Review of the 2019 Season Horn Point Oyster Hatchery

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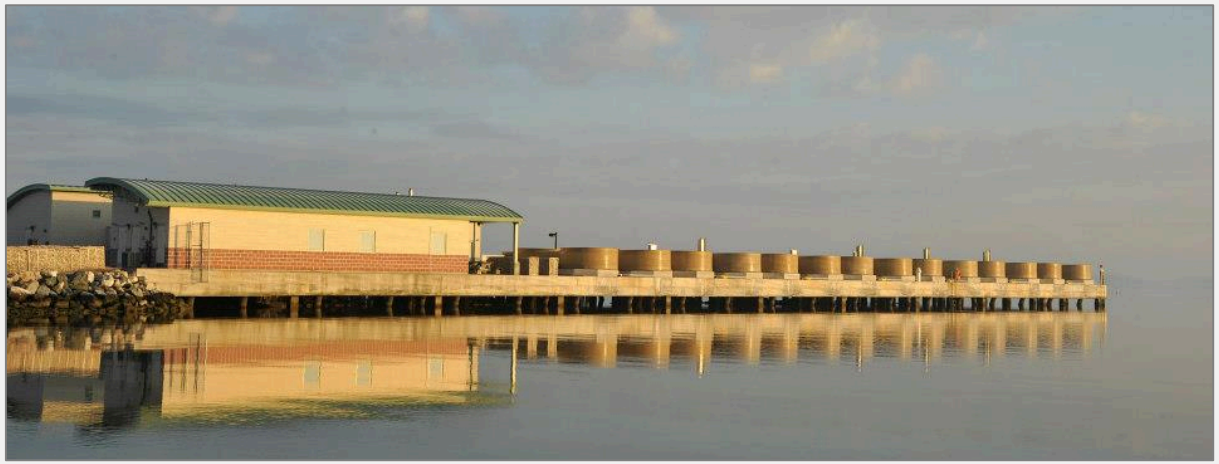
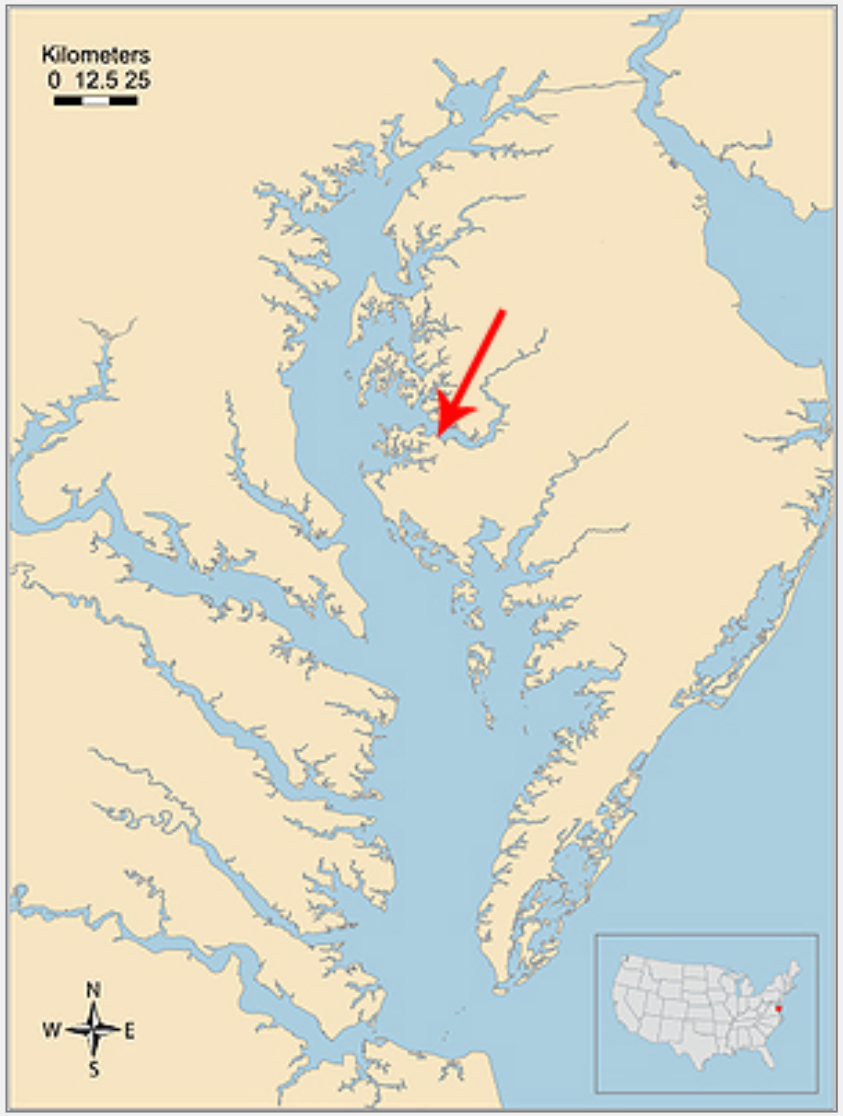
University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE
HORN POINT LABORATORY
OYSTER HATCHERY





Saxby and Boicourt, Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/imagelibrary/)

Located on the Choptank River, near Cambridge, Maryland

Normal Production Schedule

Broodstock brought into hatchery flow through conditioning system every 2 weeks starting January/February

