INTRODUCTION TO LITTLENECK CLAM FARMING IN ALASKA

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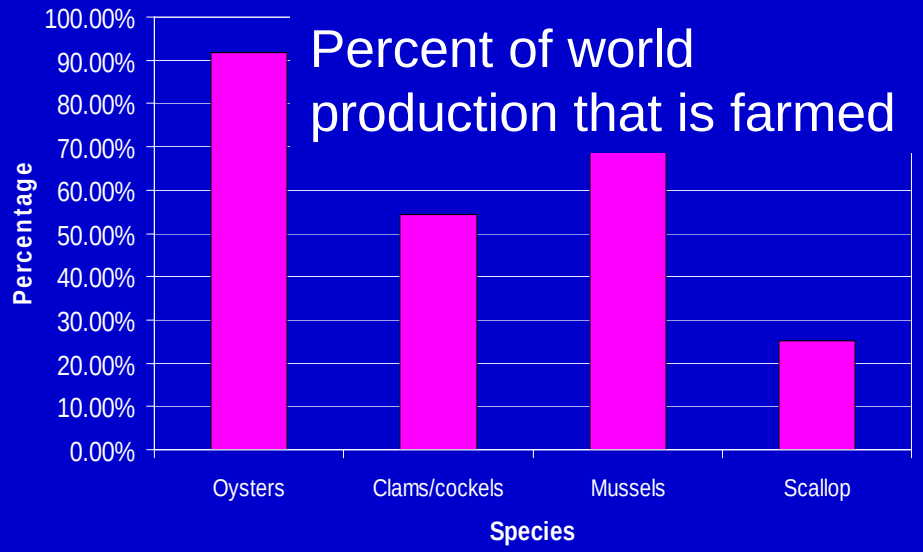
THE LITTLENECK CLAM

- Often called steamer
- Native species
  - *Prototheca staminea*
- Abundant wild populations
- Market price - 2.25-2.50/lb.
- Market size in 4-5 years.
- High quality and save shellfish.

WHY CLAM FARMING?
The rationale

- Processes that sustain a bivalve population are complex
- Natural recruitment, growth, and survival are quite variable from year to year
- Easy to overexploit a population
- Need to monitor the population to assure sustainability
- Many countries have adopted aquaculture



WHY CLAM FARMING?
Marketing

- Demand exceeds supply
  - Importing is required
- Requests for local clams
- Product diversity for farm production
  - Adds market security
- Market consistency in deliver and quality
- Environmentally friendly
  - Peer review literature shows pos
    effects of clam farming
  - Environmental endorsements fr
    - **Blue Water Institute**
    - **Monteray Bay Aquarium**
    - **Environmental Defense Fund**

THE CLAM AQUACULTURE PROCESS

SITE SELECTION

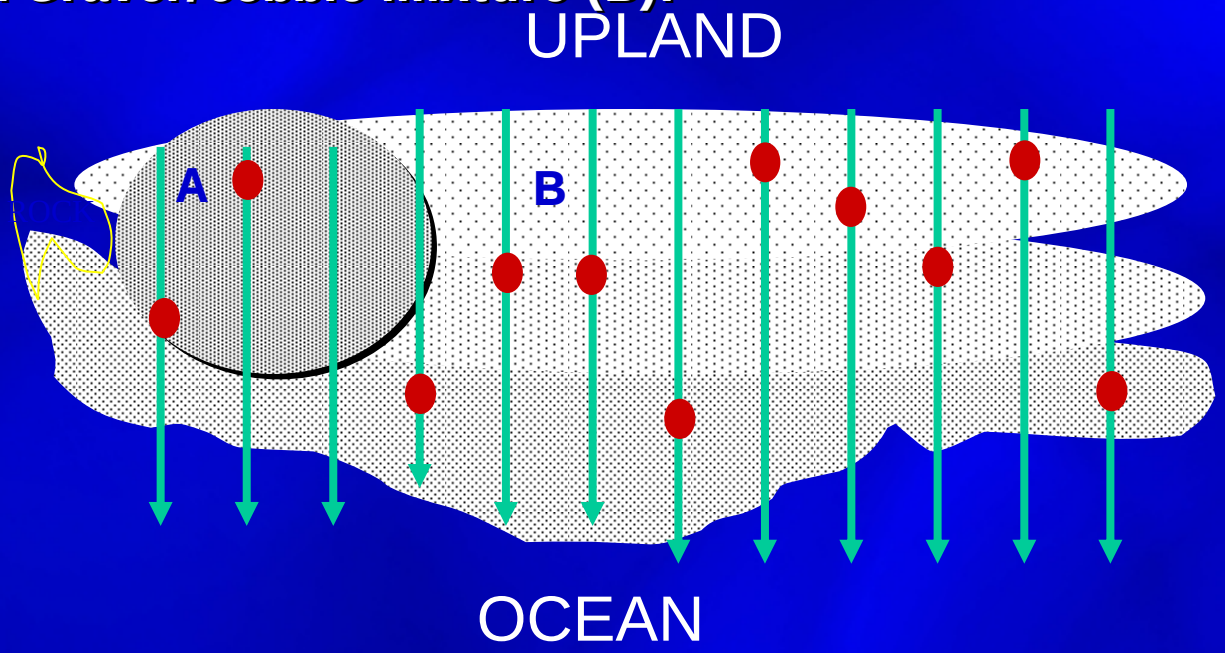
- Land use designation
- Historical and existing uses
- Sensitive areas as designated by ADNR and ADF&G
- Essential habitat
  - E.g. Eel grass
- Substrate
- Beach slope
- Water current
- Evidence of water forces
- Inventory data
- PSP testing
  - Butter clam test
- Current use of tideland
- Market
- Transportation
- Labor
- Water quality
  - Fecal coliform
  - Uplands use

