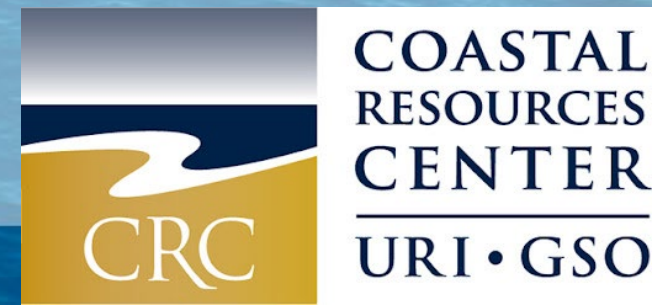


# Aquaculture in RI's Shared Waters

Rob Hudson

RI Sea Grant / URI's GSO Coastal Resources Center

October 16<sup>th</sup>, 2023



# What is Aquaculture?

- The **farming** of aquatic organisms, including fish, mollusks, crustaceans, and aquatic plants (FAO).
- The **science, business** and **art** of cultivating aquatic plants and animals (The Council on Agricultural Education).
- Aquaculture is agriculture

Photo Credit: [tcorayer@fishwrapwriter.com](mailto:tcorayer@fishwrapwriter.com)



# What is Being Cultivated in RI & Who is Cultivating

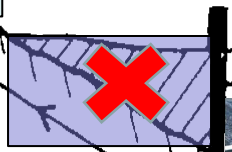
- Finfish: Aquariums, Ornamental, State Stocking Programs, Research, Education
  - (not in Narragansett Bay, Freshwater or Land base)
- Shellfish: Commercial, Research, Restoration, Stocking, Education, Ecotourism, Recreational Aquaculture Permit
  - Oysters, Blue Mussels, Bay Scallops, Quahogs, etc.
- Sea Vegetables: Small scale commercial, Research, Education
  - Kelp

# Where in Rhode Island

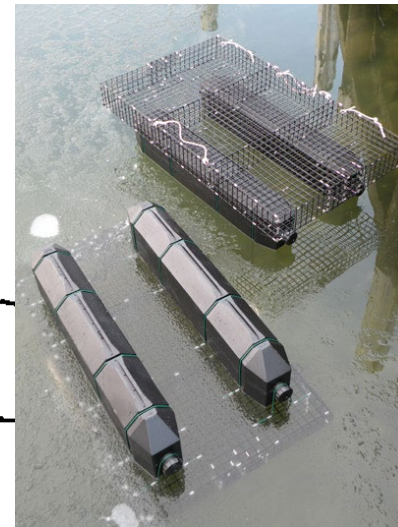
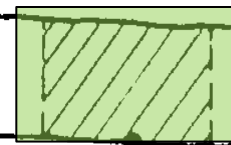
Land-based



Intertidal



Floating

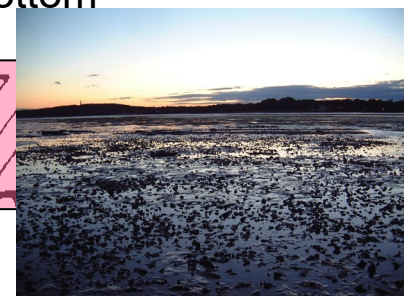


H.W.O.S.T.  
L.W.O.S.T.

