

Triploid-tetraploid Technology for Oyster Aquaculture Industry

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Marine Laboratory, FSU, Thursday, May 3, 2018

What are Triploids and Tetraploids ?

Triploid (3N): **Three** set of chromosomes (DNAs)

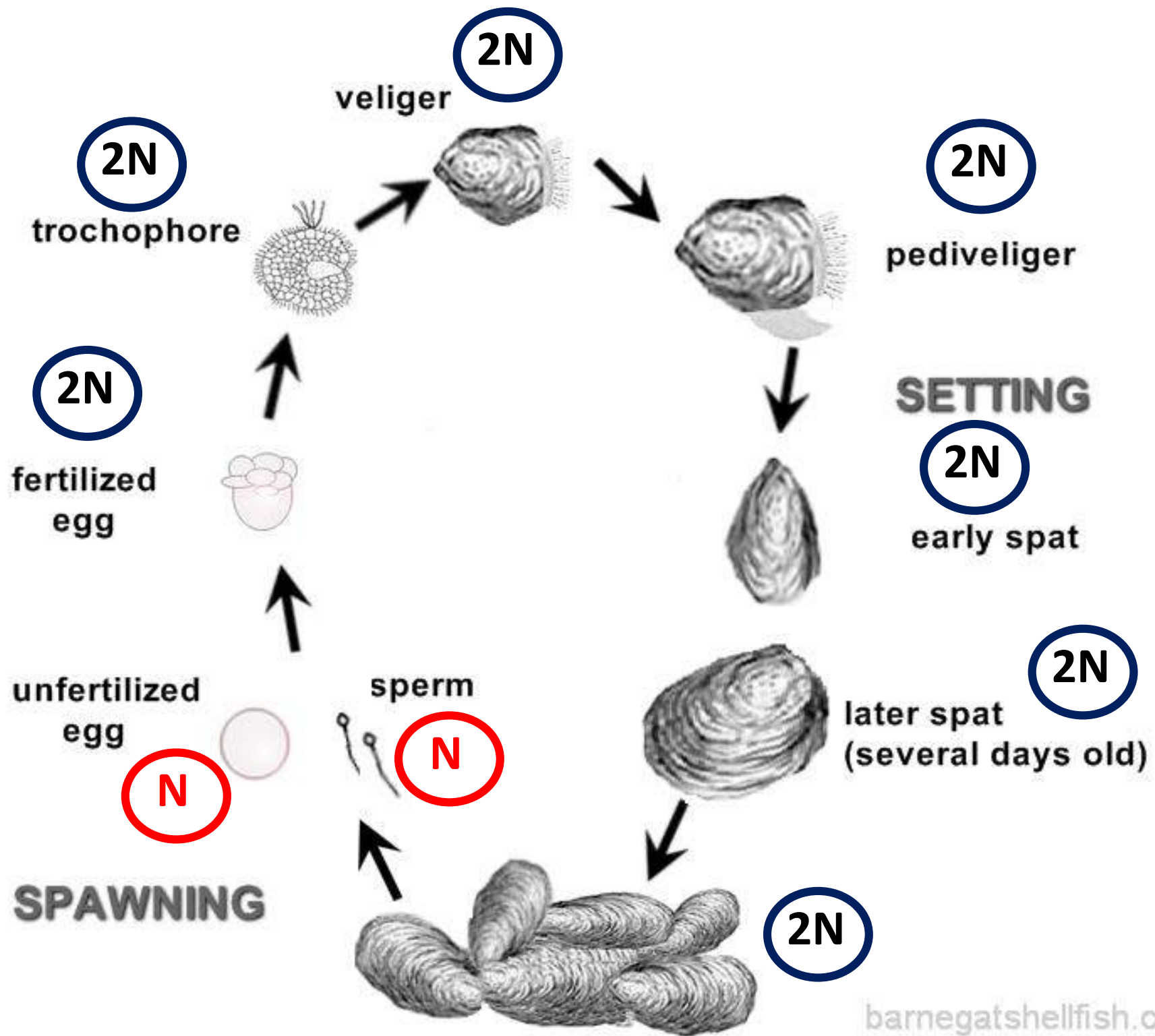
Tetraploid (4N): **Four** set of chromosomes (DNAs)