DEVELOPING A LITTLENECK CLAM FARM PRODUCTION PLAN

- Pre farming inventory and commercial harvest.
- Determine the distribution of clams on the beach.
- Inventory the beach population from at least 11 plots one square foot per acre.
- Measure clams and develop a length frequency distribution.
- Interpret the length frequency distribution to calculate current
- Develop the management plan.
  - Population control, seeding plan, harvest plan.

TYPICAL CLAM BEACH INVENTORY PLOT

Four substrate types suitable for clam farming ranging from fine (A) to sand Gravel/cobble mixture (B).



The red circles are random sample plots. The number of plots in each substrate type is determine by the relative area represented by the sample type. Substrate A is the smallest area represented by two plots, while the remaining sites are all about the same size and each larger than plot A, thus each has three sample plots

SAMPLE PLOTS IDENTIFIED

SAMPLING

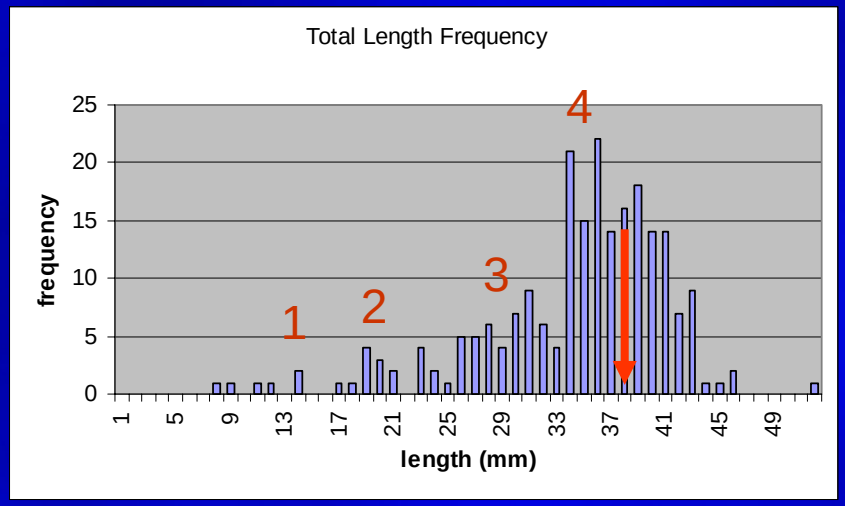
SIFT THROUGH ¾” SIEVE

LENGTH MEASUREMENT

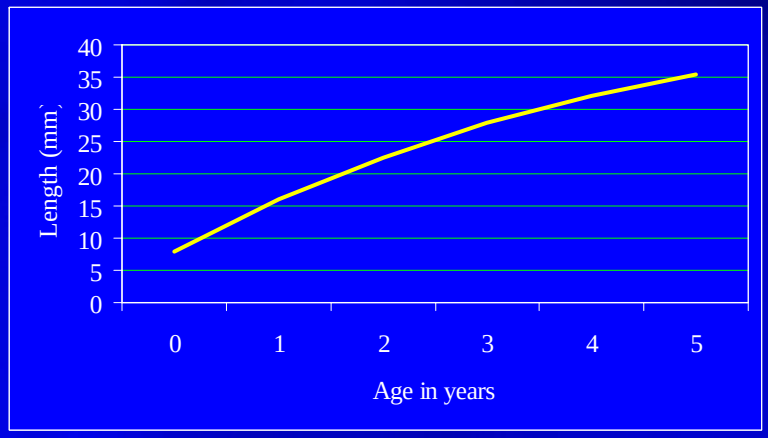
DEVELOP LENGTH FREQUENCY GRAPHS

BLUE WATER

- Poor recruitment
- Don’t know the cause
  - Very enclosed embayment
  - Likely irregular recruitment
- Density is good
  - Growth is likely good
- Harvest will be decreasing
- Post commercial harvest seeding is required at 60 Clams/ft^2

