Shellfish Aquaculture in Delaware's Inland Bays
Status, Opportunities, and Constraints

Center for the Inland Bays
PROTECTING AND PRESERVING DELAWARE'S INLAND BAYS

Sea Grant
University of Delaware

NOAA
U.S. DEPARTMENT OF COMMERCE · NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Delaware State University
Making our mark on the world

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Learn more about Aquaculture Opportunities in the Inland Bays

The Inland Bays watershed has long relied on conventional industries like agriculture and tourism to generate our local economy. As the demand for protein-rich seafood increases, many look to aquaculture as a sustainable segment of non-traditional food production that also presents new economic opportunities for southern Delaware.

This workshop will explore whether commercial shellfish production in Delaware's Inland Bays is a reasonable expectation.

"Delaware waters are a native habitat for oysters; humans living in the region have enjoyed Delaware oysters for thousands of years. Despite decades of decline, oysters do have a new future in Delaware. With science and good management, oyster production can be, and should be, encouraged and nurtured to resume its place as an important food crop, much the same as peaches, lima beans and chickens are now identified with our state. Oysters are also a keystone species responsible for a host of ecosystem services, such as water quality improvement because of their capacity for filtration."

—Ed Kee, Secretary of the Delaware Department of Agriculture

Sea Grant Delaware

The Delaware Center for the Inland Bays, a non-profit National Estuary Program with operations in Rehoboth Beach, Delaware, is partnering with sponsors including Delaware Sea Grant Marine Advisory Service, Delaware Department of Natural Resources and Environmental Control (DNREC) and UD Sustainable Coastal Communities Program to host this one day informational workshop concerning shellfish aquaculture in Delaware's Inland Bays.

Delaware Center for the Inland Bays

For more information, contact E.J. Chalabala
302-226-8105 or visit www.inlandbays.org

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Shellfish Aquaculture in the Inland Bays

Status, Opportunities and Constraints One-Day Workshop

Saturday, June 18, 2011
8:00 a.m.–4:00 p.m.
University of Delaware Virden Center
700 Pilottown Road, Lewes, Delaware

Workshop Purpose

A healthy oyster population can provide tremendous ecological benefits in an estuary, such as water quality improvements and habitat restoration. Over the past several years, the CIB, in collaboration with the University of Delaware's Marine Advisory Service, has successfully demonstrated the viability of growing shellfish in the Inland Bays using a variety of aquaculture techniques and methods. These include the off-bottom culture of oysters using Taylor floats and other commercial aquaculture gear.

In response to recent stakeholder inquiries regarding the potential for commercial aquaculture in Delaware's Inland Bays, the CIB is organizing and hosting a one-day workshop to explore the feasibility of shellfish aquaculture operations in Delaware's Inland Bays. Guest speakers include practitioners, technical experts, resource managers, and numerous policy and decision makers. A "White Paper" concerning the workshop proceedings will be published and distributed as key findings about this emerging issue. This workshop is being coordinated and hosted in collaboration with the Inland Bays Water Use Plan Implementation Committee.

Program of Events

8:00–9:00 am	Registration and Continental Breakfast
9:00	**Welcome & Announcements**—Ed Lewandowski, Delaware Center for the Inland Bays
9:05	**Aquaculture & Agriculture**—Ed Kee, Secretary, Delaware Department of Agriculture
9:20	**Aquaculture Overview**—John Ewart, Delaware Sea Grant Marine Advisory Service
9:40	**History of the Delaware Shellfish Industry**—Michael Morgan, Historian, Delaware Coast Press
10:00	**Delaware's Inland Bays**—E.J. Chalabala, Delaware Center for the Inland Bays
10:20	Break included with registration
Current Status: Inland Bays Shellfish Aquaculture Research and Restoration	
10:45	**Inland Bays Research and Restoration Summary**—John Ewart, Delaware Sea Grant Marine Advisory Service
Opportunities: Benefits of Shellfish Aquaculture	
11:15	**Environmental Benefits and Ecological Services** —Bob Rheault, East Coast Shellfish Grower's Association
12:00	Lunch
Opportunities: Benefits of Shellfish Aquaculture (continued)	
1:00	**Shellfish Aquaculture and Economic Development** (Panel)
	Virginia: Tommy Leggett, Chesapeake Bay Foundation and Chessie Seafoods
	Maryland: Don Webster, University of Maryland Extension Program
	Rhode Island: Bob Rheault, East Coast Shellfish Grower's Association
Constraints to Inland Bays Aquaculture	
2:35	**Regulatory Issues**—Roy Miller, Delaware Center for the Inland Bays and DNREC (retired)
2:45	**Socio-Economic Issues**—Karl Roscher, Maryland Department of Natural Resources
3:05	Break
Next Steps	
3:15	**Q&A/Panel Discussion with Program Speakers** —Ed Lewandowski
4:00	End

