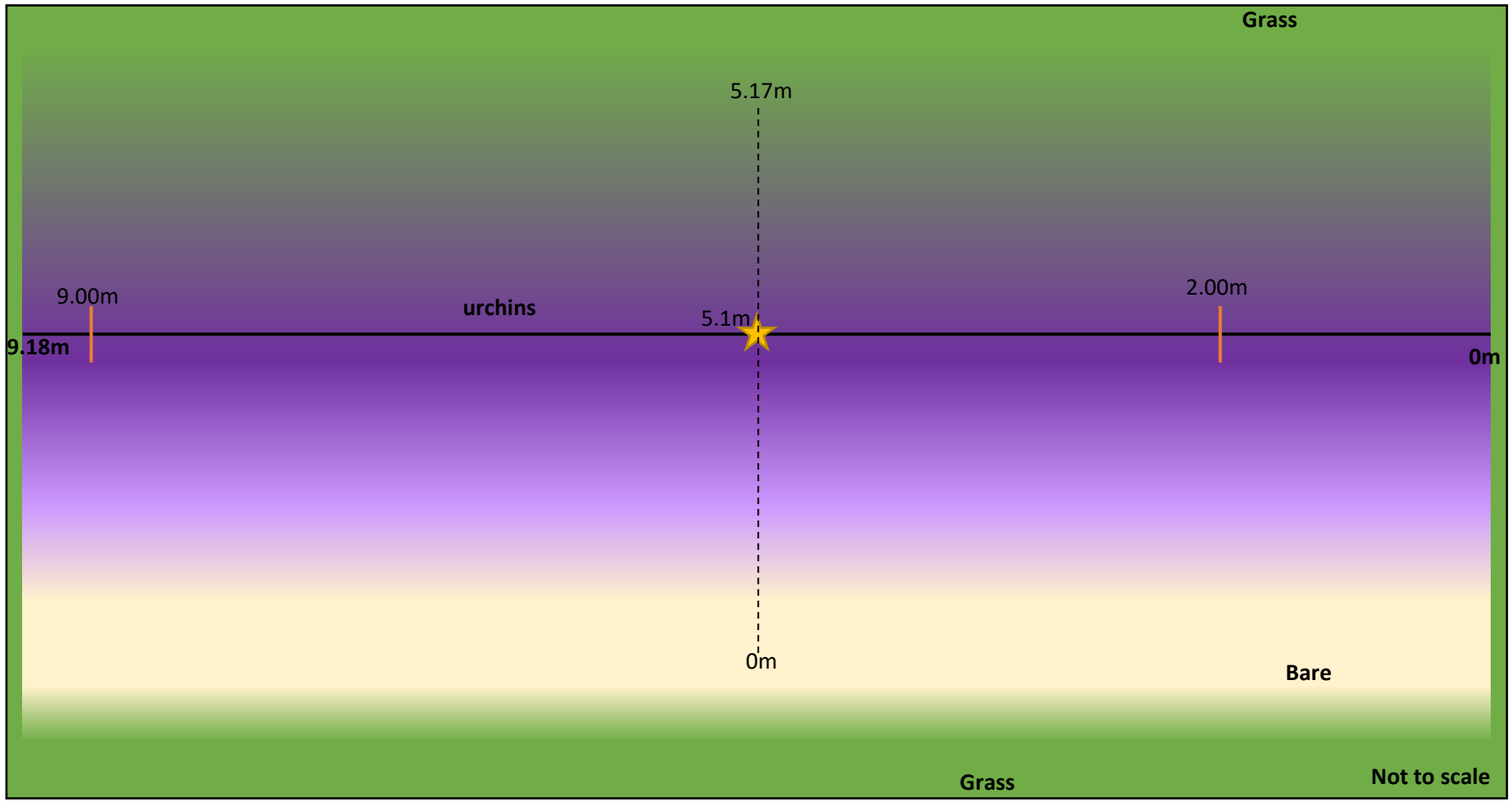
Data

Date	Site Name	Type	SPECIES	PERCENT_COVER	Canopy Height (cm)	Canopy Height (cm)	Canopy Height (cm)	URCHINS	SCALLOPS	GRASS_ALGAE	TOTAL_SAV_PERCENT_COVER	TOTAL_GRASS_PERCENT	TOTAL_MACROALGAE_PERCENT	EPIPHYTE_DENSITY	SEDIMENT_TYPE	Rhizomes
6/30/2023	USB11	Bare	SFIL	7	230	310	26	9	0	Grass	7	7	0	Clean	Sand Mud Shell	yes but only dead ttes shoots

Temp	DO (mg/L/)	Salinity	pH
29.7	7.37	27.75	8.03

Measurements from urchin bloom pocket

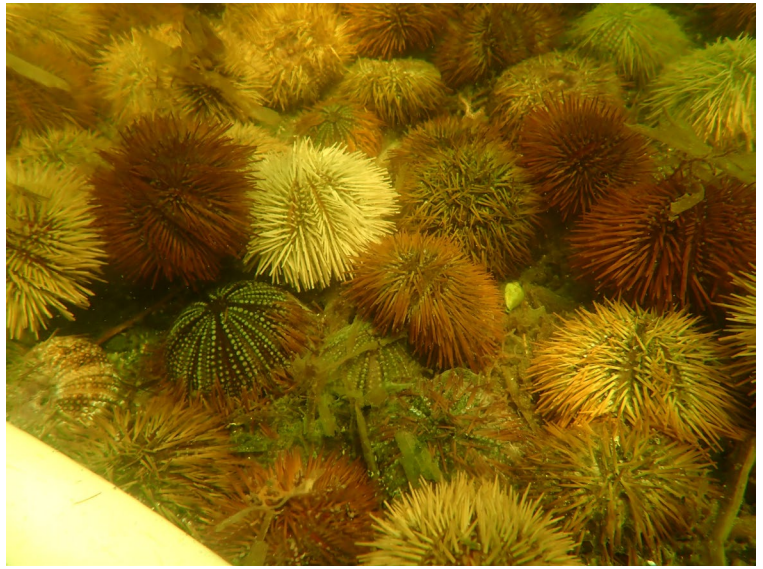
Following the completion of the quadrats, we measured the length and width of the urchin mass. It seemed to be a pocket in the grass, disconnected from any front. Unsure if there were more in the area, survey time was limited due to high winds again and visibility from the surface was greatly reduced from a combination of strong halocline due to recent rain and the chop from winds.

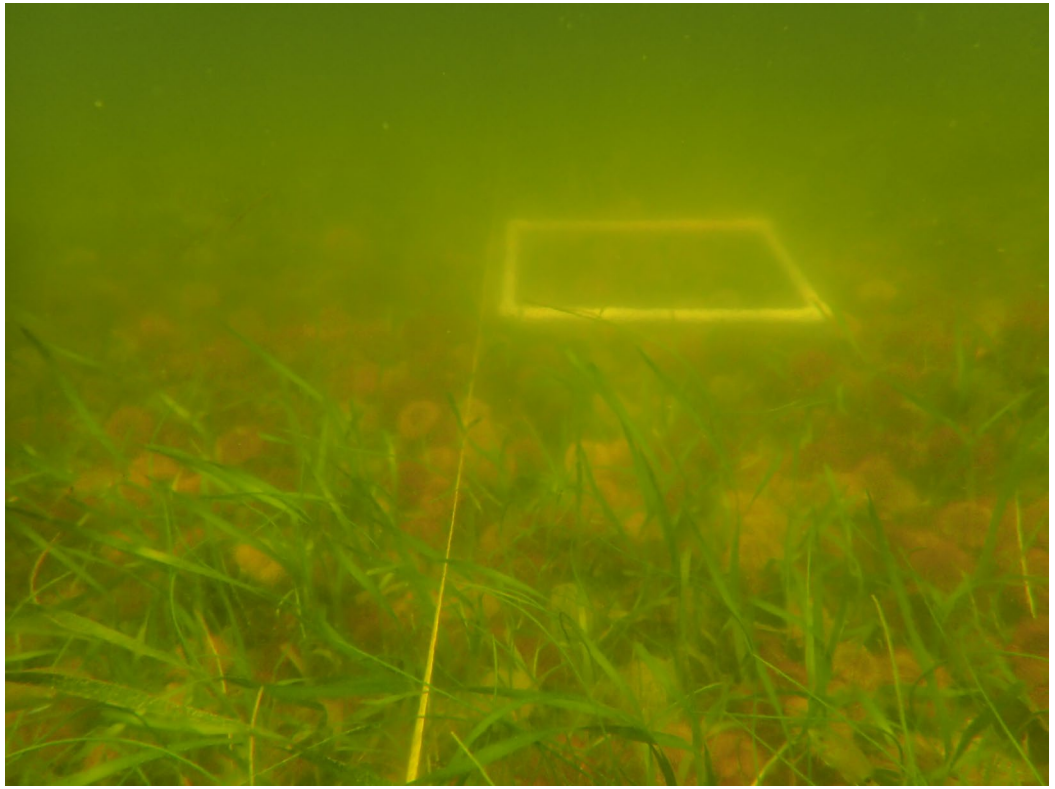


Total length across (solid line) was 9.18m, with the highest density between 2.0 and 9.0m. The widest section (dotted line) was located at the 5.1m mark and was 5.17m wide

Pics from Urchin Survey 11 transect

While swimming the length of the widest part of the urchin bloom, there were about 47 dead urchins touching the transect line (5.1m). The dead urchins were in varying states, some still with spines and some which had completely lost their spines.





Averages for All Sampling Events

Fig.1

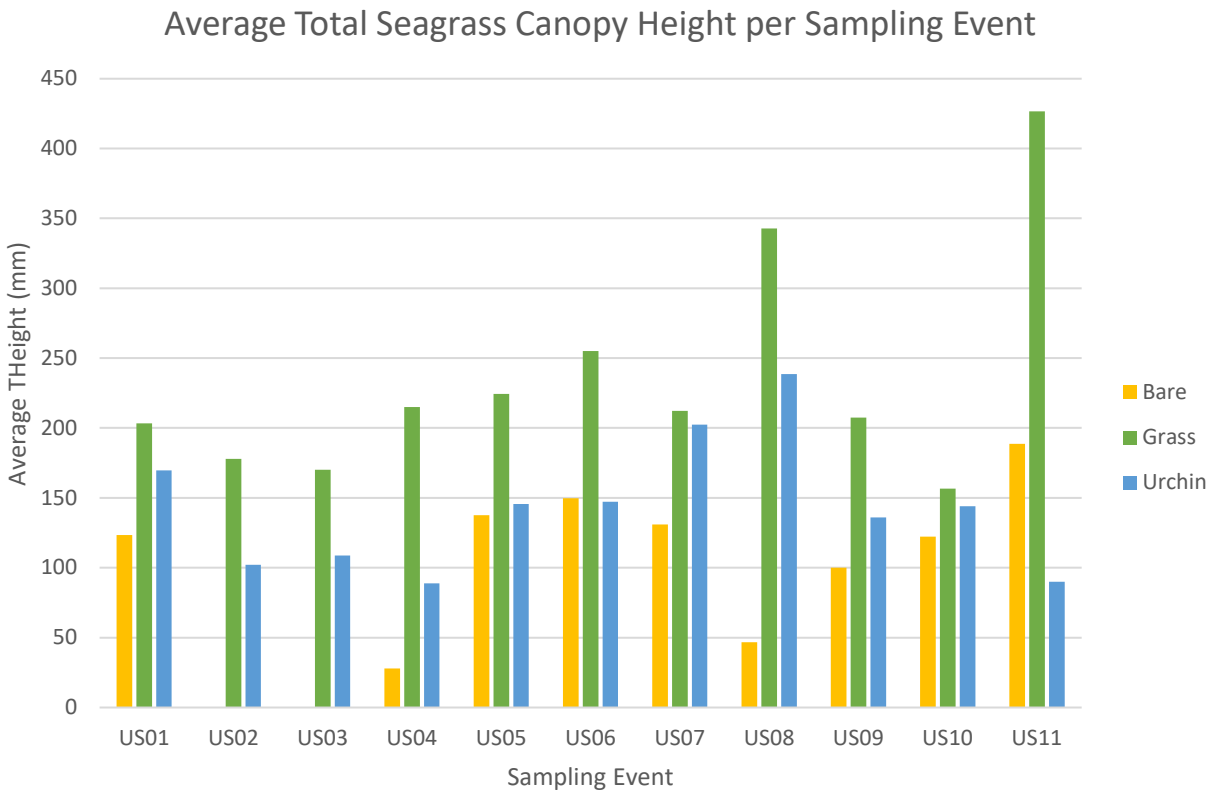


Figure 1. The average canopy height for all seagrass species within a quad.

