# Sunray Venus Clam Seed Production and Broodstock Development for Florida Culturists

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# BACKGROUND

- Based “solely” on *Mercenaria mercenaria*
- Diversifying product “line” may avoid economic and disease problems
- Different species have been examined (e.g., angel wing, scallops, ark clams)
- New species: Sunray Venus Clam

# BACKGROUND

- Attractive large (up to 15 cm SL) clam distributed from SC to FL
- Targeted species for commercial harvest in 1960s
- Harvest halted due to spotty distribution, limited fishing grounds
- Natural growth rate experiments suggested quick grower

  (7.5 cm, 40 g whole in 12 months)

# OBJECTIVE

- **Utilize current hard clam methods as a starting point to:**

  **1) Identify spawning methods**
  **2) Establish hatchery protocols**
  **3) Examine early nursery culture**
  **4) Grow a test group**
  **5) Test market product**

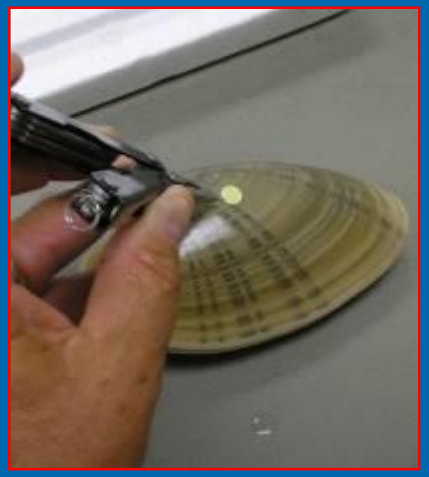
# BROODSTOCK

# BROODSTOCK


WET

DRY

# BROODSTOCK



1:1 sex ratio

< 10% mortality after 1 week

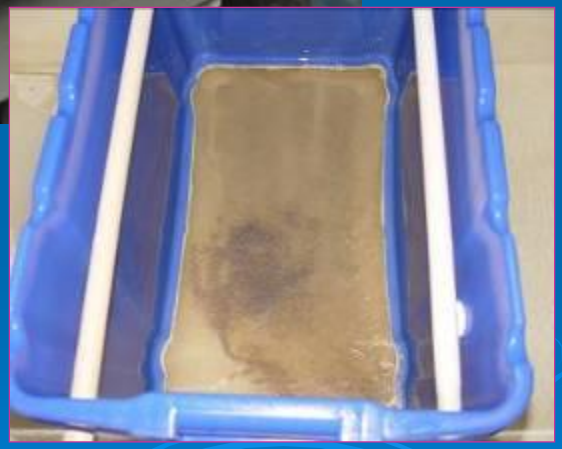
# SPAWNING

Thermal Shock (increase 10°C)
Dissected sperm addition
Serotonin injection (0.4 mL 2mM)