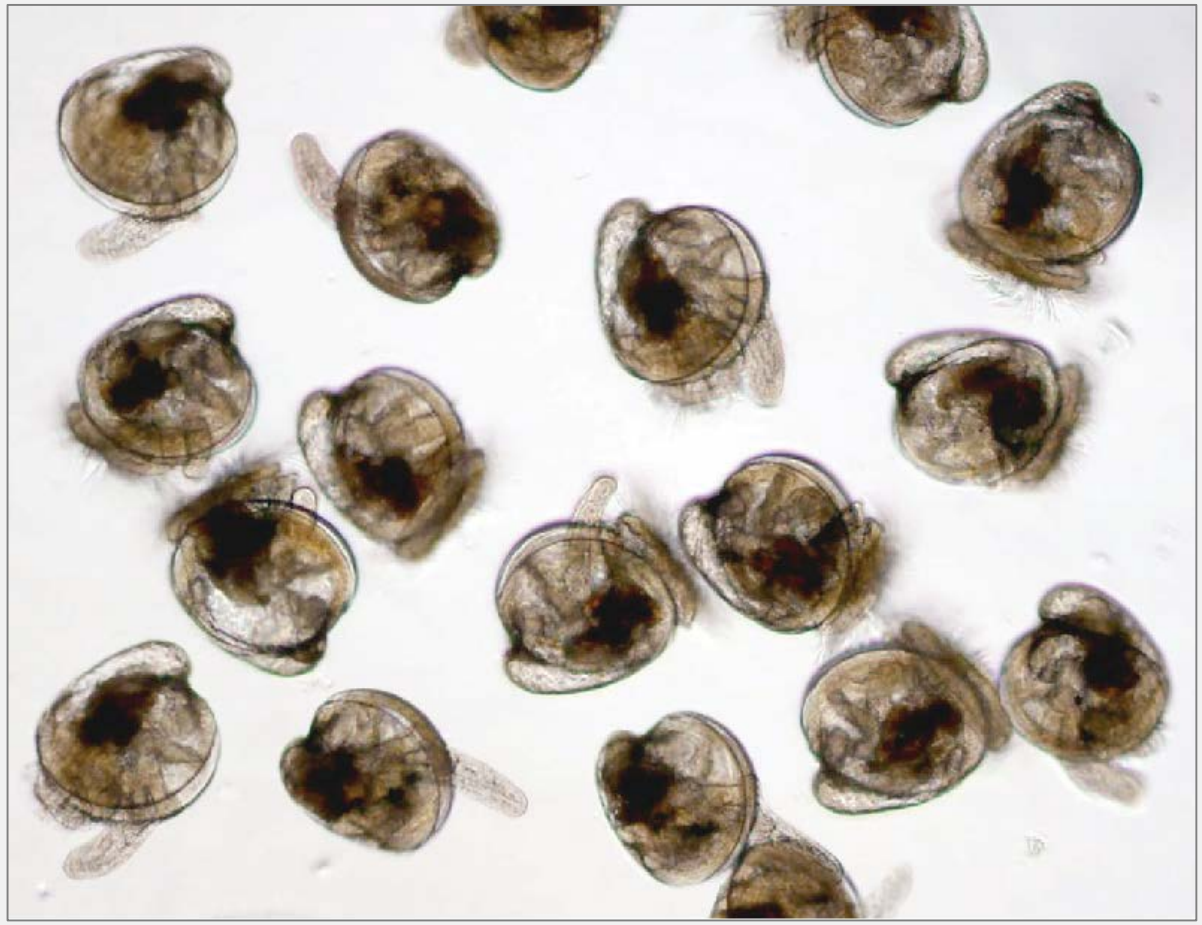
12 table rotation

Successful conditioning takes 8-12 weeks at 20C

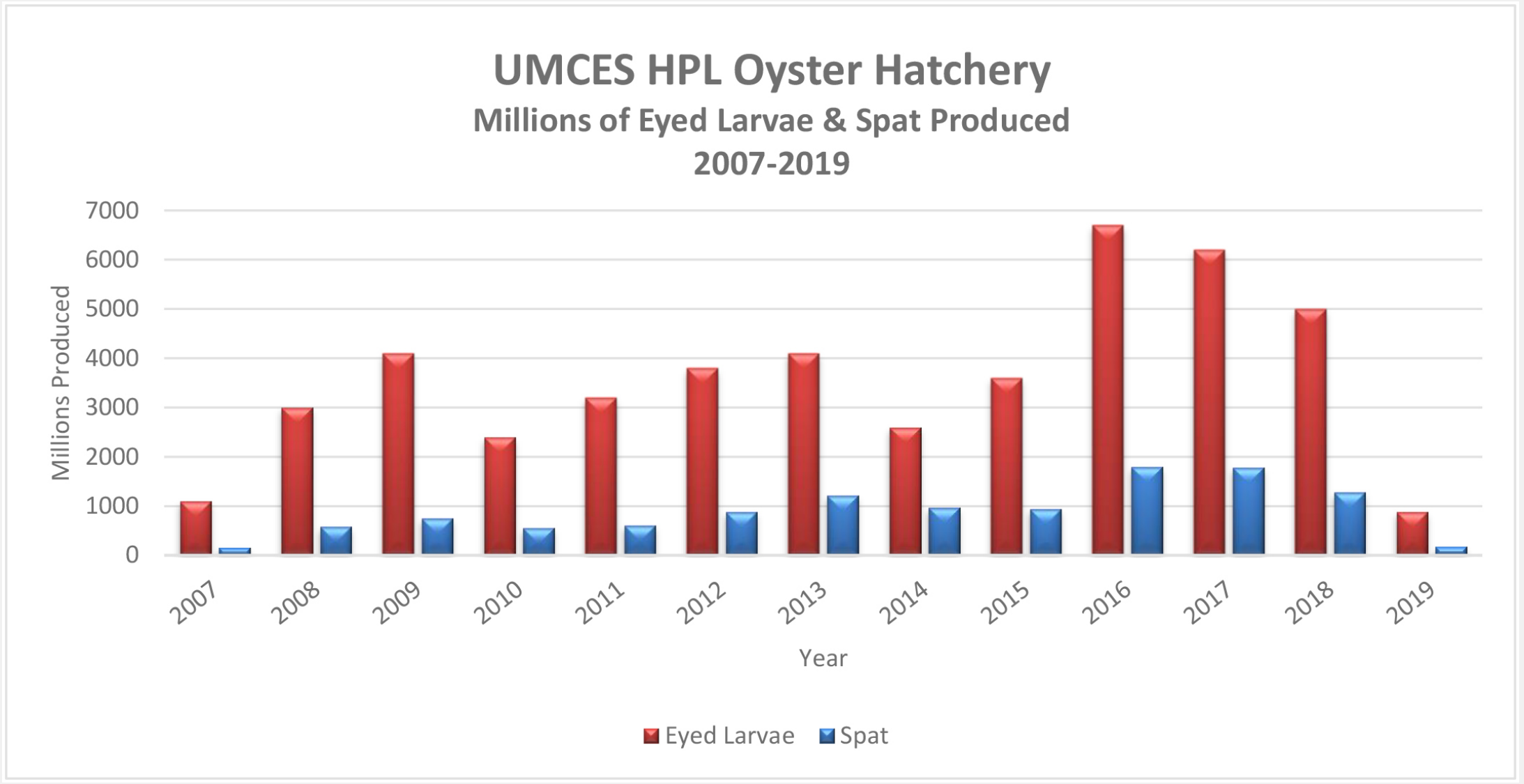
Spawning begins in March/April, continues into early September