Subtidal

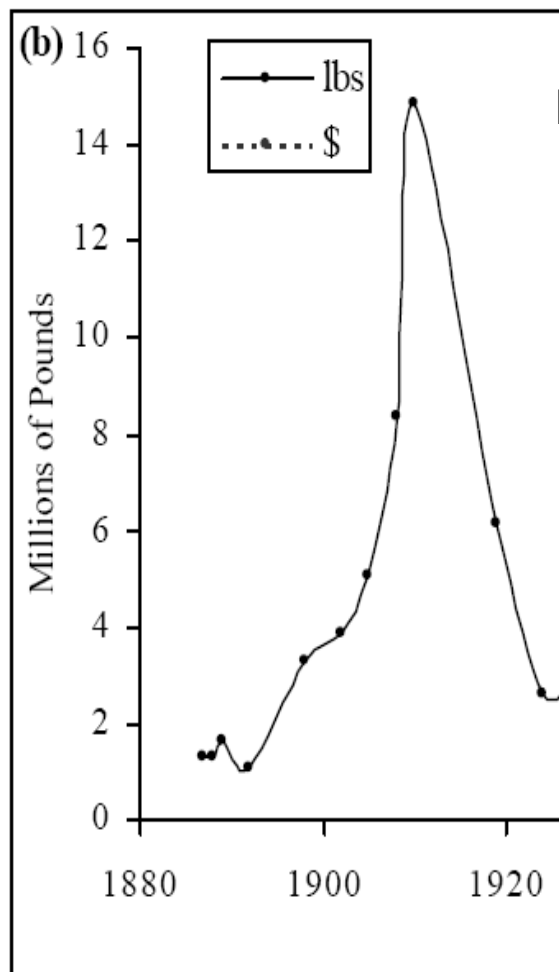


On-Bottom

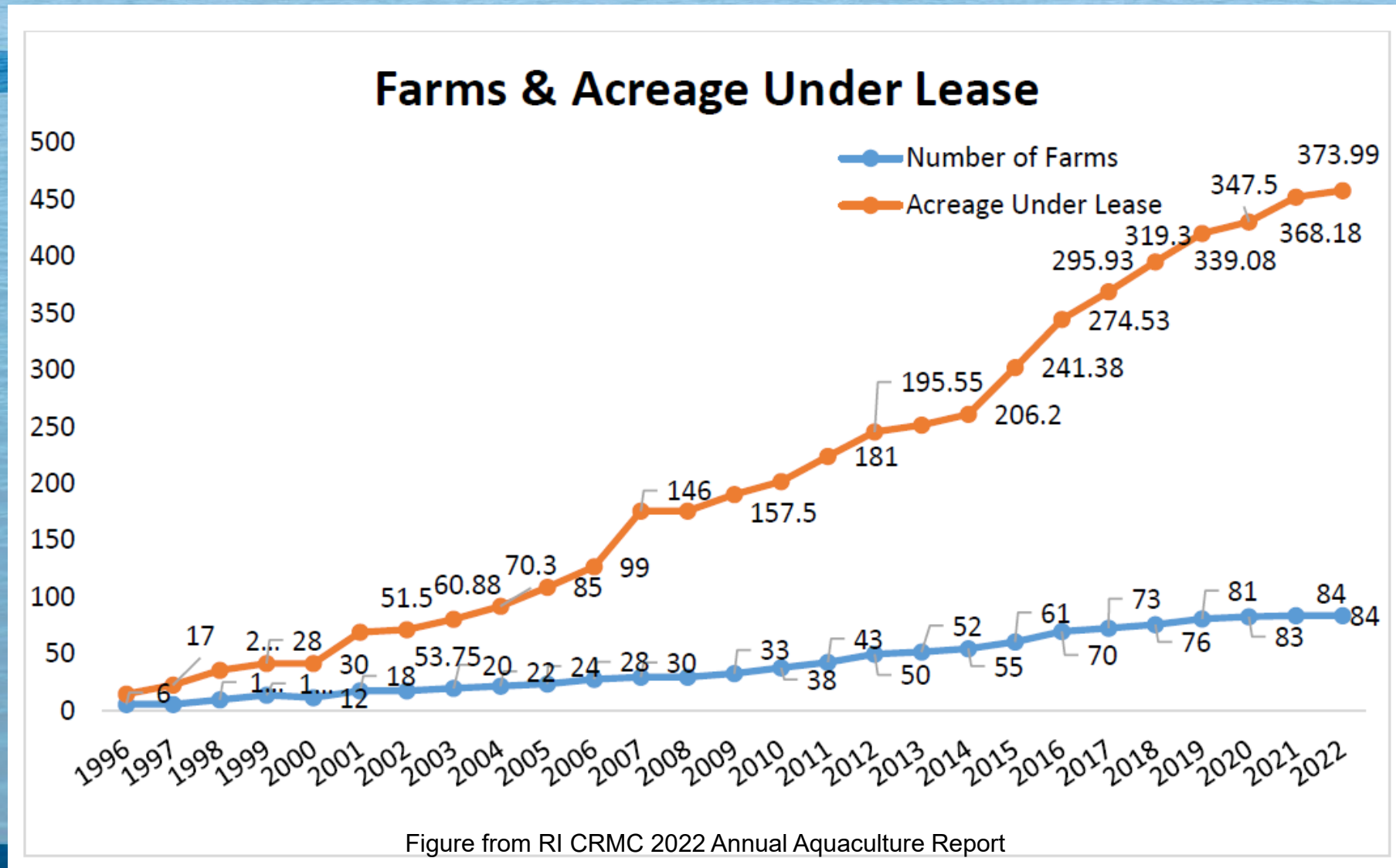


# Where in Rhode Island (Historic)

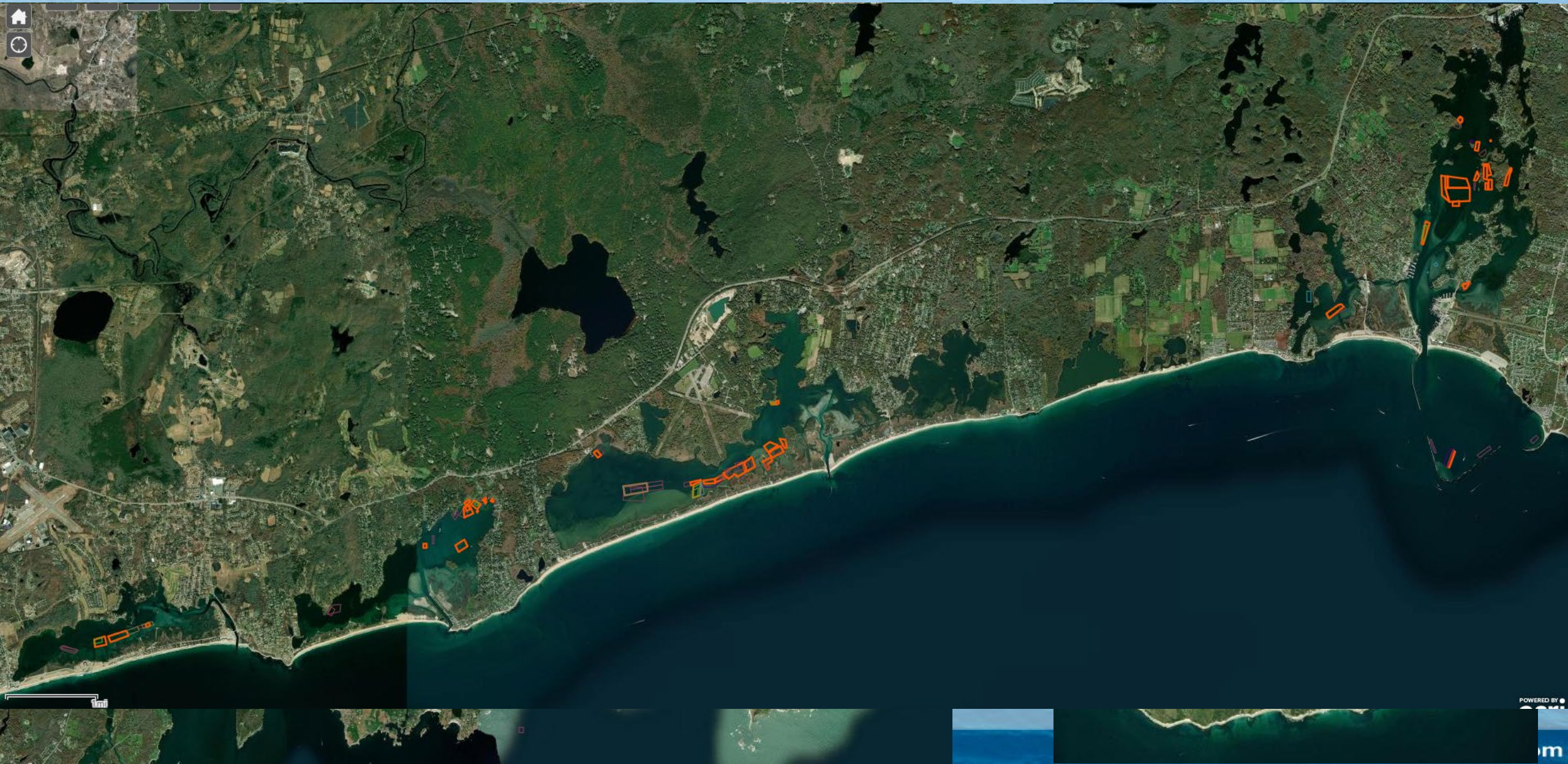
- Rhode Island has a long history of aquatic farming
- Rhode Island Oyster Act 1864
  - Established means to award oyster aquaculture leases
- By 1900 – 20,000 acres under cultivation
  - 1/3 of Narragansett Bay
  - Described as the most productive in the country
- Peak Production was 1911
  - The lease holders marketed 15 million pounds of oysters
- Collapsed by 1920's
  - Decline in seed availability
  - Water quality?
- Oysters finished off by Hurricane of 1938
- 1950's – ability to lease bottom revoked
- There was a complete rewrite of the aquaculture laws (Chapter 20-10 of the General Laws) in 1981
- 1980's – the first modern aquaculture licenses awarded



# Where in Rhode Island (Present Day)



# Where in Rhode Island (Present Day)



# Sea Vegetable (aka. Kelp) Aquaculture

**10 Permitted Farms** (3 actively producing)

2 new permits currently under review

**14,500 lbs** - Sugar kelp landings for 2022

Official landings are not reported (farmer reported)

Primary species under cultivation:

**Sugar Kelp** (*Saccharina latissima*)

Season: November to May 1<sup>st</sup>

Seed source: self-propagated and/or private supplier

Seaweed is sold: freshly harvested / raw to processors, chefs, and consumers





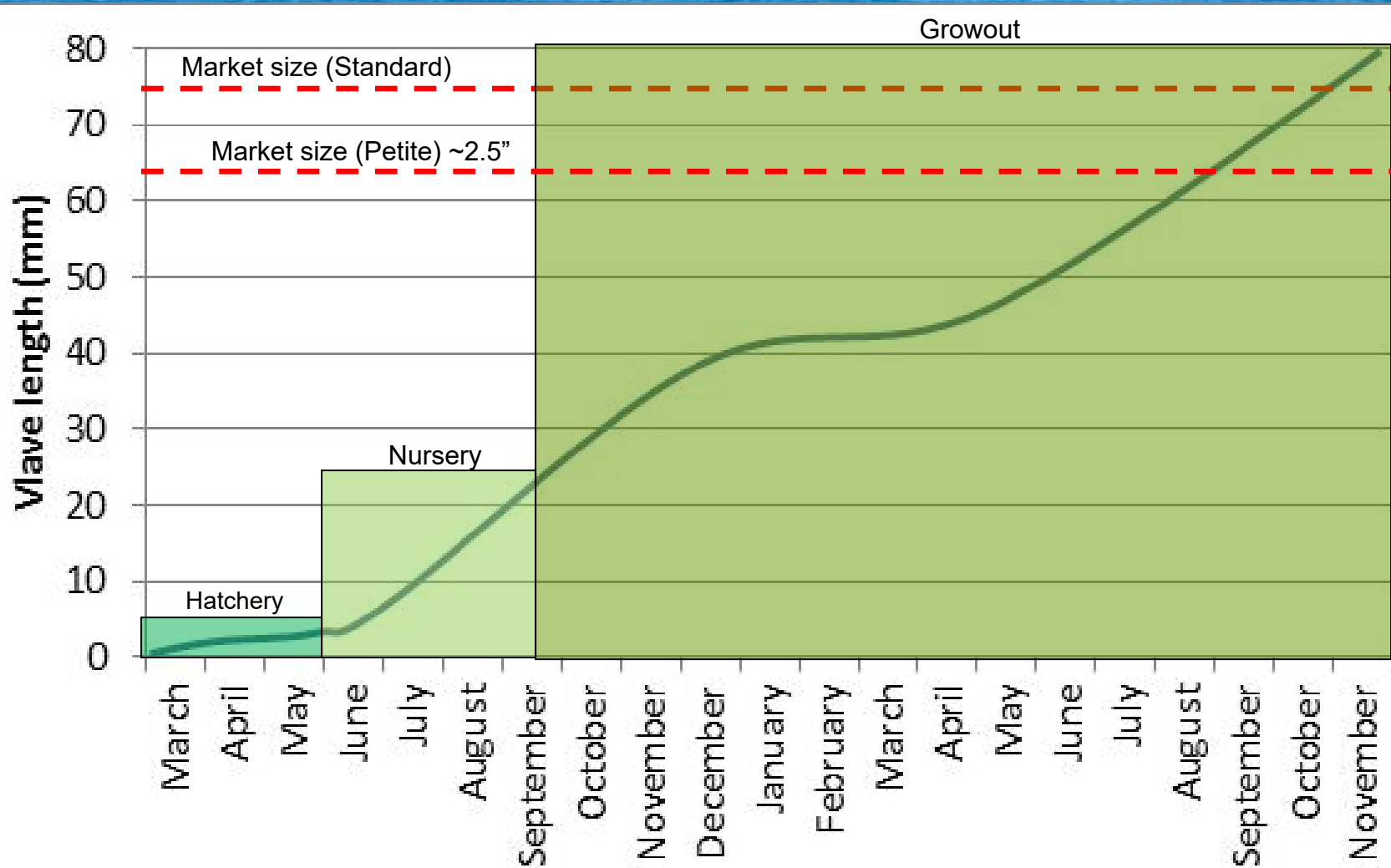
# Why Grow It?



*Chondrus crispus*



# Shellfish Aquaculture: Stages



# Shellfish Aquaculture

## Hatchery

- Larvae raised in a controlled environment
- Microscopic to ~2 millimeters (~5/64") (2-3 months)