Workshop Sign Up

Last Name _____

First Name _____

Organization|Business _____

_____

Mailing Address _____

City _____ State _____ Zip _____

Day Phone _____

Fax _____

Email _____

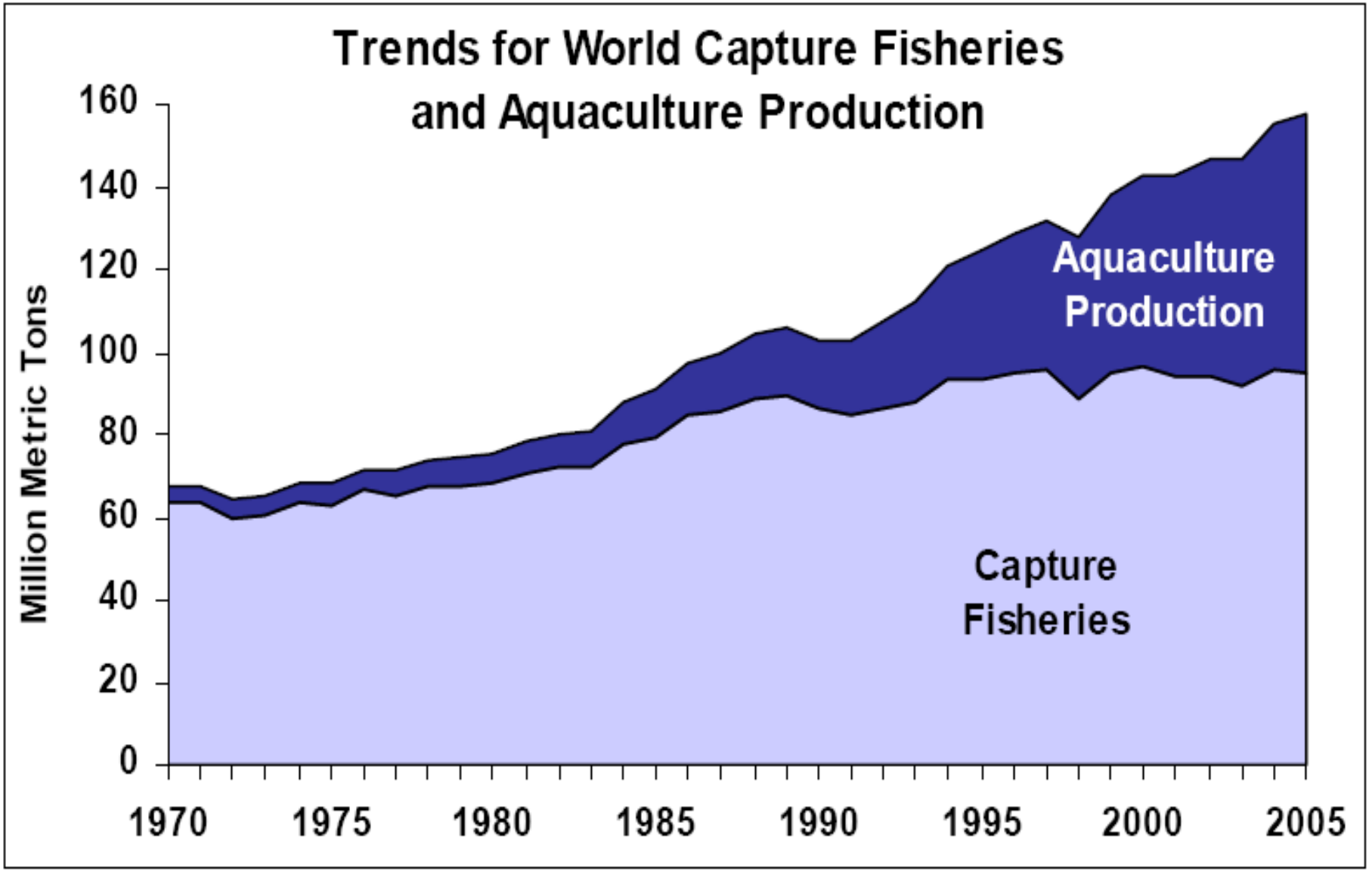
Please mail form by June 3, 2011 or register on the web at **www.inlandbays.org/event.html**

Payment of $15 is required with registration.

Delaware Center for the Inland Bays
attn: E.J. Chalabala
39375 Inlet Road
Rehoboth Beach, DE 19971

Questions? Call 302-226-8105

Delaware Center for the Inland Bays


Trends for World Capture Fisheries
and Aquaculture Production
Million Metric Tons
160
140
120
100
80
60
40
20
0
1970
1975
1980
1985
1990
1995
2000
2005
Aquaculture
Production
Capture
Fisheries

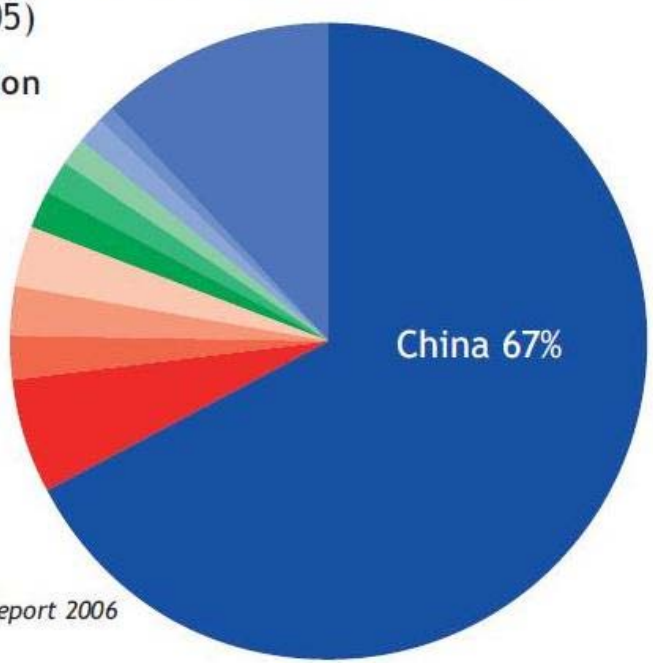
NOAA

Top 10 aquaculture producers

(in '000 metric tons, 2005)