# Setting and Post-set Culture




*Pediveligers were noted by day 6-9 and moved to setting system*



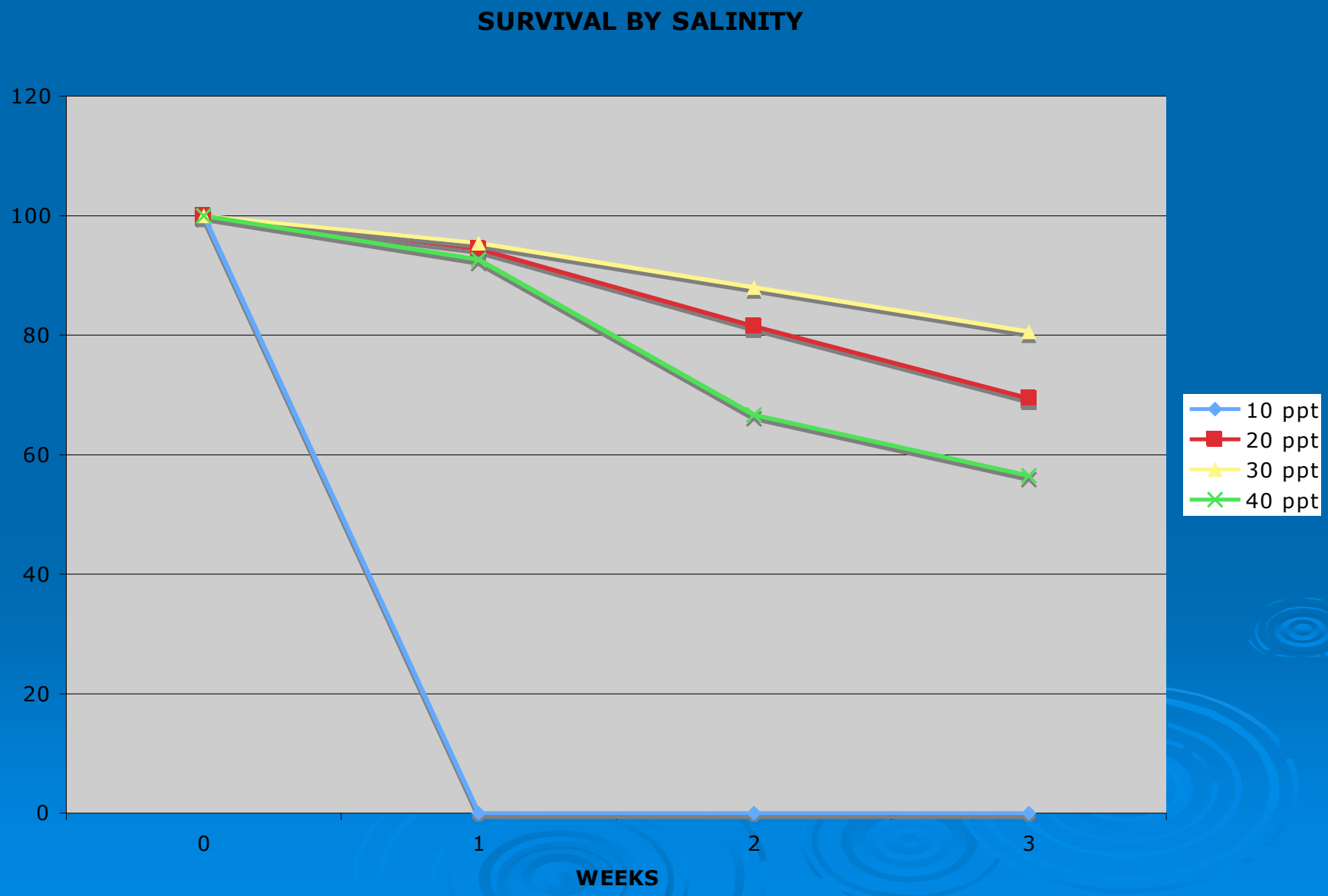
*Pediveligers stocked at 2-3K/ft$^2$ of bottom area, fed microalgae, and rinsed with saltwater*