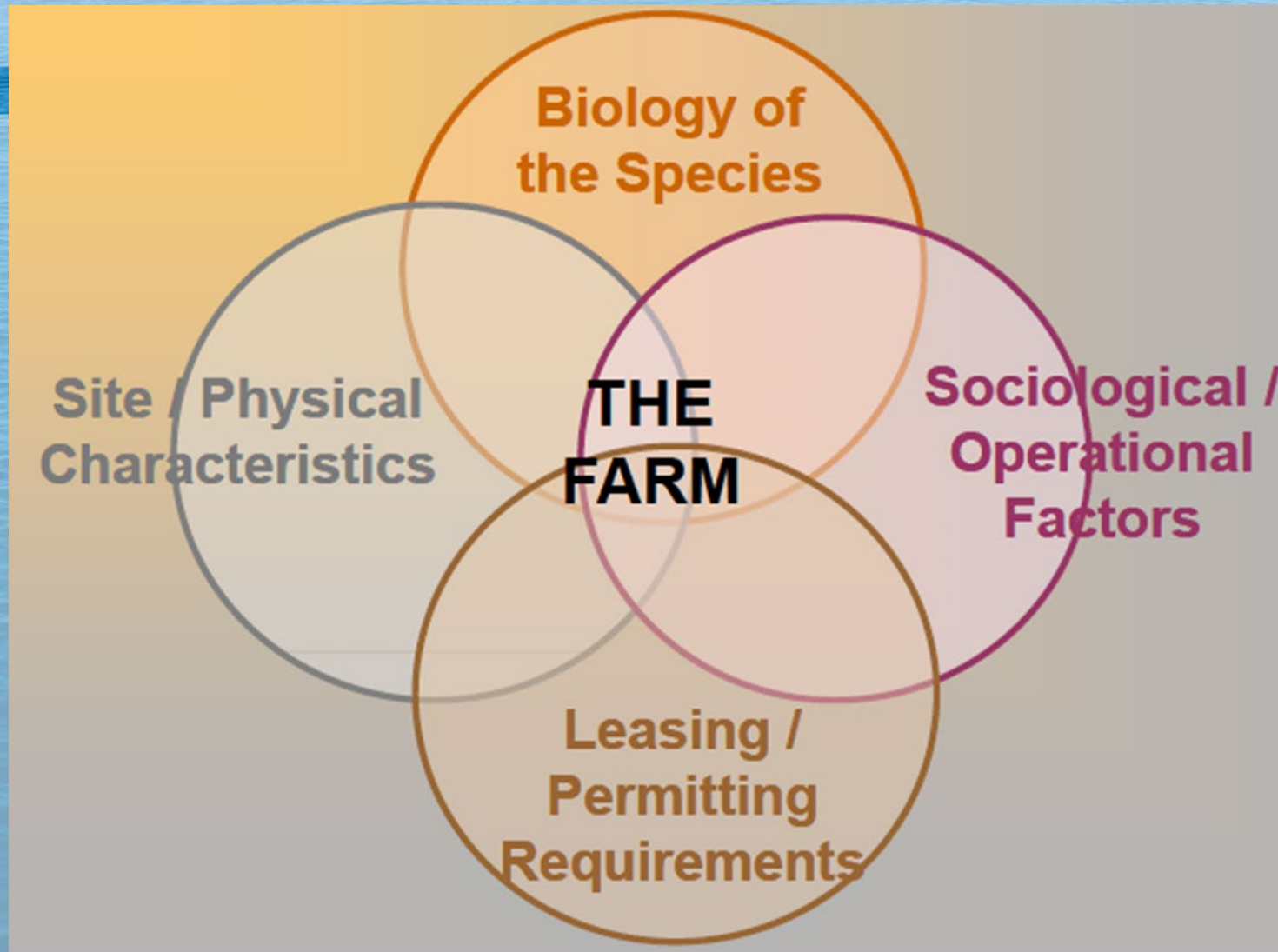
## Nursery

- Post-metamorphic spat transitioning to the open environment
- ~2 millimeters up to ~25 millimeter (~1") (3-4 months)