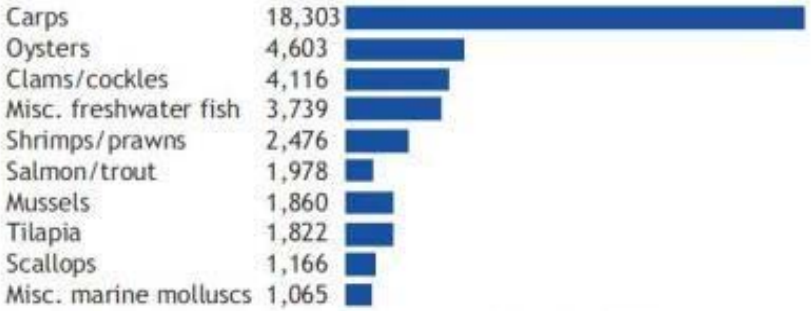
Country	Production
China	32,135
India	2,837
Thailand	1,140
Indonesia	1,197
Viet Nam	1,437
Bangladesh	882
Japan	746
Norway	656
Chile	698
USA	471
Rest of world	5,597
Total	**47,800**

SOURCE: FAO State of the World Fisheries and Aquaculture Report 2006

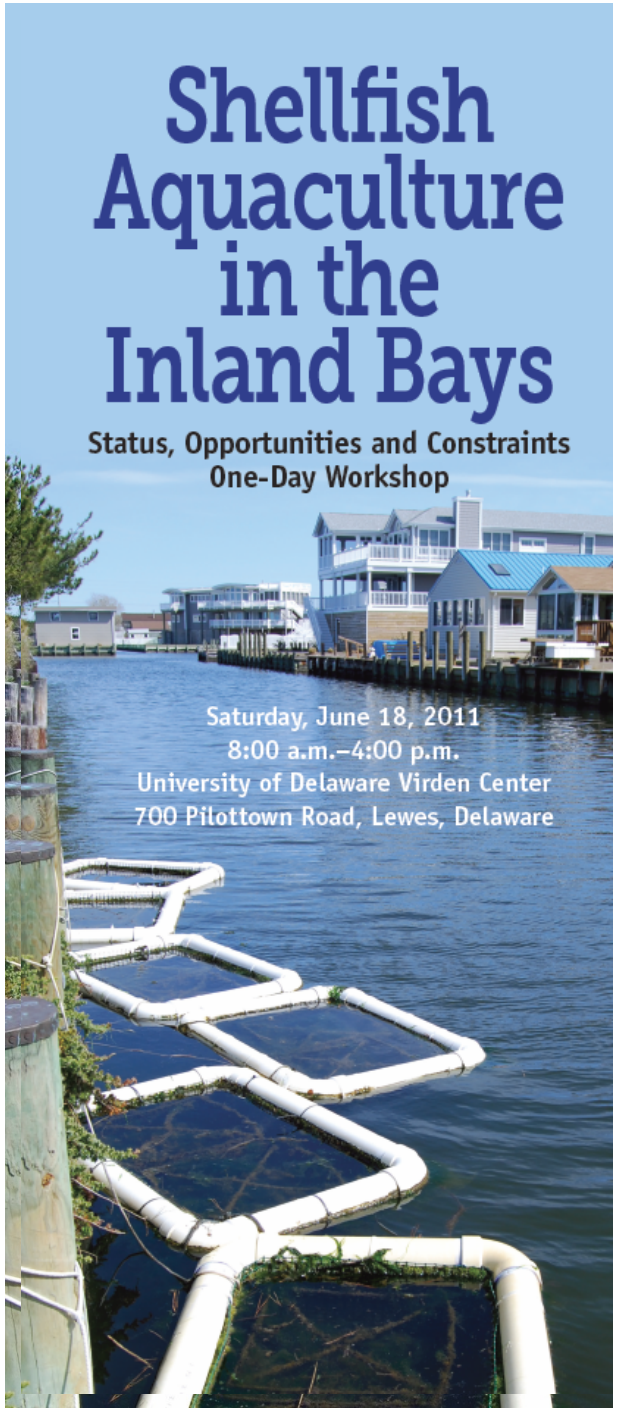


Top 10 species for aquaculture production

(in '000 metric tons, 2005)



SOURCE: FAO State of the World Fisheries and Aquaculture Report 2006



Aquaculture Overview

Aquaculture: husbandry or controlled cultivation of aquatic plants and animals

Origins: 2,500 years US industry >55 years

World Fisheries: 95 MMT aquaculture (50%)

China and Asia (91%) 46% molluscs

US Seafood: 16#; World Avg: 37#; Asia >90#

US Seafood: Import >80%, Inspect <2%
$10B trade deficit

US industry >$1B Molluscs >20%

East Coast Shellfish: $100M
1000 farms; DE - none

"During the 19th century, oystering was so profitable that it was called the "white gold" of Delaware."

