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Tidal Floating Upweller System (FLUPSY)

FRG 2015-07

Jennifer Palazzo

Final Report

Submitted December 7, 2015

Final Report – TIDAL FLUPSY

Final Report

Fishery Resource Grants Program

Project Title: Tidal Flupsy, FRGP 2015-07

Project Investigator: Jennifer Palazzo

Period Covered by this Report: April 2015-December 2015

Summary of Progress/Accomplishments for this Project:

This project was a huge success. The purpose of our project was to achieve traditional oyster seed growth using the tidal current (not electricity) and a wire cage and bag (not silo) system to deliver nutrients in the upper three feet of water column.

Our Tidal Flupsy design will have long term economic benefits (no pump to purchase/maintain, no extra labor for silo cleaning, and no electrical costs) and be a resource efficient alternative, especially for the small to medium sized oyster operation. Our goal to create a utility/electricity free Tidal Flupsy (TF) more than exceeded our expectations.

Building the Tidal Flupsy was the first step.

Building/Changes/Launching

It took us five full weekends to complete the project with two laborers and one support person. The pontoons were bulky to transport, but was managed with shrink wrap. We did make couple of slight modifications to the original design and one was that we did not add the fins to the end. This was to prevent the TF from rotating too swiftly. Without the fins, the TF was able to move in a steady fashion with the current smoothly around the post.

The second change was creating five rows of three cages each (instead of two rows of eight or four of four). This allowed us to maximize the space, taking the shape of the TF and cages into account. This configuration holds 30 bags of seed at a time which is perfect for a small operation. The bags get quite heavy as the seed matures and more than two bags in a cage could not be handled without special equipment.

The third change we made was the depth of the cages. Initially, we thought we'd have our seed four bags deep. We realized that the weight of the cages as the seed matured would not allow them to be handled without special equipment. Two bags per cage is the maximum (and what we used) that can be serviced manually.

Once the Tidal Flupsy construction was completed on land, the next step was transferring to water. This proved to be somewhat of a challenge, as the finished product was heavier than anticipated. With about six men, some careful thought, a forklift, and high tide, we were able to move the TF into the water.

Securing/ Seeding

The next step was securing it to the piling post. We used the boat to get to the TF and then while on the top (with tools connected to buoys and rope for safety) drilled the harness around the piling to the deck of the TF.

The deck of the TF was made of five separate lids (each lid covering one row of cages – three cages per row, the entire width of the TF). The lids were moved off one at a time with a boat hook for servicing.

The cages were hung incrementally as the seed grew. Initially, we hung the cages with traditional rope. We soon learned, however, that rope was not ideal for the project (extra weight and stretching) and swapped out the traditional for blue crab line. This was a nice improvement and allowed for much easier handling. Each week, we removed the seed from the bags, weighed and measured it, cleaned or switched the bags depending on amount of fowling. This was done with two people and took 4-6 hours. Perfect for the small/mid-size grower.

For our small operation, as proposed, we ran two - 100,000 count batches of 2mm seed through the TF for the season. Our first batch began on 6/15/2015 and was cage ready, some of the seed reaching 38 mm, by 9/4/2015, a 12 week growth cycle. With batch one, we were able to hold the seed past the 25mm stage as the nutrients were rich and the growth rapid. After the first few weeks of grow out, each week the seed was split in half and the bags doubled (one bag became two, two became four). The mesh bags used were approximately 2'x3' with 1.5mm, 5mm, and 17mm mesh holes. All 100,000 of the 2mm seed was initially placed in the 1.5mm size bag and was graduated to the larger mm openings as they grew. The key is to keep the water flow moving and the holes large enough for best flow but small enough to retain the seed. At the introduction of batch two, we had 13 cages full from Batch one (26 bags of more mature seed) leaving two cages available for new seed. Once we introduced batch two, we began to rotate batch one out of the TF and into bottom cages. At this point all cages were full. Batch two was started on 7/24/2015 and after just 9 weeks was unexpectedly forced into cages because of the threat of Hurricane Joaquin and the severe coastal flooding. By this time, the seed from this batch reached 20-34 mm - an outstanding growth rate. This was just shy of our anticipated 25mm goal, but with the high winds and coastal flooding it was the safe move. We placed all the seed in bottom cages, remove the lids from the TF and anchored the TF to the dock with long line.