Diploid (2N): The normal oysters (most animals)

Two sets of chromosomes

Haploid (N): The sperm or eggs

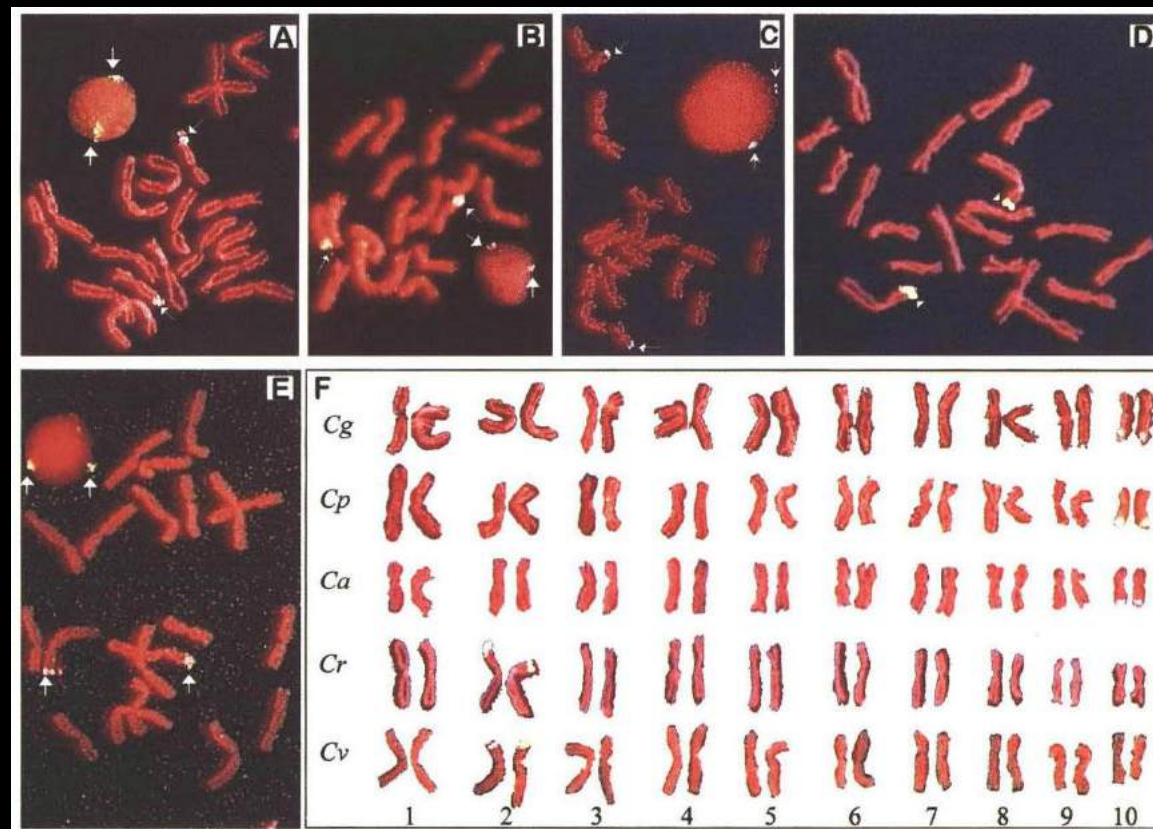
One set of chromosomes



How you define the ploidies?

Oyster diploids: $2N = 20$ chromosomes (10 pairs)

Oyster triploids: $3N = 30$ chromosomes



Why triploids in oyster aquaculture?

Fast growth

In Florida, it was reported triploid need about 8 months to reach market size.

