Practical Oyster Larvae and Remote Deployment Pool

FRG 2016-04

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Final Report

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“Practical Oyster Larvae and Remote Deployment” Barge

“POLARD” Barge Report

Dec 1, 2016

Fisheries Resource Grant - 2016-04

Section I – Narrative About the Experiment's Successes.

The application (in full at the end of this report) describes the project as such:

> *This grant will evaluate the costs of constructing and operating a 100 bushel "floating pool" in which aged, washed, and containerized shell is placed with purchased larvae for setting on the cultch. The 100 bushel sized pool is being proposed because it is a sample size large enough to test future scalability but small enough to manage as a controlled experiment. In addition, the proposal will compare the setting efficiency of the pool vs the standard upland tanks. Also, we intend to test practicality - after lifting the skirt that forms the pool – of towing the POLARDS Pool (now a barge) to place the shell on leased bottom by dropping it out of the bottom of the wire baskets. If practical, this would obviously reduce labor costs related to handling.*

My conclusion is that the POLARD Barge determined feasibility of a floating spat on shell tank but has not yet determined practicality. In short, I am happy with the results with the caveat that this was a first year experiment.

We proved that off-the-shelf materials such as plastic drums and lumber can build a barge sturdy enough to support 100 bushels of shell. Further, the premise of the experiment is that a shell doesn't weigh as much under water as it does above water… although we couldn't find the specific gravity of shell anywhere.

In terms of the set rate: Based on the estimate of 27 bushels per pool and using an estimate of 500 house shells per bushel, the set rate is 5.3%. So the concept worked, however with 2M larvae and using 27% of shell normally used for that amount of larvae, the setting rate is lower than expected.

The experiment was significantly hampered by the lack of availability of larvae and, due to this fact, we were unable to complete the proposed three rounds of spat on shell tests and instead only complete one round. The project has been donated to Tidewater Oyster Gardeners Association in hopes that they can continue the experiment.

Thoughts of the things that I would differently or experiment with:

a) Oysters weigh less under water than above, but I never measured the exact amount. I think the floatation in the barge could, maybe, be reduced by 4 barrels.
b) The volume of water covered by the tarp needs to be smaller so that the set rate becomes more efficient.
c) The sweetwater bubbler is a very expensive way to circulate water during the setting phase… I bet a couple of electric trolling motors could be much more cost effective.
d) An ice eater or some other pump running for a few weeks after the set would really jump start the spat growth and further rationalize this method.
e) I think that there is a way to design this so that no baskets are needed and less product handling is needed. There would be a an underwater box with several levels of removable plastic decking and shell could be dumped into a layer with a front end loader or conveyor…. Another layer of decking would be put down and then more shell would be added. Guillotine style doors on each end would allow for circulation of water.

Section II - Building the POLARD Barge.

The POLARD Barge was built with standard off the shelf in materials costing approximate $1,500. Plans are in the appendix. The single most important aspect of construction is the stainless metal straps that go over the barrels but under the decking. These straps prevent the buoyancy of the barrels from lifting the decking off barge. The barge has to get flipped twice in building… once to put the barrels on and then again before launching.

Barge has been flipped.

Caption: Again, note the barrel strap that will be on the top of the barrel and the metal plate around the corner. Both of these keep the stress of the weight from popping the screws.

I am sure we could have placed barrels with non-mechanical means (jacking it up and placing the barrels under) but it was way easier to flip it with a loader.

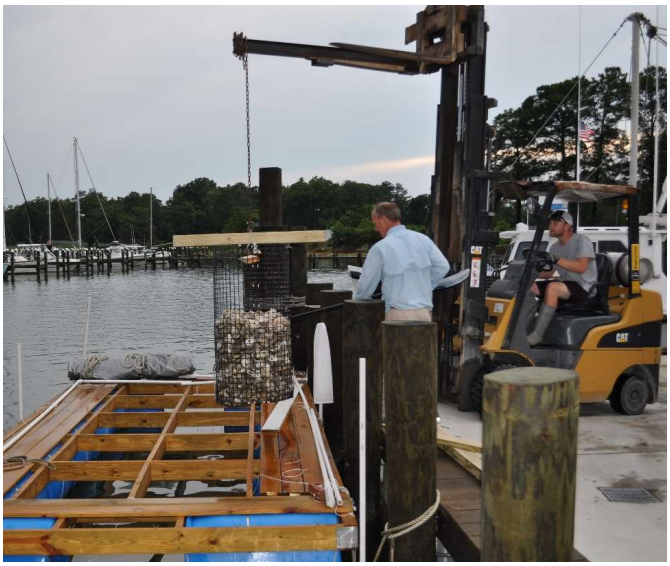
Ready to launch. A completed barge, now the real work begins…

Section II – Handling the baskets.