Fig.2

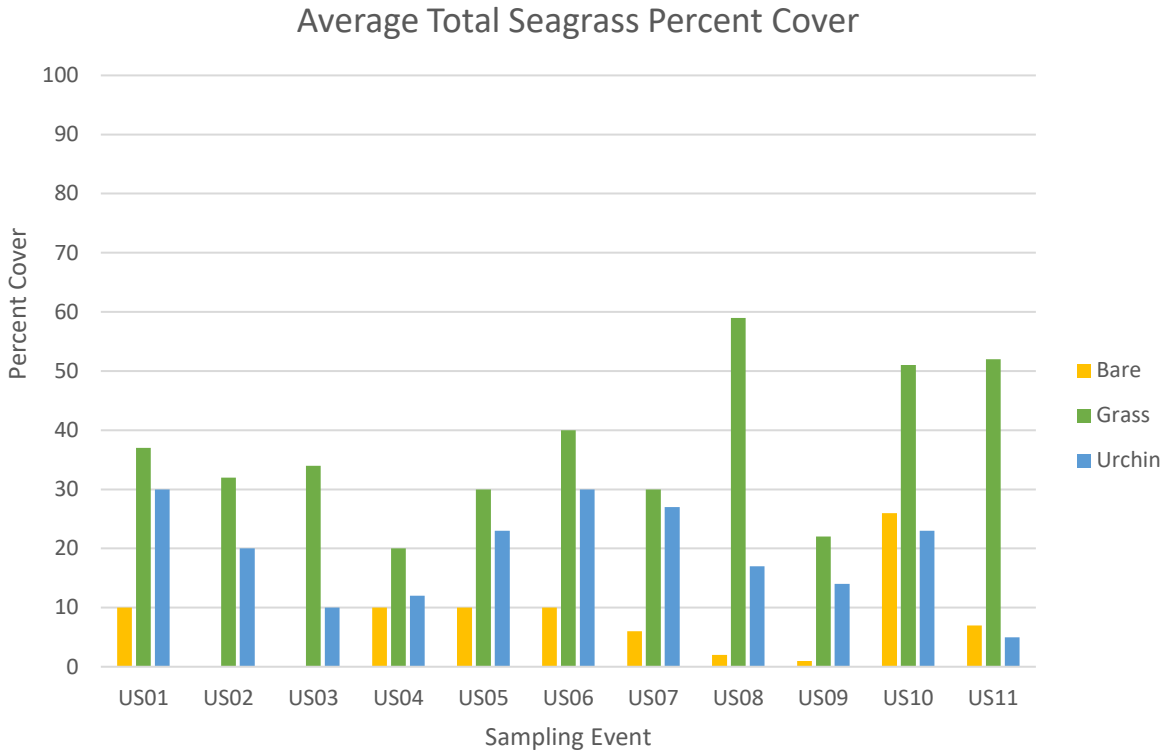
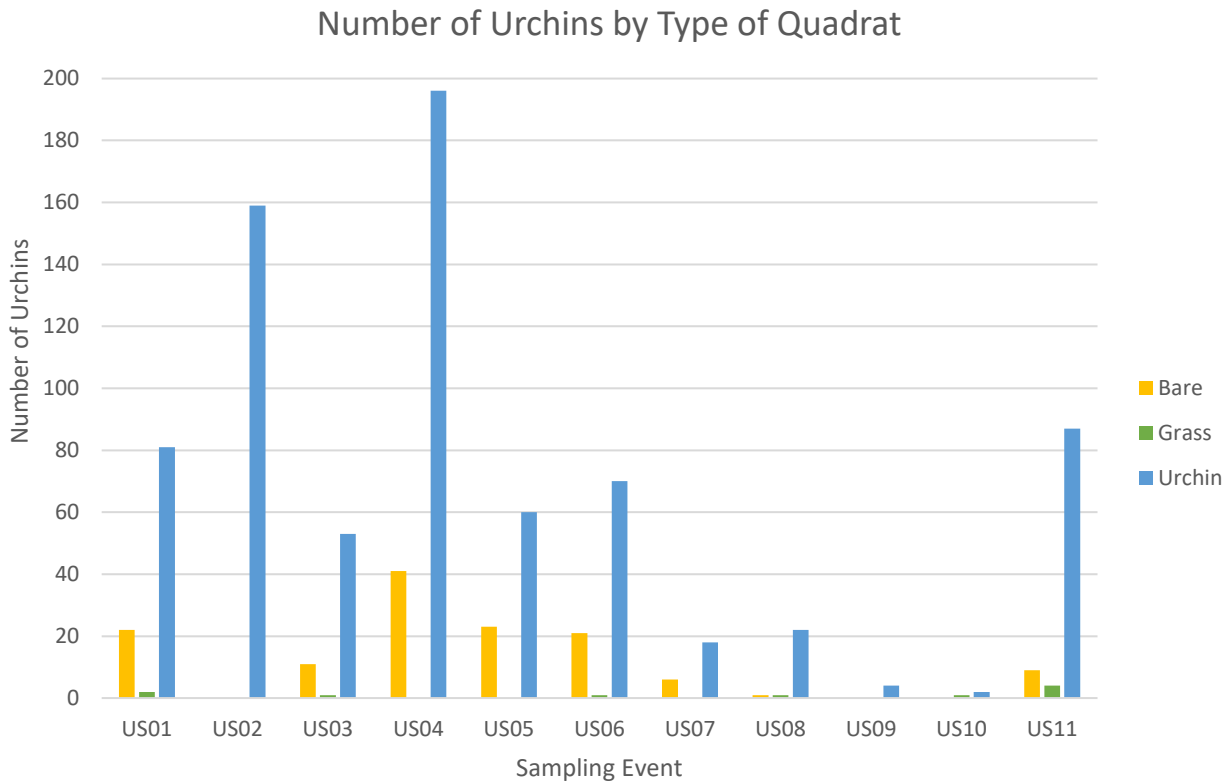


Figure 2. The total percent cover of all seagrass present in each quad.

Other Averages for All Sampling Events

Monthly density averages by type of quad

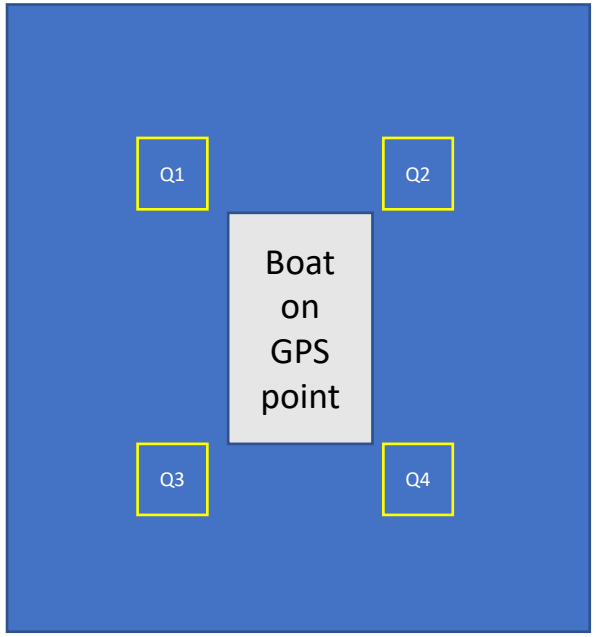
month	type	avg SAV %	avg grass %
February	Bare	3.333333	3.333333
February	Grass	34.66667	34.33333
February	Urchin	20	20
March	Bare	10	10
March	Grass	30	30
March	Urchin	21.66667	21.66667
April	Bare	6	6
April	Grass	30	30
April	Urchin	28	27
May	Bare	9.666667	9.666667
May	Grass	44.66667	44
May	Urchin	18.33333	18
June	Bare	7	7
June	Grass	52	52
June	Urchin	5	5



Note the average Braun-Blanquet density between 2017-2022 was 4.54 at DBKB14 and 4.42 at DBKB15. The surveys were conducted between DBKB 14 and DBKB15. The surveys of DBKB14 and DBKB15 on 8 February 2023 show that DBKB BB density as 1.25 for DBKB14 where the urchins have passed through already and 3.5 at DBKB15 where the urchins are headed. DBKB14 had a BB density of 3.5 and average total SAV % of 47.5% in 2022. DBKB15 had a BB density of 3.75 and total SAV % of 58% in 2022.

The following slides use a 1m² quadrat to reflect seagrass monitoring protocols followed by BBSAP. The following sites, DBKB14 and DBKB15, are established seagrass sites monitored yearly by BBSAP. SOP can be found on SEACAR under BBSAP Protocols. These sites were used to compare to historical seagrass monitoring data. Sites 14 and 15 are on either side of the seagrass front line, urchins have passed 14 and are heading in the direction of 15 currently.

Sample Design

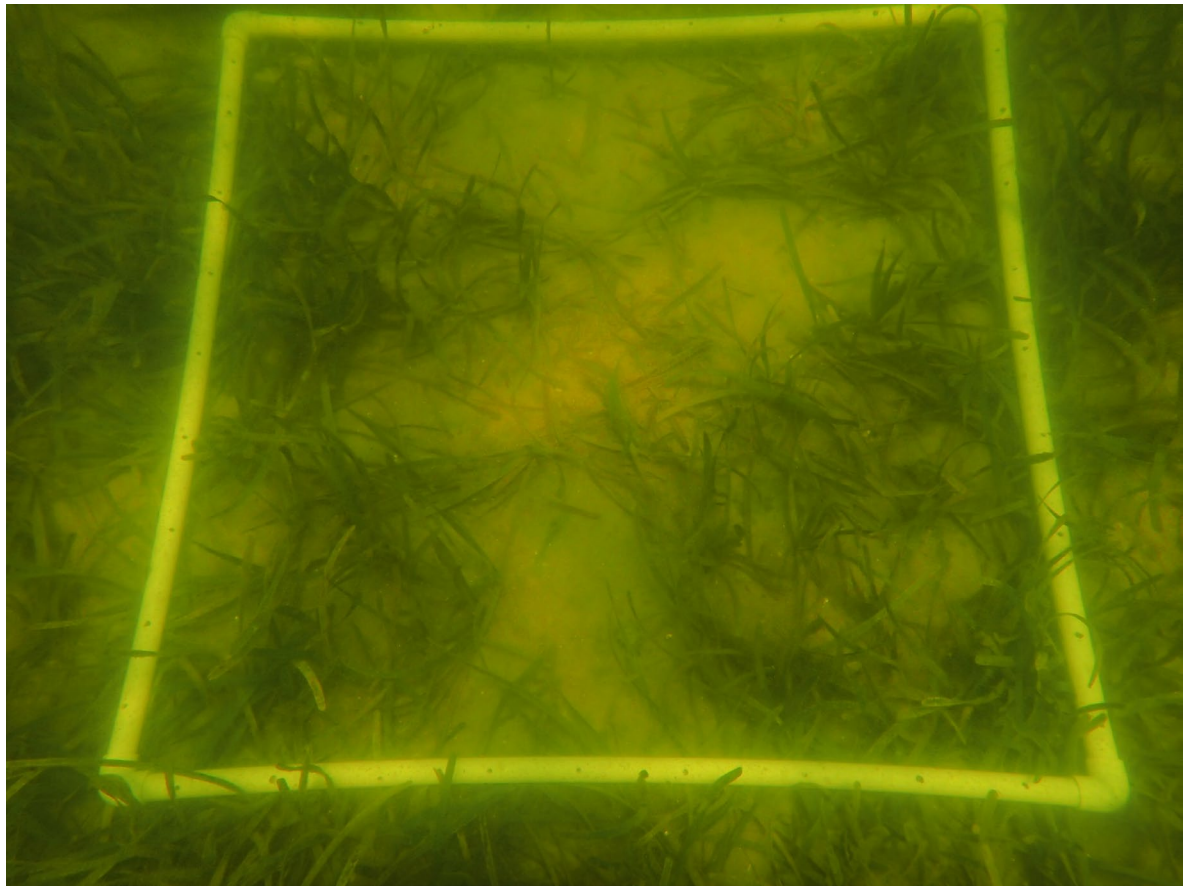


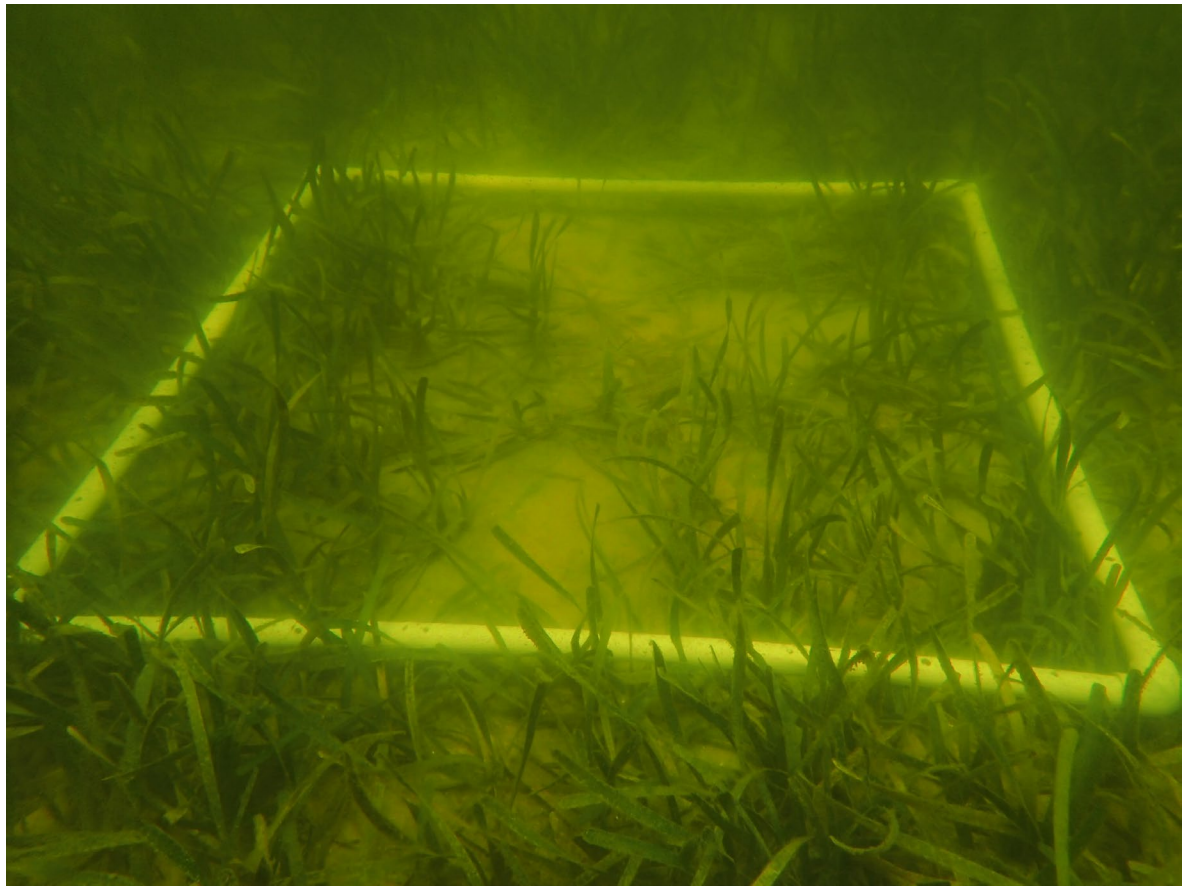
Four quadrats thrown randomly around boat which sits atop the site GPS point.