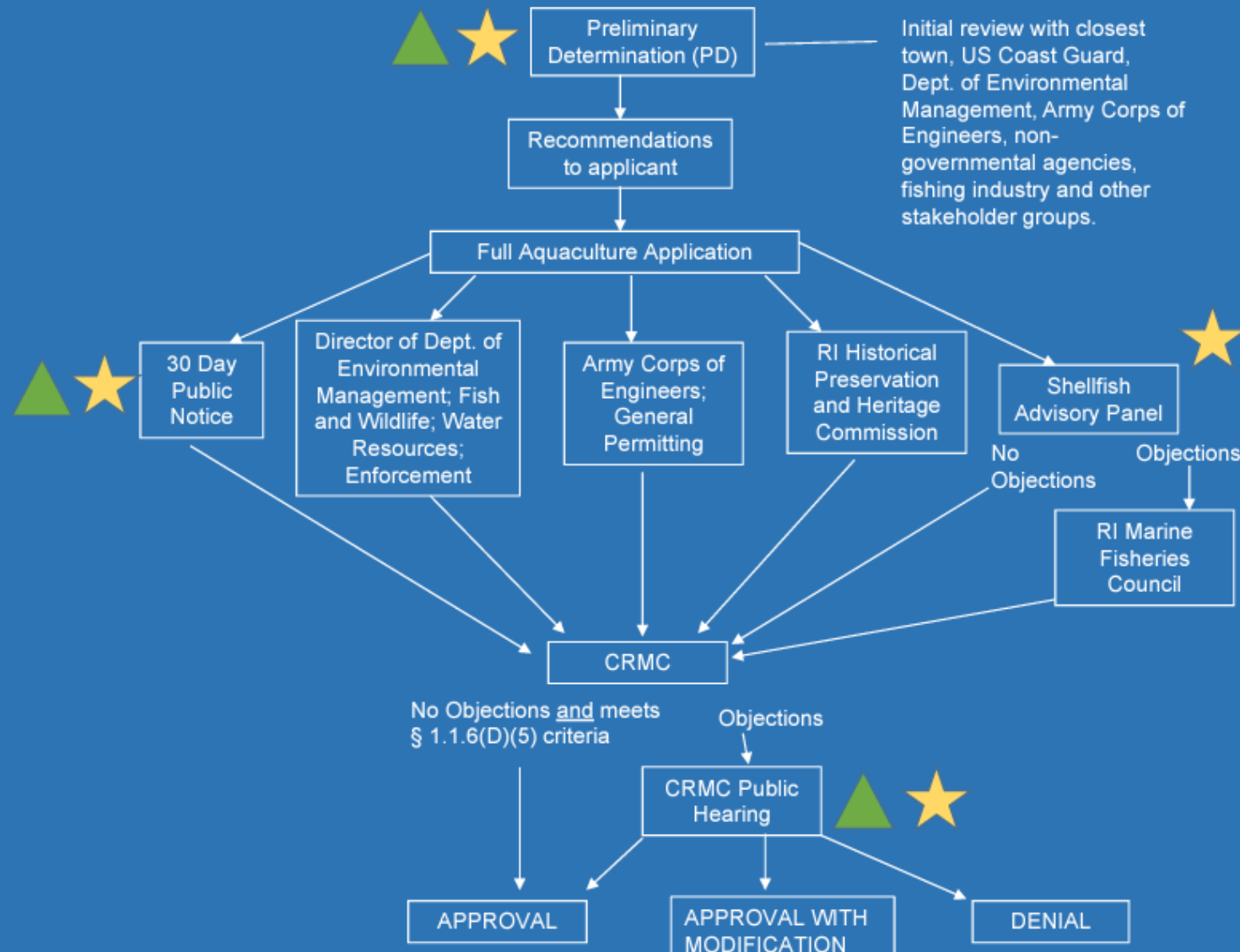
## Grow-out

- Final rearing in the open environment to market size
- ~25 millimeter to ~75 millimeter (~2.95") (12 – 16 months)

# Prior To Site Selection



# Prior To Site Approval



▲ All events marked with triangle include notification to property owners within 1000' of the application.

★ All events marked with star include notification through the new CRMC Aquaculture Listserve.



# Who Is Regulating Aquaculture? (Prior To & After Initial Permitting)

## Federal: (From Congress)

- National Aquaculture Act,
- Federal Water Pollution Control Act,
- Food, Drug & Cosmetic Act,
- Animal Drug Availability Act,
- Magnuson-Stevens Fisheries Conservation Act,
- Lacey Act,
- Virus Serum Toxin Act

# Who Is Regulating Aquaculture?

## (After Initial Permitting)

### Federal:

- FDA
  - NSSP
  - Center for Veterinary Medicine
- NOAA
- USDA
  - APHIS
- EPA
- FWS
- JSA

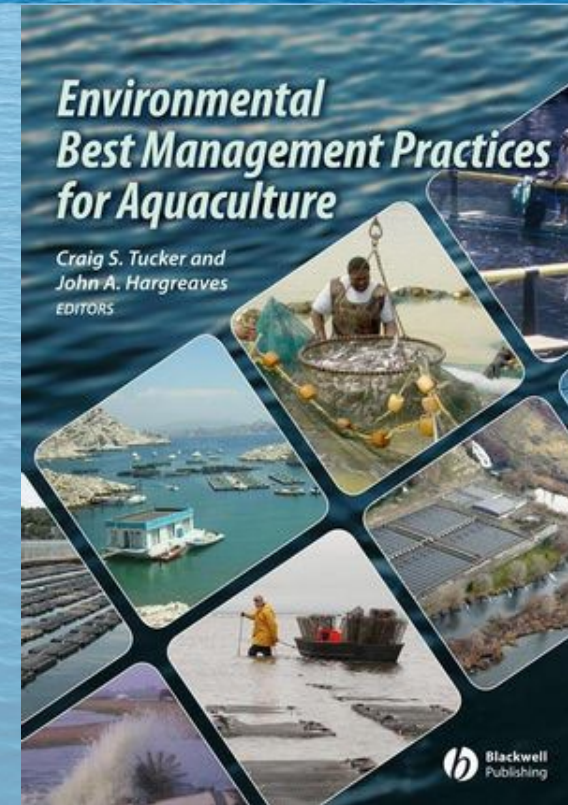


### State (RI):

- CRMC
  - Annual CRMC inspections
  - Bio-Security Board
- RIDEM
  - OWR
  - FW
  - Enforcement
  - Ag
- RI DOH