Caption: We made these wire 'lifting straps' out of 1/4 cable for the oyster baskets to have four points of contact with the strap when we lift them loaded. Probably could have used 3/16 cable… maybe even 1/8".

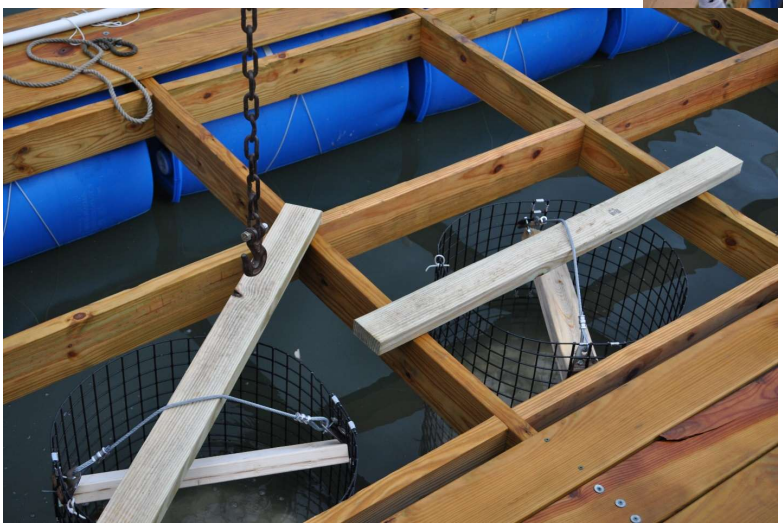
Lifting the baskets to place them in barge. In the initial experiment (which turned out to be the only experiment due to scarcity of larvae) we only filled the barge half full – approximately 26 bushels of oysters or 1500 dry pounds.

Caption: A close up of the "I beam" we used to lift the baskets. We could have had it extend out further so to reach across the center line and load both side of the barge without moving the barge. Also, maybe could have made this from angle iron welded to itself to make a "T" Bar.



This system worked remarkable well but never, ever get under the load. Total load time took 2 hours.

Caption: Again, never get under the load.
Maneuver it with a stick.



Caption: Note the 2x4s are flat. 2x4's have about 4 times more strength if they are on edge but I worried that if I stod them on edge wake might cause them to flop over and then break on impact. Some 2x4's (ones that weren't 'clear') sagged badly as spat and growth accumulated, but none broke…. I later reinforced a few.

SECTION 3. Wrapping the Tank, Setting, Handling and Deploying.

I originally tried to use this 24 mil pond liner tarp from an agricultural supply store… it was too heavy, not flexible enough, cost several hundred dollars and was basically a disaster. Went with an off the shelf 12 mil tarp measuring 20 x 30 for $40 and it worked fine. Deploying the tarp is a two person job. Subsequent experiments need to figure out a better way to deploy and even smaller tarp that wraps only the cylinders and not the whole barge.

Anatomy of the POLARD Barge

Note that some of the 2x4's really sagged… some later got reinforced

The tarp lines the whole barge and makes it a strike tank.

Filter Sock

Tiny cleats made of 3" deck screws… would be better if further inboard.

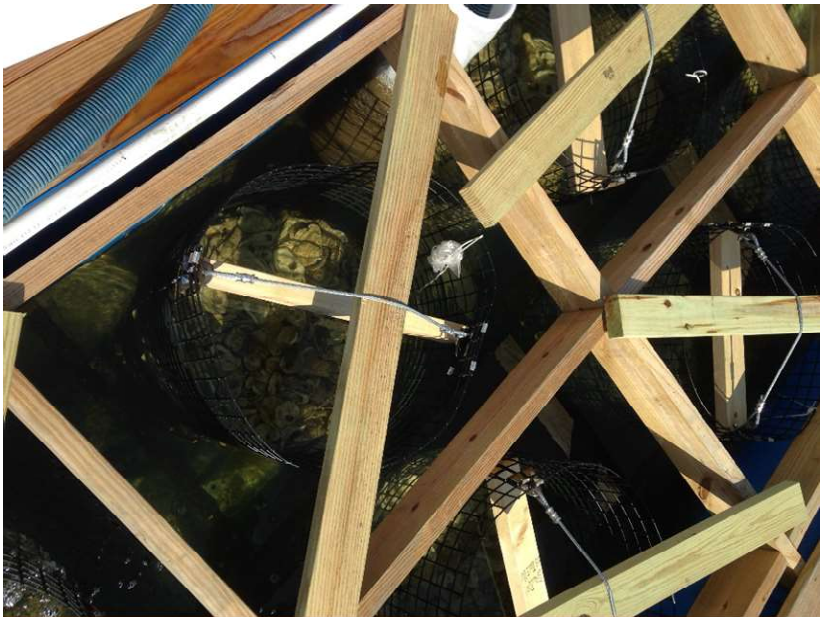
Note the stainless steel straps keeping the barrel in place.