Summary

We met our grant goal of running 200,000 seed through the TF in a summer. We had excellent survival rates, the only exception that some of the lower hanging cages closest to the rear got dragged in mud one week at extreme low tide, and there was slight mortality (see graph). In my proposal, I expected that the TF may be able to handle 300,000 seed and that seems attainable. If the seed were planted earlier, perhaps the end of May, one could run two batches of 150,000 seed. The only difference is that the seed would have to be put in cages the moment it reached 25 mm without the luxury to continue with middle column growth well past the 35-40mm stage. Of course, Mother Nature has to cooperate, also!

In summary, this project was:

1. Cost effective (less than \$4,000 compared to a traditional upweller nearing \$20,000).
2. Energy efficient (requires zero electricity, also adding to the savings and no worries of power failure).
3. Labor efficient (grew out 200,000 seed with only two laborers once weekly instead of cleaning silos multiple times weekly).

Included are photos of all phases of the construction, placement, Tidal Flupsy usage and of course, oyster growth. Also included is the spreadsheet documentation of the weekly growth and weight charts.

This Tidal Flupsy will be used for many years to come. This was a fruitful project with excellent results and can be duplicated by small oyster growers everywhere!

Building/Supplies

The following supplies were purchased:

Pressure treated timber #1 grade 1x6x10 – 50x\$11.18=\$559.00

2x6x20 – 6x\$29.33=\$175.98

2x4x8 - 10x\$4.04=\$40.40

8x2" deck board screws – 3 boxes x \$19.19+\$57.57

TOTAL INCLUDING TAX AND DELIVERY \$887.10

Custom 3x3 double stack TF bag cages 16x\$48.00= \$768.00

TOTAL \$768.00

Mini grow out bags 1.5mm 20x\$3.60= \$72.00

(Note: we already owned the 5mm bags and 17 mm bags)