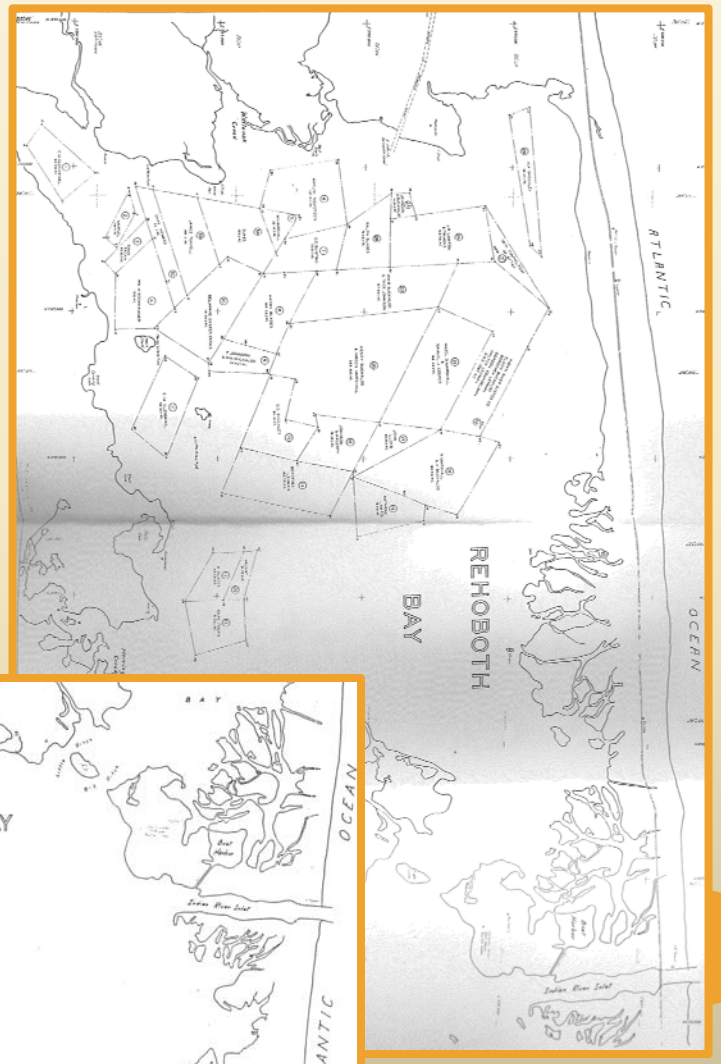
- Bay seafood prosperous, best species including "shad, rock, trout, drums, sheepsheads, osyters, clams, and crabs."
- Canned oysters shipped all over the world.
- In, 1852 DE legislature prohibited oystering from MAY 1 to AUG 10: *Big Thursday is born.*
- Festival grows until the Indian River Inlet continually shoals over decimating seafood industry.

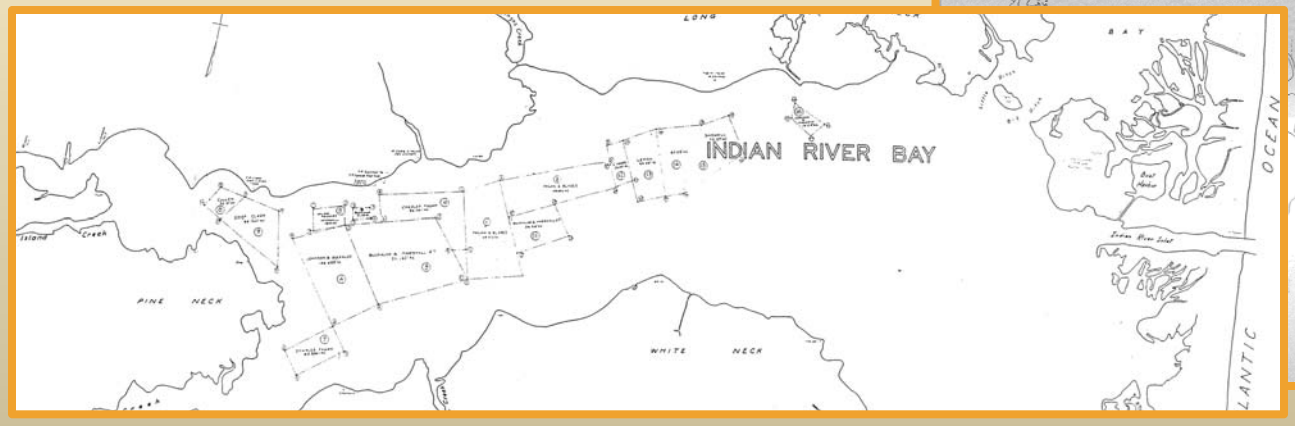
I.R. Inlet prior to stabilization in 1936

Courtesy of the Hagley Museum & Library, 70.200.09171

OYSTERING RETURNS AFTER THE INLET IS STABILIZED WITH LARGE AREAS OF BAY BOTTOM BEING LEASED.