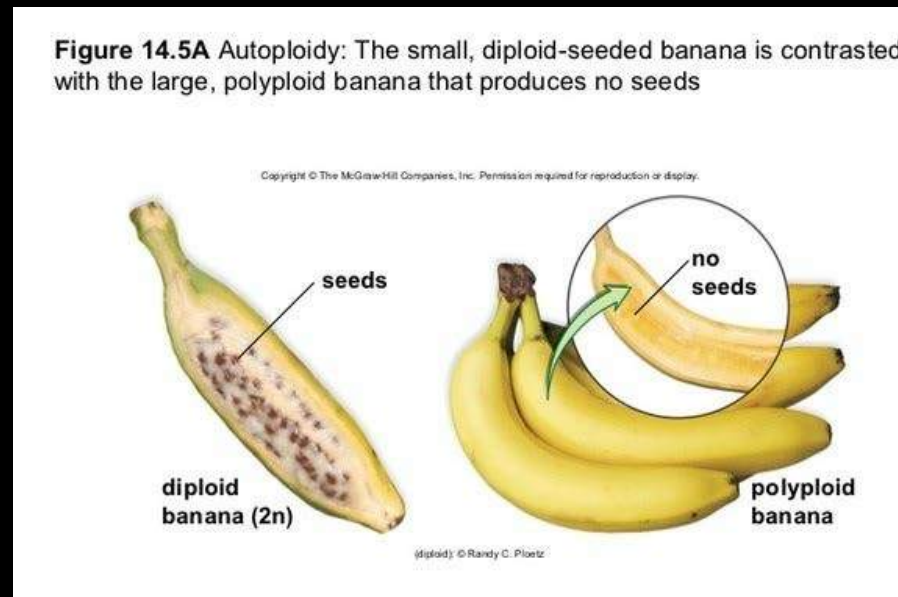
May also alleviate the fouling on oyster shells