Urchin Survey DBKB14 Quad 1

DBKB14 GPS:

Latitude	29.8067
Longitude	-83.6311



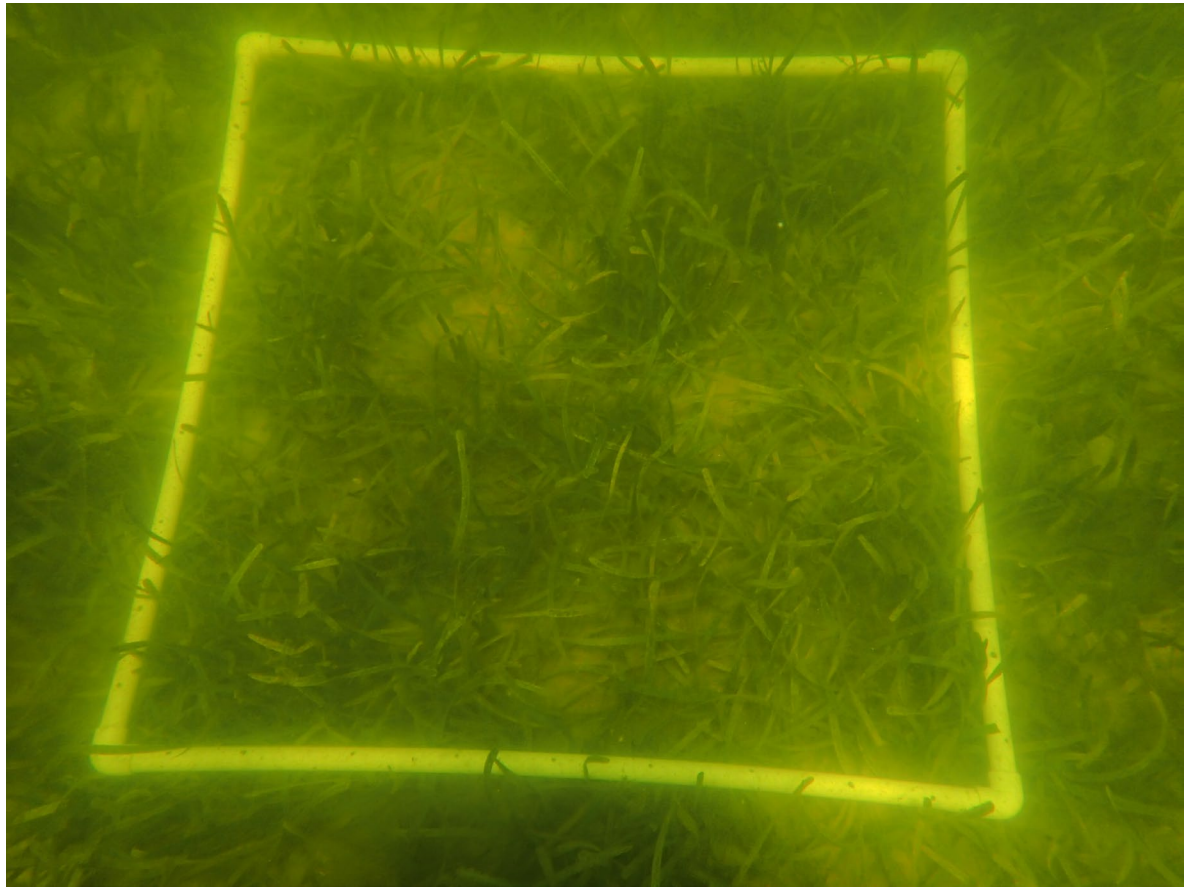


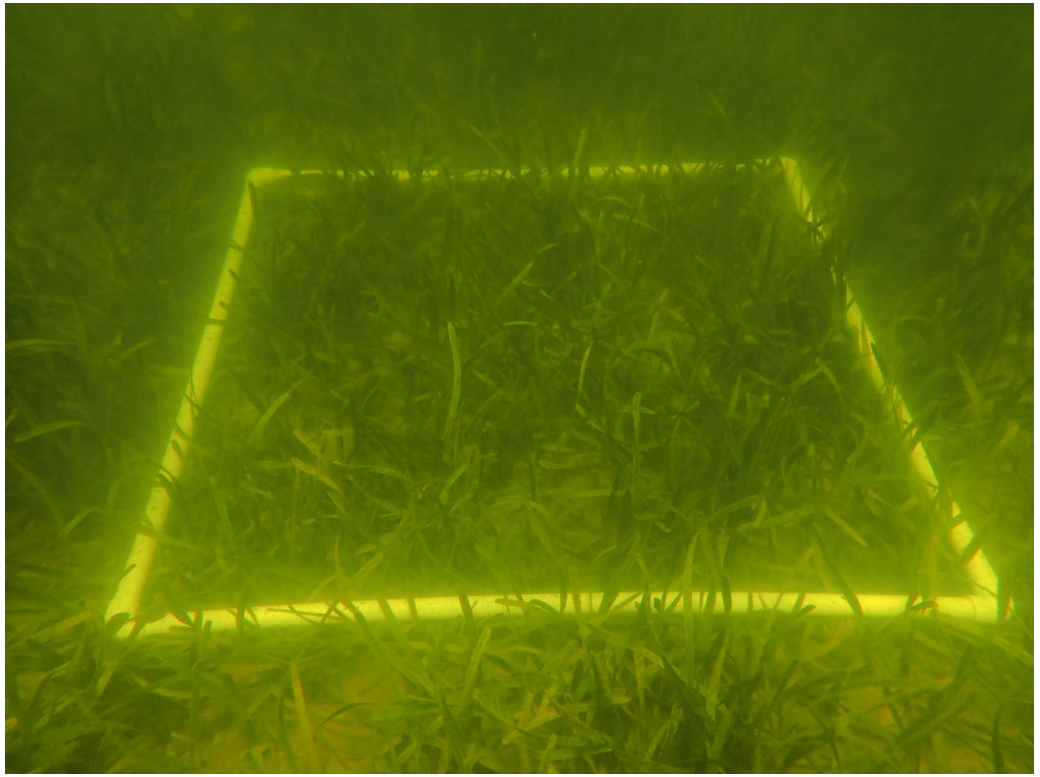
REPLICATE	SPECIES	PERCENT_COVER	BB_COVERAGE	Canopy_HT (mm)	Canopy_HT (mm)	Canopy_HT (mm)	URCHINS	SCALLOPS	GRASS_ALGAE	TOTAL_SAV_PERCENT_COVER	TOTAL_SAV_BB	TOTAL_GRASS_PERCENT	TOTAL_GRASS_BB	TOTAL_MACROALGAE_PERCENT	TOTAL_MACROALGAE_BB	EPIPHYTE_DENSITY	SEDIMENT_TYPE
1	TTES	25	2	227	167	325	0	0	Grass	25	2	25	2	0	0	Clean	Sand Mud Shell

Urchin Survey DBKB14 Quad 2

DBKB14 GPS:

Latitude	29.8067
Longitude	-83.6311



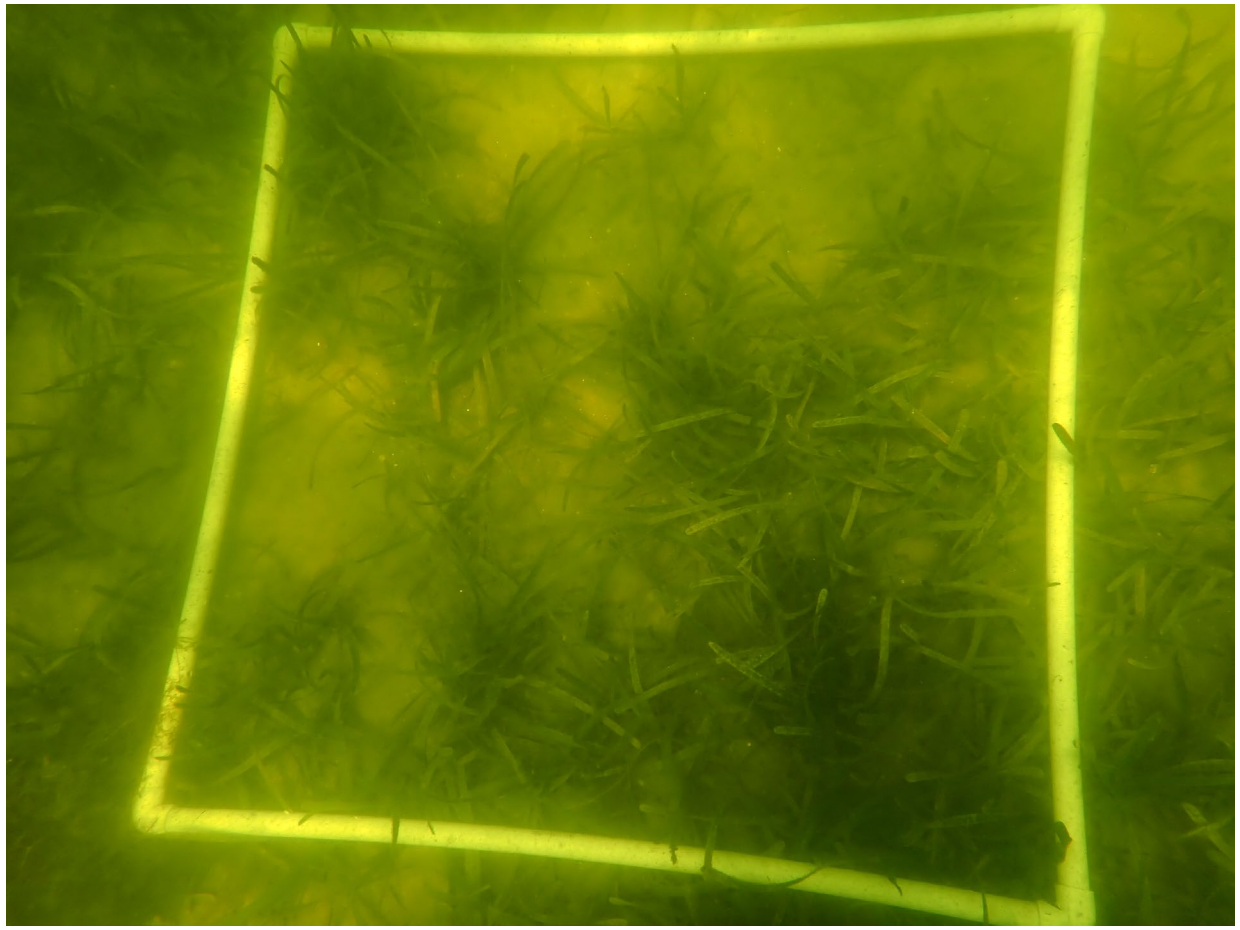


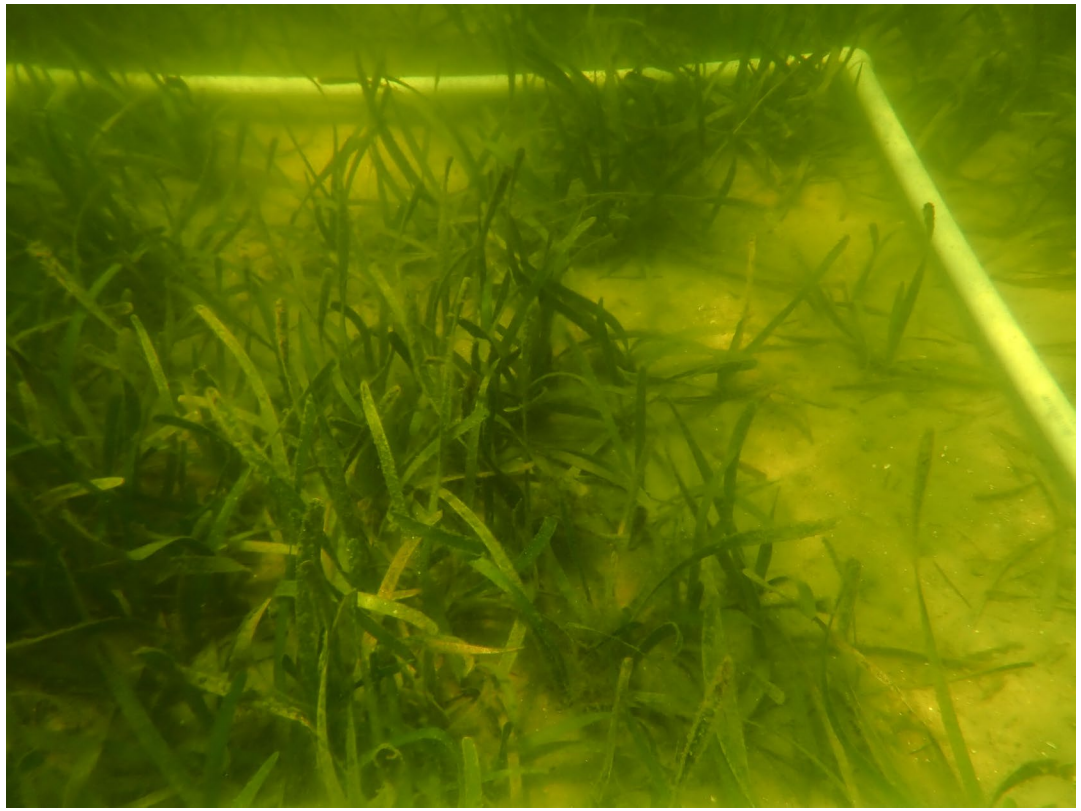
REPLICATE	SPECIES	PERCENT_COVER	BB_COVERAGE	Canopy_HT (mm)	Canopy_HT (mm)	Canopy_HT (mm)	URCHINS	SCALLOPS	GRASS_ALGAE	TOTAL_SAV_PERCENT_COVER	TOTAL_SAV_BB	TOTAL_GRASS_PERCENT	TOTAL_GRASS_BB	TOTAL_MACROALGAE_PERCENT	TOTAL_MACROALGAE_BB	EPIPHYTE_DENSITY	SEDIMENT_TYPE
2	TTES	70	4	297	242	271	0	0	Grass	70	4	70	4	0	0	Clean	Sand Mud Shell

Urchin Survey DBKB14 Quad 3

DBKB14 GPS:

Latitude	29.8067
Longitude	-83.6311



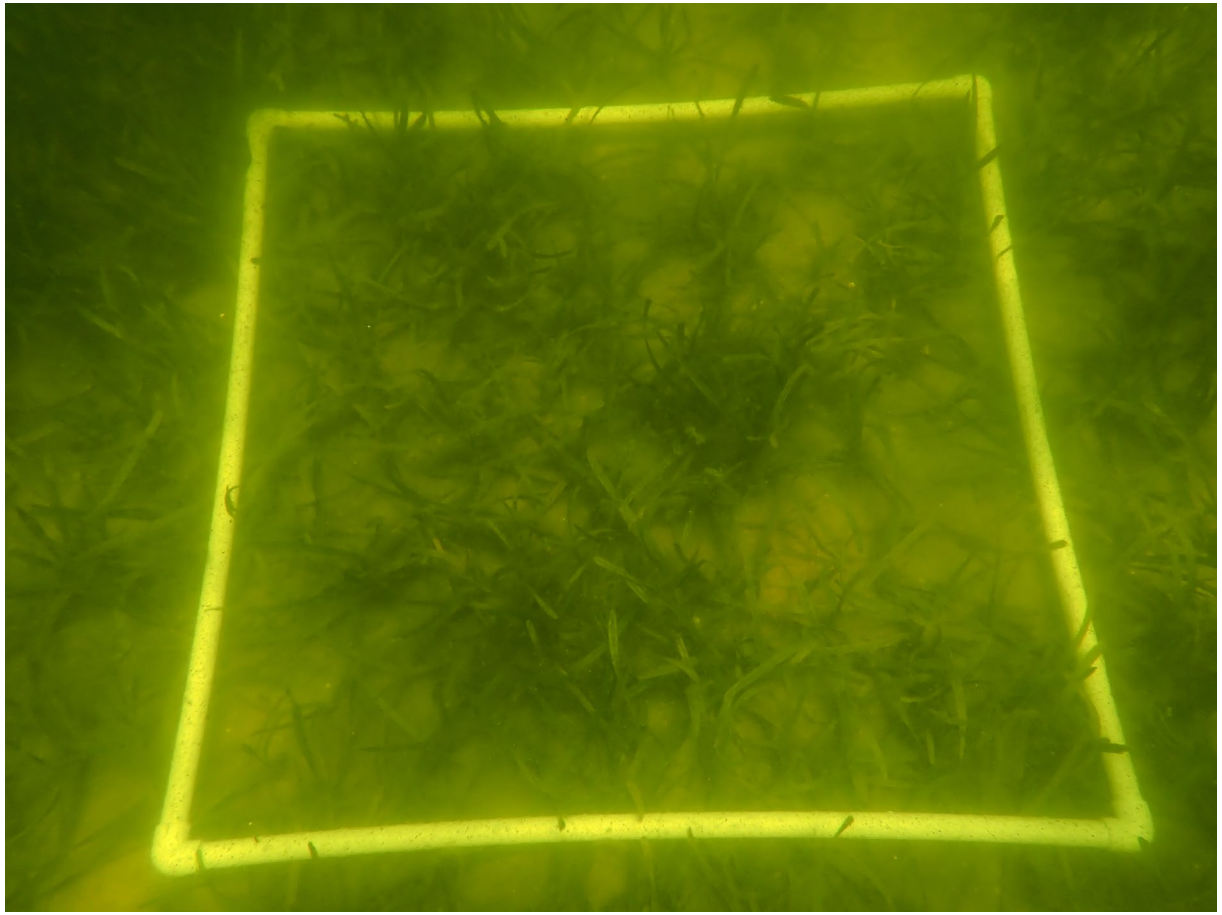


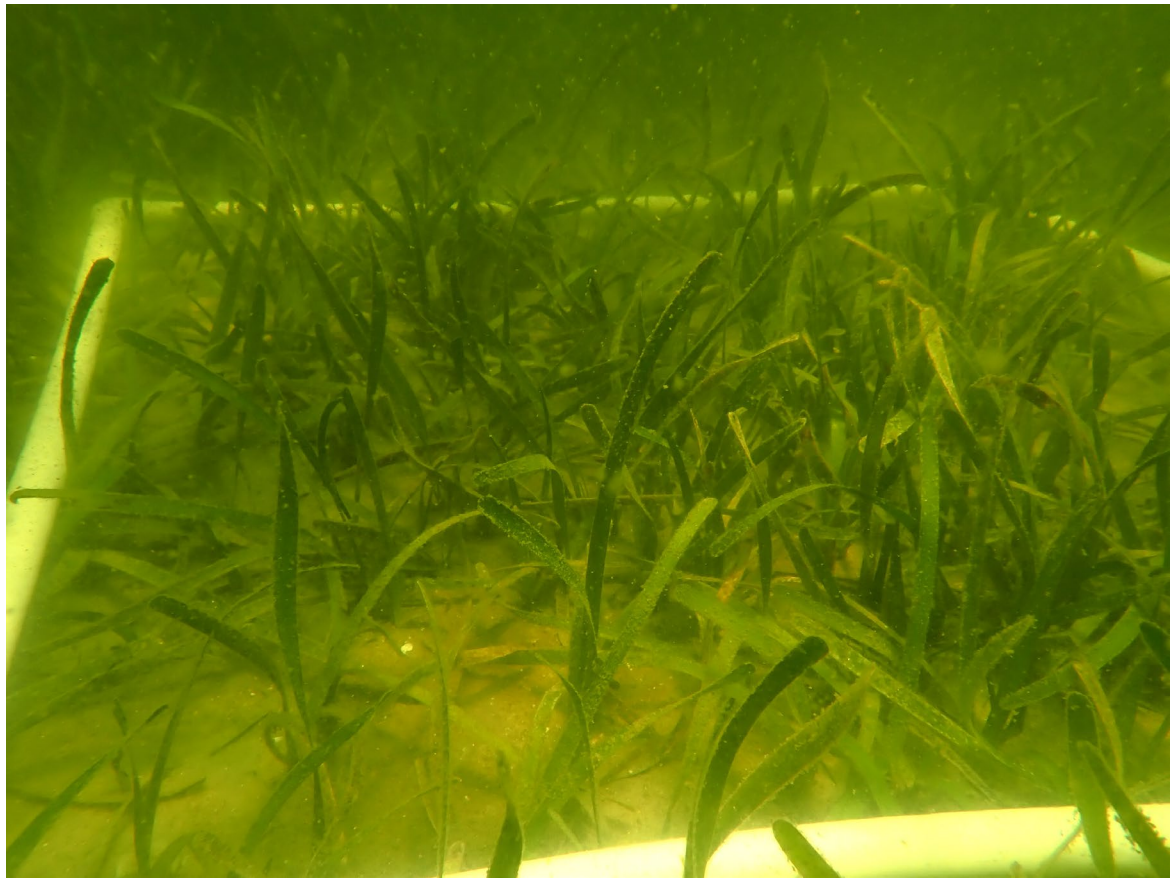
REPLICATE	SPECIES	PERCENT_COVER	BB_COVERAGE	Canopy_HT (mm)	Canopy_HT (mm)	Canopy_HT (mm)	URCHINS	SCALLOPS	GRASS_ALGAE	TOTAL_SAV_PERCENT_COVER	TOTAL_SAV_BB	TOTAL_GRASS_PERCENT	TOTAL_GRASS_BB	TOTAL_MACROALGAE_PERCENT	TOTAL_MACROALGAE_BB	EPIPHYTE_DENSITY	SEDIMENT_TYPE
3	TTES	40	3	205	261	230	0	0	Grass	40	3	40	3	0	0	Light	Sand Mud Shell

Urchin Survey DBKB14 Quad 4

DBKB14 GPS:

Latitude	29.8067
Longitude	-83.6311



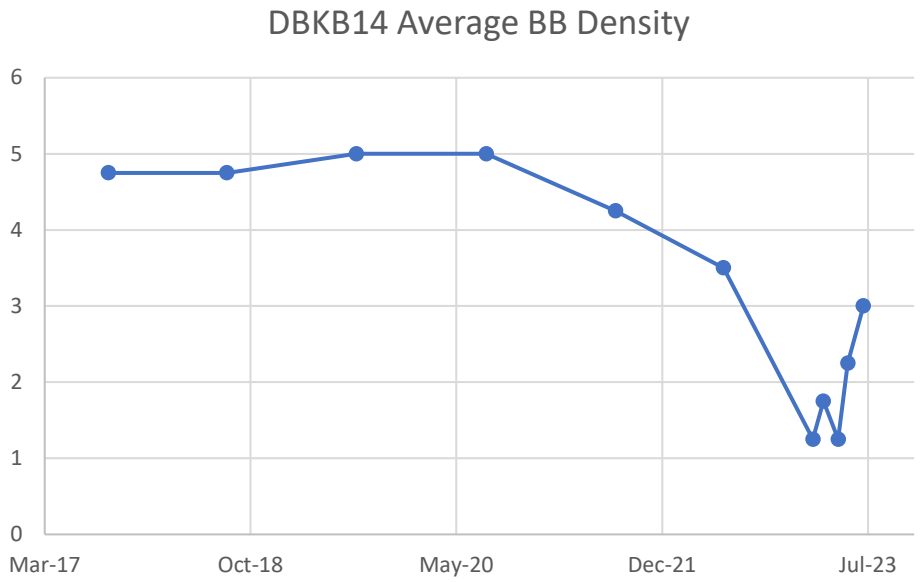


REPLICATE	SPECIES	PERCENT_COVER	BB_COVERAGE	Canopy_HT (mm)	Canopy_HT (mm)	Canopy_HT (mm)	URCHINS	SCALLOPS	GRASS_ALGAE	TOTAL_SAV_PERCENT_COVER	TOTAL_SAV_BB	TOTAL_GRASS_PERCENT	TOTAL_GRASS_BB	TOTAL_MACROALGAE_PERCENT	TOTAL_MACROALGAE_BB	EPIPHYTE_DENSITY	SEDIMENT_TYPE
4	TTES	45	3	261	300	105	0	0	Grass	45	3	45	3	0	0	Clean	Sand Mud Shell

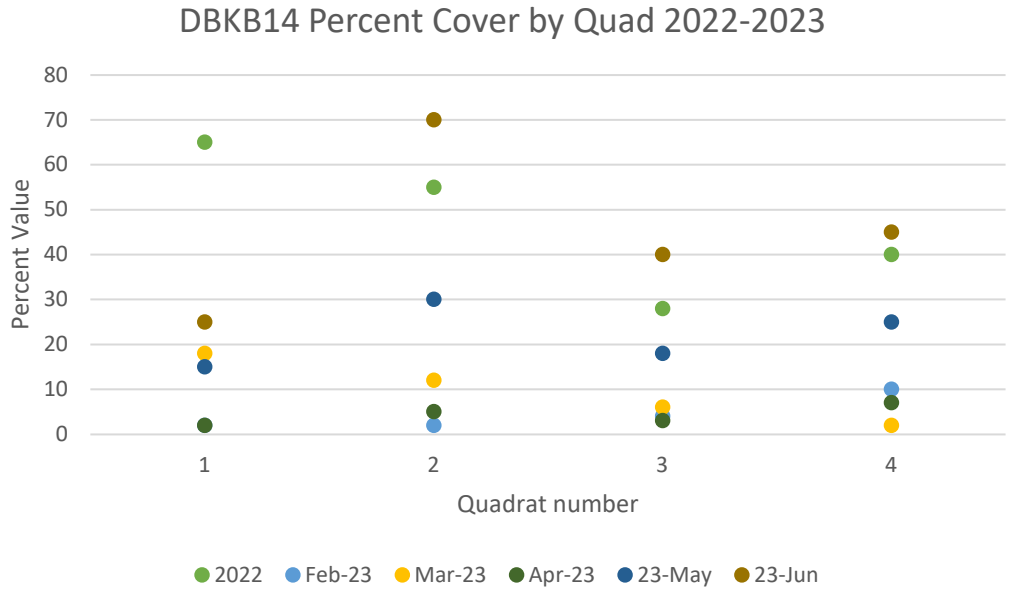
Urchin Survey DBKB14 Visit

DBKB14 GPS:

Latitude	29.8067
Longitude	-83.6311



Year	Density
Sep-17	4.75
Aug-18	4.75
Aug-19	5
Aug-20	5
Aug-21	4.25
Jun-22	3.5
Feb-23	1.25
Mar-23	1.75
4/20/2023	1.25
5/17/2023	2.25
6/30/2023	3



Braun-Blanquet Score	2017	2018	2019	2020	2021	2022	Feb-23	Mar-23	4/20/2023	23-May	6/30/2023
Quad 1	5	5	5	5	4	4	1	2	1	2	2
Quad 2	5	5	5	5	5	4	1	2	1	3	4
Quad 3	4	4	5	5	4	3	1	2	1	2	3
Quad 4	5	5	5	5	4	3	2	1	2	2	3

Percent Cover by QUadYear	2022	Feb-23	Mar-23	4/23/2023	17-May	6/30/2023
Quad 1	65	2	18	2	15	25
Quad 2	55	2	12	5	30	70
Quad 3	28	4	6	3	18	40
Quad 4	40	10	2	7	25	45

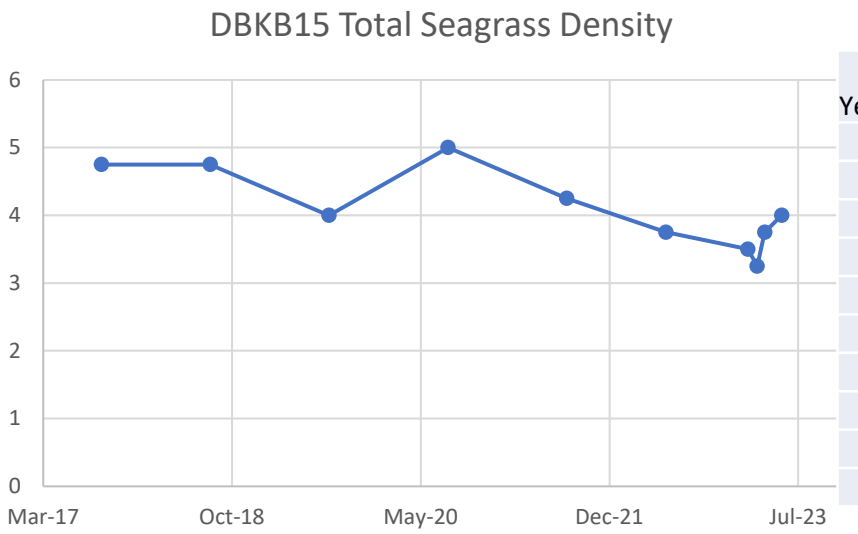
Note that only species of seagrass found in DBKB14 has been T. testudium, except once in 2022 when H. engelmannii was found in one replicate at 2%

Also note that GPS accuracy is to 9 meters and the quads are tossed at random around the coordinate so the quads will not land in the exact spot each time.