# Other Eyes Watching Farmers

- Environmental Codes of Practice
- BMPs
- Industry groups
  - ECSGA
  - OSAA
- Other farmers
- Wild Harvesters
- NGOs
- All users of RI Waters

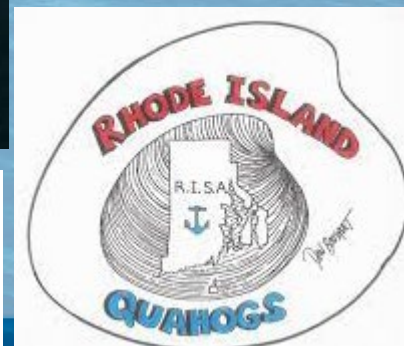


Monterey Bay Aquarium  
**Seafood Watch**



**SAVE THE BAY®**

NARRAGANSETT BAY





# Responses:

- **Working Group on Aquaculture Regulations (WGAR)**
  - WGAR 1 – Bay
  - WGAR 2 – Salt Ponds
- **RI Shellfish Management Plan (RI SMP)**
- Baird Symposiums
- **Narragansett Bay SAMP (Aquaculture Element)**
  - Notification to property owners within 1,000'
  - Aquaculture Listserv
- **Webinars/Town Meetings**

# Economics

- The **farm gate value** of a cultivated product in agriculture and aquaculture [1] is the **market value of a product minus the selling costs** (transport costs, marketing costs)