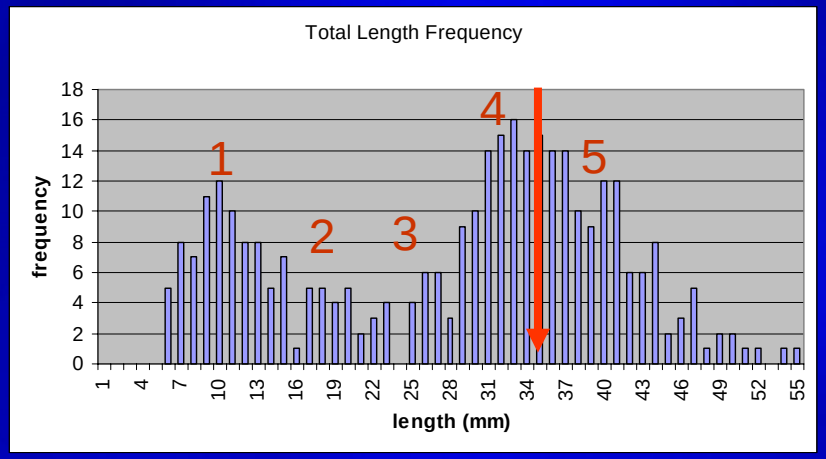


Pre harvest 52.21 clams/ft^2
Legal size 40.37 clams/ft^2

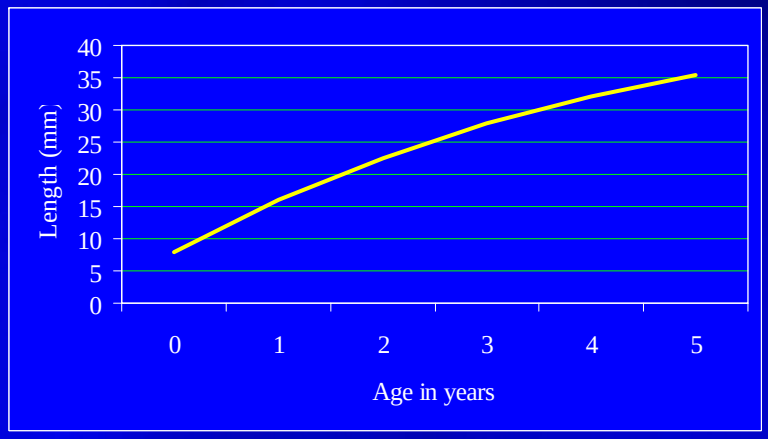


TENASS PASS

- Good recruitment of year one age class
- Sizable harvest population
  - Removal of very large clams will increase growth rate of small clams
  - With years 2 and 3 being small year class contributors controlling the harvest will sustain the harvest through time
- Removal of the large clams may improve survival and increase recruitment
  - Survey the following year
- Post commercial harvest seeding at about 40 clams/ft^2

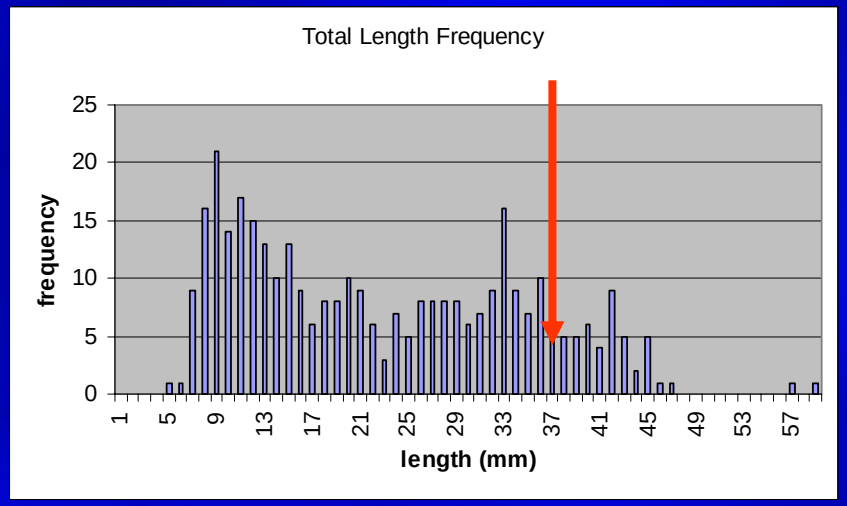


Pre harvest 69.60 clams/ft^2
Legal size 38.94 clams/ft^2

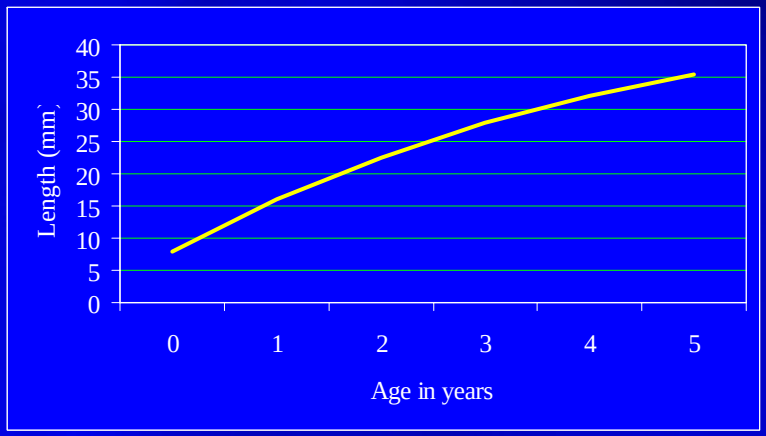


CANOE LAGOON

- Very good recruitment
- Not many harvestable size clams
  - But harvest will be sustainable every year
- Density is right at maximum for best growth
- Removal of above 38 mm clams will likely improve growth and survival of younger clams
- Post commercial harvest seeding at 30 clams/ft^2