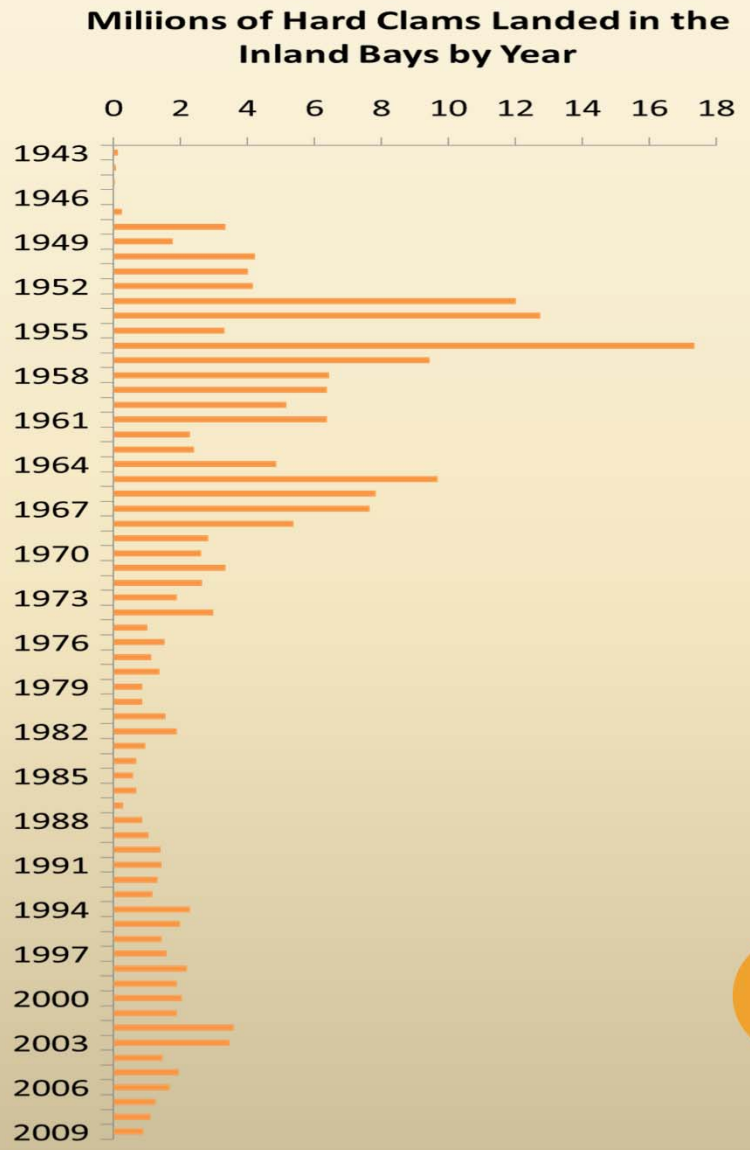
- In 1948, more than 3,164 acres (34%) of Rehoboth Bay and 1,143 acres of of Indian River Bay (13%) was leased for oyster production grounds.
- DE Commission of Shellfisheries promoted the use of the Bays for this purpose.



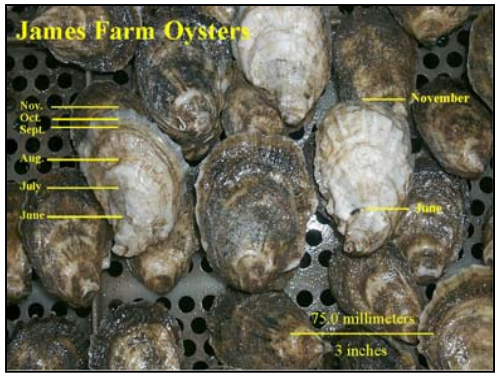


THE OYSTER DISEASE MSX ENDED THE INLAND BAYS OYSTER INDUSTRY BY THE 1960S.

- Relay of oysters from DE Bay and tributaries occurred till the 1970s.
- The last lease planting was made in 1978.
- All bottom leases reverted back to State/public ownership in 1979
- 1980s Dave Monte: *Mercenaria* Manufacturing
- Oyster gardening begins in 2003



Shellfish Field Research, Demonstration & Restoration 1998-2012



Year

1998 - 01 Characterize Seasonal growth & survival

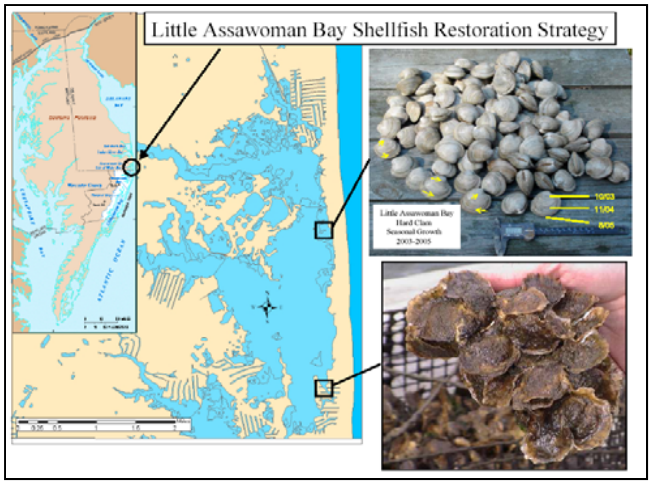
2001 & 04 Shellfish pathogen surveys

2001 - 06 Establish & monitor a pilot scale oyster reef

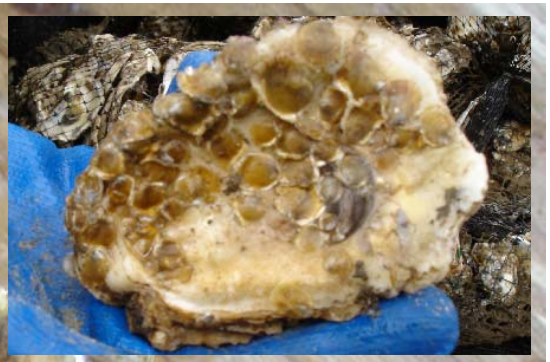
2002 - 03 L. Assawoman Bay shellfish stock assessment