Figure from RI CRMC 2022 Annual Aquaculture Report

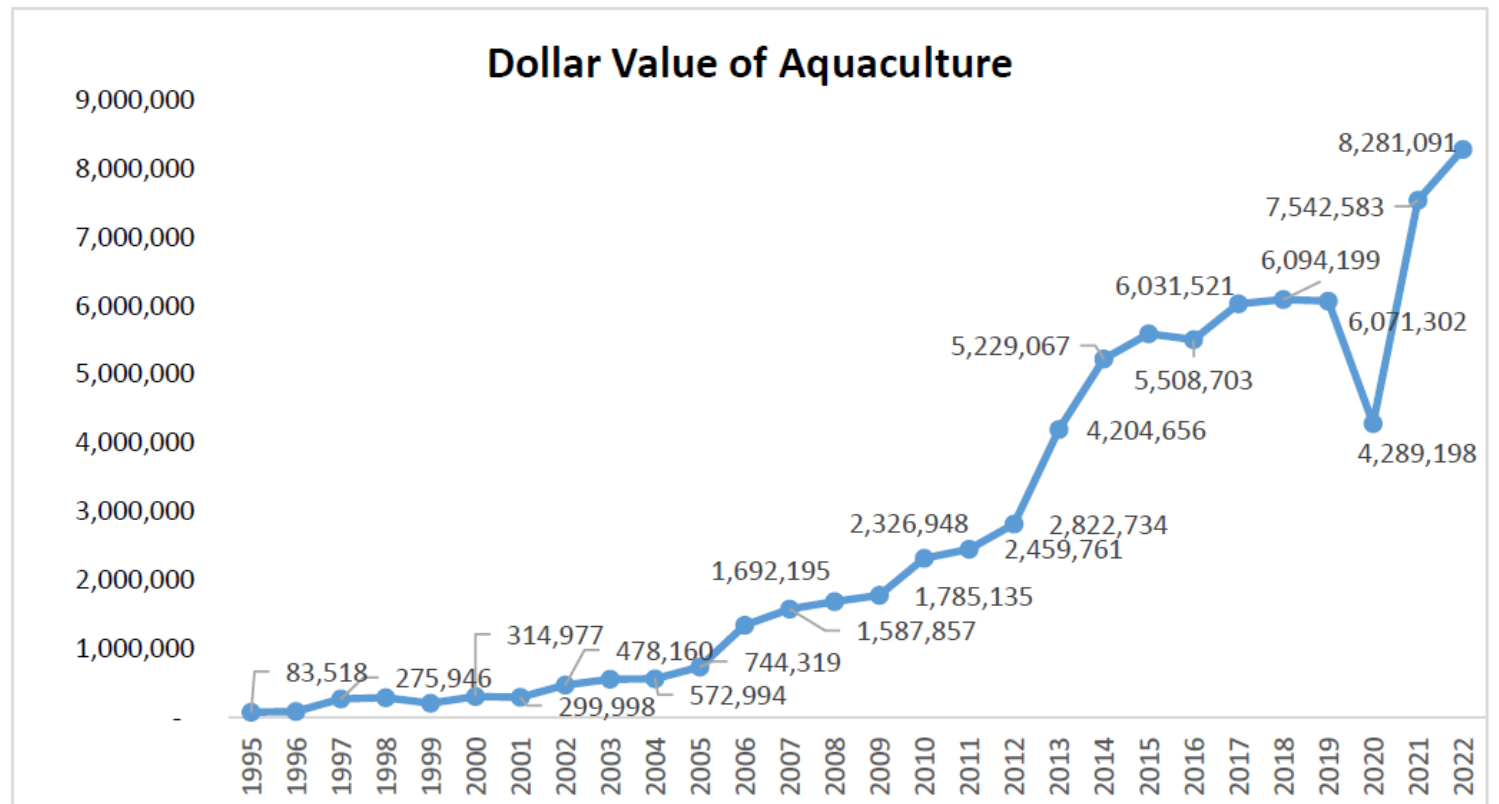


Figure 3. Total dollar value of all aquaculture products

# Economics/ Blue Economy

## Aquaculture Employment

Year	Full Time Year	Full Time Season	Part Time Year	Part Time Season	Total
2006	17	8	17	15	57
2007	14	2	28	15	61
2008	12	1	25	24	62
2009	14	3	25	20	62
2010	17	4	30	28	79
2011	23	3	26	32	84
2012	32	9	32	32	105
2013	35	13	37	42	127
2014	47	17	35	43	142
2015	47	26	39	59	171
2016	49	30	49	49	177
2017	62	27	41	64	194
2018	62	31	38	69	200
2019	59	47	46	67	219
2020	69	20	52	75	216
2021	69	36	52	65	222
2022	76	45	53	72	246

## #'s and \$\$ Doesn't Include:

- Wholesalers
- Processors
- Industry Suppliers
- Marinas (fuel, repairs, slip).
- Etc.

**Figure 4.** Aquaculture farm jobs increased by 9.7% in 2022

Figure from RI CRMC 2022 Annual Aquaculture Report

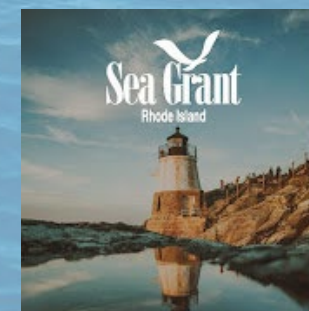
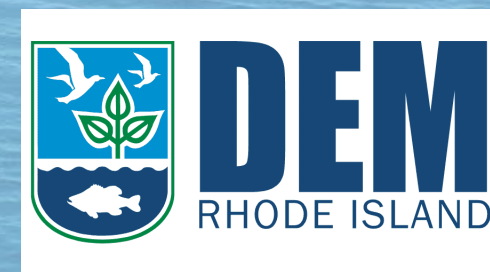
# Get Involved

- Signup for CRMC Aquaculture Listserv
- Restoration Projects
  - Shellfish Restoration and Enhancement Plan (SREP)
  - Warren
  - TNC
- Informed consumer
  - RI Seafood

Ecosystem Services Provided by Oysters		
<b>Provisioning Services</b> <ul style="list-style-type: none"><li>• Fisheries</li><li>• Aquaculture</li><li>• Fertilizer, building materials</li><li>• Jewelry, other decoration</li></ul>	<b>Regulating Services</b> <ul style="list-style-type: none"><li>• Water quality maintenance</li><li>• Storm surge protection</li><li>• Reduction of shoreline erosion</li><li>• Submerged land stabilization</li></ul>	<b>Cultural Services</b> <ul style="list-style-type: none"><li>• Tourism and recreation</li><li>• Symbolic of coastal heritage</li><li>• ???</li><li>• ???</li></ul>
<i>Products obtained from ecosystems</i>	<i>Benefits obtained from regulation of ecosystem processes</i>	<i>Nonmaterial benefits obtained from ecosystems</i>
<b>Supporting Services</b> <ul style="list-style-type: none"><li>• Cycling of nutrients</li><li>• Nursery habitats</li></ul>		
<i>Services necessary for the production of other services</i>		
<small>Adapted from: MA, 2005; Pacific Shellfish Institute, 2018</small>		

# Resources:

- CRMC Aquaculture Listserv:  
<http://www.crmc.ri.gov/aquaculture.html>
- ShellfishRI: <https://www.shellfishri.com/>
- RI Aquaculture Permitting:  
<https://www.riaquaculturepermitting.org/>
- SREP: <https://www.risrep.org/>
- RI Sea Grant – Sustainable Seafood:  
<https://seagrants.gso.uri.edu/our-work/sustainable-seafood/>
- Previous Bay SAMP Webinars:  
<https://web.uri.edu/crc/narragansett-bay-samp/>



# Thank You!

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