Urchin Survey DBKB15 Visit

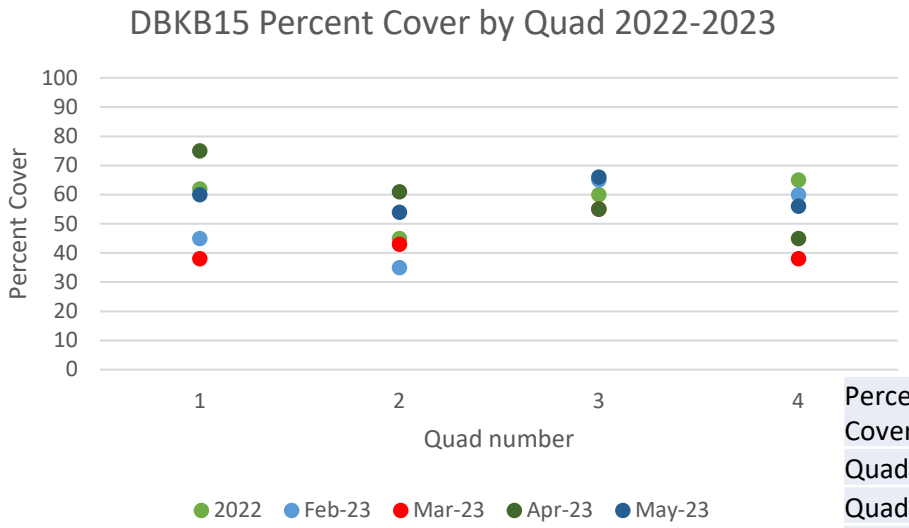
DBKB15 GPS:

Latitude	29.8015
Longitude	-83.6171

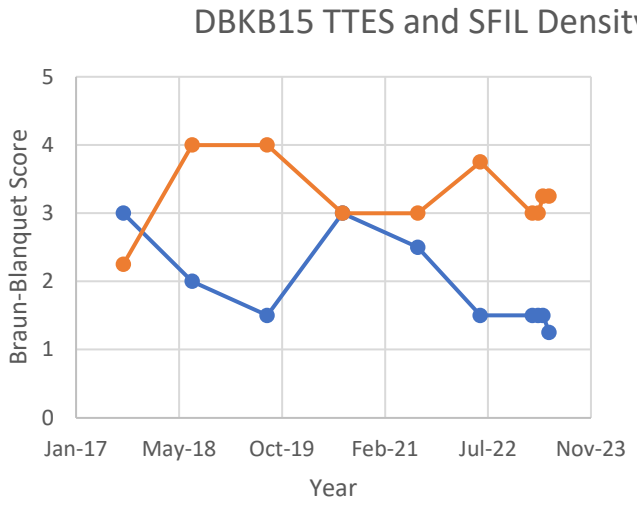


Year	BB Density
Sep-17	4.75
Aug-18	4.75
Aug-19	4
Aug-20	5
Aug-21	4.25
Jun-22	3.75
Feb-23	3.5
Mar-23	3.25
Apr-23	3.75
23-May	4

Braun-Blanquet Scores	2017	2018	2019	2020	2021	2022	Feb-23	Mar-23	Apr-23	23-May
Quad 1	5	4	4	5	5	4	3	3	4	4
Quad 2	5	5	2	5	4	3	3	3	4	4
Quad 3	5	5	5	5	5	4	4	4	4	4
Quad 4	4	5	5	5	3	4	4	3	3	4



Inclement weather in the month of June limited field sampling time, DBKB15 was not visited in June.



Percent Cover	2022	Feb-23	Mar-23	Apr-23	17-May
Quad 1	62	45	38	75	60
Quad 2	45	35	43	61	54
Quad 3	60	65	55	55	66
Quad 4	65	60	38	45	56

Year	TTES Density	SFIL Density
Sep-17	3	2.25
Aug-18	2	4
Aug-19	1.5	4
Aug-20	3	3
Aug-21	2.5	3
Jun-22	1.5	3.75
Feb-23	1.5	3
Mar-23	1.5	3
Apr-23	1.5	3.25
May-23	1.25	3.25

Established Transect for Shoot Counts

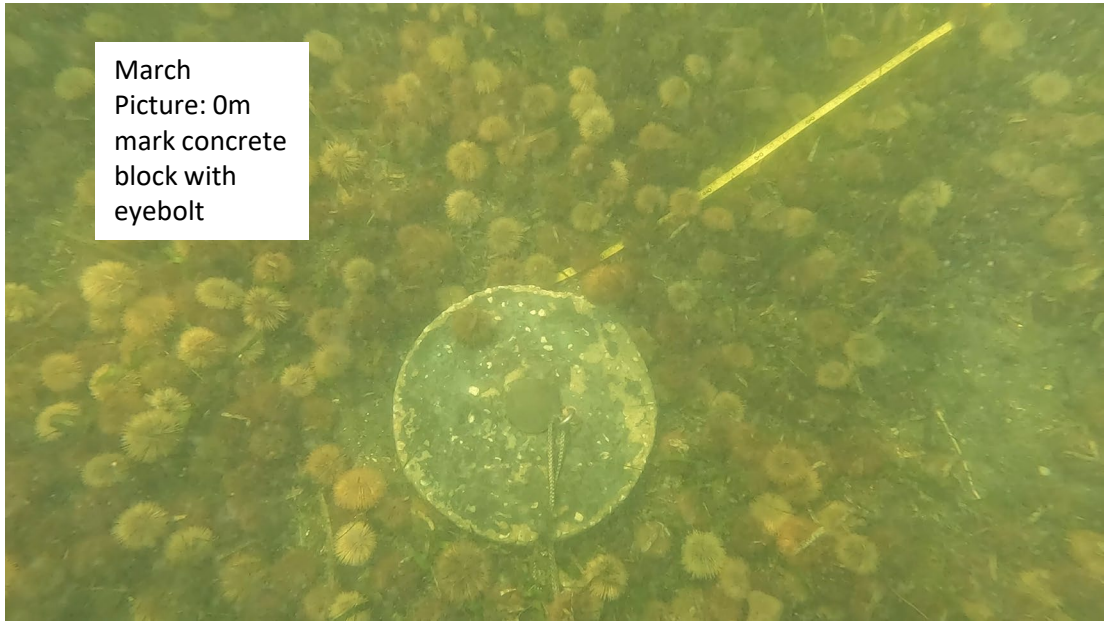
Addition of a 20m established transect starting in March. A cinderblock with and eyebolt was placed on the back edge of the urchin front and a transect of 20m was run from it toward the grazed area. At the 20m mark rebar was placed and flagged. GPS coordinates were taken at each end. Mini quadrats of 0.04 m^2 were placed every 2m starting at zero. Shoot heights of any living seagrass shoot were measured in millimeters using a ruler and recorded. The goal of this transect is to monitor any regrowth of seagrass following the grazing event. Pictures were taken at each quadrat and a video was taken of the entire line.

GPS:29.80332 -83.6267

March Picture: 20m mark with rebar & flagging tape

HOBO sensor

Broke on initial deployment, nothing to report.



March Picture: 0m mark concrete block with eyebolt

June Established Transect Data

Fig1

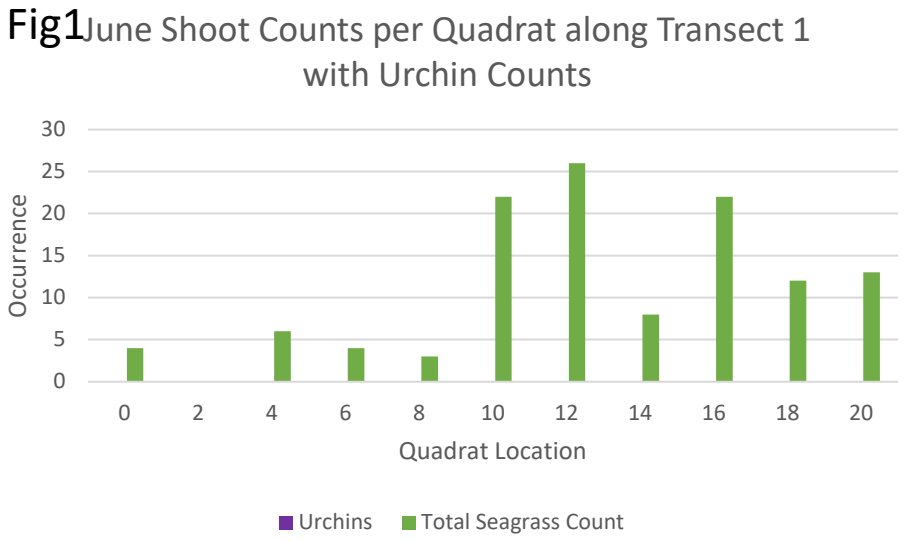


Fig2

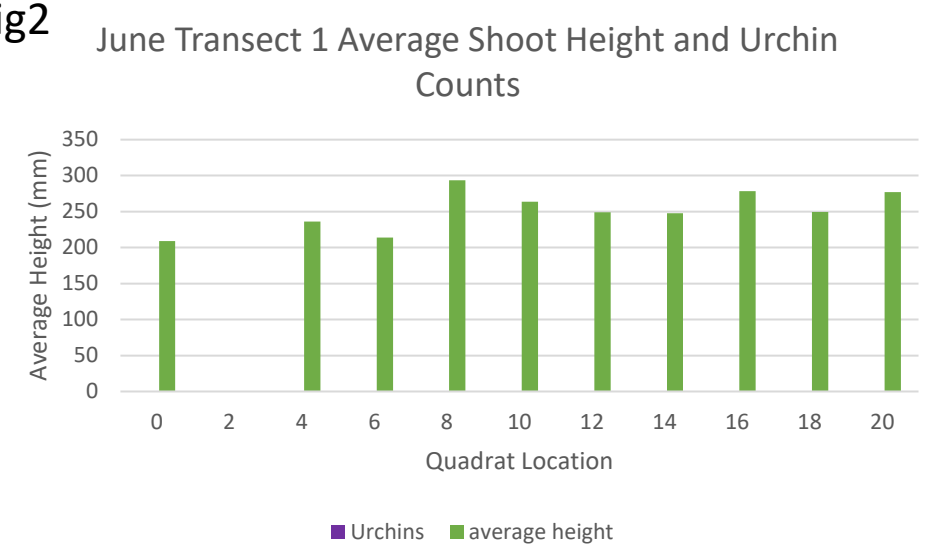


Fig3

Figure 1. Number of individual shoots and number of urchins per quad. Figure 2. Average height in mm of all shoots in the quad and urchin count. Figure 3. Average height (mm) of each species shoot found in a quadrat, not all quads had all species present.

Ongoing Established Transect Data

Fig1

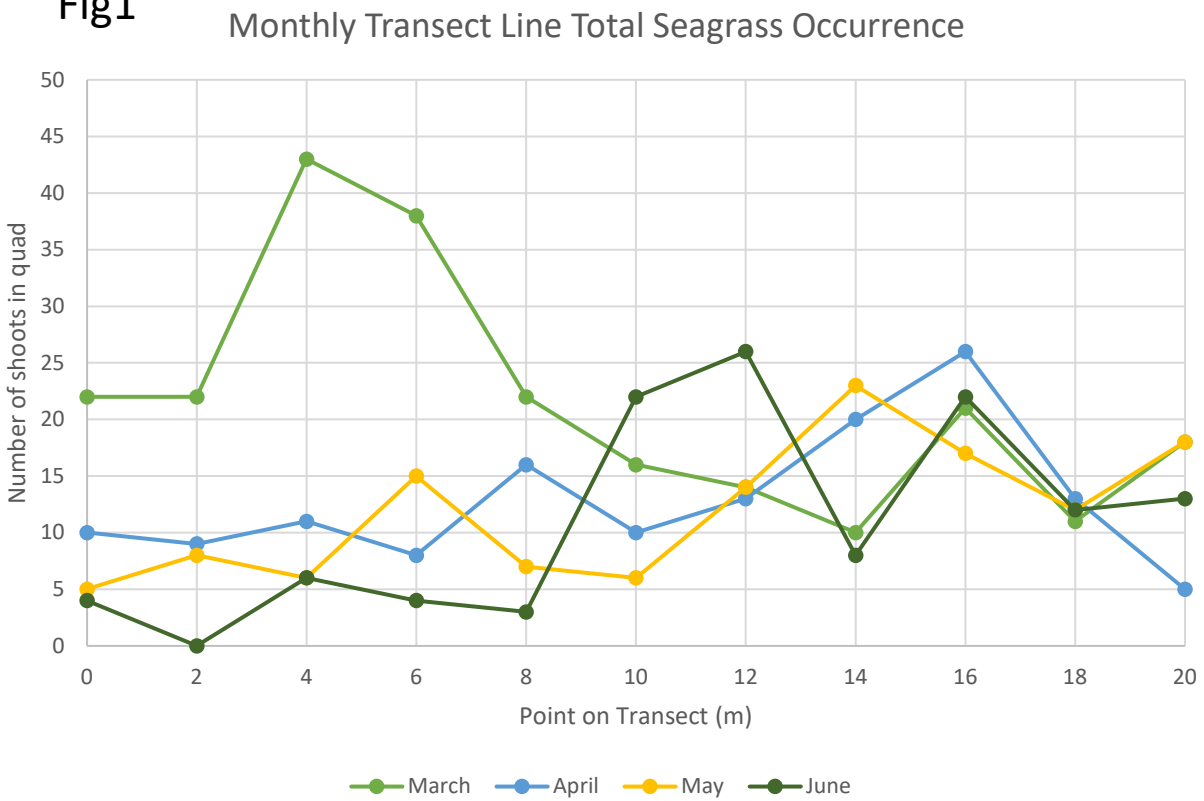


Figure 1. Total seagrass occurrence at each transect quadrat by month. Note that sites 0,2,and 4 had urchin line still on top of them in March, that line has since moved forward and/or dispersed.

