Community-Based Stock Enhancement:

Rearing and Releasing Winter Flounder *Pseudopleuronectes americanus* in Aquinnah, Massachusetts

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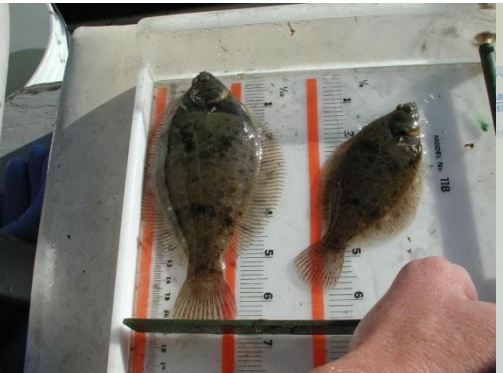
University of New Hampshire
Durham, NH, USA

Community-Based Effort

- University of New Hampshire
- New Hampshire & National Sea Grant College Program
- Dukes County/Martha's Vineyard Fishermen's Association
- Wampanoag Tribe of Aquinnah & Natural Resources Department
- Towns of Chilmark, Tisbury, Oak Bluffs – Shellfish Constables
- Northwest Marine Technology
- Support from NOAA & MA DMF
- Science Consortium for Ocean Replenishment
- Captains & crews of F/V Unicorn, Chili Dog, Quitsa Strider II
- …And many volunteers and students!

Overall Project Goals

- Determine if winter flounder stocking is a viable management tool
- Use Martha's Vineyard as the demonstration site
- The audacity of hope….Restore local winter flounder fishery





Ecosystem Analyses: PHASE 1

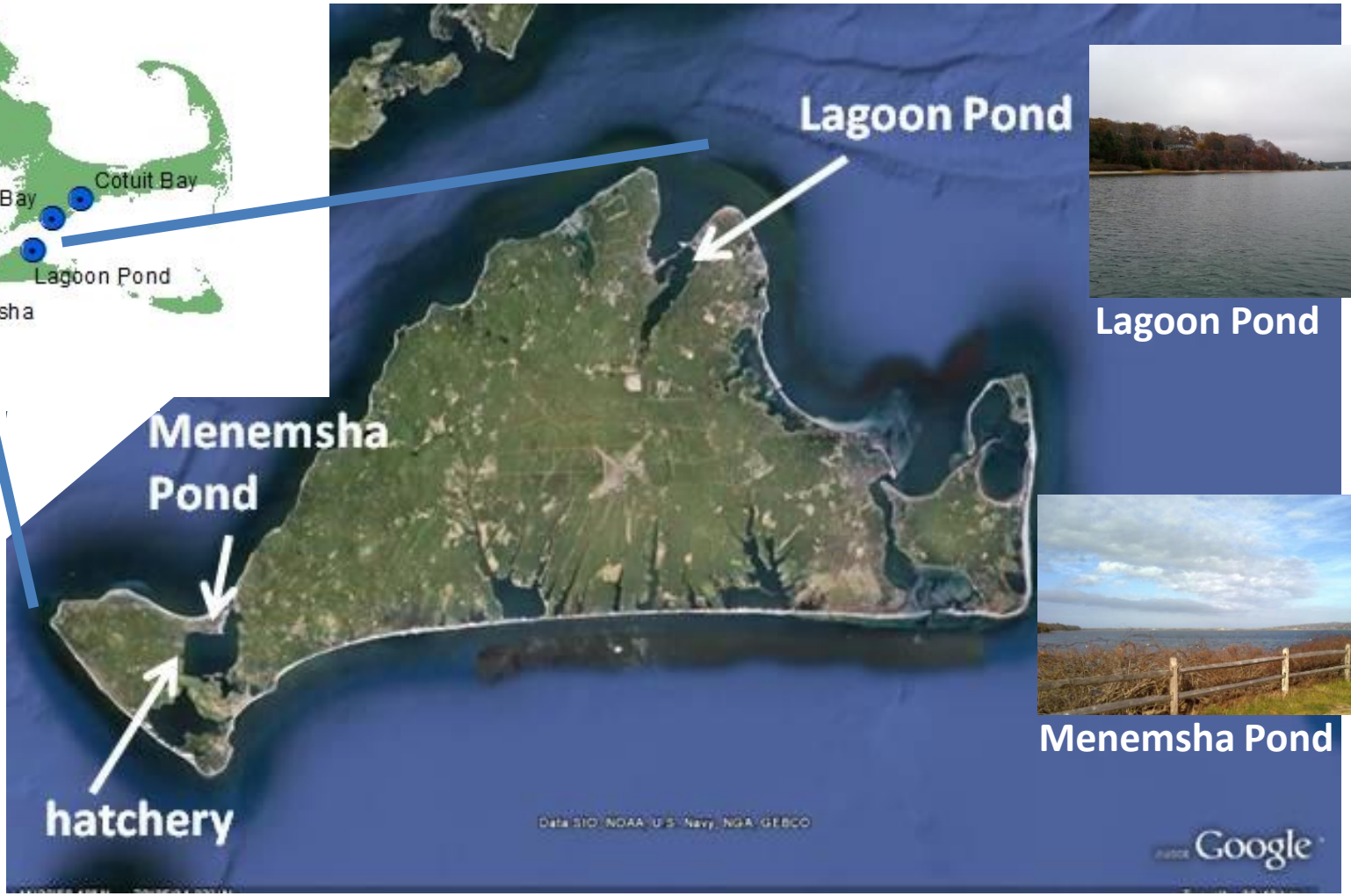
What's the best release strategy?

