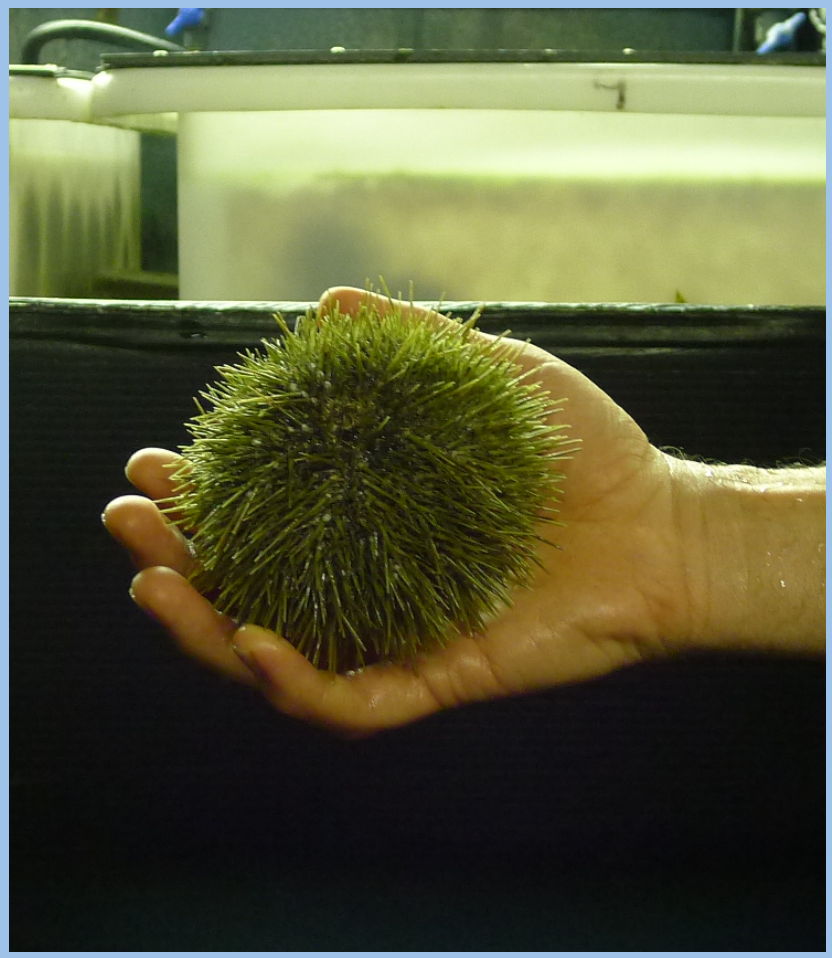
Bulking Sea Urchins With Seaweed

Presented by Steve Eddy
Center for Cooperative Aquaculture Research

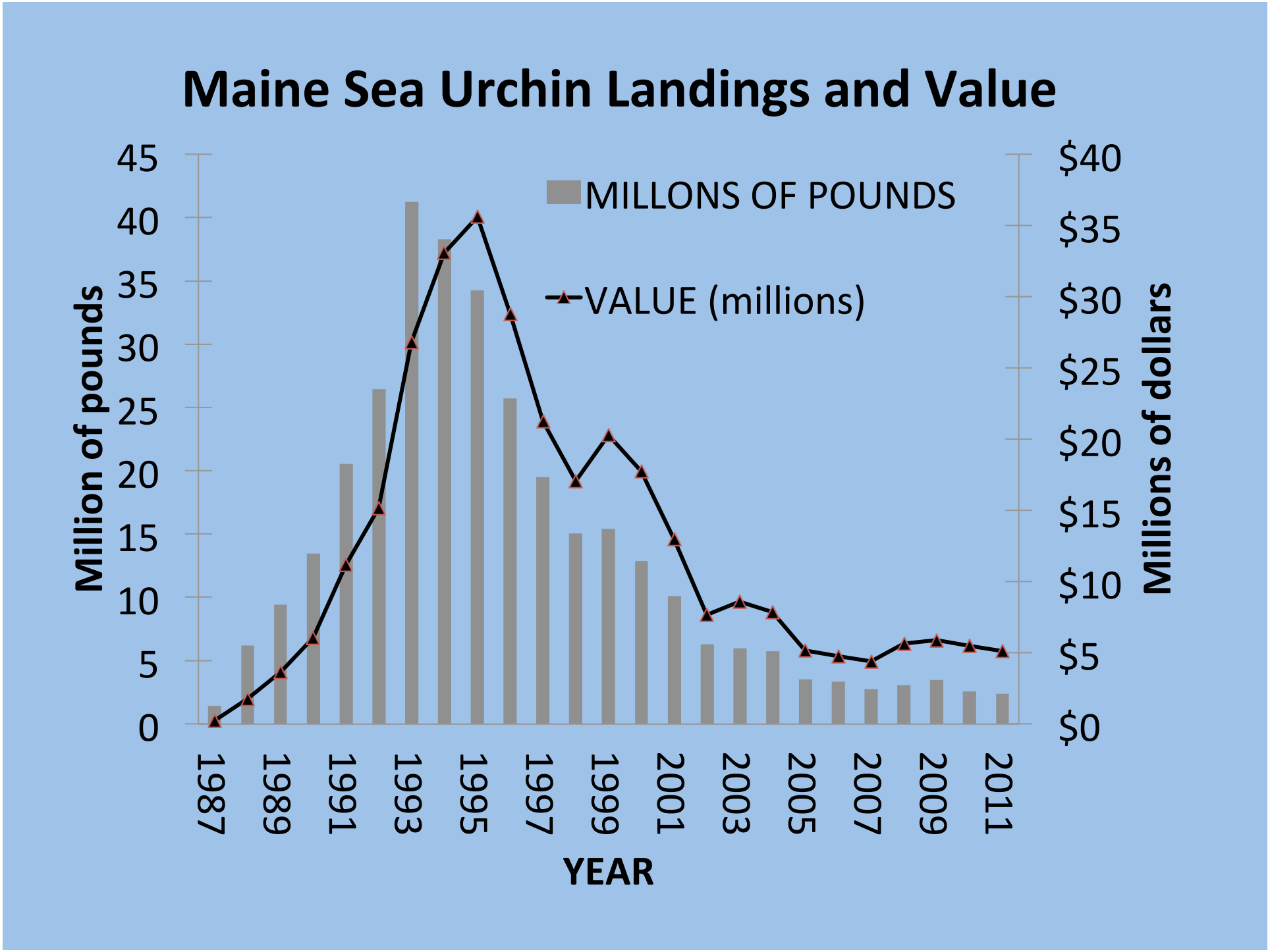
Strongylocentrotus droebachiensis

- Green sea urchin major herbivore in the GOM
- A population boom of green sea urchins led to a major fishery in Maine in the 1990's