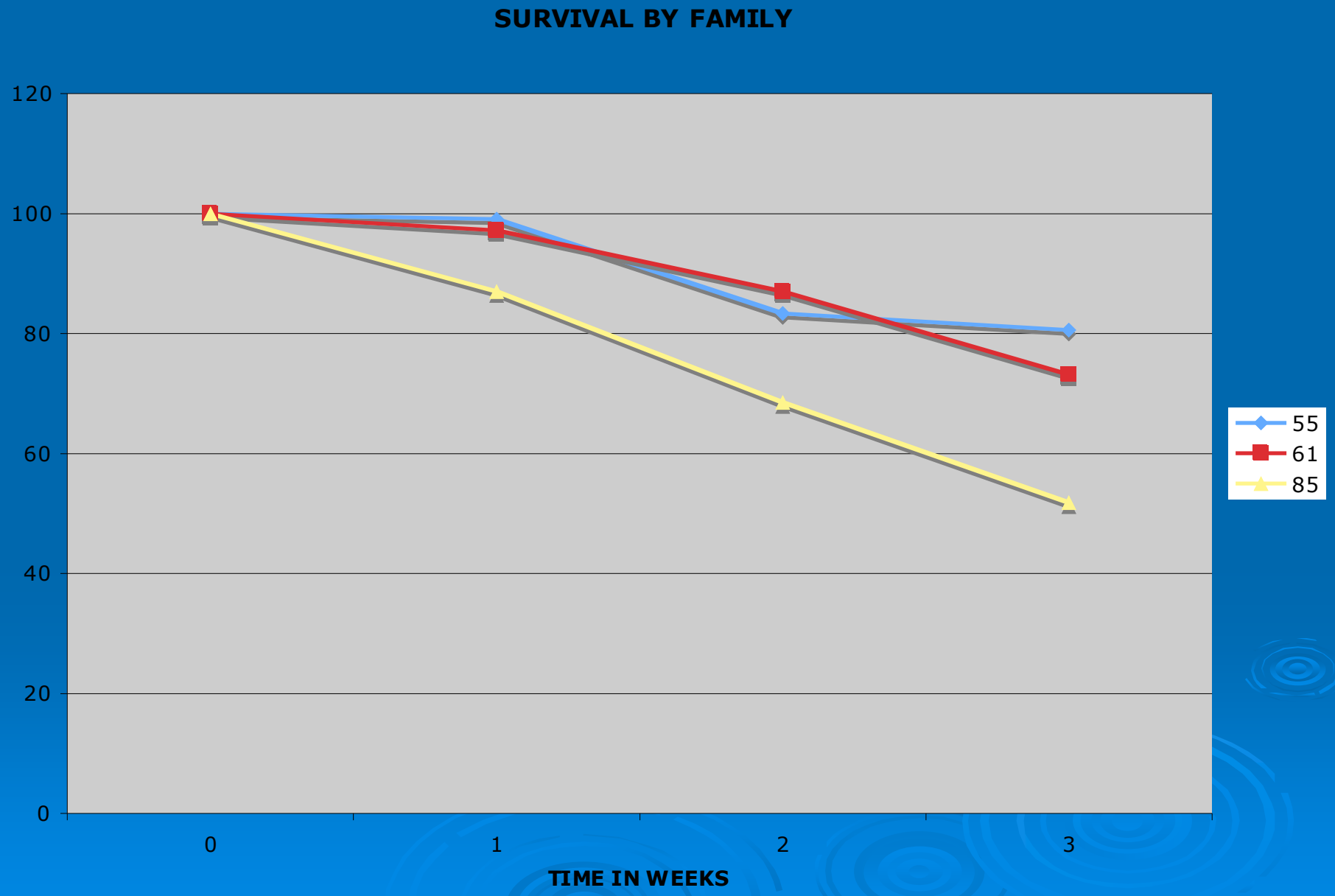
Courtesy L.N. Sturmer

# Salinity Materials and Methods

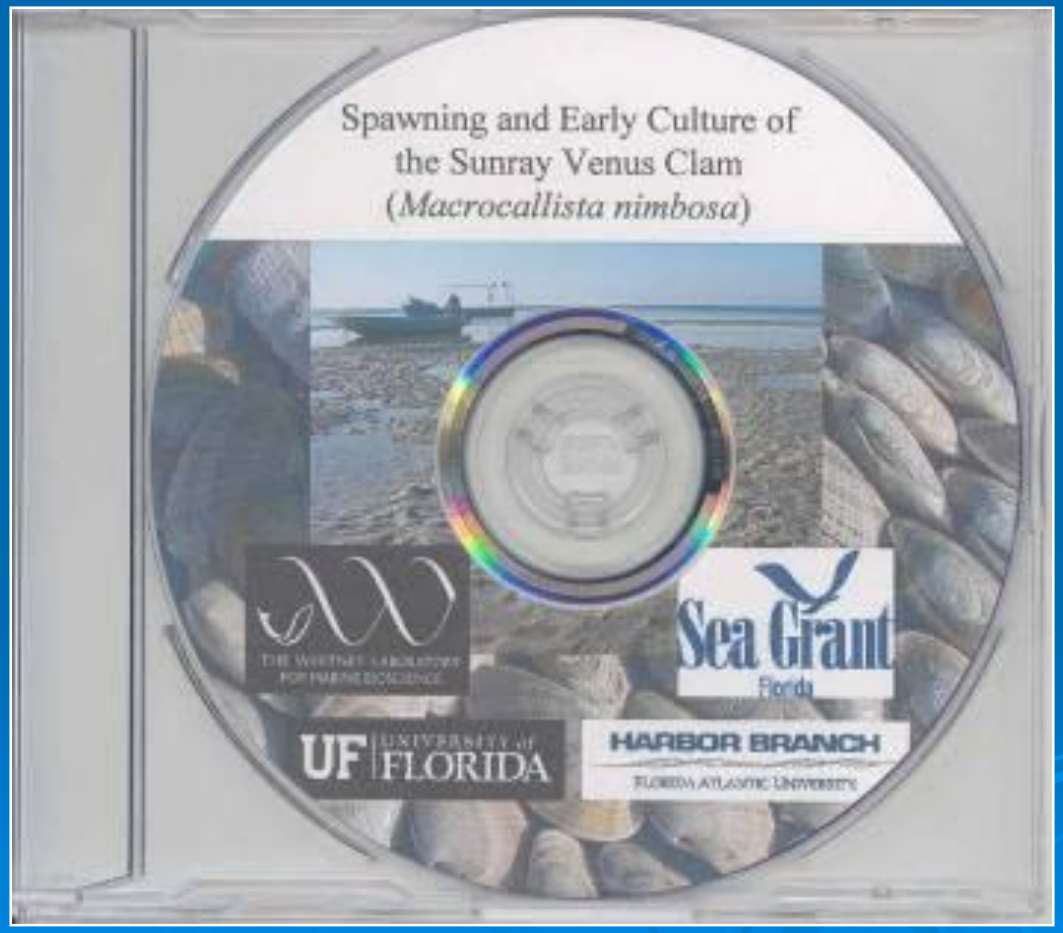
- Triplicate Families (55, 61 & 85)
- 12 clams from each family/ 4-L beaker
- Avg wt 19±3 mg
- Avg length 4.7±0.3 mm