Pre harvest 62.62 clams/ft^2
Legal size 21.63 clams/ft^2



FIRST HARVEST ESTMATE FOR ONE ACRE

Length class	Sample No.	Percent	Total Number/ sq ft.	Number/acre
0-5	12	4.51%	2	83,812
6-10	47	17.67%	8	328,264
11-15	30	11.28%	5	209,530
16-20	24	9.02%	4	167,624
21-25	27	10.15%	4	188,577
26-30	45	16.92%	7	314,295
31-35	49	18.42%	8	342,233
36-37	11	4.14%	2	76,828
38 & above	21	7.89%	3	146,671
Total	266		43	1,857,834

Length class	Weight/ft^2 Pounds	Percentage Weight	Weight/acre Pounds	Income at $2.25/lb
0-5	0.0002	0.025%	8.6	
6-10	0.0039	0.503%	171.6	
11-15	0.0099	1.265%	431.9	
16-20	0.0207	2.639%	901.1	
21-25	0.0513	6.549%	2,236.2	
26-30	0.1541	19.656%	6,711.5	
31-35	0.2648	33.780%	11,534.1	
36-37	0.0782	9.980%	3,407.7	
38 & above	0.2010	25.648%	8,757.5	$19,704.37/Acre

Common property
Harvest income

FIRST HARVEST ESTMATE FOR ONE ACRE

Length class	Sample No.	Percent	Total Number/ sq ft.		Number/acre
0-5	16	2.65%	3		112,461
6-10	26	4.31%	4		182,750
11-15	20	3.32%	3		140,577
16-20	29	4.81%	5		203,836
21-25	69	11.44%	11		484,990
26-30	114	18.91%	18		801,287
31-35	191	31.67%	31		1,342,508
36-37	55	9.12%	9		386,586
38 & above	83	13.76%	13	12 year old	583,393
Total	603		97		4,238,388

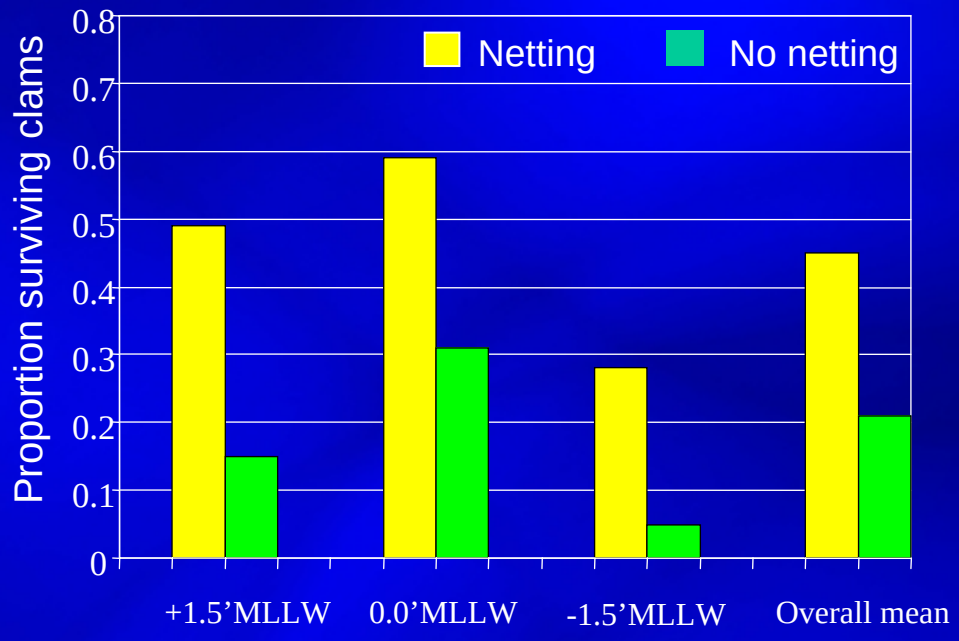
Length class	Weight/ft^2 Pounds	Percentage Weight	Weight/acre Pounds	Income at $2.25/lb
0-5	0.0001	0.008%	6.1	
6-10	0.0014	0.078%	60.9	
11-15	0.0044	0.246%	192.0	
16-20	0.0177	0.987%	768.9	
21-25	0.0848	4.744%	3,695.8	
26-30	0.2405	13.448%	10,476.9	
31-35	0.6467	36.158%	28,170.1	
36-37	0.2454	13.721%	10,689.8	
38 & above	0.5475	30.611%	23,848.6	

Common property
Harvest income

$53,659.35/Acre

WHY PREDATOR NETTING?