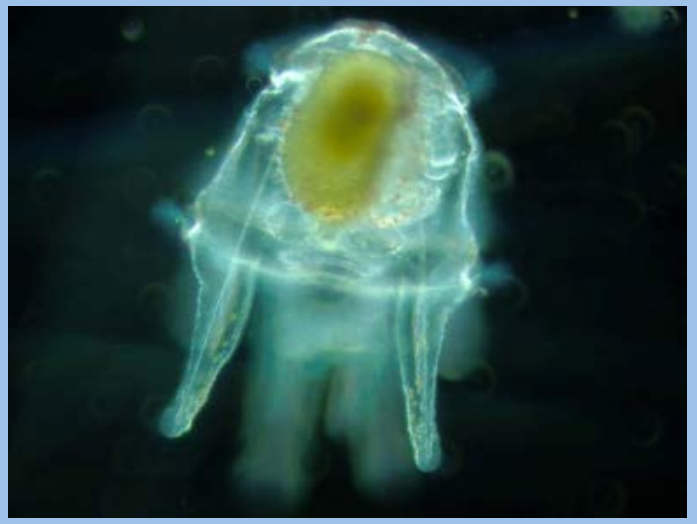
Edible Gonads

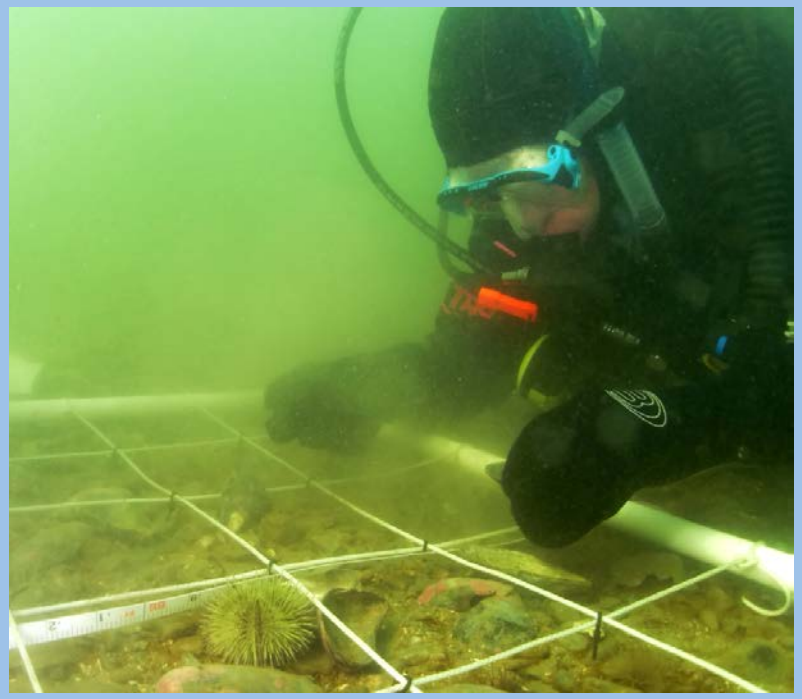
- Known as roe, eggs, or uni
- Japan: 9,000 tons of uni; 70g per person
  80% is imported
- Uni auction values from $80 to $300 per kg.
- Japanese market value = $200 million to $300 million

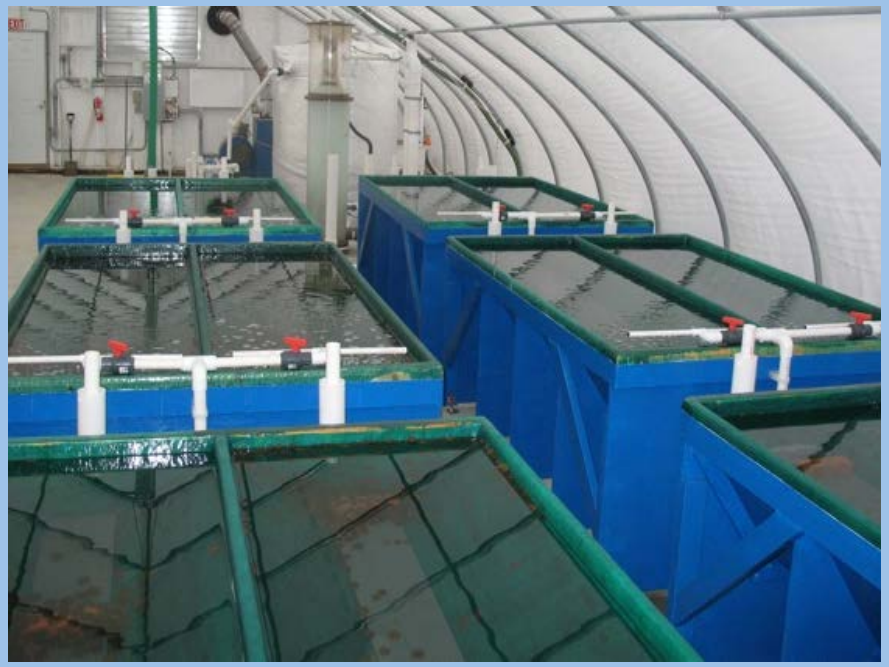

Maine Sea Urchin Landings and Value
MILLONS OF POUNDS
VALUE (millions)
Million of pounds
Millions of dollars
0
5
10
15
20
25
30
35
40
45
$0
$5
$10
$15
$20
$25
$30
$35
$40
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
YEAR