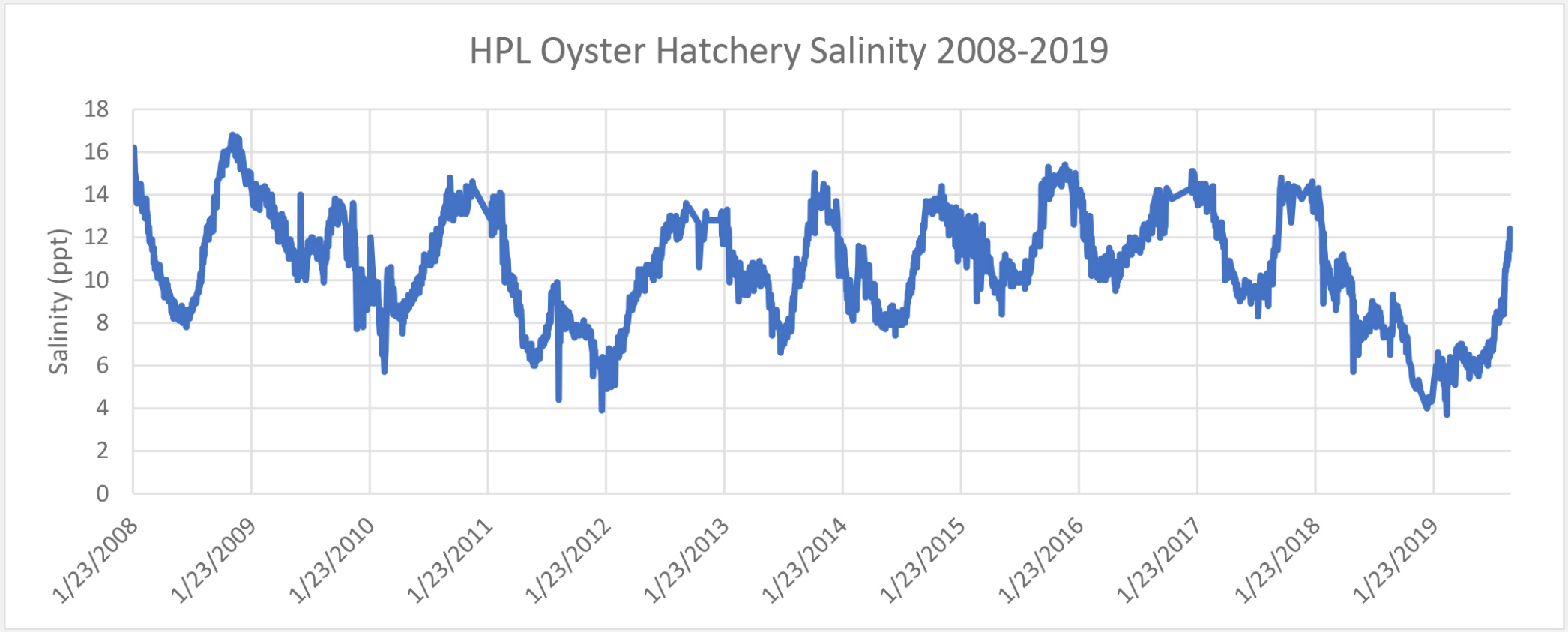
Larvae are grown in large tanks and fed a cultured diet of algae for ~2-3 weeks