TOTAL \$72.00

Miscellaneous bolts, nuts, washers, braces, snap hooks, driver bit, spring hooks

TOTAL \$283.92

Supplies continues

2'x4'x16" Polyflange Floats – 10 x \$125 = \$1250

Inside Corners – 4x \$23.50 = \$94.00

Angle 2 ½"x5" – 8x\$7=\$56.00

5/16 x 1 ½ SS lag bolt set – 92x 0.80 = \$73.60

HD Tubular Piling Hoop – 1x\$79.00

½"x2" SS lag bolt with washer set 18.8 Hex Lag – 8x\$2.30= \$18.40

½" x 3" SS Lag bolt set – 2x\$2.60=\$5.20

Heavy duty dock plate – 1x\$58.00=\$58.00

Heavy duty roller assembly (6"roller) – 1x\$50.00=\$50.00

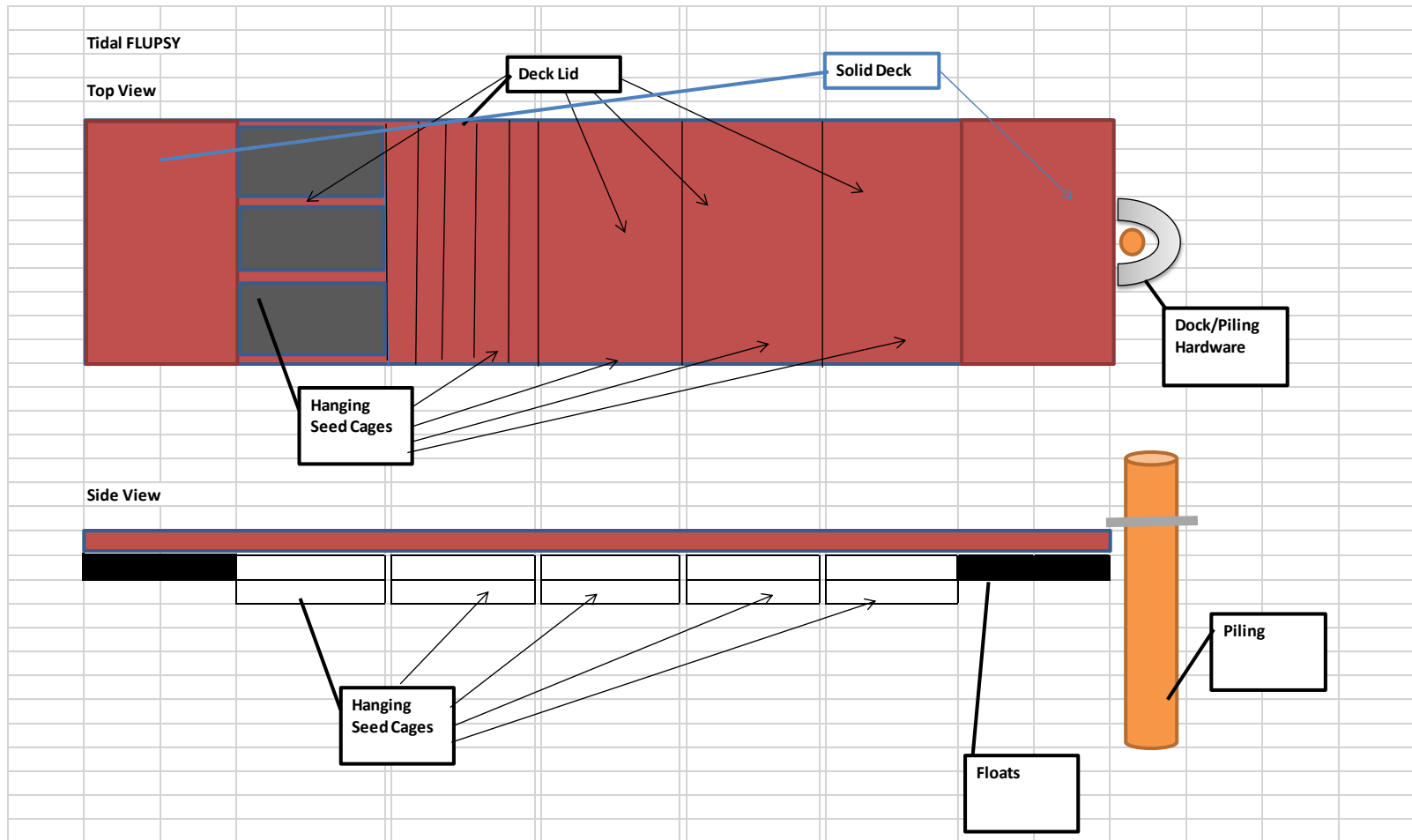
Galvanized carriage bolt set ½'x3" – 32x\$1.55=\$49.60

Pre-season float discount (\$100)

TOTAL INCLUDING TAX \$1720.39

GRAND TOTAL \$3731.41

Tidal Flupsy Final Sketch













Week 3 - July 5,
2015



8/2/15 Seed Batch 2
1 week



second batch

8/9/15



8/14/15 Batch 1



8/16/15 Batch 2



Batch 1 week 9 GREAT
GROWTH!