Sea Urchin Aquaculture at the CCAR

- Hatchery
- Nursery Strategies
- Feed trials
- Tank farming
- Sea ranching







Formulated Feeds

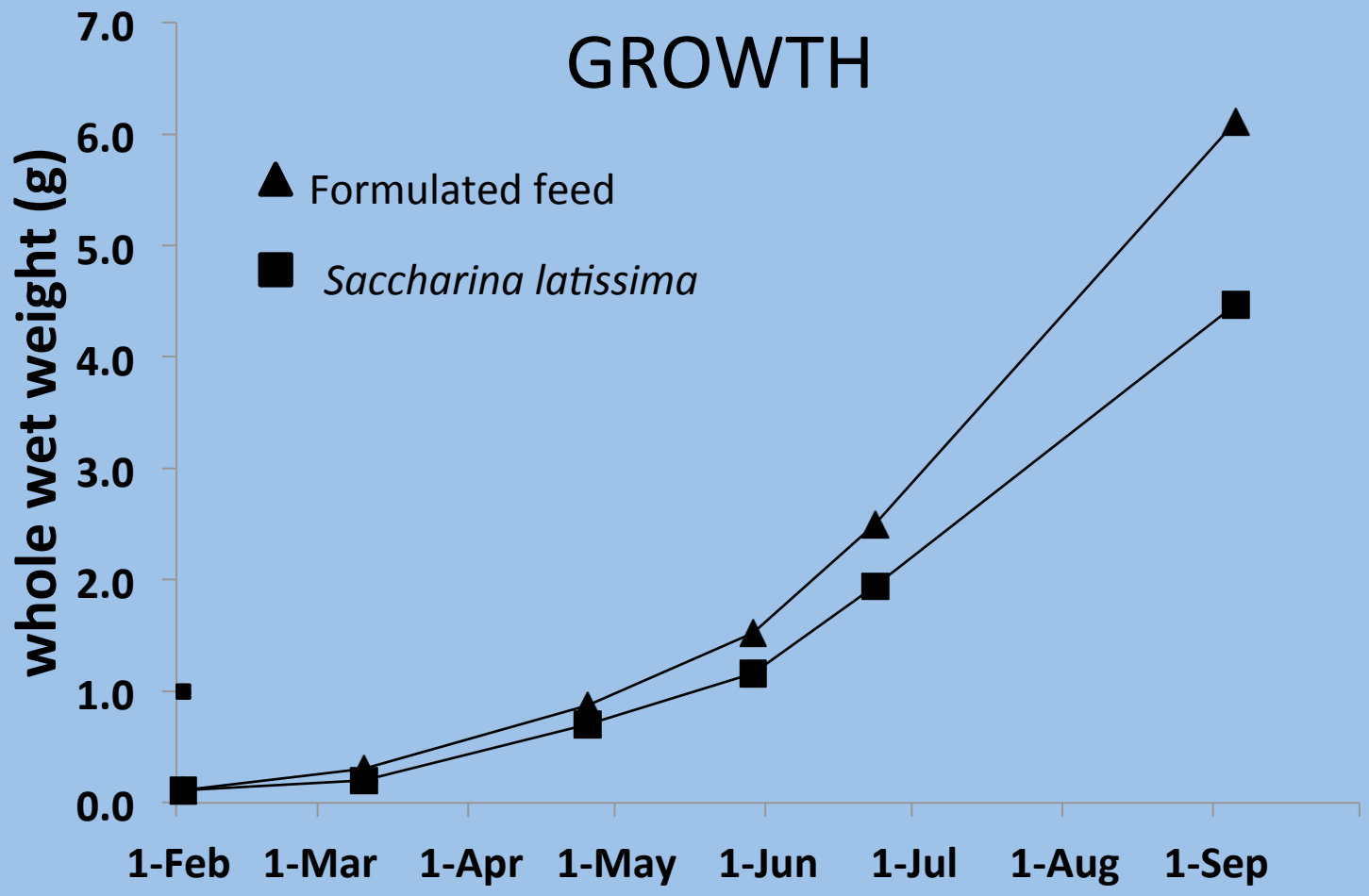
Texas A&M noodles

Nofima (Norway)