Fig2

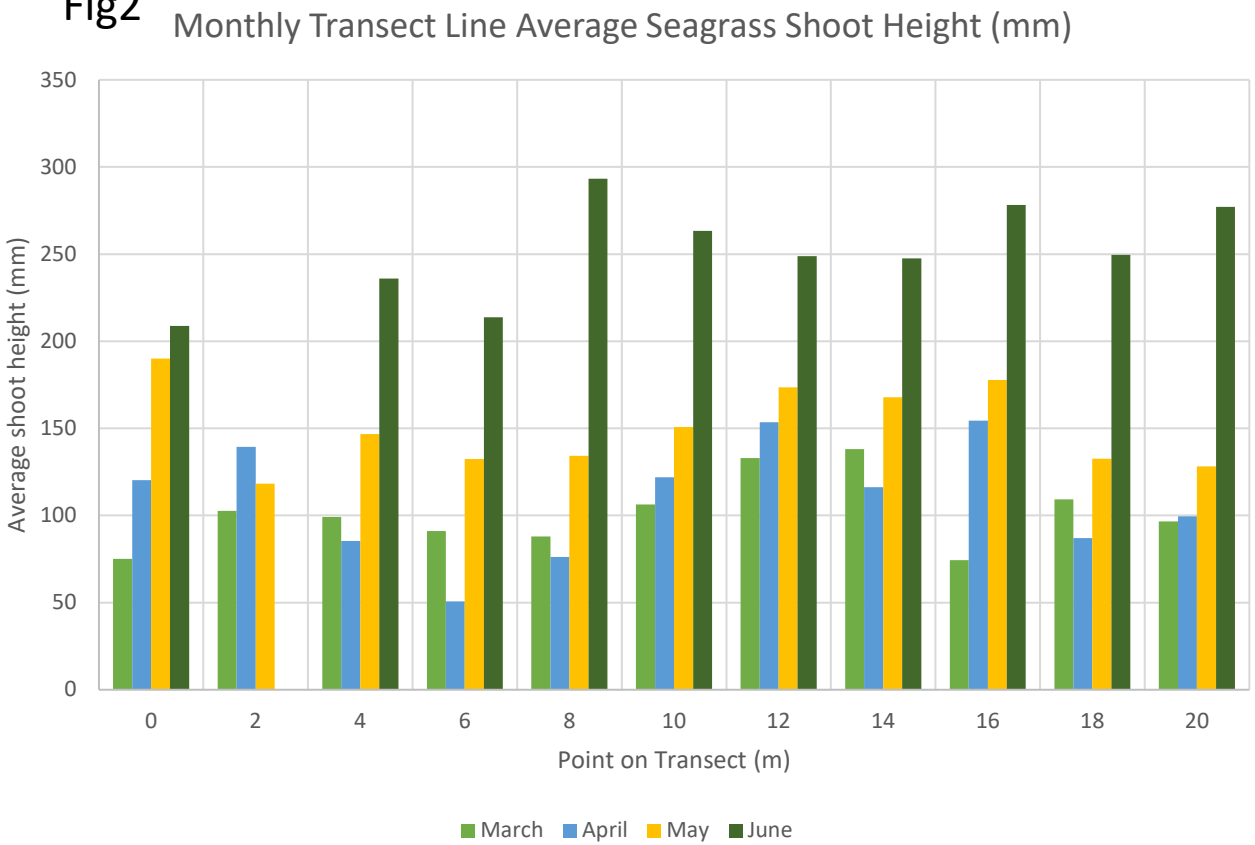


Figure 2. Average height in mm of all shoots in the quad by month. Note seagrass growing season begins in May.

Ongoing Established Transect Data

Fig1 Monthly Transect Line Total TTES Occurrence

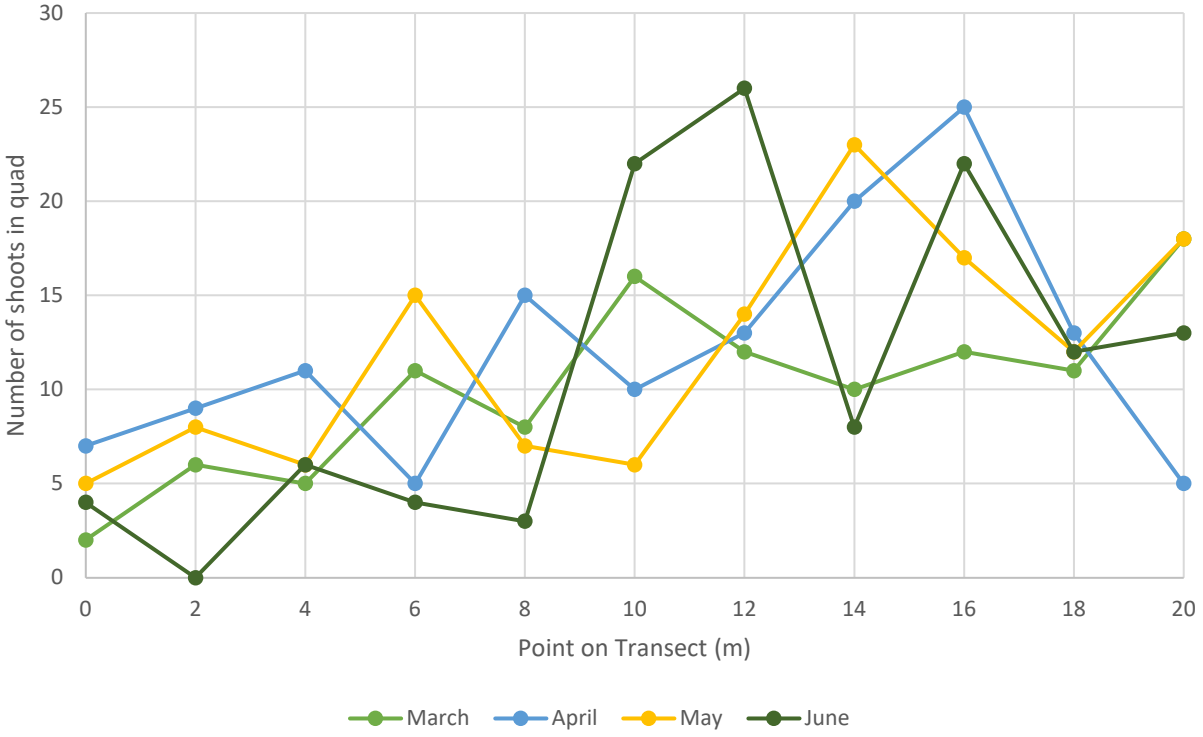


Figure 1. Total *Thalassia testudinum* (TTES) occurrence at each transect quadrat by month. Note that sites 0,2,and 4 had urchin line still on top of them in March, that line has since moved forward and/or dispersed.

Fig2 Monthly Transect Line Average TTES Shoot Height (mm)

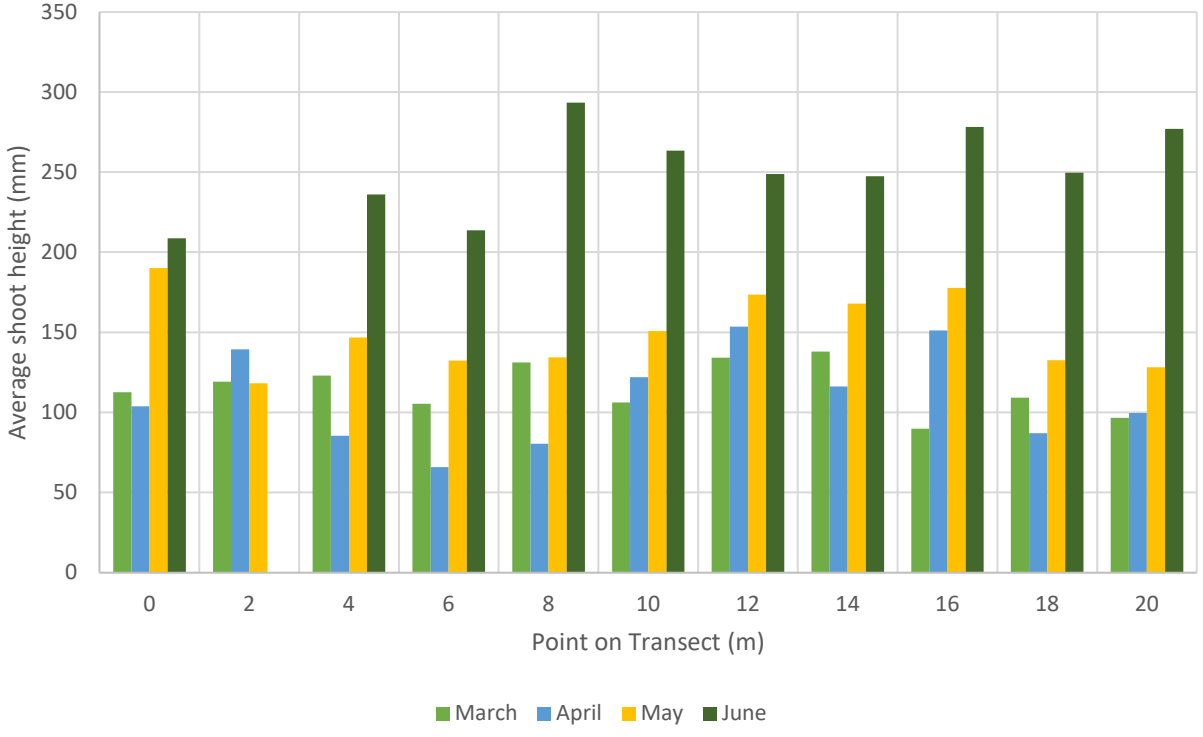


Figure 2. Average TTES height in mm of all shoots in the quad by month. Note seagrass growing season begins in May.

Ongoing Established Transect Data

Fig1

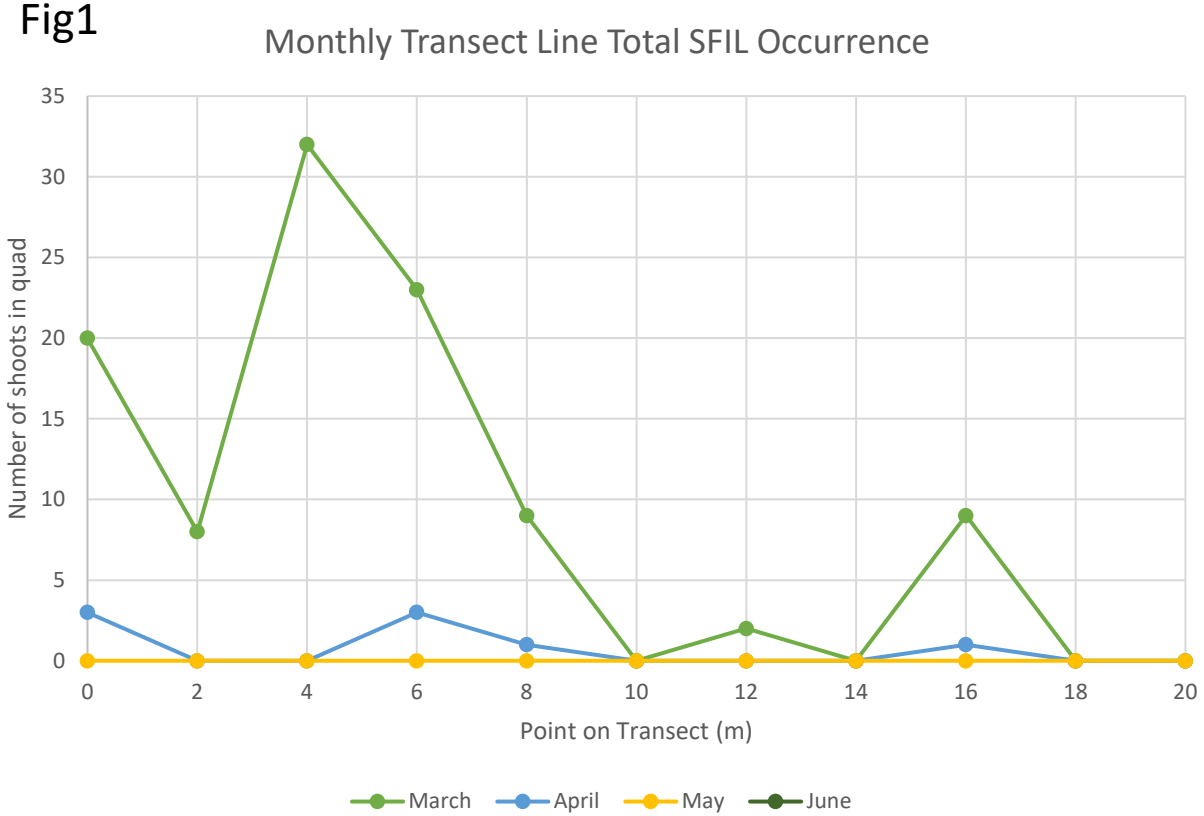


Figure 1. Total *Syringodium filiforme* (SFIL) occurrence at each transect quadrat by month. Note that SFIL was only found in 4 quads in April, no SFIL was found in any quad in May or June.

Fig2

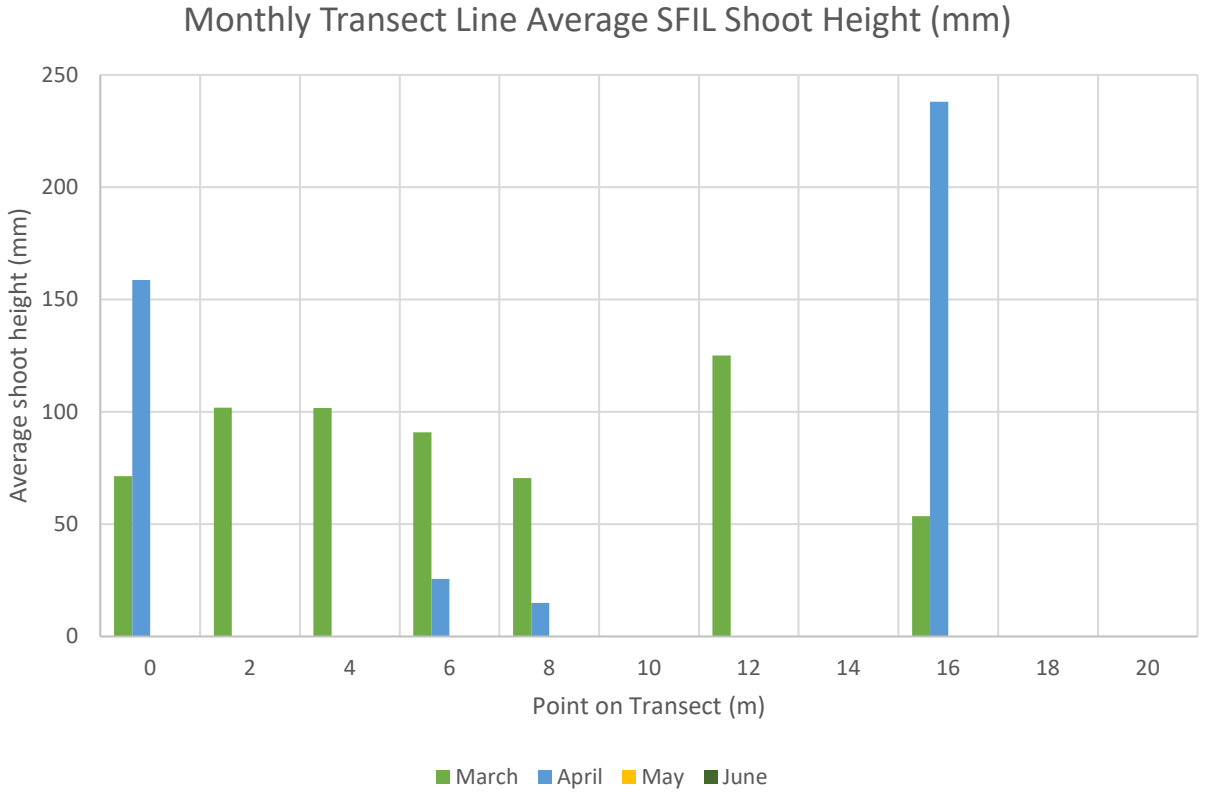
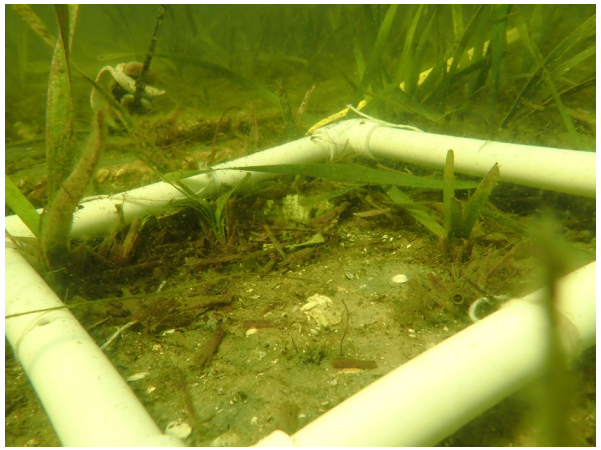


Figure 2. Average height in mm of all shoots in the quad by month. Note seagrass growing season begins in May. Note that SFIL was only found in 4 quads in April, no SFIL was found in any quad in May or June.