2003 - 2012 Oyster gardening program

2005 - 2012 IB Oyster Habitat/Restoration Research



Oyster Gardening Overview



Who: Inland Bay residents and volunteers

What: Nursery culture of 10 mm oyster spat to juvenile/adult

When: April to November …all year for FTR

Where: Residential lagoon communities

Why: Supply oysters for restoration/stock enhancement

Citizen involvement and education

Applied research & demonstration

Floating Nursery Habitat

- VG – EX oyster growth and survival
- YOY recruitment and habitat (49 sp)
- Structure and refuge from predation
- Natural oyster recruitment

Rip Rap Oyster Planting

- Off-bottom 3D structure
- Low intertidal/sub-tidal
- Good water flow
- Protection from predators

Ecosystem Services from Shellfish Aquaculture

Filtration: single oyster 15-50 gallons/day

Reduced turbidity, > water quality & clarity

Improved light penetration

- **Allows eelgrass to recolonize areas**
- **Increases depth of aerobic sediments**

Enhance sedimentation rates & nutrient removal

"Capture" phytoplankton biomass (N & P) and make it available to benthic species

Stimulates bacterial denitrification

Gear provides habitat for juvenile fish, crabs, & forage species

A market-size oyster contains 0.2 - 0.5 grams N and 0.16 g P

The harvest of 3,750 oysters (15 bushels) compensates for the annual nitrogenous wastes produced by one person leaching into the watershed

Benefits of Oyster Farming

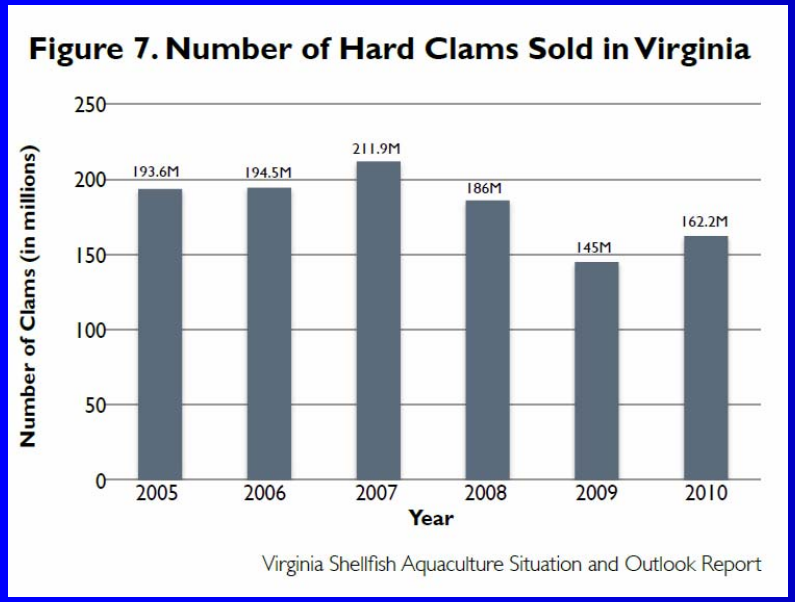
East and Gulf coast aquaculture production – 800 million oysters/year

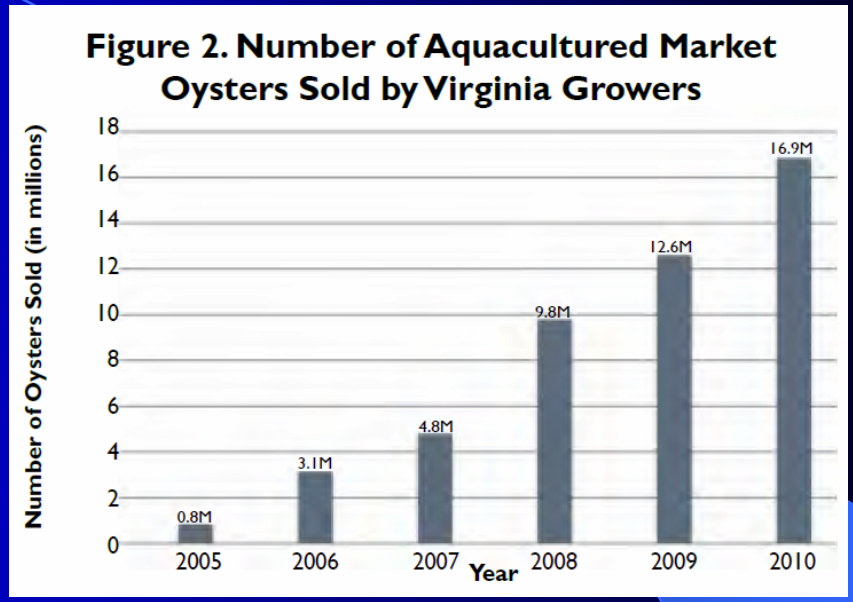
- 357 metric tons of nitrogen removed
- 110 metric tons of phosphate removed
- Hundreds of tons of other nutrients removed by burial or denitrification
- 51,559 tons of carbon sequestered (in shell)
- 1.7 x $10E^{15}$ larvae released each year
- 94 million cubic meters of water filtered daily
- Thousands of acres of barren bottom turned into productive fish habitat