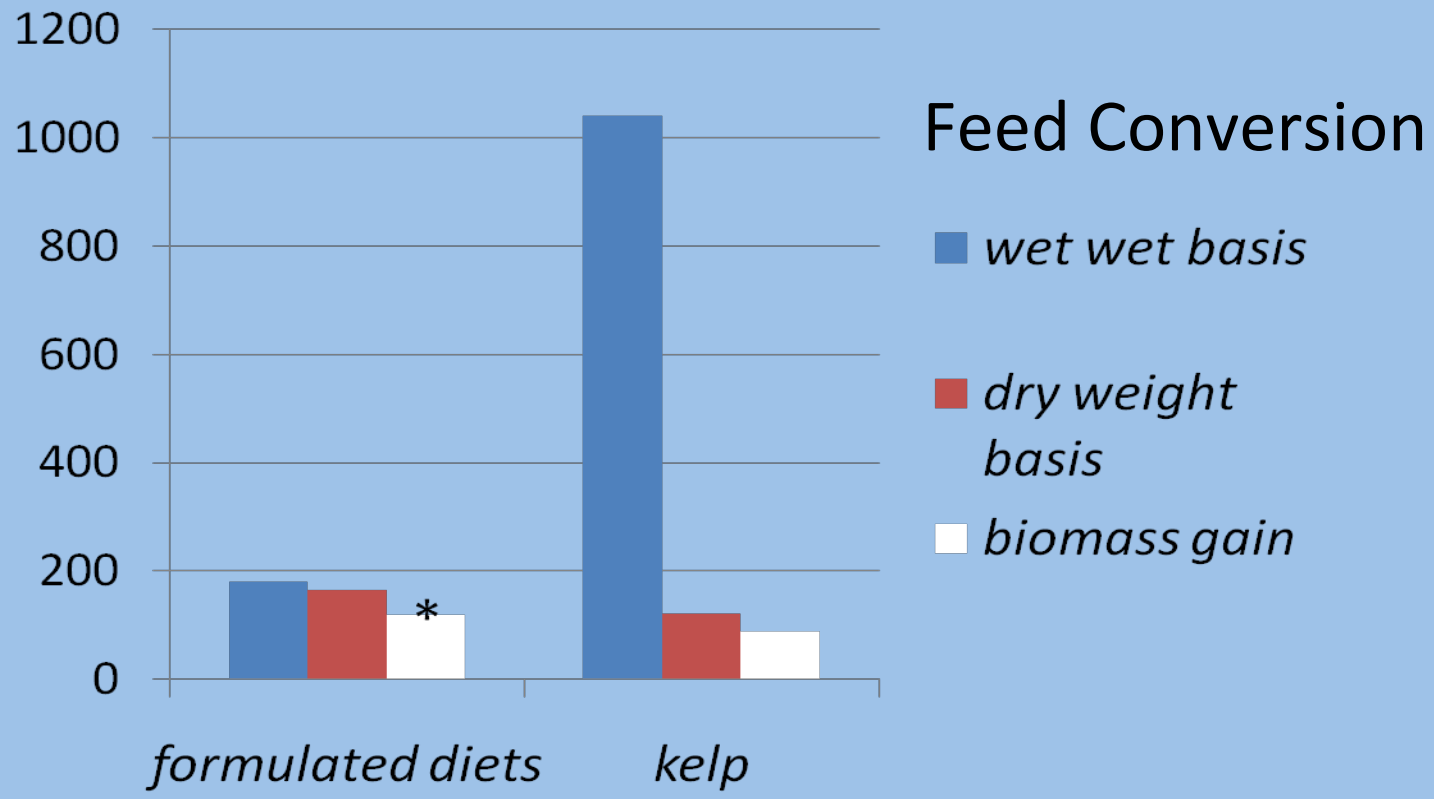
Catfish feed

Abalone feed

Formulated Feeds vs. Kelp



Formulated Feeds vs. Kelp

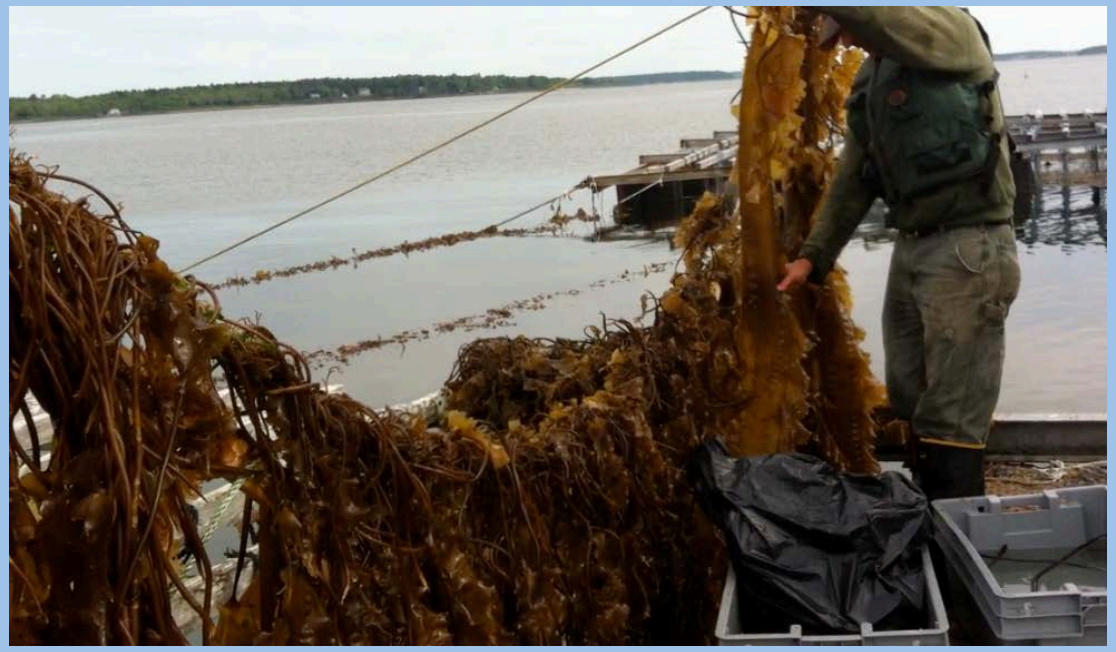


- Kelp FCR: 11.8g kelp yields 1g of urchin biomass.
- Formulated feed FCR: 1.5g feed yields 1g of biomass.

- Formulated diets are not produced at a commercial scale
- Costly
- Can adversely affect gonad quality
- Sugar kelp is a preferred food and abundant