# RESULTS


SURVIVAL BY SALINITY
120
100
80
60
40
20
0
0
1
2
3
WEEKS
10 ppt
20 ppt
30 ppt
40 ppt

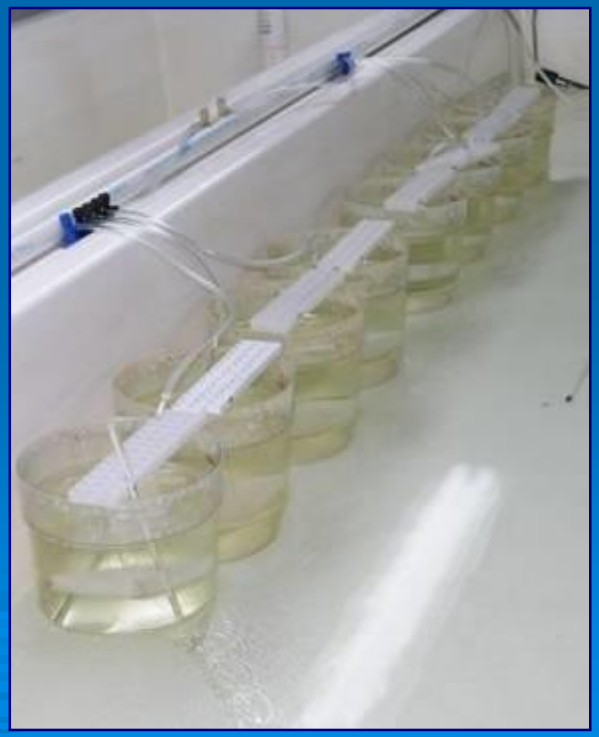

SURVIVAL BY FAMILY
120
100
80
60
40
20
0
0
1
2
3
TIME IN WEEKS
55
61
85

DVD summarizing seed production techniques and documentation of sunray venus development during hatchery phase is available (FLSG).