Shellfish Aquaculture and Economic Development

- Diversify Coastal Business Economy
- Full and part-time employment
- Industry support services (2.5X multiplier)
- Contribute to local seafood supply
- Enhanced recreational fishing
- Eco-tourism
- Preservation of working waterfront and cultural heritage
- Ecosystem services have an economic value

Virginia Shellfish Aquaculture





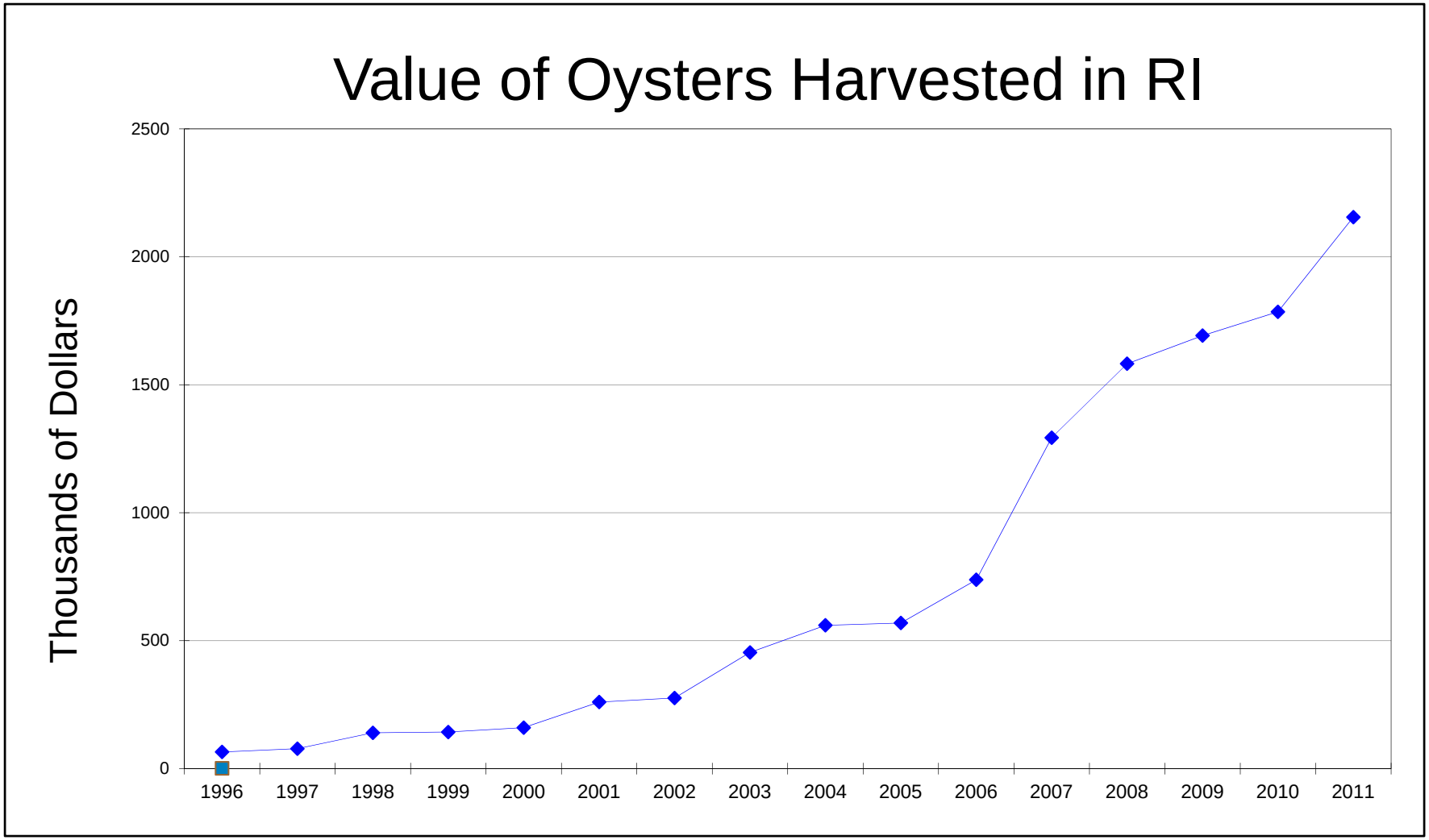
2010 Value: $25M

2010 Value: $5M

2010: 73 farms; 6569 acres; $30M

186 FT jobs; 180 PT or seasonal

RI growing at 30%+ per year



2011: 43 farms; 160 acres; $2.7M; 99% oysters; 26 FT jobs; 58 PT or seasonal

Issues/Constraints Affecting IB Shellfish Aquaculture

Sub-aqueous Leases

DF&W has authority to issue leases of shellfish bottom,

except within 1,000 yards of natural shoreline,

except on natural oyster beds,

except within Indian River and Rehoboth Bays (no leases may be granted there) until:

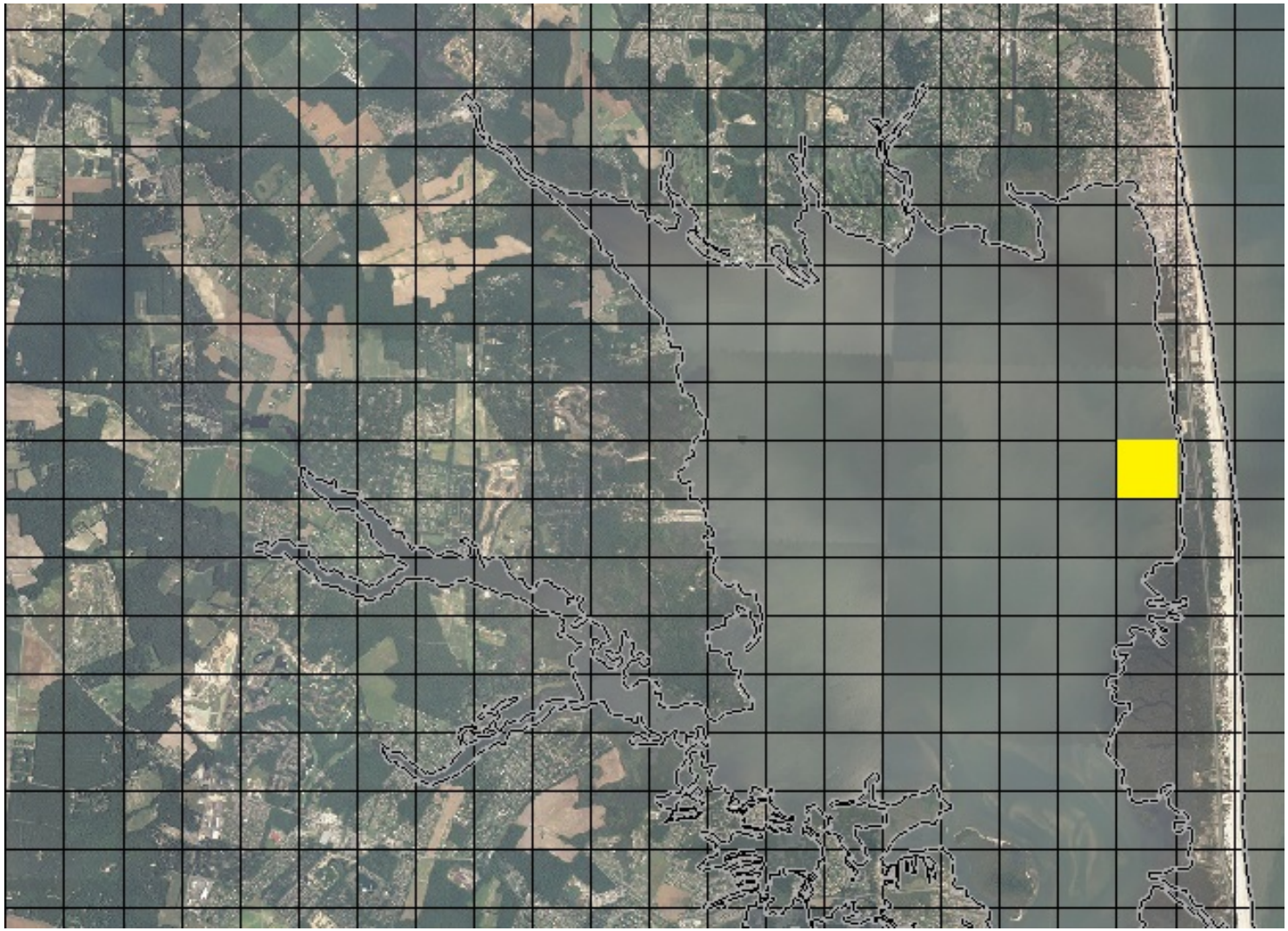
1. **completion of a shellfish survey (done in late 1970s,**
2. **2 public hearings (1 held in Feb. 1979),**
3. **concurrent resolution by General Assembly to approve shellfish management plan for above bays (the plan was submitted in 1979, but never fully approved by G.A.).**

1000-yd restriction

Issues and Constraints Affecting Inland Bays Shellfish Aquaculture

- Illegal to harvest shellfish from unapproved areas
- Unlawful to take shellfish from beds leased to another or shellfish other than oysters and crabs from natural beds
- DF&W must be given 48 hr. notice of harvesting from leased beds
- Can't harvest from natural beds while harvesting from leased beds
- For leases, there are fees, size requirements (50-100acres only), advertising & monthly reporting requirements

Rehoboth Bay – 100 ac grid



Issues and Constraints Affecting Inland Bays Shellfish Aquaculture

Socio-Economic Issues

Conflicting use with other IB stakeholders

- Recreational and commercial fisheries
- Recreational watercraft
- Waterfront Views.. NIMBY – not in my back yard
- Machinery noise, siting and storage areas

Coastal Marine Spatial Planning (CMSP)

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Next Steps

CIB Shellfish "Tiger Team"

Broad stakeholder representation

Coastal Marine Spatial Planning

Review legal/regulatory framework

Review Socio-economic issues

Consensus and legislative initiative

Inland Bays Shellfish Aquaculture

THINK --

Environment

Economy

Employment