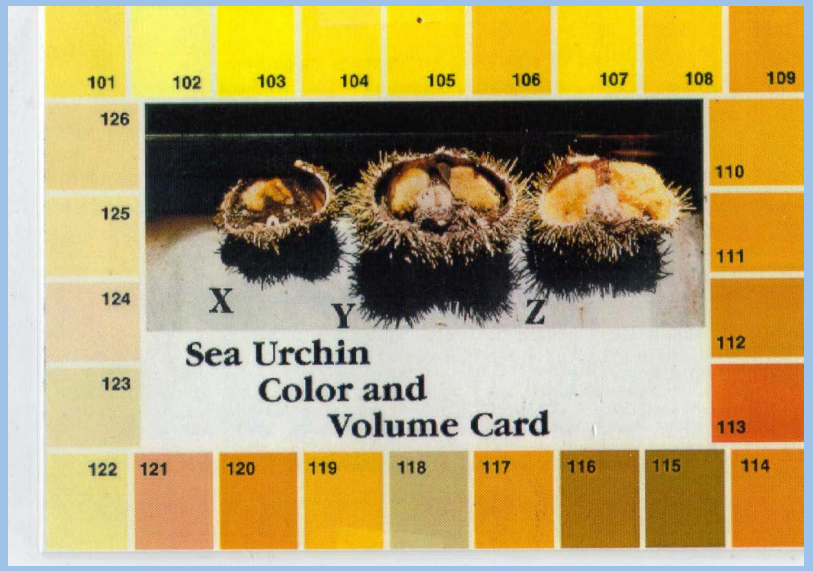
Sugar Kelp *Saccharina latissima*

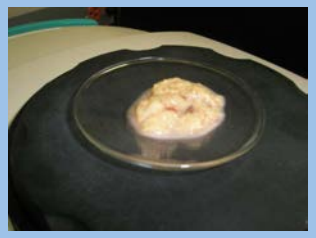
Wild gathered



Rope grown

GONAD ENHANCEMENT





Bulking

- Improved yields and quality with good nutrition

ATLANTIC RAINBOW TRADING INC	PROCESSOR	PORTLAND
BENNYS MAINE SEAFOOD INC	PROCESSOR	WALDOBORO
EAST ATLANTIC SEAFOOD	PROCESSOR	PORTLAND
FAMILY SEAFOOD INC	PROCESSOR	SCARBOROUGH
FRESH ATLANTIC USA INC	PROCESSOR	PORTLAND
GULF OF MAINE INC	PROCESSOR	PEMBROKE
ISF TRADING INC	PROCESSOR	PORTLAND
KME SEAFOOD	PROCESSOR	SCARBOROUGH
SAMAKI SEAFOOD INC	PROCESSOR	SCARBOROUGH
SAREYCHUMTIT SEAFOOD CO	PROCESSOR	PORTLAND

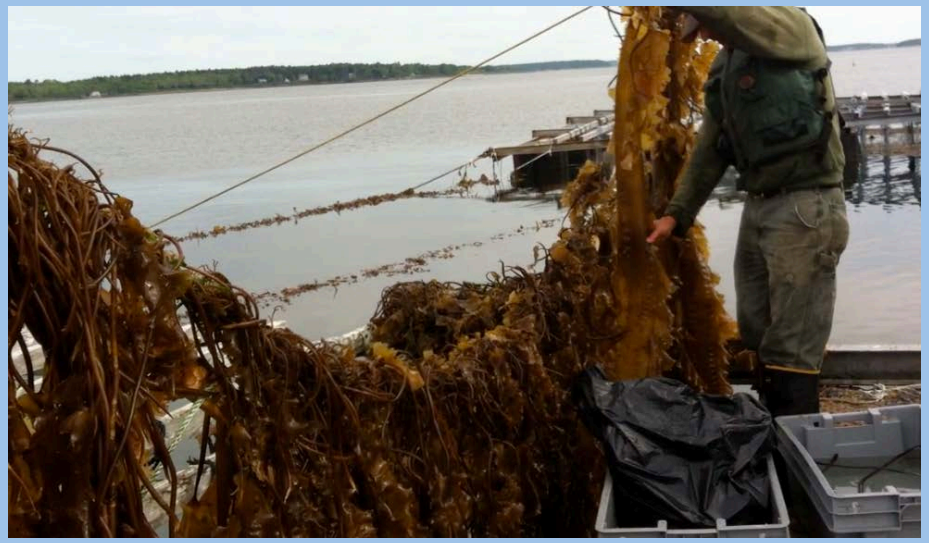
- As of 2011-2012 ten processors in Maine
- One processor need a minimum of
  50 totes/day (≈4,000 lbs) 3 days week
- 50 totes from 5 to 10 divers or draggers
- At 70g avg. per urchin this is ≈26,000 animals
- Season lasts for 28 weeks, Sept.-March

Gonad Yield	Sea urchins (lbs)	Uni (kgs)	Value @ $90 per kg	Value over 28 week season
7%	4,000	127	$11,430	$320,040
10%	4,000	181	$16,290	$456,120
15%	4,000	272	$24,480	$685,440
20%	4,000	363	$32,670	$914,760
25%	4,000	454	$40,860	$1,144,080

A 5% increase in gonad yield for one processing day per week could add >$200,000 in income over the season

Bulking at Sea

- Transplanting urchins to kelp beds
- Bales of seaweed dropped on urchin barrens
- Cages hung over the pier
- Lobster pounds