Better meat-quality

especially in hot summer, thus can be year-round harvest

No environmental pressure

Triploid Oysters just like Seedless Watermelon and Grapes



Diploids

Showing the full-developed gonad



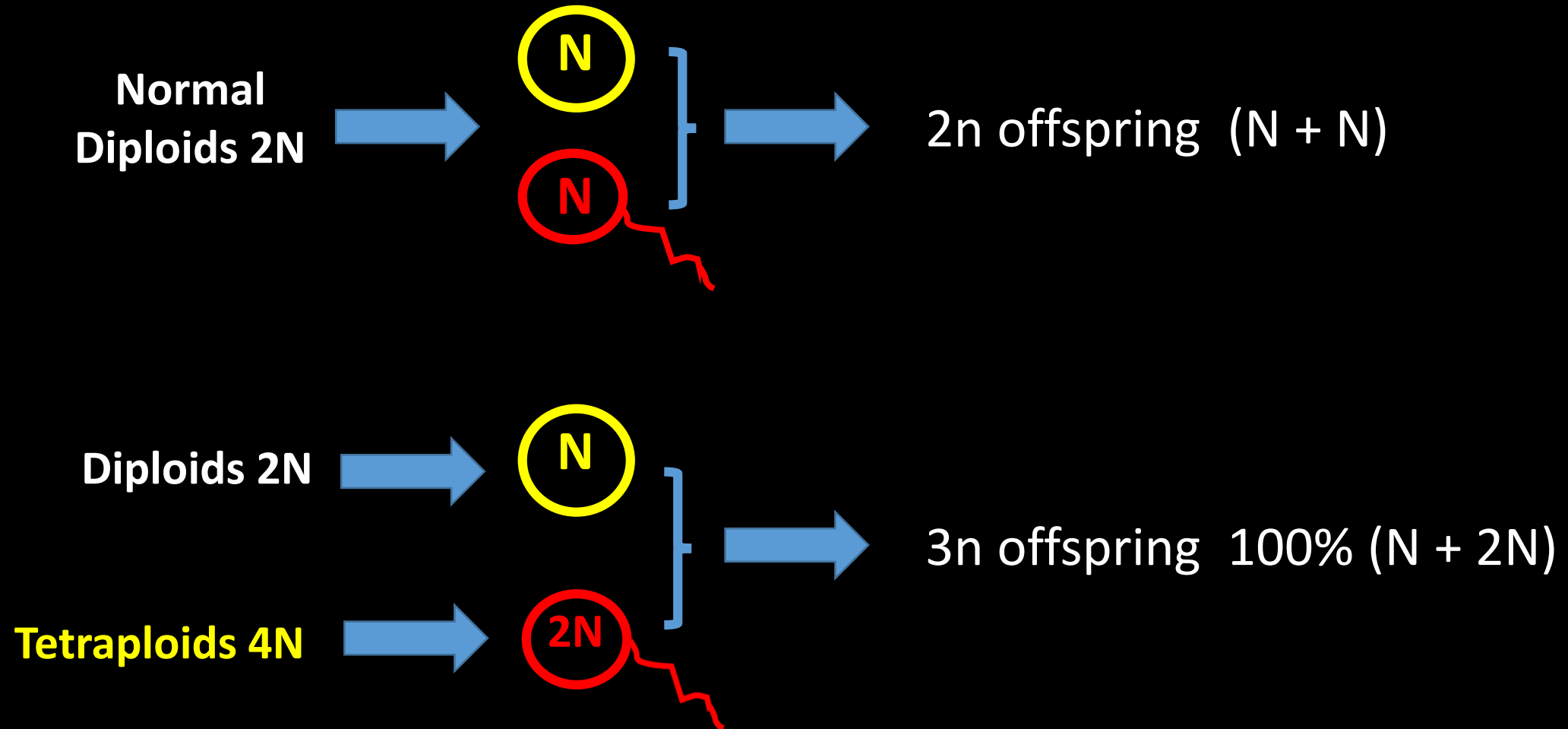