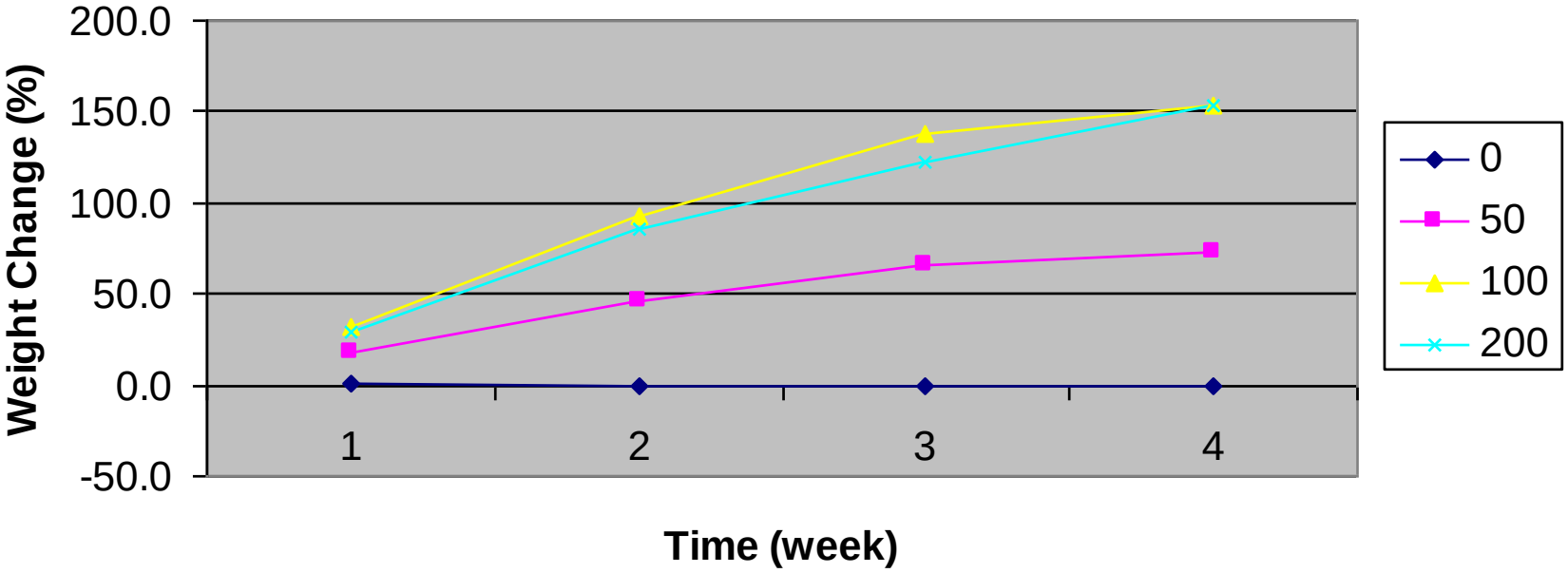


# Feed Experiment

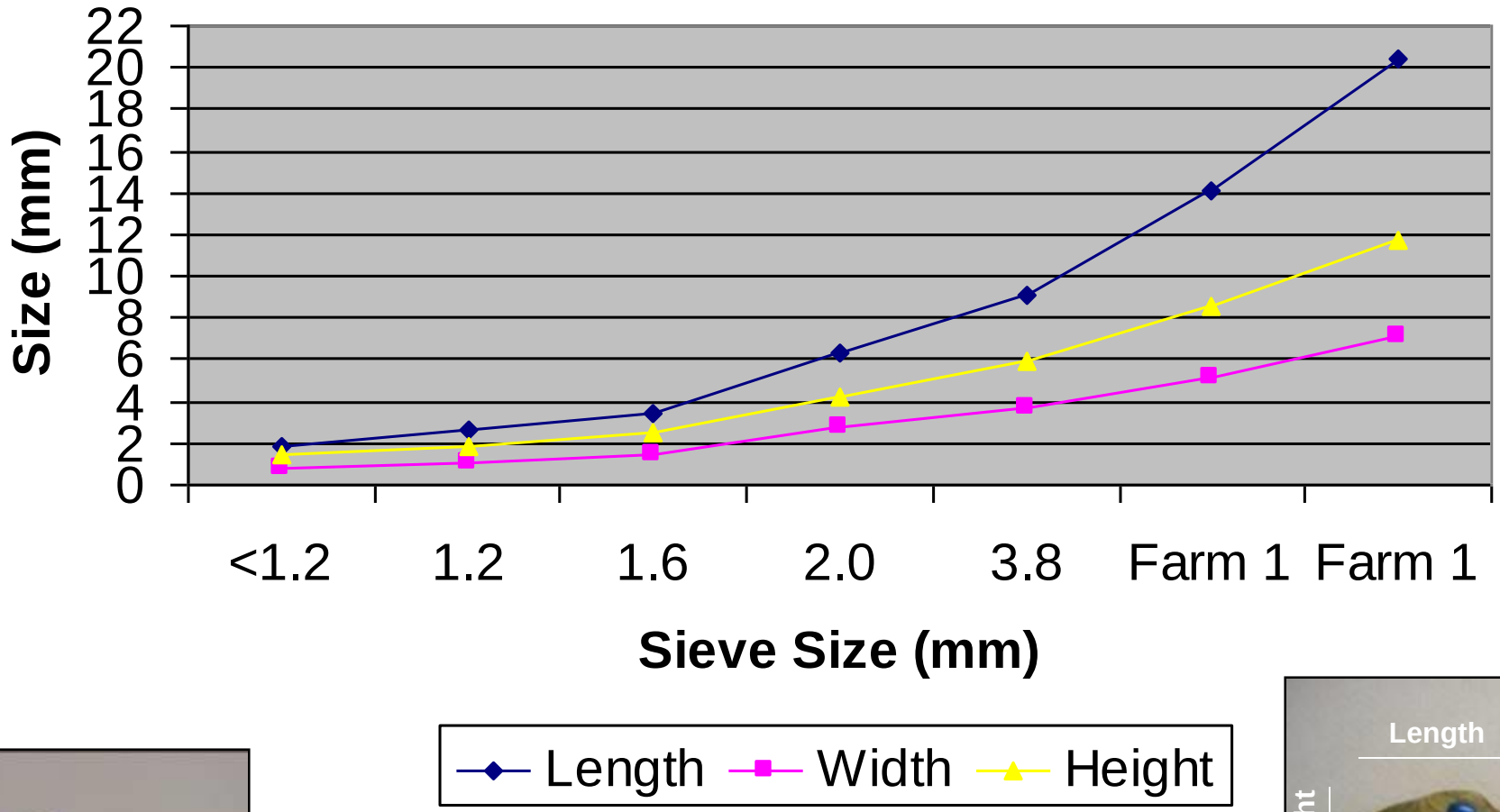
- Triplicate 4-L beakers
- 24 clams/beaker (42±3 mg/clam)
- Fed T-Iso, twice/day
  (0, 50, 100, 200K cells/mL)
- Salinity ~30 ppt
  Temp 23-29°C