8/28/15 Batch 2



8/28/15 WK 5

Batch 1 8/29/15



Batch 2 8/29/15



Week 9 Batch 1



Batch 2 9/4/15



Batch 2 9/12/15



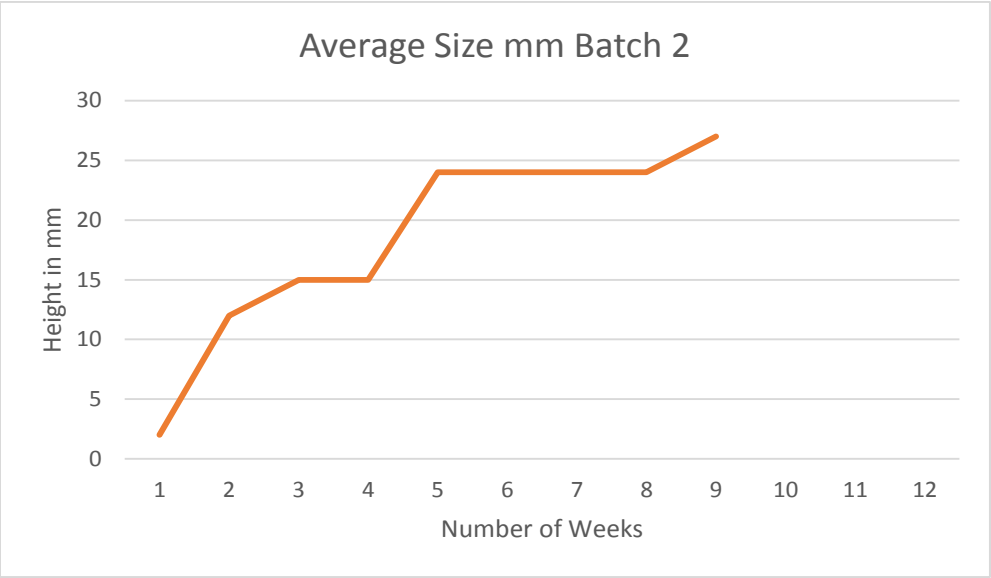
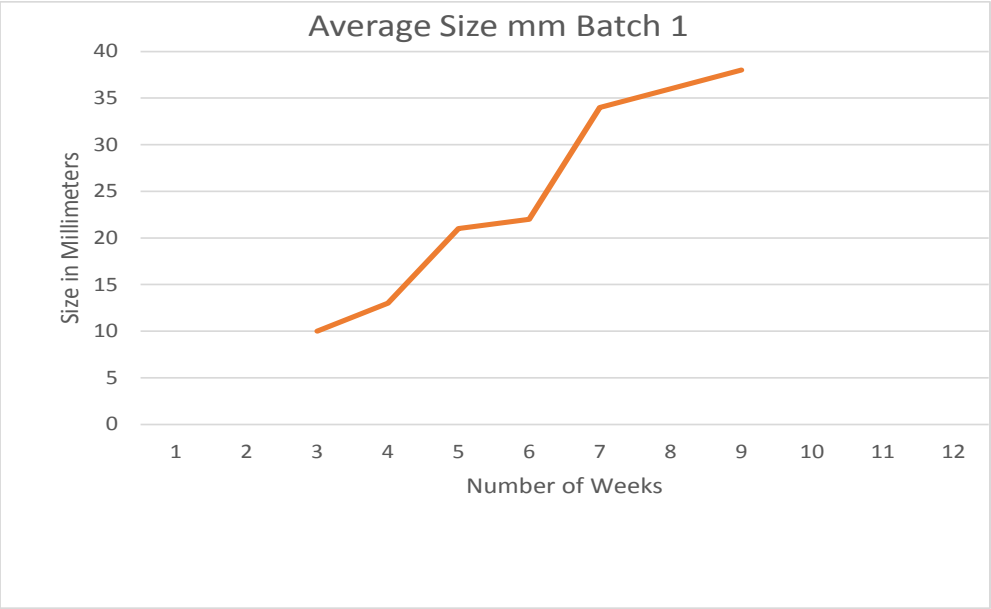
Only 8 weeks!

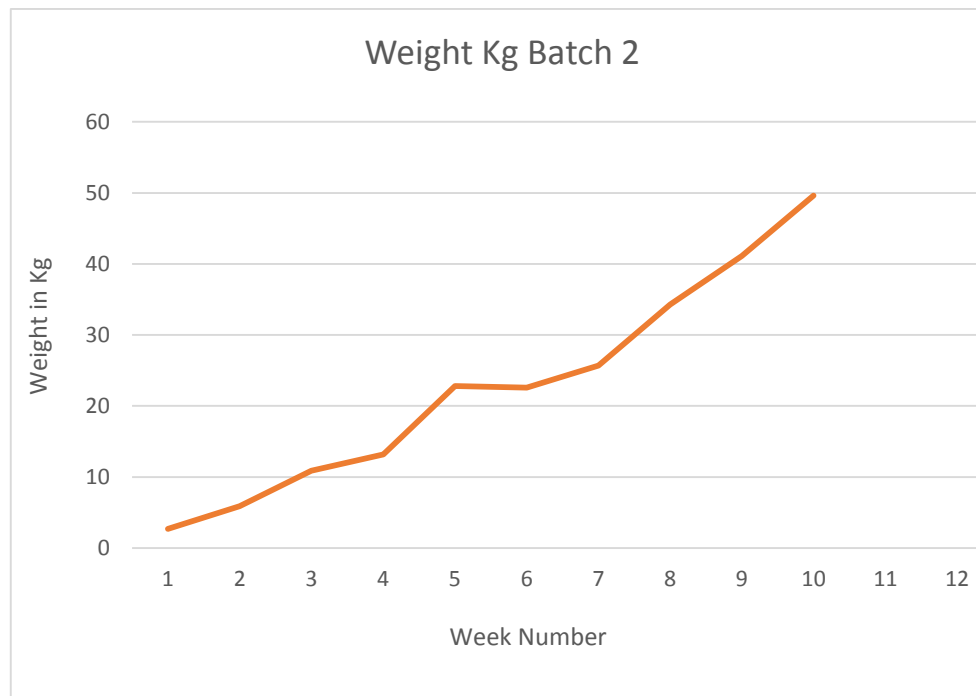
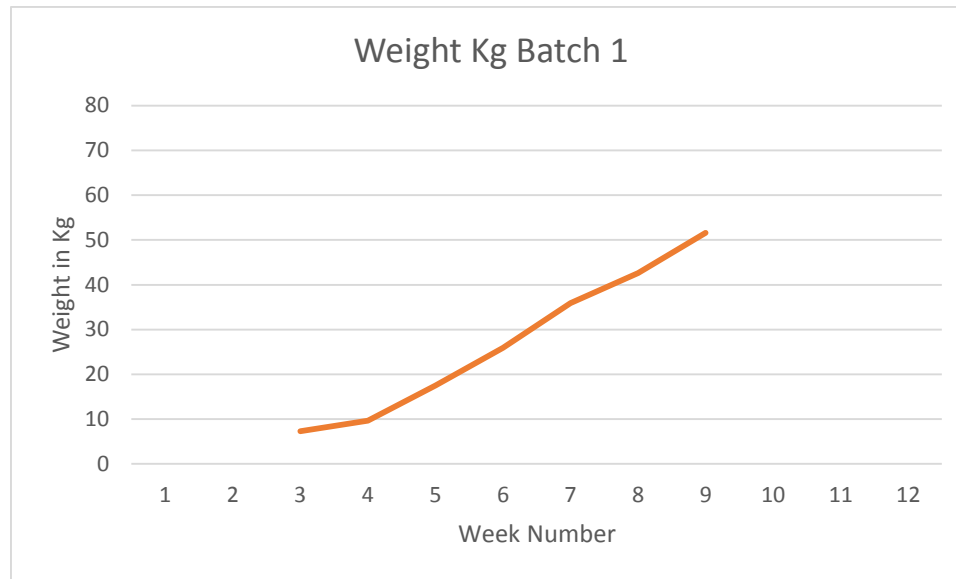
9/19/15 Batch 2