Triploids

Showing the undeveloped gonads



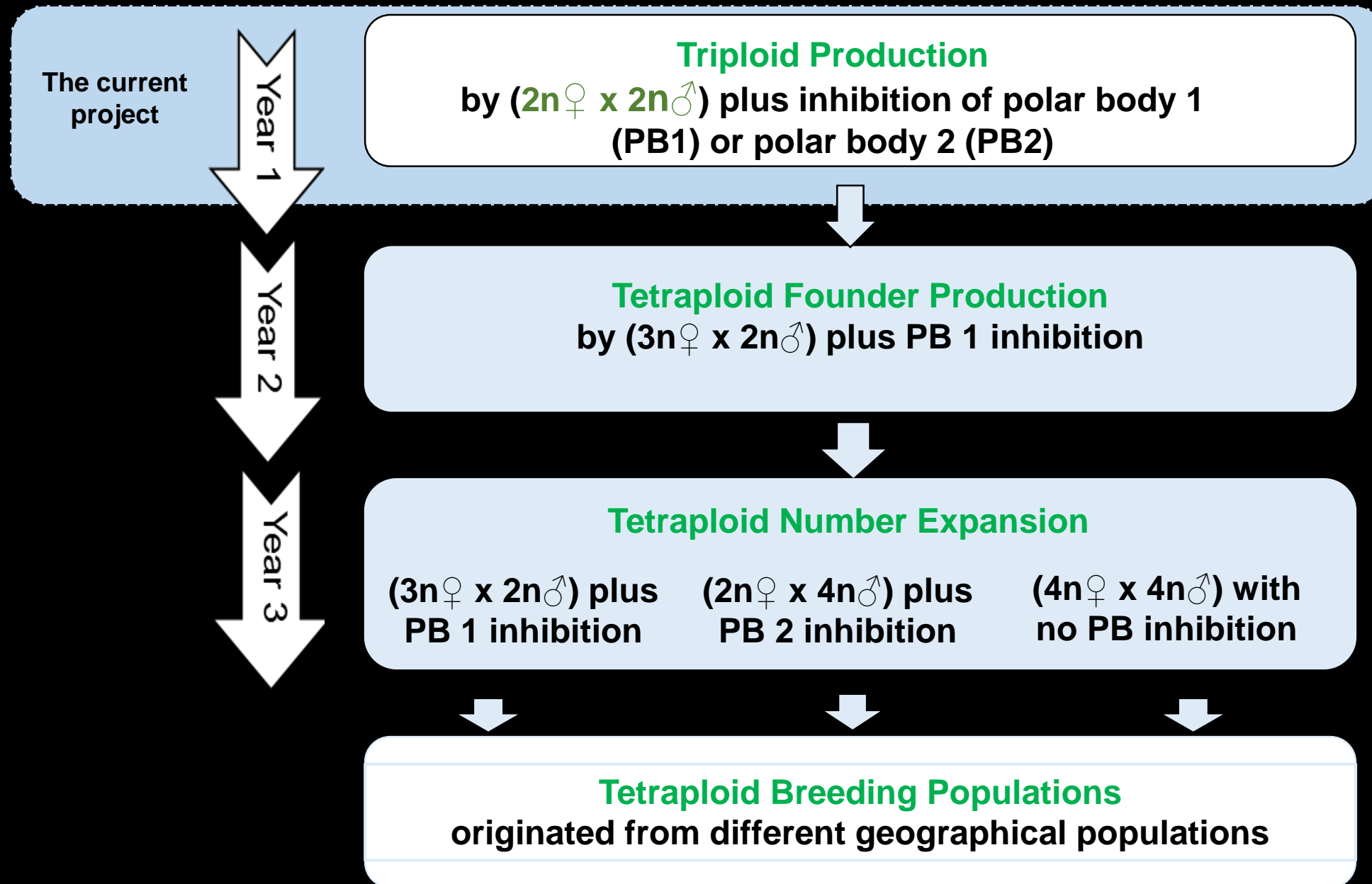
One-year old siblings
April 19, 2018

How to Produce Triploid Seed?



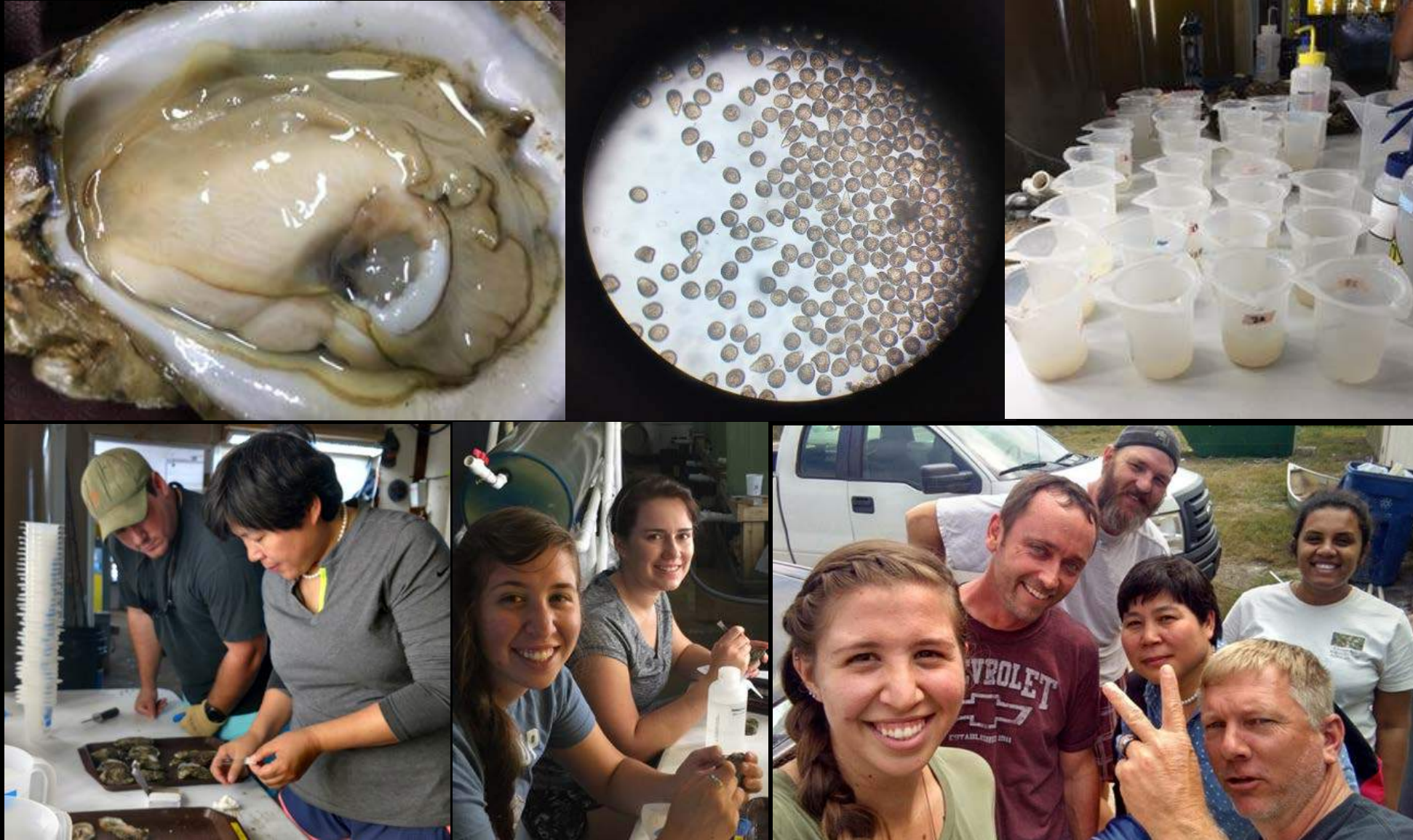
Tetraploid breeding stock is the KEY for this technology