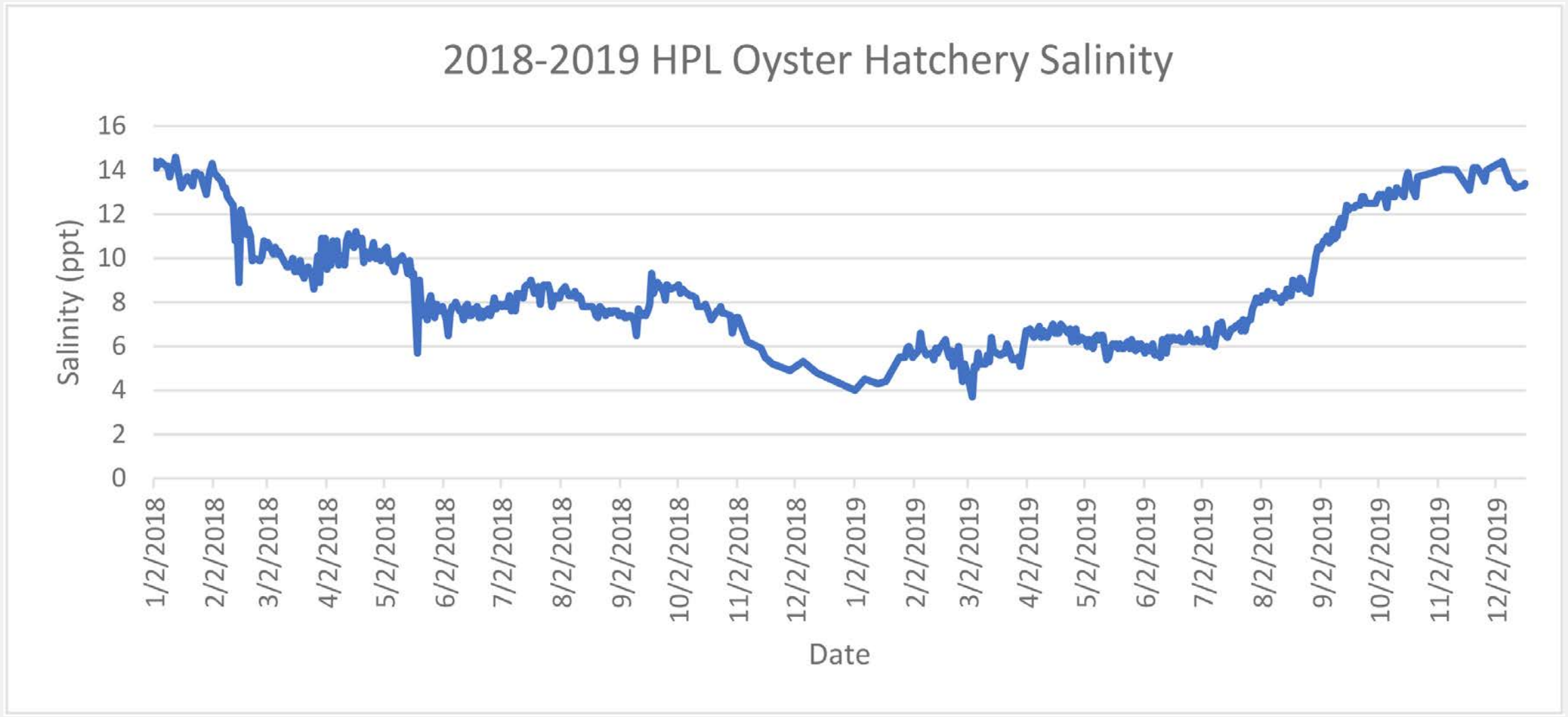
Aim to produce high quality larvae, spat on shell and seed for restoration, aquaculture, and research



Partnerships make it all work!

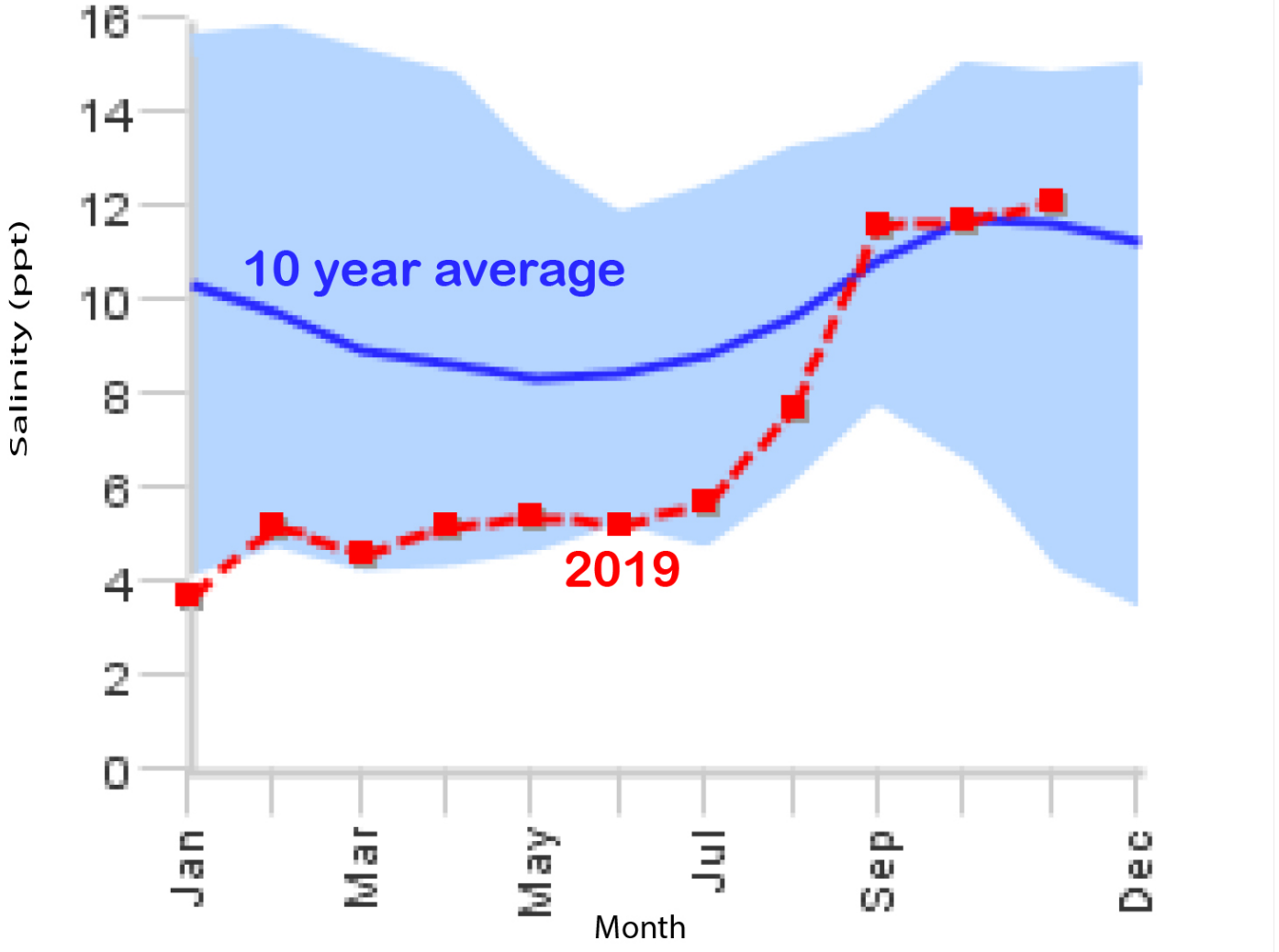

UMCES HPL Oyster Hatchery
Millions of Eyed Larvae & Spat Produced
2007-2019
Millions Produced
7000
6000
5000
4000
3000
2000
1000
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Year
Eyed Larvae
Spat