Placed in Bottom Cages







DATE	BATCH 1 KCB	COUNTING DESCRIPTIONS		
6/15/2015	New Seed	Bag #	Units	Millimeters
		1	16214	
		2	16036	
		3	15714	
		4	15321	
		5	15714	
		6	14500	
		Total	93499 units	2-4mm per KCB
6/18/2015	Checked Fowling			
	Left- Slight			
	Center- None			
6/20/2015	Checked Fowling			
	Left- Some			
	Center- None			
6/25/2015	Checked Fowling			
	Lots of Fowling- Cleaned Off			
7/5/2015	Cleaning	Bag # 1.5mm	Oyster Weight (kg)	Millimeters
		1	1.055	
		2	0.848	
		3	1.101	
		4	1.452	
		5	0.918	
		6	0.955	
		7	0.925	
		8	0.76	
		9	0.721	
		Total	8.735	6-14 mm (photo)
7/12/2015	Cleaning	Bag#	Oyster Weight (kg)	Millimeters
		1 - 5mm	2.80555	
		2 -5mm	3.3635	
		3 - 5mm	3.034	
		4- 1.5mm	0.391	
		Total	9.59405	9-18 mm (photo)

7/18/2015	Cleaning	Bag #	Oyster Weight (kg)	Millimeters
		1- 1.5mm	0.8845	
		2 - 5mm	5.371	
		3 - 5mm	6.5985	
		4 - 5mm	4.641	
		total	17.495	16-26 mm (photo)
7/24/2015	Cleaning	Bag#	Oyster Weight (kg)	Millimeters
		1- 5mm	6.08	
		2- 5mm	2.712	
		3- 5mm	3.387	
		4- 5mm	5.741	
		5- 5mm	3.482	
		6- 5mm	4.507	
		7- 5mm	1.48	
		total	27.389	18-26mm (photo)
8/2/2015	Cleaning	Bag#	Oyster Weight (kg)	Millimeters
		1- 5mm	9.565	
		2- 5mm	3.9571	
		3- 5mm	6.18	
		4- 5mm	3.8055	
		5- 5mm	7.498	
		6- 5mm	4.925	
		7- 5mm	1.005	
		total	36.93kg	
8/9/2015	Sorting	Buckets	Oyster Weight (kg)	Millimeters
	used mechanical sorter	1	9.921	
		2	10.462	
		3	11.404	
		4	10.89	
		total	42.67 kg	30mm-42mm (photo)