- Deploy or not to deploy?
  - Farmers would prefer not to deploy netting if they had a choice
  - Is predation a problem?
  - Substrate suitability
  - Security of the net
  - Fouling could be a problem
- How long must the netting remain?
  - Clam life stage
  - Type of predation



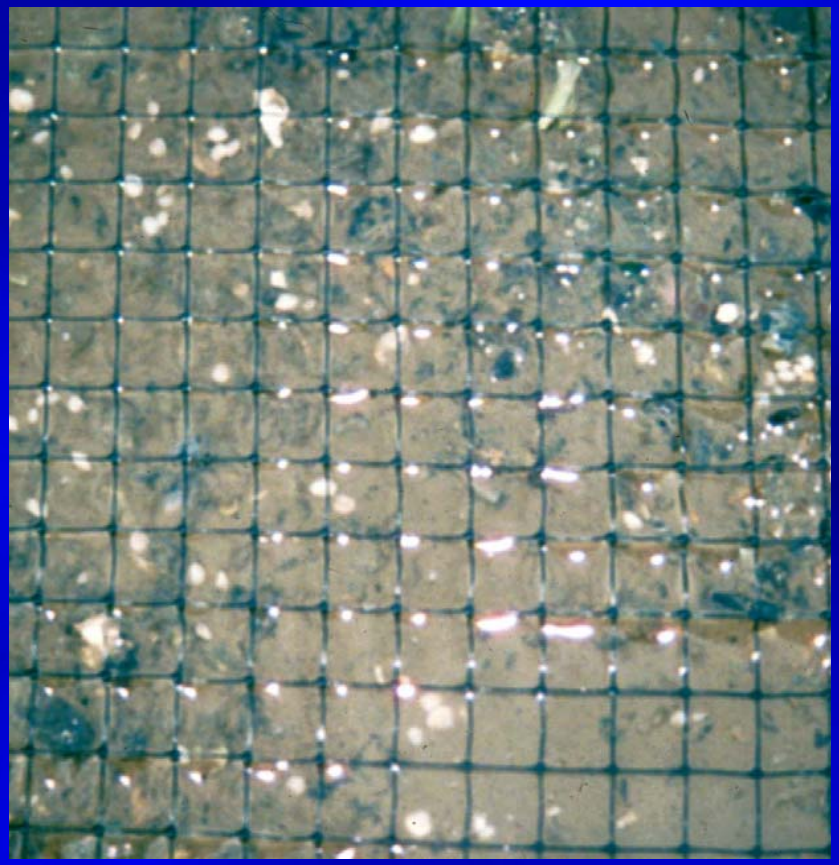
From Brooks 2000

PREDATOR NET DEPLOYMENT

- Remove high spots
  - E.g. bolders
- Cut netting to fit site
  - 15-20 ft segments
- Lay out net
- Fold over edges
- Dig trench around the margin
- Bury and anchor net edge

PREDATOR NETTING

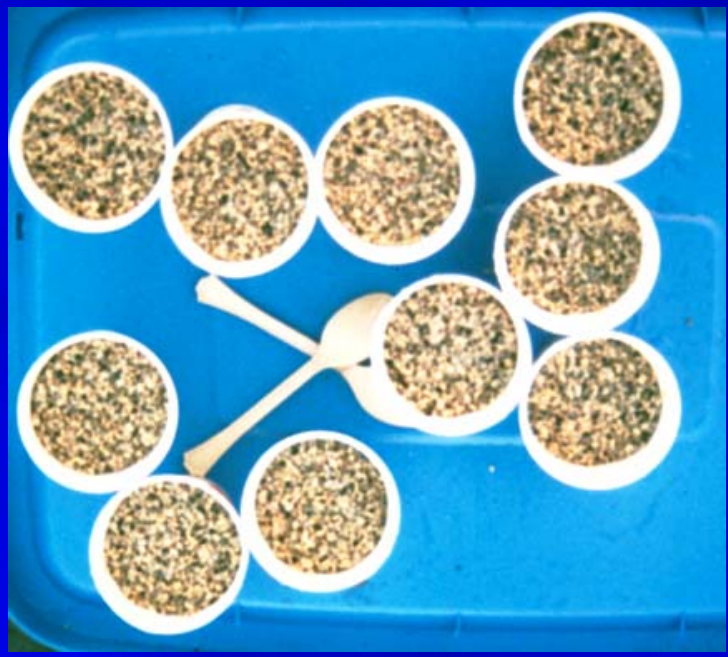
- Netting negatively buoyant
- Mesh size 5/8-1”
- Must lay snug to the bottom
- Rock placed on top if necessary
- Secured during a tidal cycle, planted at next cycle