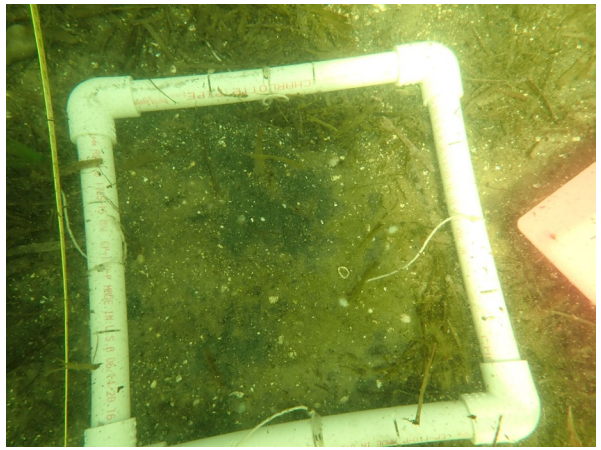
June Transect Pictures

Meter 0



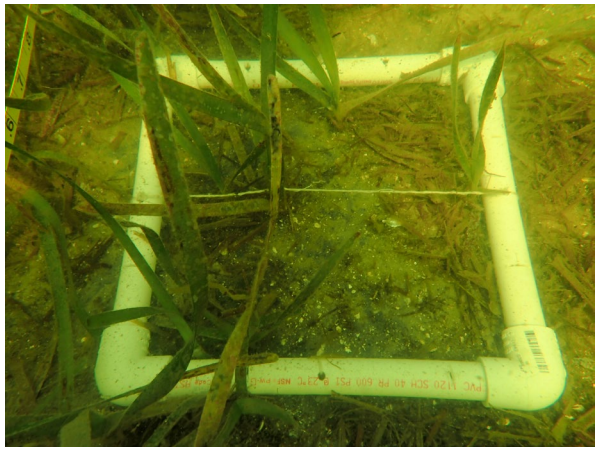
Meter 0 Data
Urchin Count: 0
Shoot count: 4
Average Height (mm): 208.75

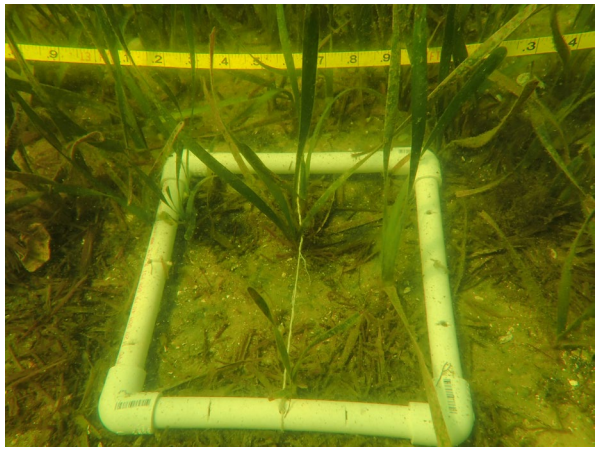
Meter 2



Meter 2 Data
Urchin Count: 0
Shoot count: 0
Average Height (mm): 0

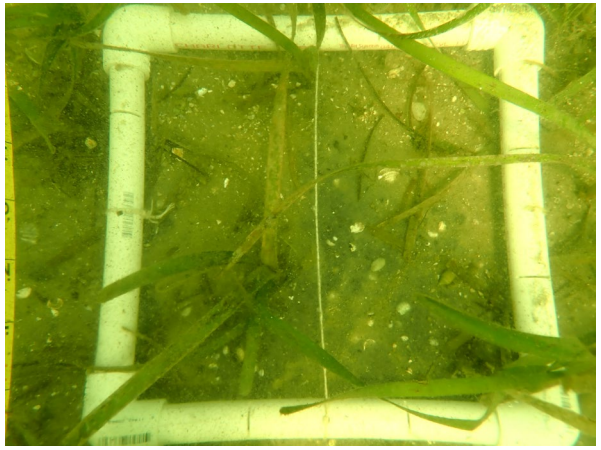
Meter 4





Meter 4 Data
Urchin Count: 0
Shoot count: 6
Average Height (mm): 236

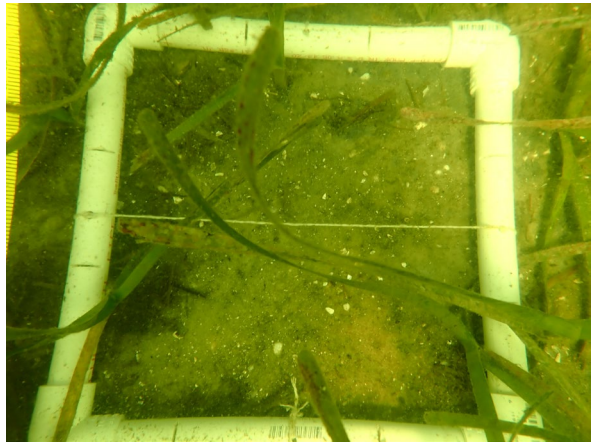
Meter 6

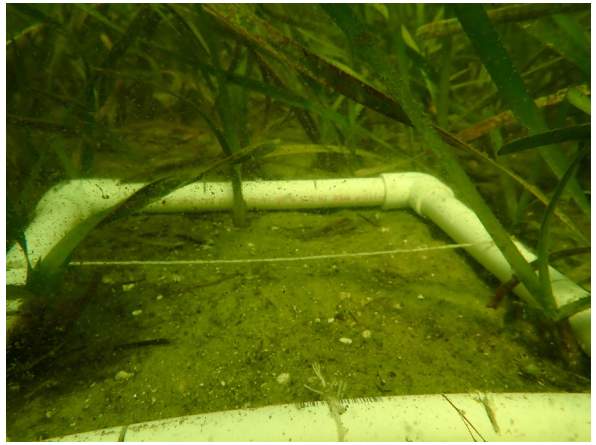


Meter 6 Data
Urchin Count: 0
Shoot count: 4
Average Height (mm): 213.75

June Transect Pictures

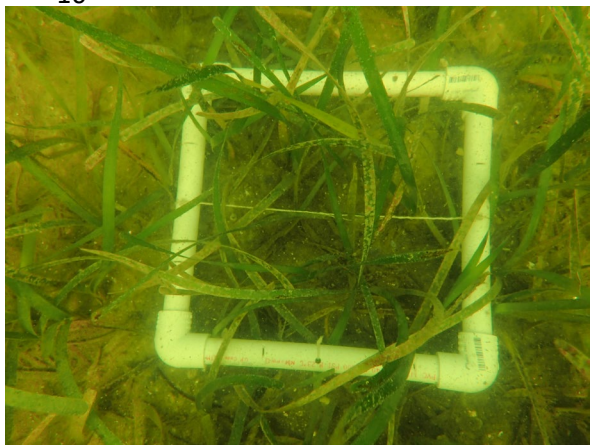
Meter 8





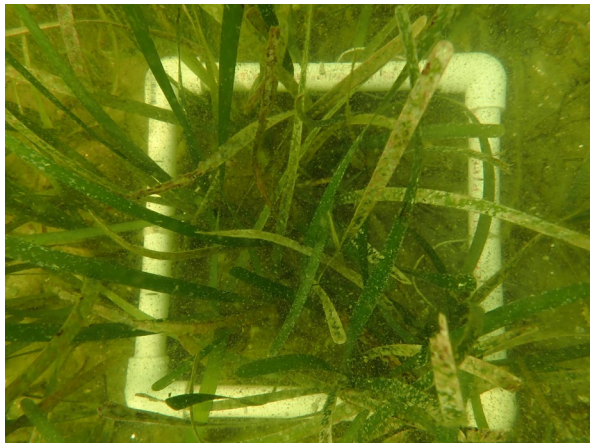
Meter 8 Data
Urchin Count: 0
Shoot count: 3
Average Height (mm): 293.33

Meter 10



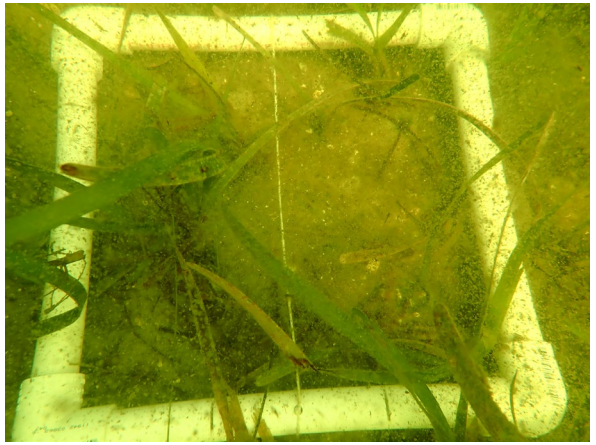
Meter 10 Data
Urchin Count: 0
Shoot count: 22
Average Height (mm): 263.41