8/16/2015	Cleaning	Bag	Oyster Weight (kg)	Millimeters
		1-17mm	5.633	
		2-17mm	3.5	
		3-17mm	3.034	
		4-5mm	5.96	
		5-5mm	5.007	
		6-5mm	5.404	
		7-5mm	4.926	
		8-5mm	5.814	
		9-5mm	6	
		10-5mm	6.357	
Technically ready for bottom cages!		total	51.635kg	24mm-34mm (photo)
8/24/2015	cleaning	bags	Weight kg	Millimeters
		12-5mm bags	no wts.	
		6-17mm bags		
8/29/2015	cleaning	Buckets	Weight kg	Millimeters
		1	19.746kg	ready for line
		2	22.85	ready for line
		3	24.14	ready for line
		total	66.73 kg	24-38mm (photo)
9/4/2015	Sorting	Bags/Cages	Weight kg	Millimeters
	used mechanical sorter	8-17mm bags	ready for line	
		3-5mm bags	ready for line	
		1-half inch cage	taken to line 1	Large group photo
9/12/2015	Cleaning	Bags	Weight kg	Millimeters
		10- 5mm bags	ready for line	
		7- 17mm bags	ready for line	no photo
9/19/2015	Cleaning	bags	Weight kg	Millimeters
		11-5mm bags	ready for line	
		7-17mm bags	ready for line	no photo
9/26/2015	Cleaning	bags	Weight kg	Millimeters
		12 - 5mm bags	ready for line	no photo
		6- 17mm bags	ready for line	no photo
10/1/2015	Hurricane and Tidal Flooding	bags	Weight kg	Millimeters
		* all bags emptied into cages and put on line		

DATE	BATCH 2 OSH	COUNTING DESCRIPTIONS		
7/24/2015	New Seed	Bag #	Oyster Weight (kg)	Millimeters
		1- 1.5 mm	0.846	
		2- 1.5 mm	0.8828	
		3- 1.5 mm	0.8717	
		Total	2.6025 kg	2-4mm per OSH
8/2/2015	cleaning	Bag # 1.5 mm	Oyster Weight (kg)	Millimeters
		1	1.805	
		2	2.4	
		3	1.687	
		Total	5.892	5mm-18mm(photo)
8/9/2015	cleaning	Bag # 1.5 mm	Oyster Weight (kg)	Millimeters
		1	1.246	
		2	1.58	
		3	2.229	
		4	1.229	
		5	1.83	
		6	2.083	
		Total	10.197	6mm-24mm(photo)
8/16/2015	cleaning	Bag # 1.5 mm	Oyster Weight (kg)	Millimeters
		1	1.2585	
		2	1.057	
		3	1.168	
		4	1.289	
		5	1.428	
		6	1.035	
		7	1.069	
		8	1.528	
		9	0.761	
		10	0.623	
		11	0.797	
		12	1.13	
		Total	13.1435	8mm-20mm(photo)

8/23/2015	cleaning	Bag Total	Oyster Weight (kg)	Millimeters
		1-6 (1.5mm)	10.315	
		7-12(1.5mm)	12.493	
		Total	22.808	16mm-32mm(photo)
8/29/2015	cleaning	Bag Totals	Oyster Weight(kg)	Millimeters
		Bag 1 (5mm)	6.512	
		Bag 2 (5mm)	4.88	
		Bag 3 (5mm)	5.045	
		Bag 4(5mm)	6.185	
		Total	22.622	12-24mm(photo)
			<i>*death from low-hanging</i>	
			<i>cage in mud= LOSS</i>	
9/4/2015	Sorting	Bucket totals	Oyster Weight (kg)	Millimeters
	used mechanical sorter	1	9.76	
	put all seed into buckets	2	5.87	
		3	6.72	
		4	3.32	
		Total	25.67	14-30mm (photo)
9/12/2019	cleaning	Bags	Oyster Weight (kg)	Millimeters
		5mm bags 7	29.65	
		17 mm bag 1	4.65	
		Total	34.3	18-30mm (photo)
9/19/2015	cleaning	Bags	Oyster Weight (kg)	Millimeters
		bags 1+2	8.75	
		3	5.41	
		4	3.92	
		5	4.88	
		6	5.46	
		7	4.89	
		bags 8+9	7.75	
		total	41.06	20-34mm

9/26/2015	cleaning	bags	Oyster Weight (kg)	Millimeters
		1	3.01	
		2	5.54	
		3	3.21	
		4	4.89	
		5	4.66	
		6	3.88	
		7	3.86	
		8	3.92	
		9	4.51	
		10	5.77	
		11	6.44	
		total	49.69	no photo
10/1/2015	Hurricane/Tidal Flood	bags	Weight kg	Millimeters
		* all bags emptied into cages and put on line		