PREDATOR NETTING AFTER TWO YEARS

SEEDING THE BEACH

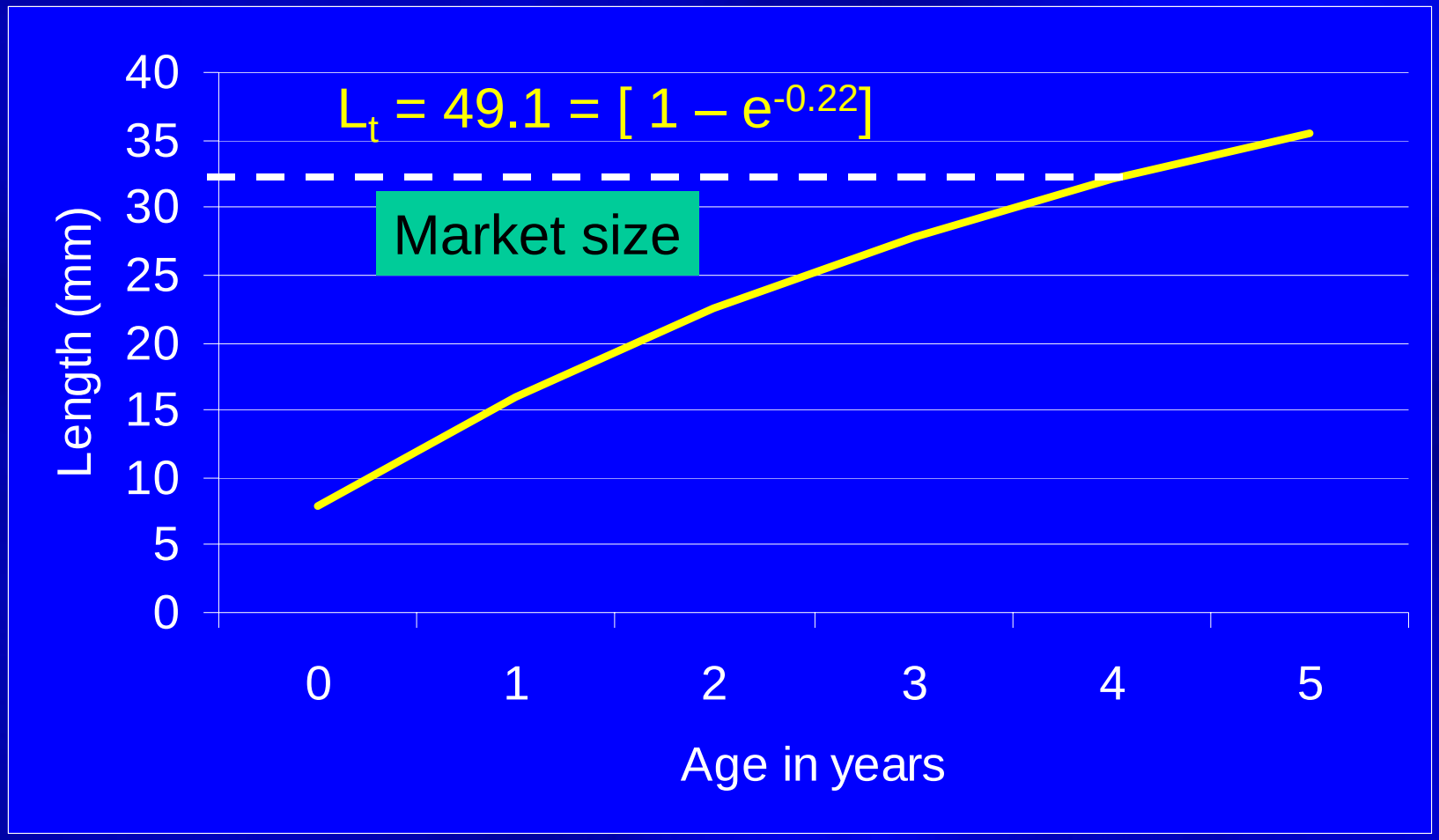
- Hatchery seed
  - Transport restrictions
  - Hatchery practices that foster genetic diversity
- Cost $7.50-9.50/1,000
- Count and inventory volumetrically




SEEDING THE BEACH
On an incoming tide

RESEARCH

AGE AND GROWTH



RECRUITMENT
is extremely variable between even adjacent plots

Upper plot									
Plot number	**1-A**	**1-B**	**1-C**	**2-A**	**2-B**	**2-C**	**3-A**	**3-B**	**3-C**
Stocking number	90	30	60	30	90	60	90	60	30
Percent recruitment	91.38	60.00	57.89	92.59	60.71	17.50	30.19	33.33	23.33
Lower plot									
Plot number	**1-A**	**1-B**	**1-C**	**-2-A**	**2-B**	**2-C**	**3-A**	**3-B**	**3-C**
Stocking number	90	30	60	30	90	60	90	60	30
Percent recruitment	93.75	76.92	68.42	79.55	81.82	66.67	57.69	33.33	53.13