HPL Oyster Hatchery Salinity 2008-2019
Salinity (ppt)
18
16
14
12
10
8
6
4
2
0
1/23/2008
1/23/2009
1/23/2010
1/23/2011
1/23/2012
1/23/2013
1/23/2014
1/23/2015
1/23/2016
1/23/2017
1/23/2018
1/23/2019


2018-2019 HPL Oyster Hatchery Salinity
Salinity (ppt)
16
14
12
10
8
6
4
2
0
1/2/2018
2/2/2018
3/2/2018
4/2/2018
5/2/2018
6/2/2018
7/2/2018
8/2/2018
9/2/2018
10/2/2018
11/2/2018
12/2/2018
1/2/2019
2/2/2019
3/2/2019
4/2/2019
5/2/2019
6/2/2019
7/2/2019
8/2/2019
9/2/2019
10/2/2019
11/2/2019
12/2/2019
Date

Ten Year Choptank River Salinity Levels

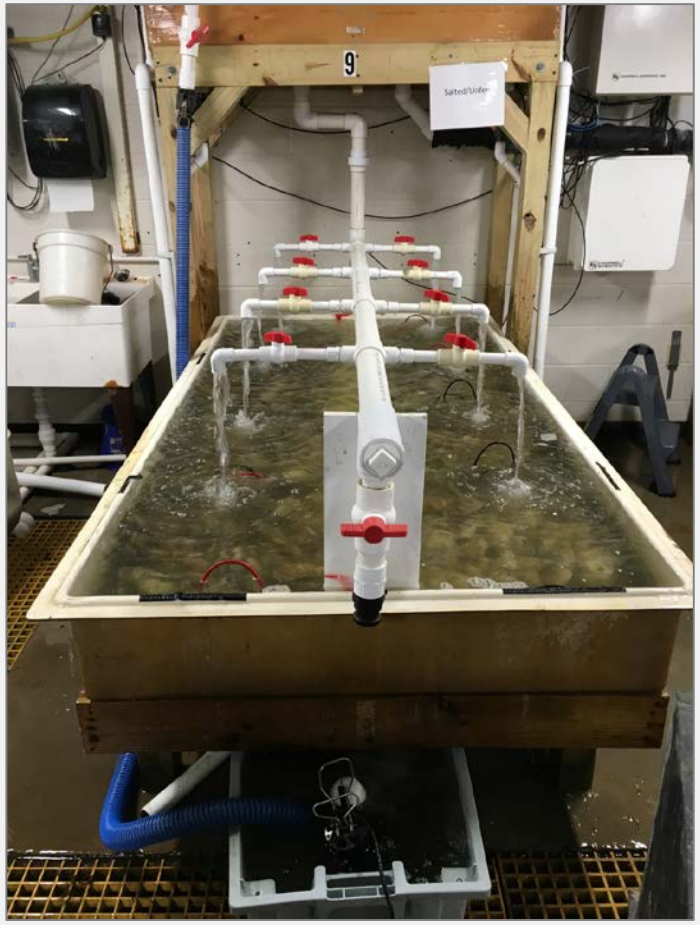
Image: MDDNR Eyes on the Bay



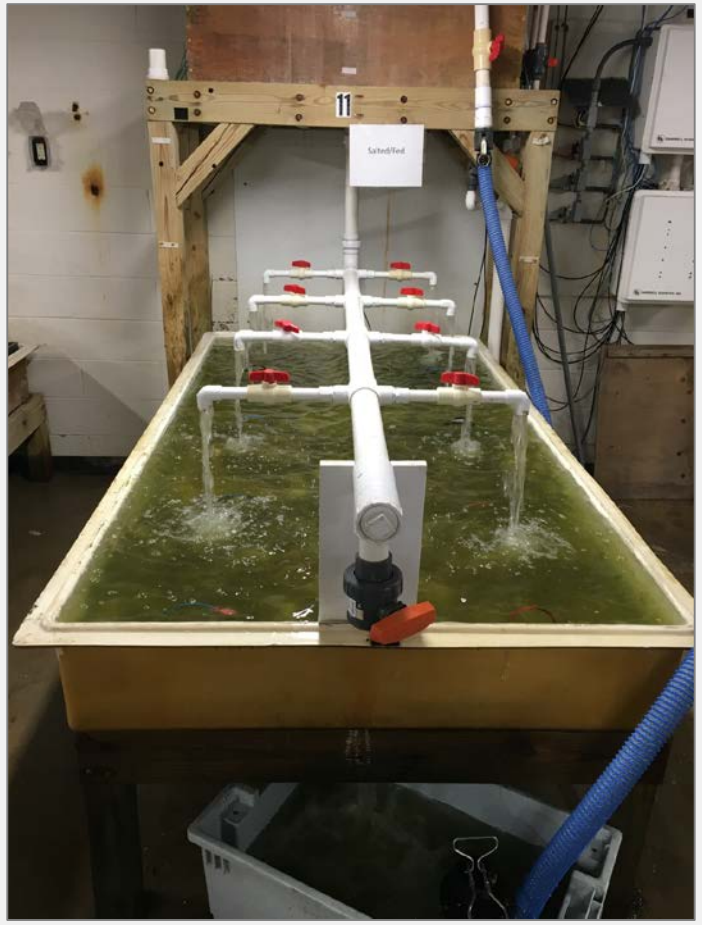
We have no salt, how can we save our season?