Off the shelf sump pump (under water) that pumped into the filter sock

Swbeetwater bubbler (not paid for with the grant) to airate after spat are introduced but before the tarp is removed.

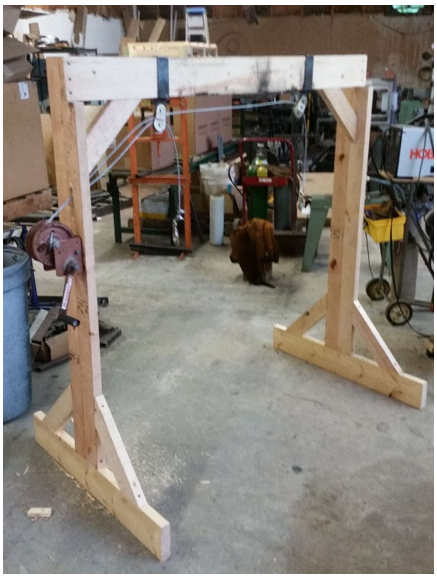
Underwater portion of the bubbler has 1/8 holes every foot or so.

I think there is a much cheaper way to agitate the water than the sweetwater bubbling system above (electric trolling motors come to mind), but it worked fine. As seen above the blower ran to a "T" with a pressure release (ball) valve on one side and the bubbling system on the other. The bubbler was a series of 1/8 holes in 1' pipes at 12" centers that were submerged at a depth of ~ 4'. Pipe glue held the system together above the water line but friction held it together below the water line so that it could be taken apart when moving the barge. The bubbler pipes ran the length of both sides of the barge and had air diffusers at the end (which I also thing were unneeded). Final note: for the bubbler pipes I both weighted them down with bricks but held them at a depth of 4' with 1/8" line. I would turn on the blower and slowly increase pressure by closing the ball valve.



Confusing photo but it shows the water clarity after the sump pump had been pushing water through the sock filter for 24 hours. The system worked will and was cheap.

Tarp around the barge for three days or so after the larvae has been introduced. It is ugly but worked fine. I am sure subsequent try it would go easier.



Crane with hoist… 5’ high and worked great but should have been about 6” higher. Also, we overbuilt, no need to make this “a double” just slide the pulley down.

Hoist on barge… note that the tarp has been removed. Oysters are growing in the cages… an ice eater circulating water probably would have sped the growth some. Instead of crane I had originally worked on a mechanism to lower the bottom of the cage down with a long threaded rod. I should have just started with a hoist like this, plus it lets one check the set rate.

An 8 HP pulls the barge out to the shore… It was slow going with all the drag but the little engine did the job.

The hoist in action… yep, should have made it a little taller. We used a self-locking winch I had laying around… I highly recommend that style as ratchet could “get away from you”. The span bar is a 2x6” untreated. Also, we overbuilt, no need to make this “a double” we should have just slid a single pulley to whichever side we wanted to lift up.

Empty the cylinder straight onto the oyster ground. I will leave them in mounds on the bottom ground as a hedge against cow nosed rays.

High total set but relatively low set rate (read the narrative). I am convinced this had to do with the large total volume of water compared to the total volume of cultch. Subsequent experiments should have the tarp encircle only the cages as opposed to the whole barge…

Nice!

Notes on the first set ~ August 1th.

Loaded washed shell ½ full baskets on Wed July 27th. Approximate time 2 hours.

Wrapped the tank in the tarp on the 28th… approx. time 1 hour.

28th Hooked up filter. Time 2 hours (wrong pump)… 2nd time ½ an hour.

Ran the 50 micron filter till Saturday evening then set with 2 million larvae.

Others from that batch report 20% set rate. This is two different sets and two different counts.

Bubbler ran from Sat evening till Monday evening with one short interruption… cord came undone on low tide.

Unwrapped on August the 1st.

Hooked up bubbler took 10 minutes.