THE BOTTOM LINE

Stocking and recruitment

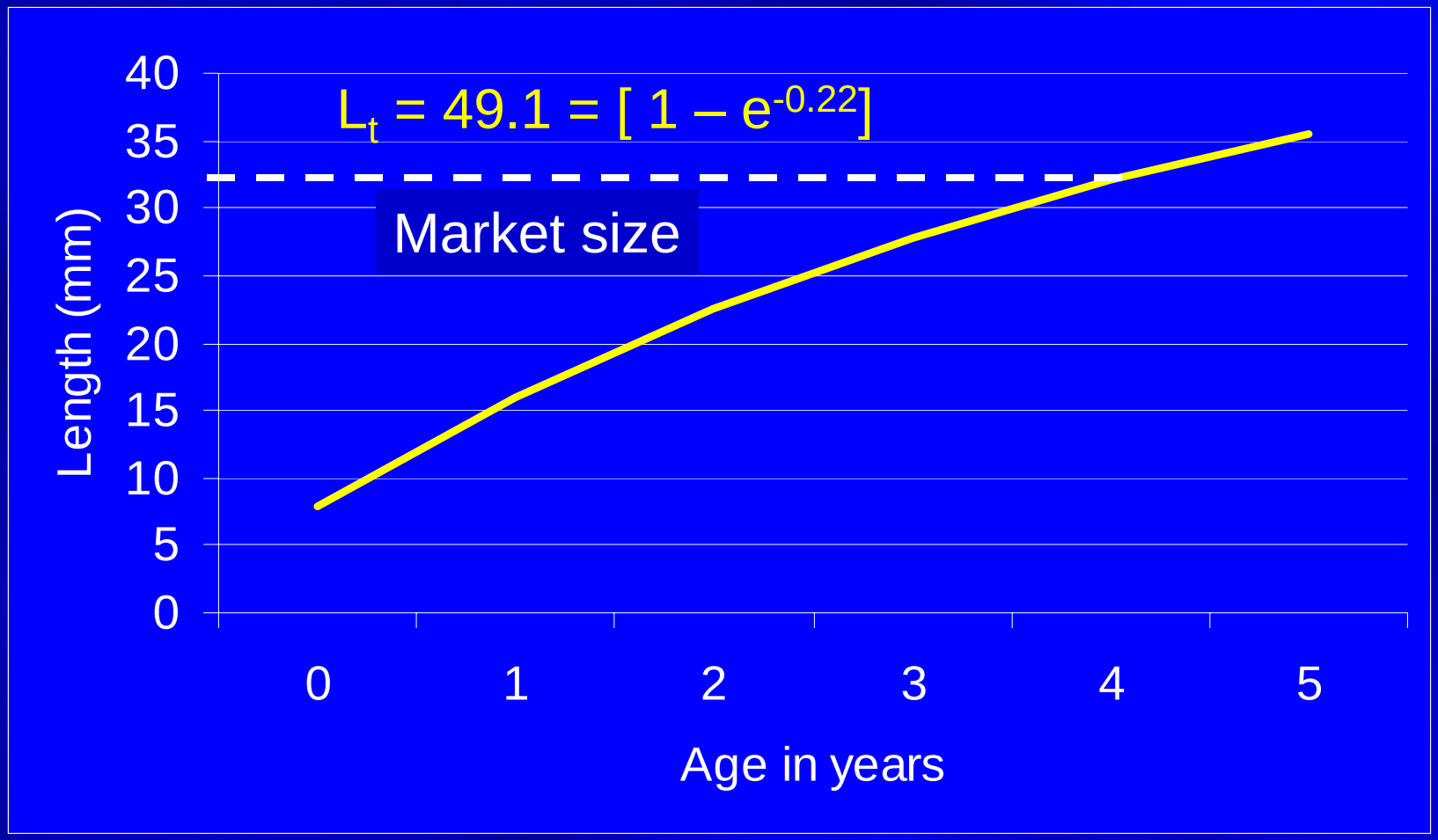
Stocking clams/ft²	Recruitment		
	Low	Moderate	Heavy
30	S+ G+ $L	S+ G+ $L	S+ G+ $M
60	S+ G+ $M	S+ G+ $M	S+ G+ $H
90	S+ G+ $M	S+ G+ $H	S- G+ $L

S = Survival
G = Growth
$ = Income

L = - $6,000 to +$7,000
M = +$10,000 to $32,000
H = $40,000 +

Profitability - Red Low, Yellow Medium, Green High

AGE AND GROWTH



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90	S+ G+ $M	S+ G+ $H	S- G+ $L

S = Survival
G = Growth
$ = Income

L = $5,000 to $10,000
M = +$10,000 to $25,000
H = $40,000

WHAT WE LEARNED FROM GROWOUT RESEARCH

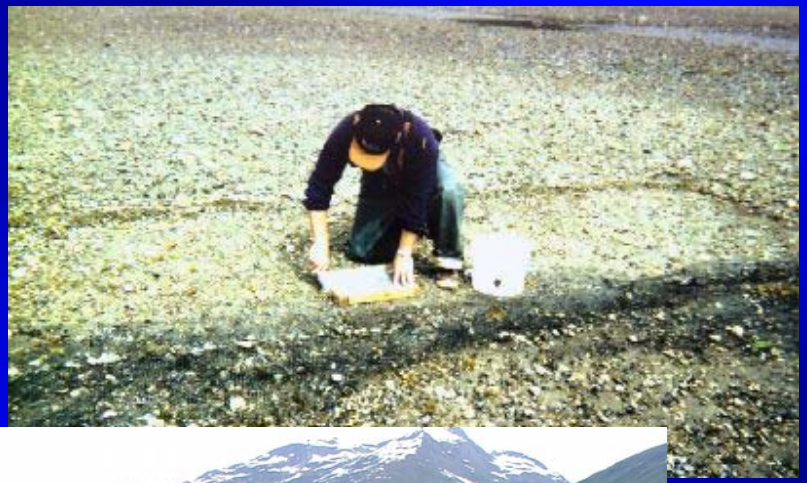
- High energy beaches
  - Poor survival and growth
- Predator nets do not appear to cause siltation
  - No significant change in before or after particle size
- Plant small seed (2-5 mm) in spring, nursery cultured seed (8-12 mm) in fall