- Series of trials and experiments to see if we could solve the issues
  - Broodstock?
  - Water filtration?
  - Salt?
  - Pesticide analysis?
  - Chemical analysis?
  - Ripe oysters sent to another hatchery?
  - Larvae spawned at another hatchery sent to us to grow?
  - Algae?
  - Water collected from Deal Island?
  - Vibrio sampling?
  - Bacterial community shift? Probiotics?

Set up a higher salinity recirculated broodstock system



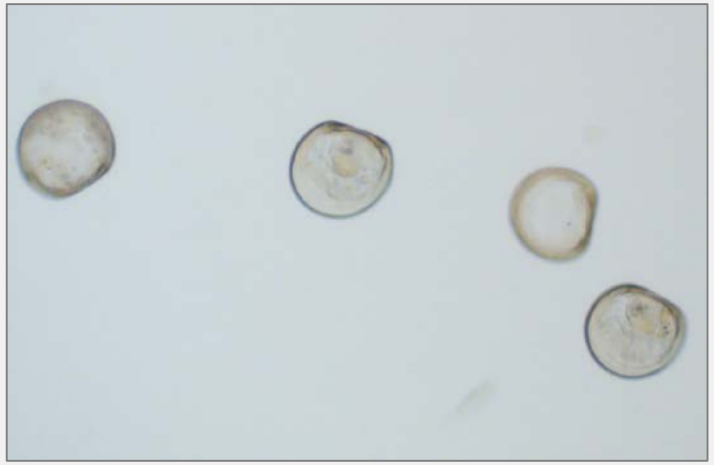
Salted/Unfed treatment



Salted/Fed Treatment

Unsalted/Fed Treatment

Collected adult oysters from the Manokin River



No difference.

Tested different water filtering treatments

Larval rearing comparisons using the same feeding regimens:

-Choptank Cartridge Filtered System (CFS) water vs. Charcoal filtered water

-Choptank ozonated water vs. CFS/charcoal filtered water

-Choptank CFS/charcoal filtered water vs. bleach/thiosulfate treated Choptank CFS/charcoal filtered water

-DI water + salt + algae diet
-Charcoal water + salt + algae diet
-CFS + salt + algae diet
-Charcoal water + salt + carboy algae

No difference.

Trials using different brands of salt

No difference.

Can another facility grow our larvae? Can they spawn our oysters?

- Sent broodstock to VIMS for them to strip spawn and raise the larvae at their facility. The larvae weren't quite on the expected timeline for happy, healthy cultures, but they stabilized & started to grow by day 8 with VIMS water & food.

- Sent 15 million fertilized embryos from spawn at HPL to VIMS- unfortunately the embryos made the journey ok but didn't continue to develop once they arrived.

- The spawn (315.1 million eggs) kept at HPL hatched at 67.7% (day 2, 213.3 million 60-70 microns) then at day 5 crashed to 36.9 million 70 micron, combined with other tank.

Can we grow larvae spawned at another hatchery at HPL?

- VIMS sent us 1.5 million 3 day old DEBY larvae to grow at HPL, received 6/27/19 and placed into C10, charcoal filtered and salted to 11ppt, fed via AAFS

- Results: Yes we can grow the larvae at HPL feeding them our food

Is there an issue with our feeding system/algae?

Hand fed 2L bottles set up with 2L of either ambient salinity CFS (6.5) or CFS salted to 10.0 ppt with Crystal Sea Marinemix. 20,000 eggs from spawn added to each bottle. Larvae fed daily ration as per standard hatchery protocols. 5 treatments- Isochrysis, Nanno, Pavlova, 3H, and Chaet cal. Bottles drained through small 20 µM nitex screen at day 8. No surviving larvae.

Hand fed 2L bottles set up with either salted Choptank water or Wachapreague water. Fed both algae (Nanno and Iso) grown in Choptank water and Wachapreague water. No difference.

Larval rearing comparison between Choptank string/charcoal filtered water and Deal Island string/charcoal filtered water using the same feeding regimens.

Water type	Choptank	Deal Island
# of fertilized eggs	20m	20m
1st drain (notes)	10.1m pale 60-70um	16.9m pale 60-70um
2nd drain (notes)	1.2m pale 60-80um	12.2 pale 70-90um
3rd drain (notes)	dumped	8.91m pale 60-90um

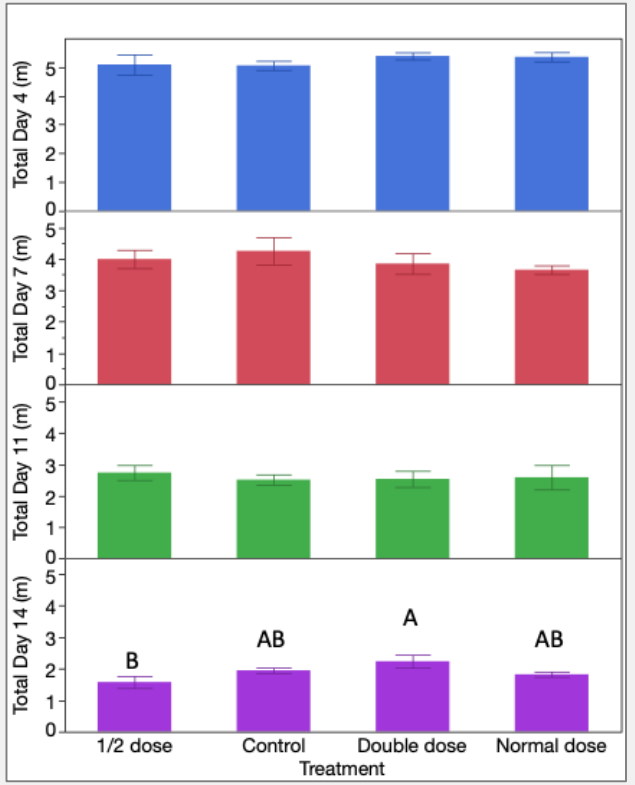
It was determined that there was not enough of a difference at the 3rd drain to continue making trips to Deal Island to get water, however 8.91m larvae (although not growing) is a large enough amount to continue the culture.