On 8/4/16 evening wrapped one cylinder in plastic and then ran water through the top to see if we could spur growth.

Instead of counting the strike using the French string method as described in the grant, 10 shells collected by hand from top layer then as cylinders were hoisted up and shells being released out the bottom– a random handful of shells was collected from the bottom and middle layers ending up to be roughly 10-15 from each layer). In total 30 shells from each cylinder (representing top, middle and bottom) were evaluated for setting rate.

•There were only about 12 shells total that had no spat set! So that means the strike was good throughout the cylinder- not just on top.

•The highest spat per she'll were in cylinders 7,8&9. These were closest to the pump and where we saw the least bubbling, as I recall.

• Average spat per shell=8

•highest ave spat per shell =13.1

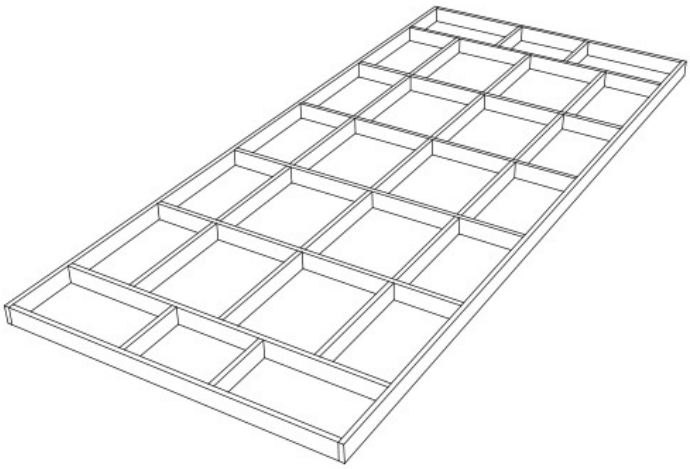
•lowest ave= 4.8

There were ~ 2 million larvae and the 2x4 cylinders have 50 cubic feet of volume. A bushel is of 9.30918 cubic feet... so 5.37 bushels per cylinder if full = 5.37 x 10 wire cages = 53.7 bushel capacity.

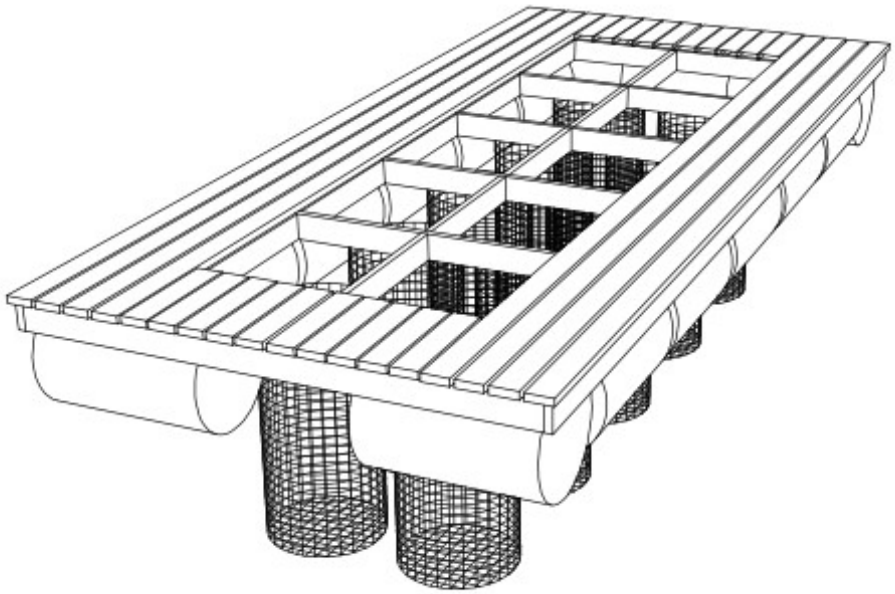
The cylinders were half full or a little more so 53.7/2 = 26.8 bushels.

Based on the estimate of 27 bushels per pool and using an estimate of 500 house shells per bushel, the set rate is 5.3%.
So the concept worked, however with 2M larvae and using 27% of shell normally used for that amount of larvae, the setting rate is lower than expected.

Frame View – Email pollard.albert@gmail.com for lumber dimensions. Don't forget the corner strapping and the barrel straps!



Assembled View – Your feet might get wet but I think it is *possible* to build this without the four barrels on the ends.



Top View and Overall Dimensions. It is a tight fit in a standard 10’ boat slip but not sure how to make it narrower.