Meter 12



Meter 12 Data
Urchin Count: 0
Shoot count: 26
Average Height (mm): 248.77

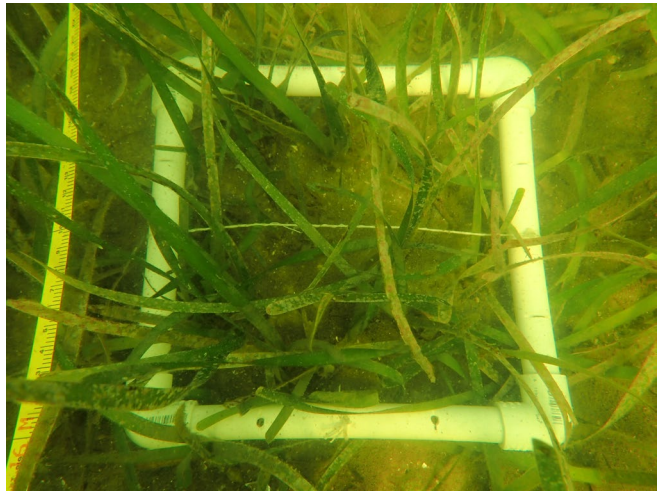
Meter 14



Meter 14 Data
Urchin Count: 0
Shoot count: 8
Average Height (mm): 247.5

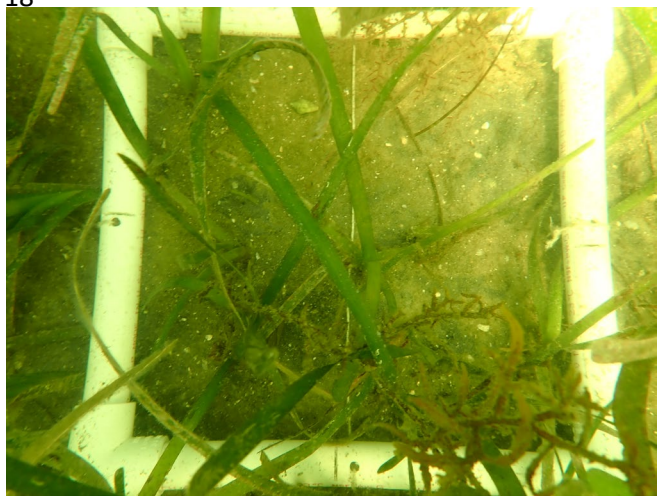
June Transect Pictures

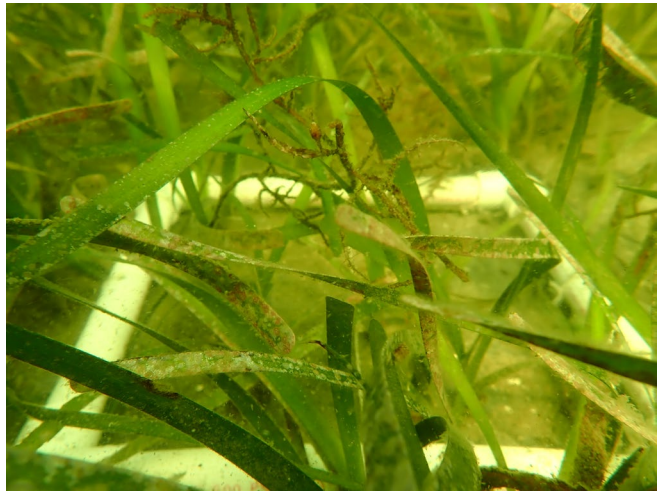
Meter 16



Meter 16 Data
Urchin Count: 0
Shoot count: 22
Average Height (mm): 278.18

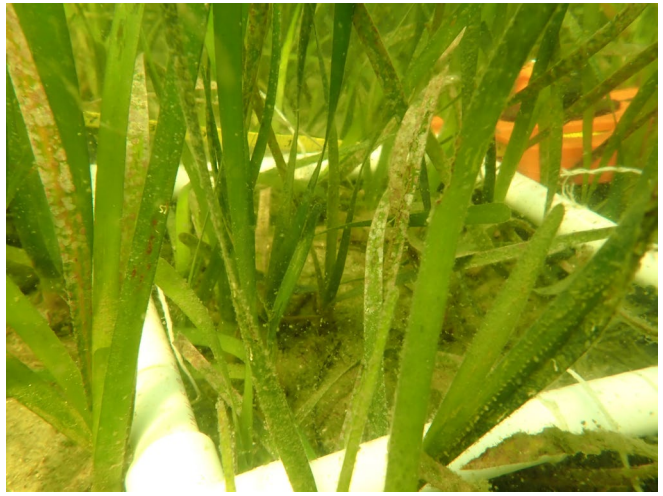
Meter 18





Meter 18 Data
Urchin Count: 0
Shoot count: 12
Average Height (mm): 249.58

Meter 20

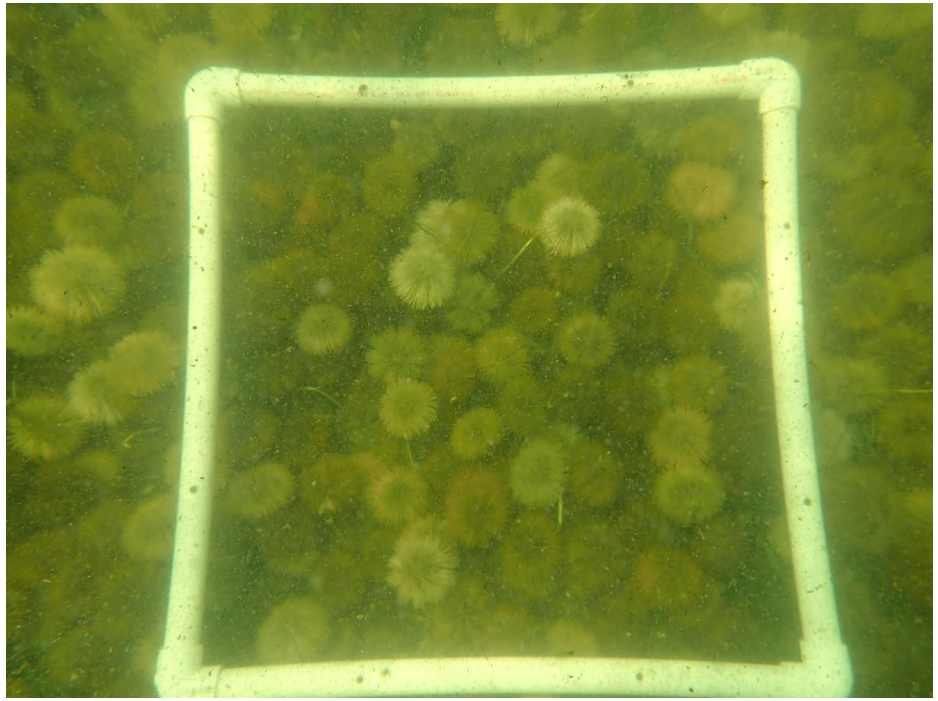


Meter 20 Data
Urchin Count: 0
Shoot count: 13
Average Height (mm): 277.08

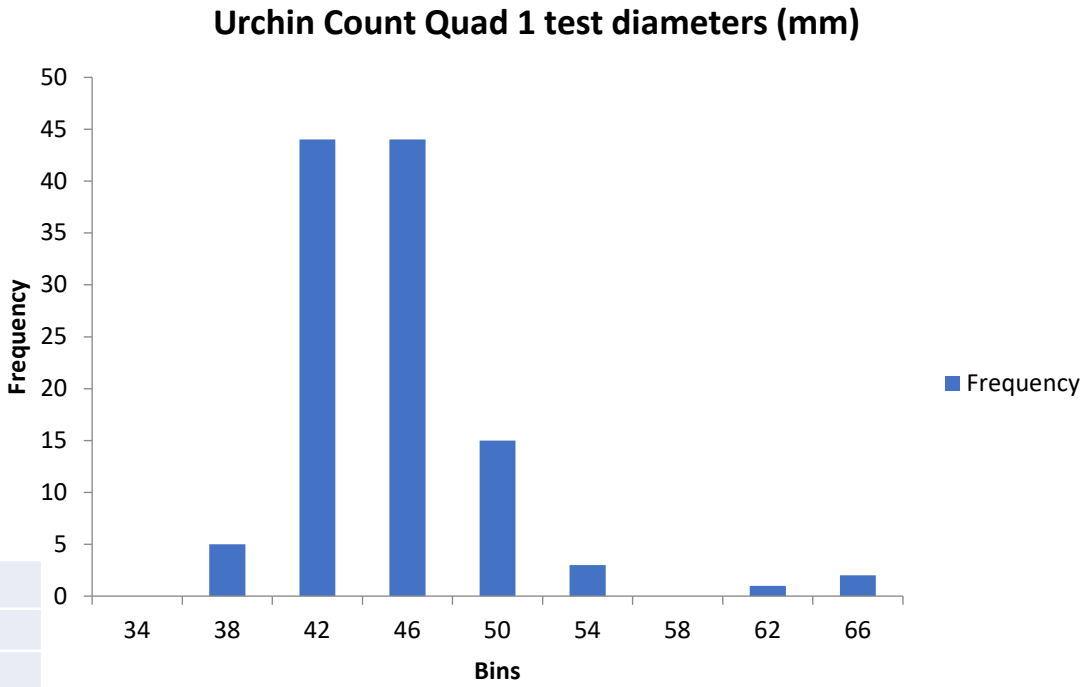
Extra Urchin Counts

UrchCo01
3/09/2023
GPS:29.80338 -83.6267

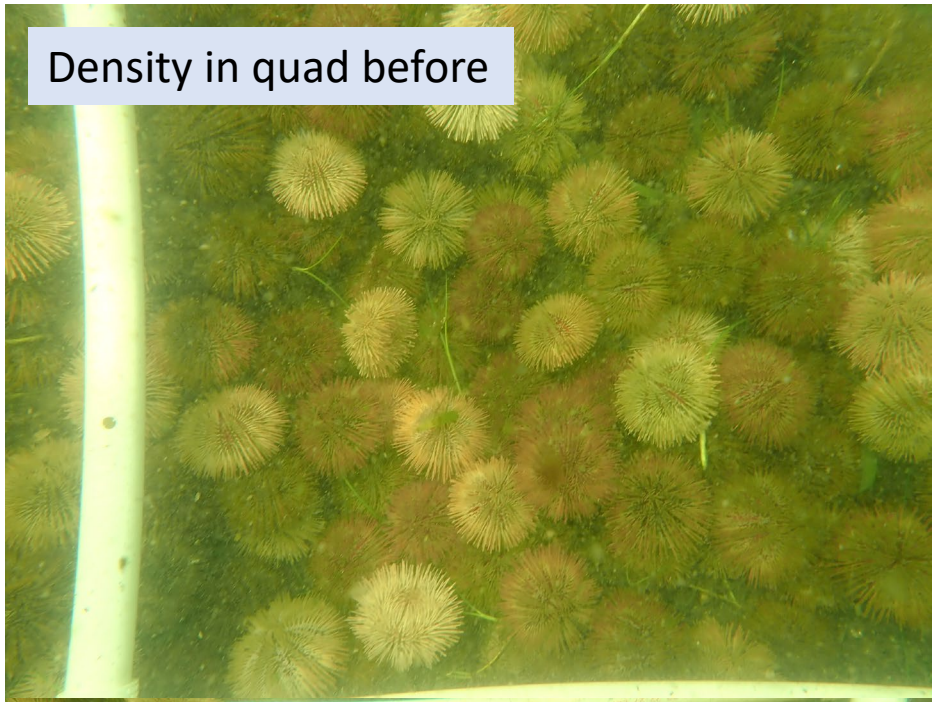
In an effort to collect more urchin per quad data, an extra quad was taken near the transect 1 site in the urchin front. The quad was randomly thrown over the front and all urchins inside were collected and measured. Quadrat named UrchCo1, more urchin count quads may be taken moving forward.



Urchin_test (mm)	
Mean	43.44825
Standard Deviation	4.605907
Range	28.46
Minimum	35.85
Maximum	64.31
Count	114

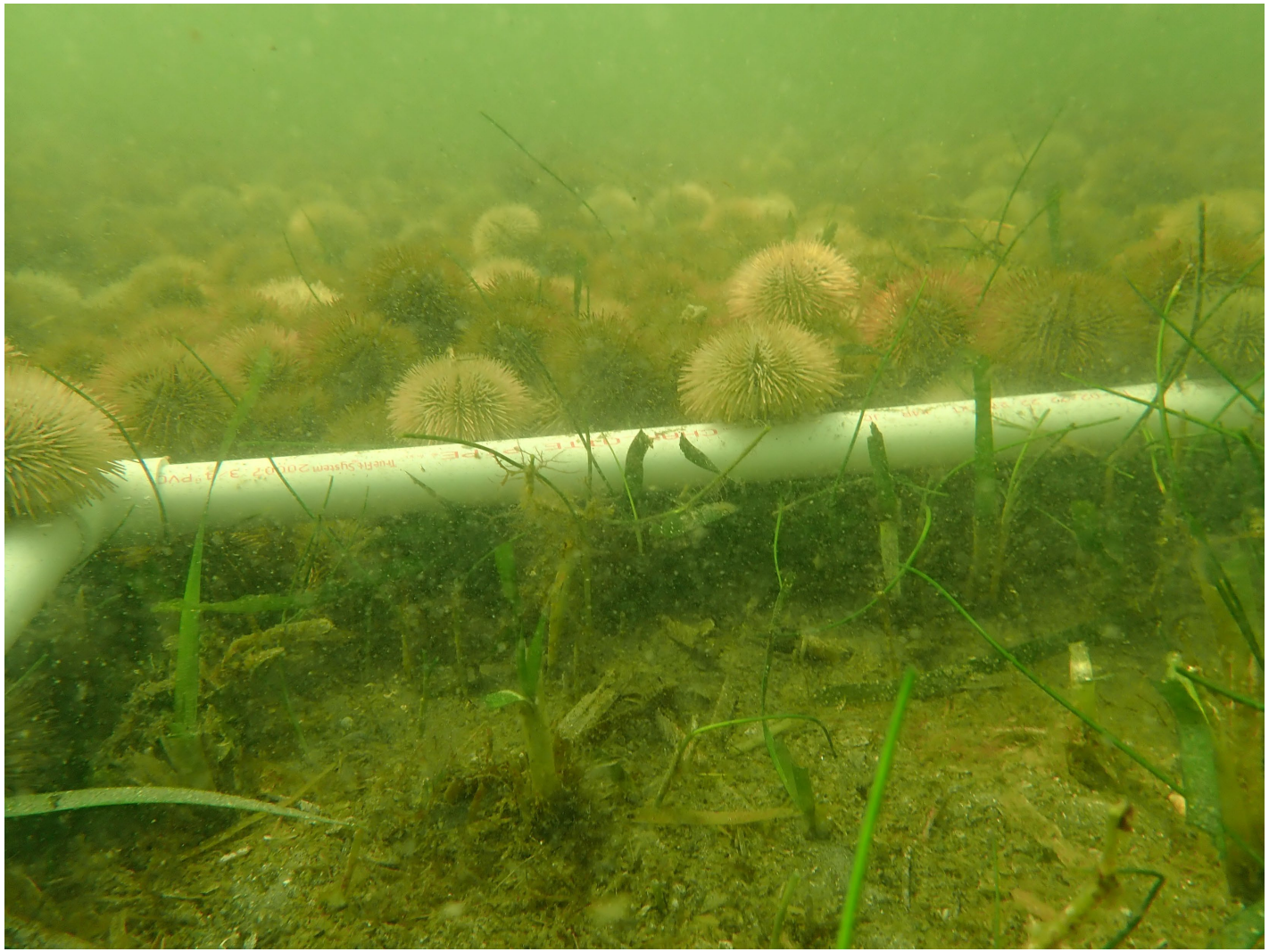


UrchCo01 pictures



Density in quad before

After removal

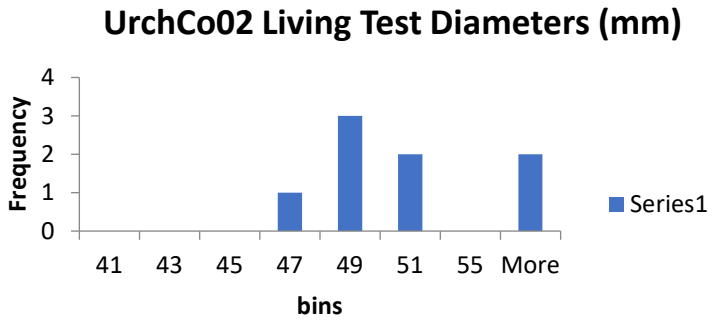


View in quad after removal, you can see some grass shoots and the front around the removed area.

Extra Urchin Counts

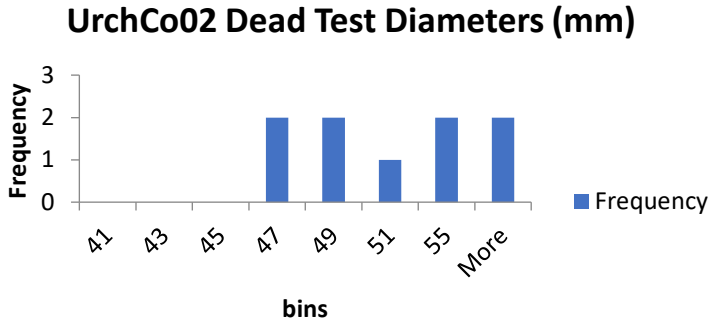
UrchCo02
5/16/2023
GPS: 29.80412, -83.6225

Urchin Count Quad 02 was taken in May near the same location as UrchCo01. These quads were also taken around the established transect line. UrchCo02 had a significant number of dead urchins in and around it, there was also a slight line between grazed and ungrazed grasses. Both live urchin and dead urchin tests were measured. Dead urchins were only measured if their test was still complete.



bins	Frequency
41	0
43	0
45	0
47	1
49	3
51	2
55	0
More	2

UrchCo02 Live Diameters (mm)	
Mean	49.775
Standard Deviation	7.494621
Range	20.08
Minimum	42.36
Maximum	62.44
Count	8



bins	Frequency
41	0
43	0
45	0
47	2
49	2
51	1
55	2
More	2

UrchCo02 Dead Diameters (mm)	
Mean	50.73889
Standard Deviation	8.857735
Range	27.66
Minimum	41.15
Maximum	68.81
Count	9

UrchCo02 pictures

Dead tests scattered, live urchin using dead test as hat

Other notes from the field:

Did not see any *Arbacia punctulata* during the in June. Still a decent number of dead urchin tests. In some areas, the sediment is covered in loose spines that have dropped from the urchins (picture)

Next urchin surveys will occur in July.
Still working on getting aerial imagery to map the extent of damage.

Data collected by Big Bend Seagrasses Aquatic Preserves.
Please contact Kate Suchanec at Katherine.Suchanec@floridadep.gov with any questions, comments, or requests for further data & pictures.
Special thanks to Cheryl Clark, DEP central office, for assisting with urchin measurements in February and March.