Vibrio testing conducted by Gary Richards, UDel

Water (from larval tank) and larvae samples (MLT2)

Results: No *Vibrio* sp. Found. “Very unusual results. There was no growth on any of the plates (designed to specifically isolate *vibrios*). No growth at all is somewhat unheard of for larvae, even for healthy ones. The lack of any *vibrios* in the larvae suggests something is inhibiting the growth of normal *vibrio* flora and that same something could be killing the larvae.”

Tested probiotics to see if that would help bacterial community



Image/statistics: Matt Gray

At this point we ended experiments because the salinity in the river had slowly increased as the weeks went on and was finally above 10ppt. Our adults were successfully spawning and our larvae were finally growing happily!

2019 Production

- Attempted to spawn 21,182 oysters

  2018 = 15,917 oysters attempted

- Produced 30.2 billion eggs

  2018 = 55.7 billion eggs

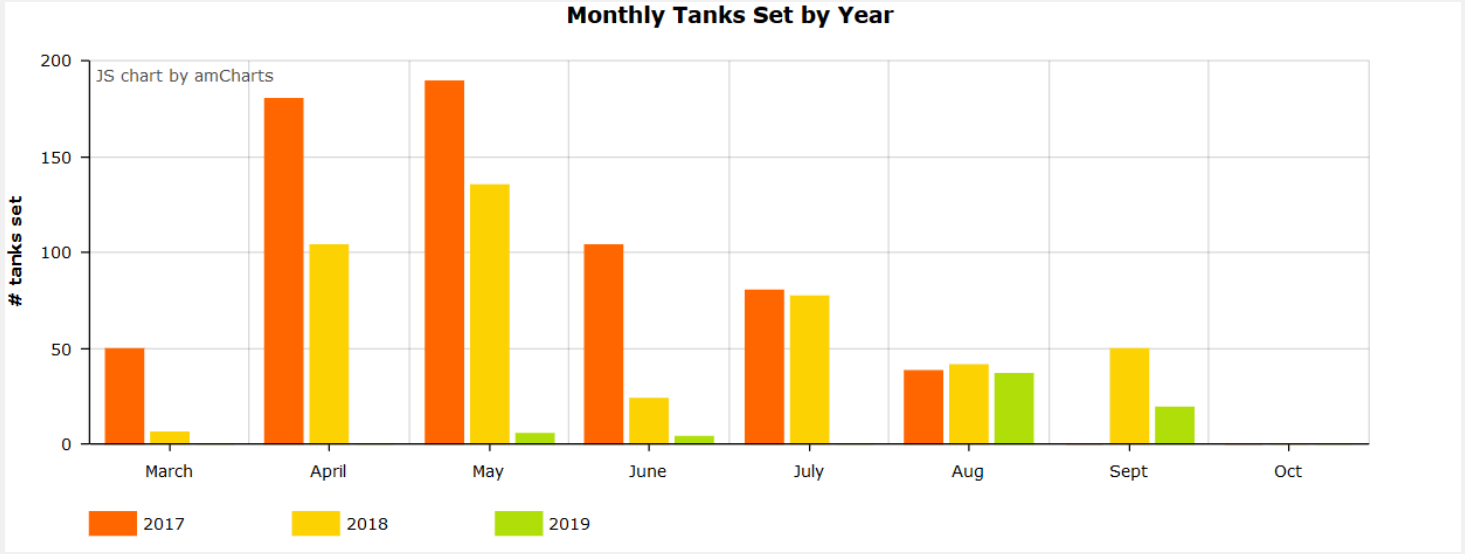
- Produced 884 million eyed larvae

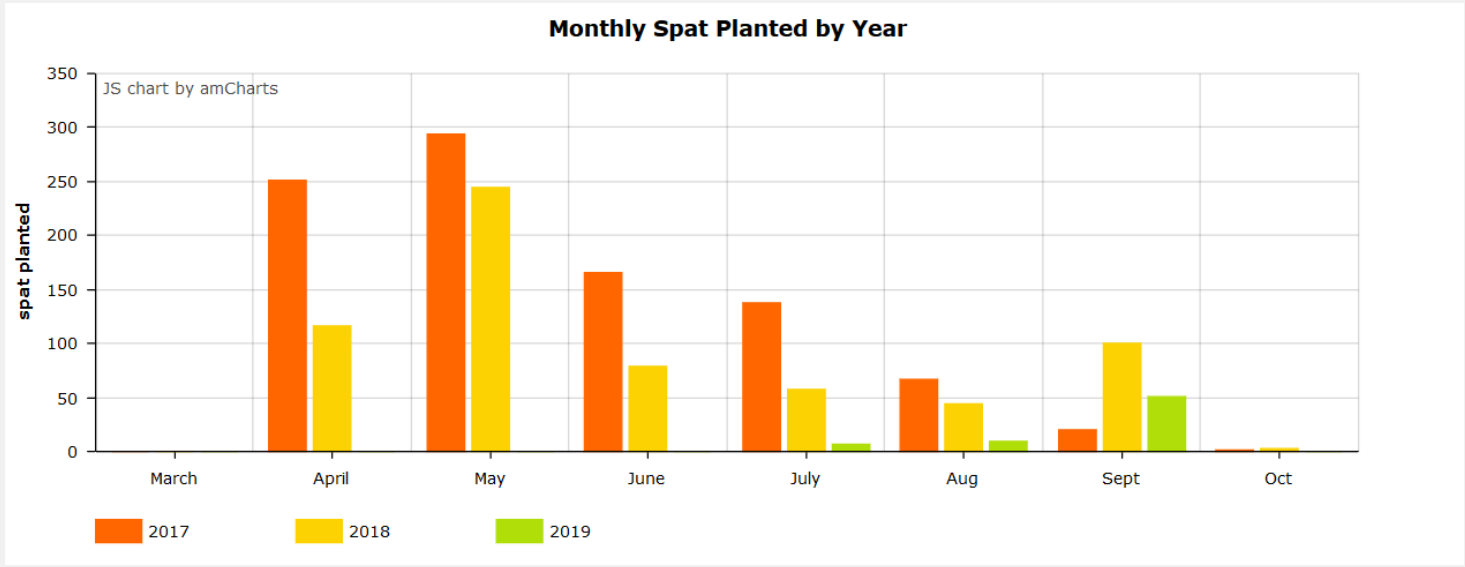
  2018 = 5.04 billion eyed larvae

- Produced an estimated 197 million spat

  2018 = 1.28 billion spat