WHAT WE LEARNED FROM GROWOUT RESEARCH

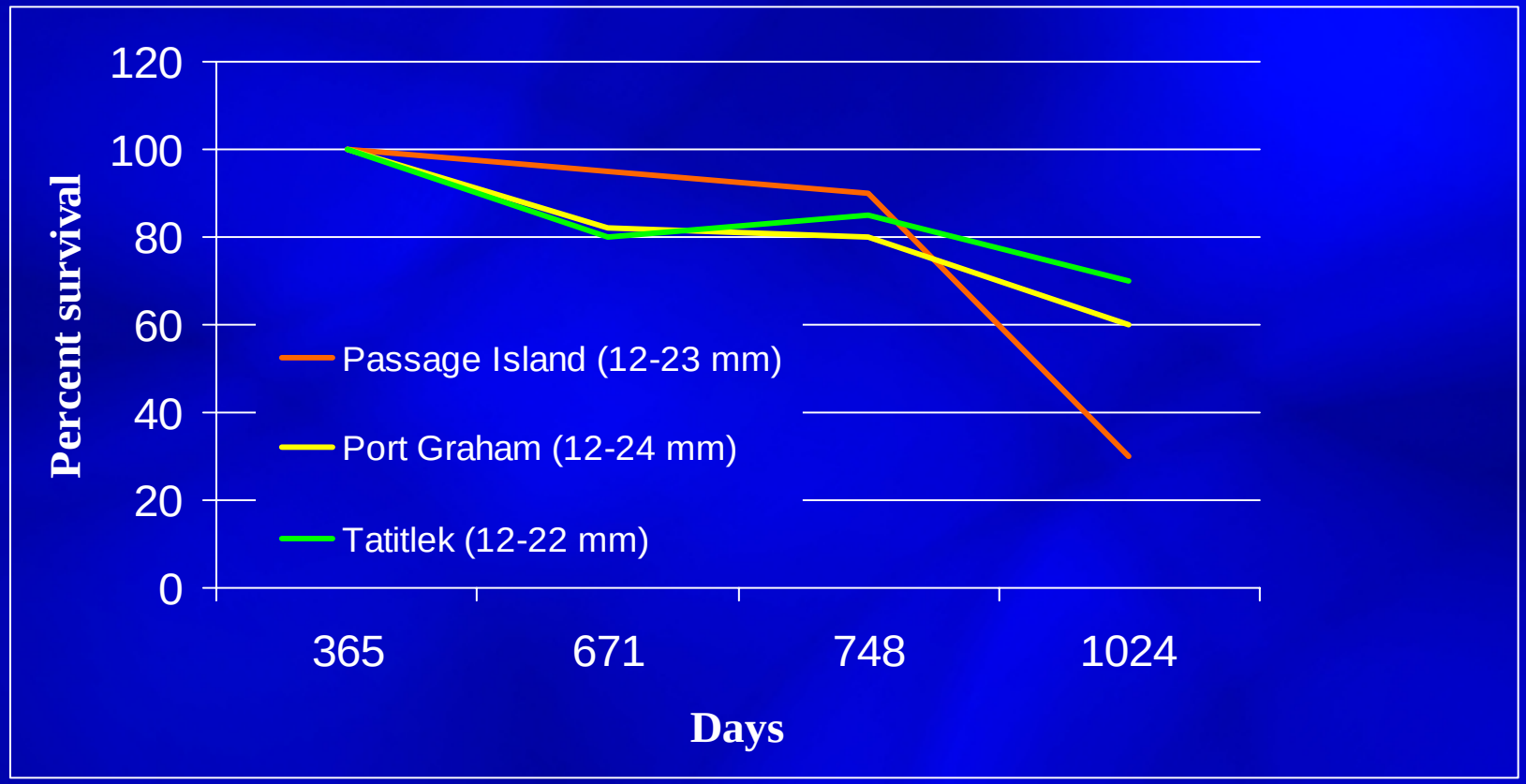
- Correlation between initial size distribution with recruitment and survival
- Pay attention to recruitment to maximize survival
- No difference between +1 and –1 tidal heights
- Relying on natural recruitment for sustained income is risky
- Overall the best results occurred at a standing stock density of approximately 60 clam seed/ft2

MAINTAINING THE FARM

- Regular inventories
  - Check for seed growth, survival, and natural recruitment
- Net repairs
- Fouling removal if necessary



SURVIVAL



Brooks 2000

HARVESTING

- Hand harvesting
- Raking to 6”
- Rack entire bed
- Replacing and smoothing substrate

QUESTIONS?

- Contact me
  - Ray RaLonde – University of Alaska Sea Grant Program – Marine Advisory Program
    - 907-274-9697
    - E-mail – afrlr@uaa.alaska.edu