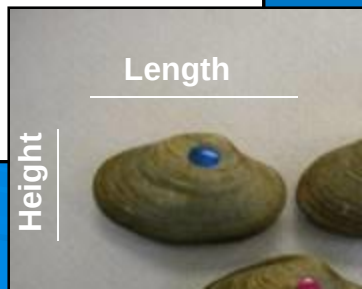


# Feed Experiment




# Sunray Venus Clam Seed Size

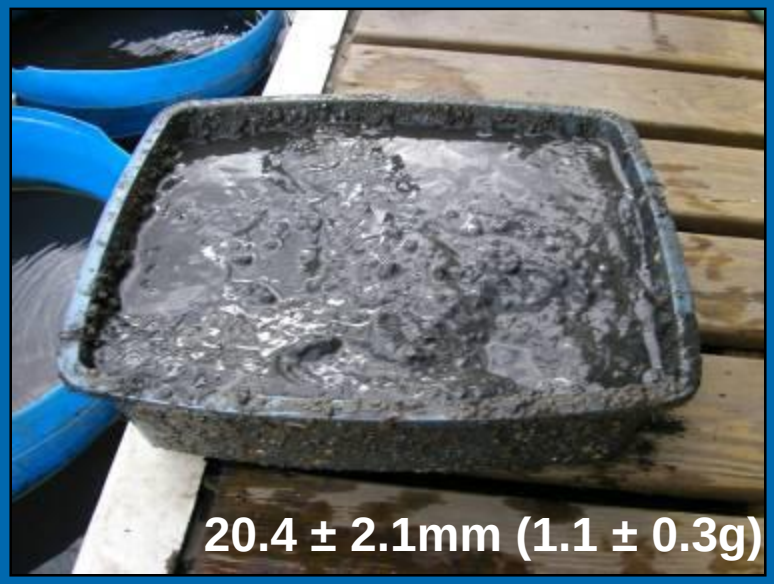


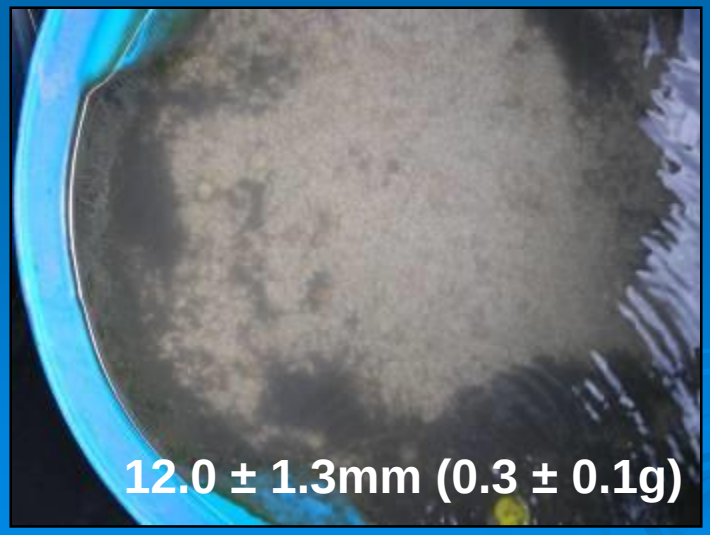



# “Field” Nursery


**37/mL at 17200/m$^2$ (1600/ft$^2$)**

# “Field” Nursery (4 months)



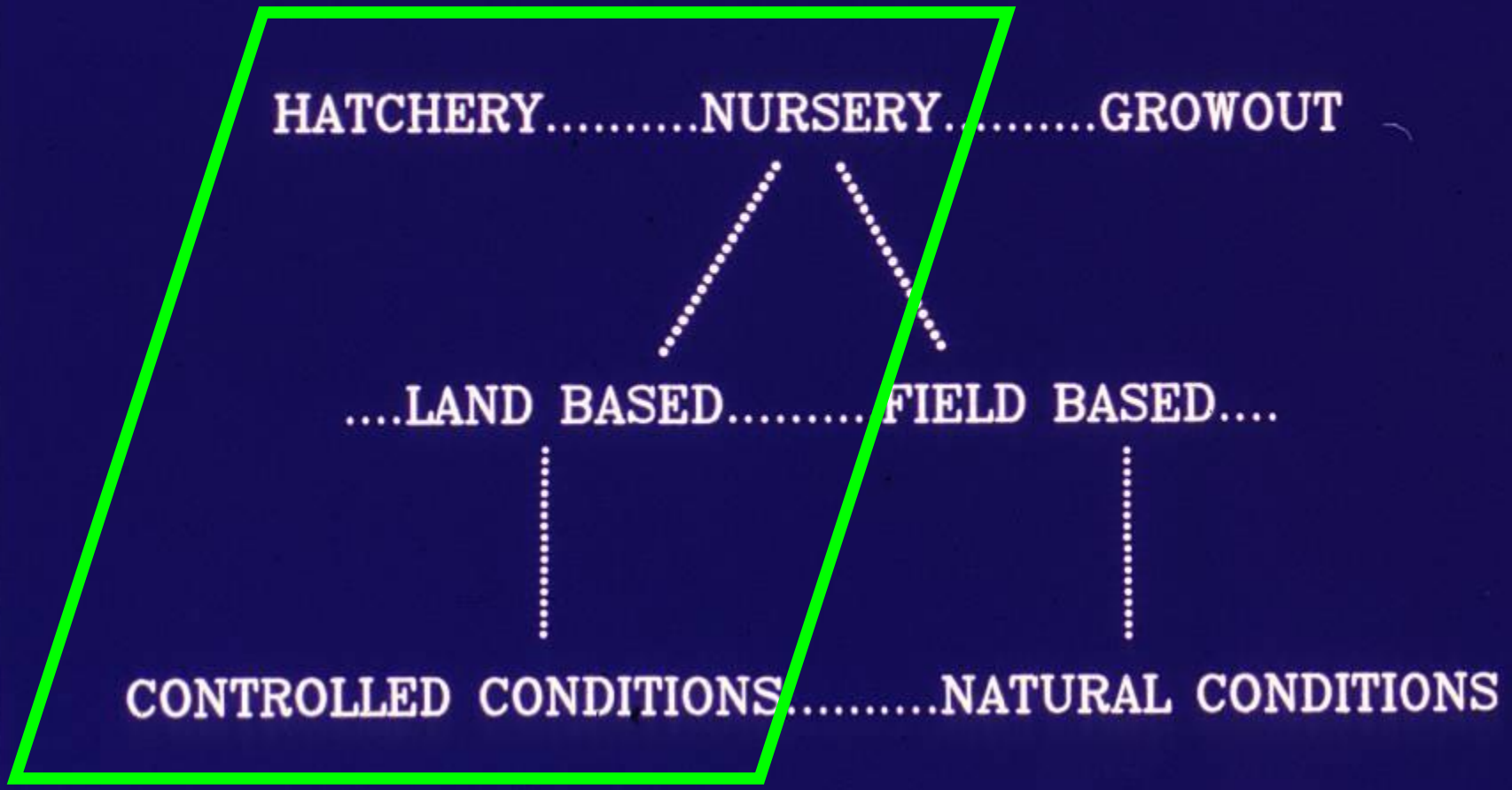




# Field Nursery

# Broodstock Development

- Florida BMPs (Local Stocks)
- Maintaining Genetic Diversity
- Effective Population Size ($N_e$)

# STAGES FOR THE CULTIVATION OF BIVALVE MOLLUSCS



# Induced Spawning - Diversity

# Effective Parental Number

$$N_e = \frac{(4\ N_m\ N_f)}{(N_m + N_f)}$$

**Where:**

**$N_e$ = Effective Parental Number (20?)**

**$N_m$ = Number of Contributing Males**

**$N_f$ = Number of Contributing Females**

# Effective Parental Number

| ♀ | ♂ | Total Spawners | Ne |
|---|---|---|---|
| 10 | 10 | 20 | 20 |
| 9 | 11 | 20 | 19.8 |
| 8 | 12 | 20 | 19.2 |
| 7 | 13 | 20 | 18.2 |
| 6 | 14 | 20 | 16.8 |
| 5 | 15 | 20 | 15 |
| 1 | 19 | 20 | 3.8 |
| 7 | 18 | 25 | 20.2 |
| 6 | 30 | 36 | 20 |
| 5 | 195 | 200 | 19.5 |

# Breeding Contribution
## Equal Gametic (nuclear/mt)

| | ♂a | ♂b | ♂c | ♂d | ♂e |
|---|---|---|---|---|---|
| ♀A | Aa | Ab | Ac | Ad | Ae |
| ♀B | Ba | Bb | Bc | Bd | Be |
| ♀C | Ca | Cb | Cc | Cd | Ce |
| ♀D | Da | Db | Dc | Dd | De |
| ♀E | Ea | Eb | Ec | Ed | Ee |