An Oyster Tetraploid Program in Florida



Spawning and Treatment

- 1) Broodstock were collected from six locations in Florida
Port Charlotte, Sarasota, Cedar Key, Wakulla, Alligator Harbor, and Pensacola Bay
- 2) From March to May, we made 11 field spawning trips with 24 spawning trials



Triploid Larval Production and Survival

- 1) Triploid larvae were produced with 20-70% in all of the 24 spawns
- 2) Larvae in five groups were survived beyond metamorphosis - spat



Triploid Seed Harvest for Growout Culture

Triploid seed were harvested in three groups, and triploids were confirmed individually

Labelling	Spawning Date	Broodstock source	Seed Number (estimated)	Triploid (%) (Date to test)
2017CK1	April 5, 2017	Cedar Key	~30,000	38 (06/08/2017)
2017WA1	May 4, 2017	Wakulla	~20,000	57 (06/28/2017)
2017CK2	May 30, 2017	Cedar Key	15,525	53 (07/19/2017)





Ploidy Determination

- Protocol for ploidy determination was developed by using propidium iodide (PI) staining with flow cytometry.
- Larvae: Pooling sample
- Spat: Whole soft tissue
- Adult: Tissue



Broodstock	Labelling	Number	Triploid % (Date)	Location
Cedar Key	2017CK1	5,000	54% (11/08/2017)	Southern Cross Sea Farm
Wakulla	2017WA1	~20,000	76% (11/07/2017)	Bay Shellfish Inc.
			64% (10/31/2017)	Oyster Mom Inc.
			54% (10/04/2017)	Cedar Key Seafarms
Cedar Key	2017CK2	17,766	62% (10/23/2017)	Southern Cross Sea Farms
				Cedar Key Seafarms
				Pensacola Oyster Company
				Northwest Gulf Seafood Farms



2018, Finding 3N females → Tetraploid Induction



Measure oyster sizes



Line up in plate



Open the oysters



Sex male and female under microscope



Dissect one piece of gill



Stain cells and votex



Filter samples



Check the ploidy



Egg collection from 3n female for 4n induction

Acknowledgements

The Gulf States Marine Fisheries Commission (GSMFC)



Industry organizations

- Florida Shellfish Aquaculture Association
- Cedar Key Aquaculture Association

Industry collaborating farms

- Southern Cross Farm, Cedar Key, FL
- Bay Shellfish Inc., Terra Ceia, FL
- Clamtastic Seafood Inc., Cedar Key, FL
- Cedar Key Seafarms, Cedar Key, FL
- Northwest Gulf Seafood Farms, Wakulla, FL
- Mr. Bill Lartz's farm, Alligator Harbor, FL
- Pensacola Oyster Company, Pensacola, FL
- Oyster Mom, Inc., Wakulla, FL



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Graduate/undergraduate students, and staff

- | | | |
|--------------------|---------------------|----------------|
| - Natalie Simon | - Cher Nicholson | - Keegan Kelly |
| - Erangi Henkeenda | - August J Planmann | - Sara Thorses |
| - Yangqing Zeng | - Anthony Boullosa | - Matt |

Thank you!



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