Bulking on Land

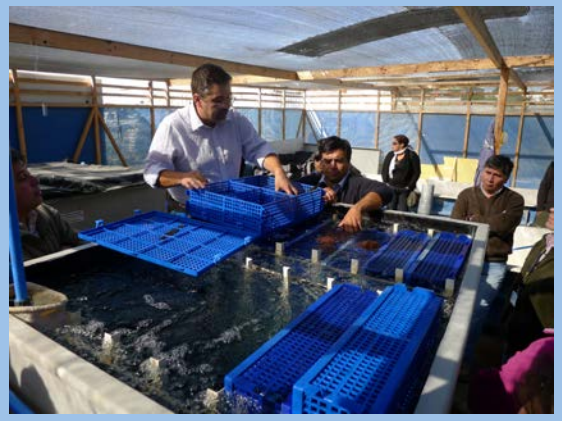
- Intensive tank and cage systems.
- Batch Control
- Season and Market timing
- Efficient Feeding

UrchinPlatter™ intensive sea urchin bulking system in Ireland

From Capture to Culture: Adding Value to the Sea Urchin Fishery with Aquaculture

NOAA Sea Grant Project, 2012-2014

- Demonstrate intensive land based bulking
- Compare cultured with wild sea urchins
- Compare formulated feeds with seaweed
- Use aquacultured and wild seaweed for bulking and compare different species
- Economic analysis of goad enhancement



Dimensions: 22” x 16” x 5”

Trial #1

METHODS

- System stocked with ≈500 lbs of urchins in May
- Starting gonad index was <10%
- Weekly feeding rate 10-20%
- Farmed kelp for 1st nine weeks (up to Aug. 1)
- Wild kelp the past five weeks

PRELIMINARY RESULTS

- Fed 1,181 lbs of farmed and 470 lbs of wild kelp
- Gonad yields improved to 15% by Aug. 20
- Will harvest all remaining by Sept. 12

Nutritional Analysis

DATE & DESCRIPTION	% MOISTURE	% PROTEIN	% FAT	% FIBER	% ASH	% CARBOHYDRATE
Feb. 14, 2008 wild	90.3	2.4/24.7	0.7	ND	3.9	ND
Apr. 30, 2008 wild	88.2	3.9/33.1	.07	0.9	4.2	3.7
June 25, 2008 wild	86.2	1.9/13.8	0.3	ND	4.1	7.6
June 25, 2013 Kelp blade Rope grown	90%	1.6/16.0	.07%	1.1%	4.2%	4.5%
June 25, 2013 Kelp stipe Rope grown	92%	0.5/6.3	0	0.6%	4.1%	3.5%

Commercialization?

- Company wants steady supply of bulked urchins for last 14 weeks of season
- Adds 4,000 lbs/week to bulking system for 1st 14 weeks of season
- Harvests 4,000 lbs/week for final 14 weeks of season

Week	Lbs of urchins	Seaweed @ 15%	Seaweed @ .25/lb
1	4,000	600	$150
2	8,000	1,200	$300
3	12,000	1,800	$450
4	16,000	2,400	$600
5	20,000	3,000	$750
6	24,000	3,600	$900
7	28,000	4,200	$1,050
8	32,000	4,800	$1,200
9	36,000	5,400	$1,350
10	40,000	6,000	$1,500
11	44,000	6,600	$1,650
12	48,000	7,200	$1,800
13	52,000	7,800	$1,950
14	56,000	8,400	$2,100

Potential Value

- Maximum urchin biomass = 56,000 lbs
- Total kelp required @15% feeding rate = 58.8 tons
- Kelp value @ $500/ton = $29,400
- Uni value @ 10% yield and $90/kg = $228,571
- Uni value @ 17% yield and $90/kg = $388,571
- Added value = $130,600

Going Forward

- Winter trial to start Nov/Dec
- Farmed vs. wild urchins
- Dried kelp vs. fresh kelp
- Bio-remediation kelp?
- Mixed species, e.g. *Alaria, Laminaria digitata*
- Taste panel to validate results
- Economic analysis

CREDITS

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- Maine Aquaculture Innovation Center
- Maine Technology Institute
- Maine Sea Grant
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