# Breeding Contribution
## Un-Equal Gametic

| | ♂a | ♂b | ♂c | ♂d | ♂e |
|---|---|---|---|---|---|
| **♀A** | **Aa** | **Ab** | **Ac** | **Ad** | **Ae** |
| ♀B | Ba | Bb | Bc | Bd | Be |
| ♀C | Ca | Cb | Cc | Cd | Ce |
| ♀D | Da | Db | Dc | Dd | De |
| ♀E | Ea | Eb | Ec | Ed | Ee |

# Breeding Contribution
## Un-Equal Gametic

| | ♂a | ♂b | ♂c | ♂d | ♂e |
|---|---|---|---|---|---|
| ♀A | Aa | Ab | Ac | Ad | Ae |
| ♀B | Ba | Bb | Bc | Bd | Be |
| ♀C | Ca | Cb | Cc | Cd | Ce |
| ♀D | Da | Db | Dc | Dd | De |
| ♀E | Ea | Eb | Ec | Ed | Ee |

# Breeding Contribution
## Un-Equal Gametic/Larval Survival

| | ♂a | ♂b | ♂c | ♂d | ♂e |
|---|---|---|---|---|---|
| ♀A | | Ab | | Ad | |
| ♀B | | | | | |
| ♀C | | | Cc | Cd | |
| ♀D | | | | | De |
| ♀E | | Eb | Ec | | |

# Breeding Contribution
## Unintended Selection (nuclear/mt)

| | ♂a | ♂b | ♂c | ♂d | ♂e |
|---|---|---|---|---|---|
| ♀A | Aa | Ab | | | |
| ♀B | Ba | Bb | | | |
| ♀C | | | | | |
| ♀D | | | | | |
| ♀E | | | | | |

# Project Continuation

- 1) Create initial founder broodstock lines for Florida hatcheries
- 2) Demonstrate to hatchery operators the proper development and maintenance of broodstock for seed production

# ACKNOWLEDGMENTS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  Kyrstal Baird (HBOI)
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