  - 63.7 million large scale restoration off deck of *Poppa Francis* in Little Choptank and Tred Avon Rivers
  - 2 million spat on shell sales (bags)
  - Estimated 131 million spat produced from larvae


Monthly Tanks Set by Year
JS chart by amCharts
tanks set
200
150
100
50
0
March
April
May
June
July
Aug
Sept
Oct
2017
2018
2019


Monthly Spat Planted by Year
JS chart by amCharts
spat planted
350
300
250
200
150
100
50
0
March
April
May
June
July
Aug
Sept
Oct
2017
2018
2019

2019 Allocations

- Set 414 million eyed larvae on the pier for restoration

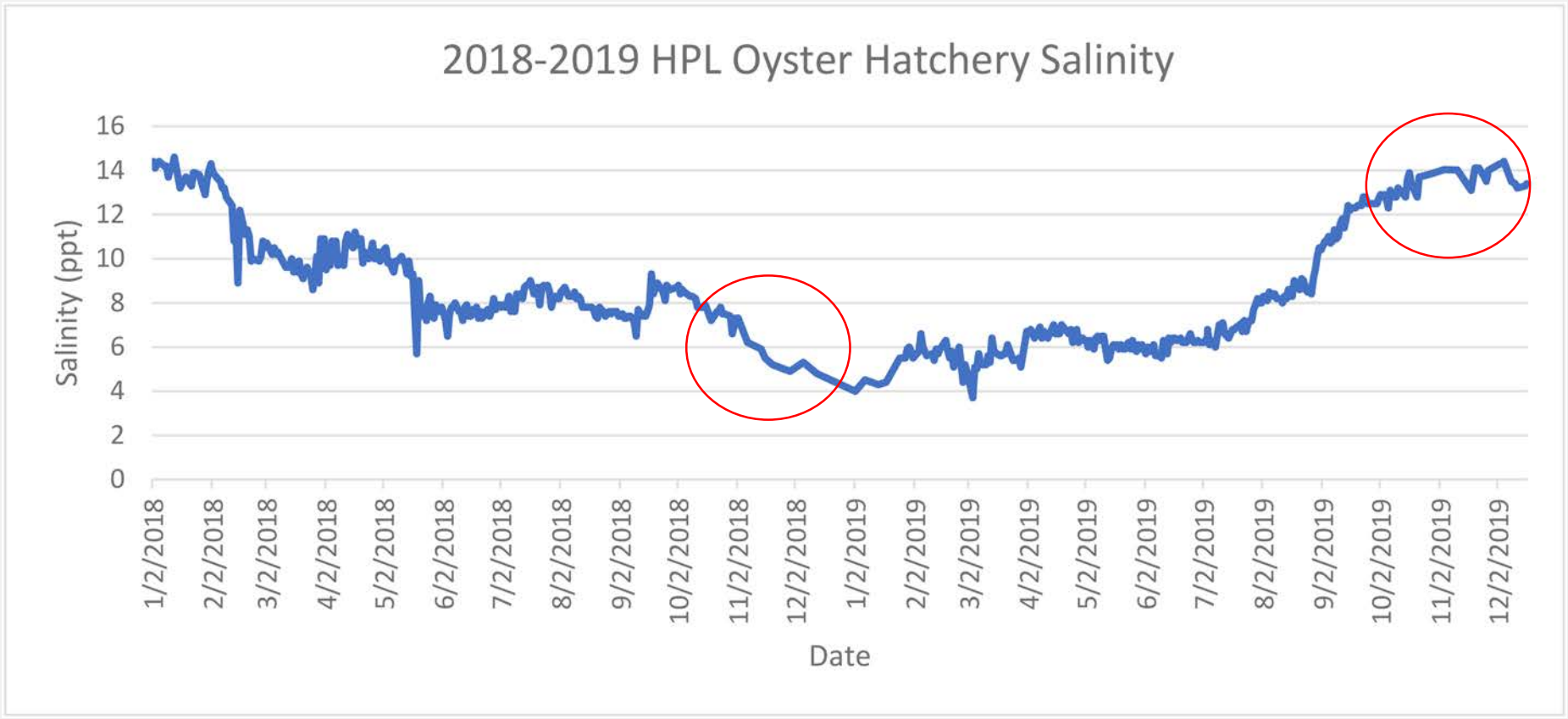
  2018 = set 2.6 billion eyed larvae on the pier

- Produced 469 million eyed larvae set remotely from the hatchery

  2018 = produced 2.4 billion eyed larvae set remotely

  - Private Aquaculture (sales, remote setting, seed) 181.5 million larvae 2018 = 1.8 billion
  - Public Fishery (county setters) 252 million larvae 2018 = 454 million
  - Environmental Groups (CBF, St. Mary's Riverkeeper) 22.6 million larvae 2018 = 155 million
  - Other (research) 13 million larvae 2018 = 32 million

Outlook for 2020- Looking Up!



Questions/Comments?

2019 Hatchery Crew