- Tags
- What size fish to release?
- Where to release?
- When?
- How?
- Potential problems & mitigation

Site- Specific



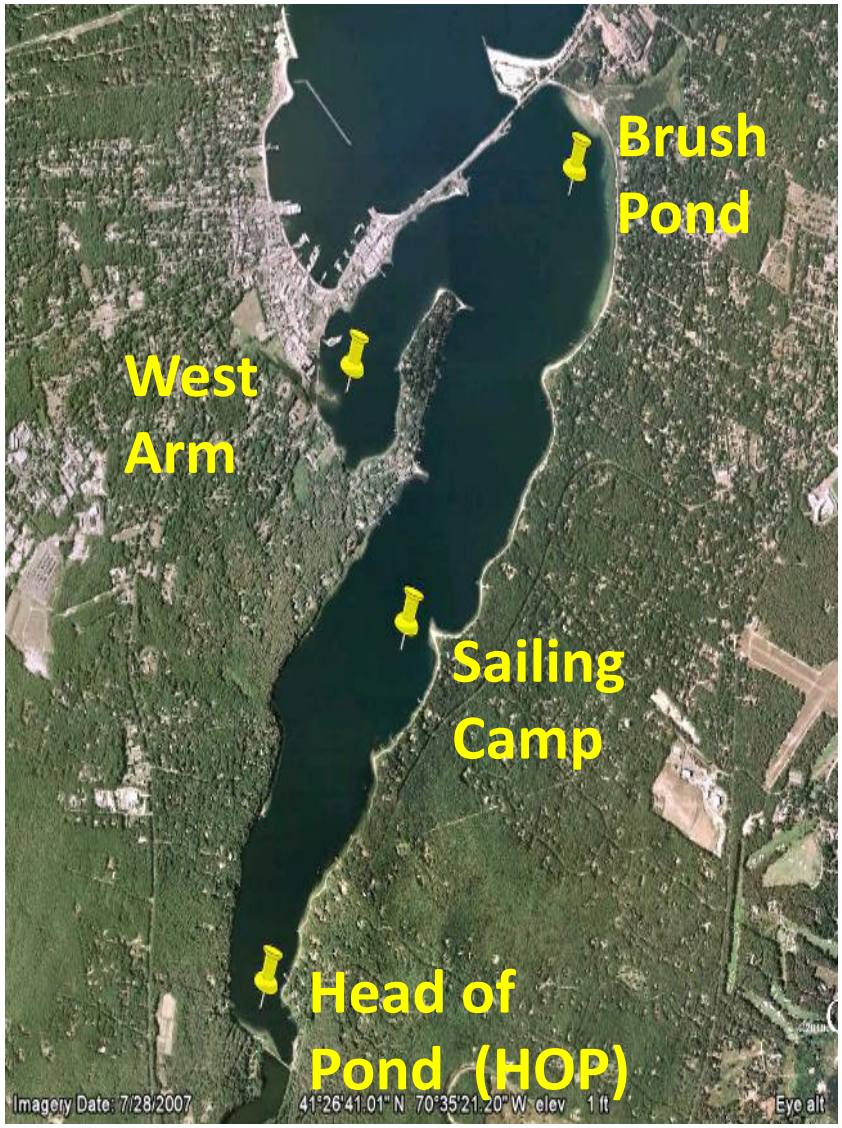
Martha's Vineyard Sites



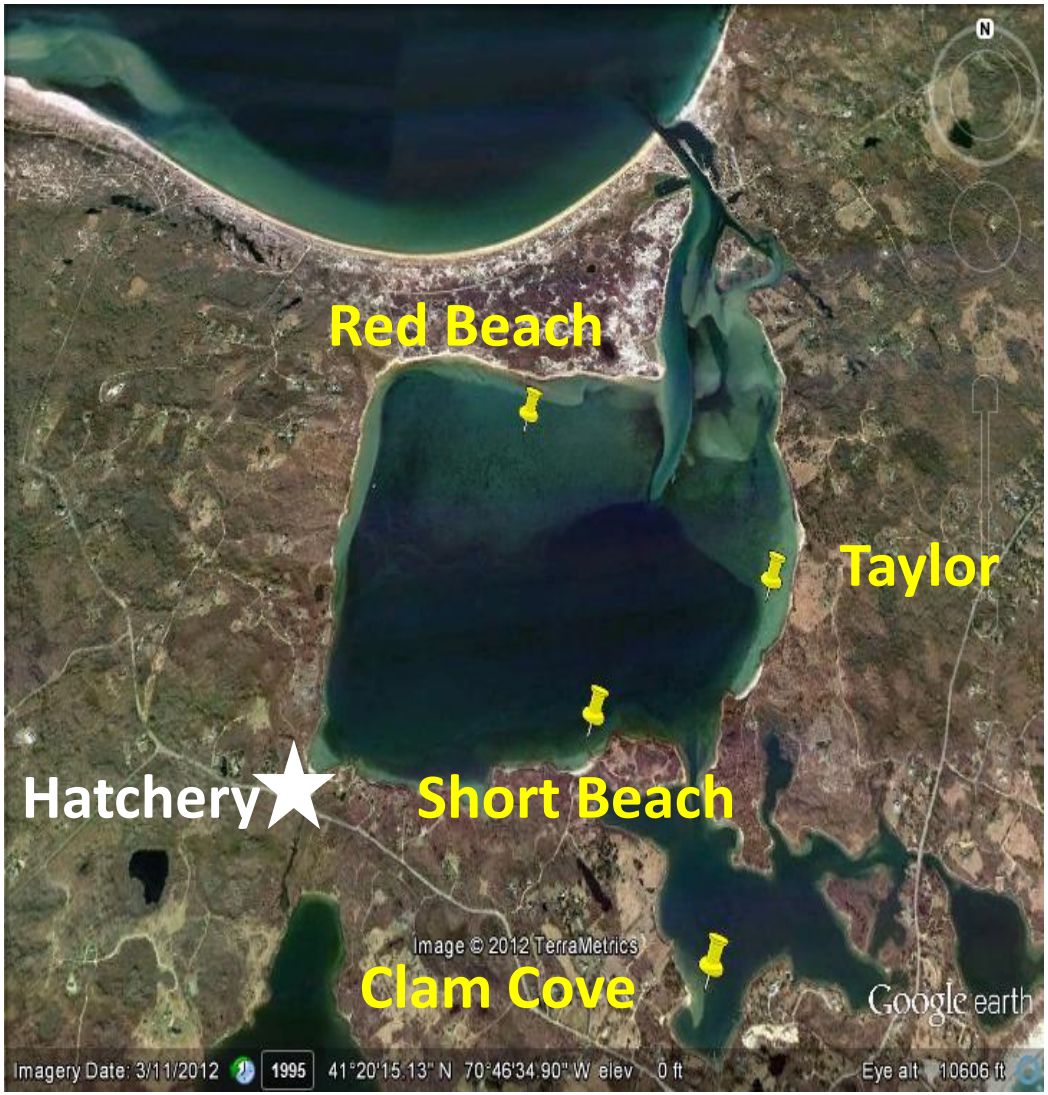
Lagoon Pond

Menemsha Pond

Lagoon Pond



Menemsha Pond



Ecosystem Analyses on the Vineyard

Measure water quality

- Fixed stations and when sampling

Beam trawl and beach seine

- To know what fish and macro-invertebrates are in the estuaries
- Winter flounder, their predators, their competitors…

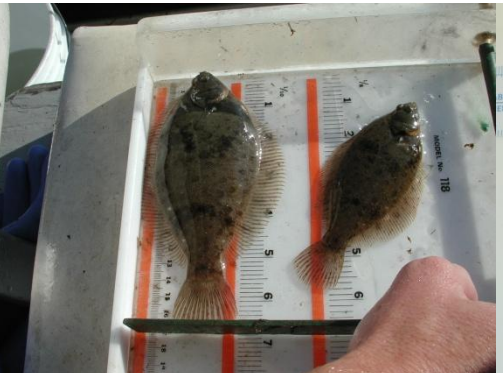
Ecosystem Analyses on the Vineyard

Benthic cores:

To know what is available for winter flounder to eat

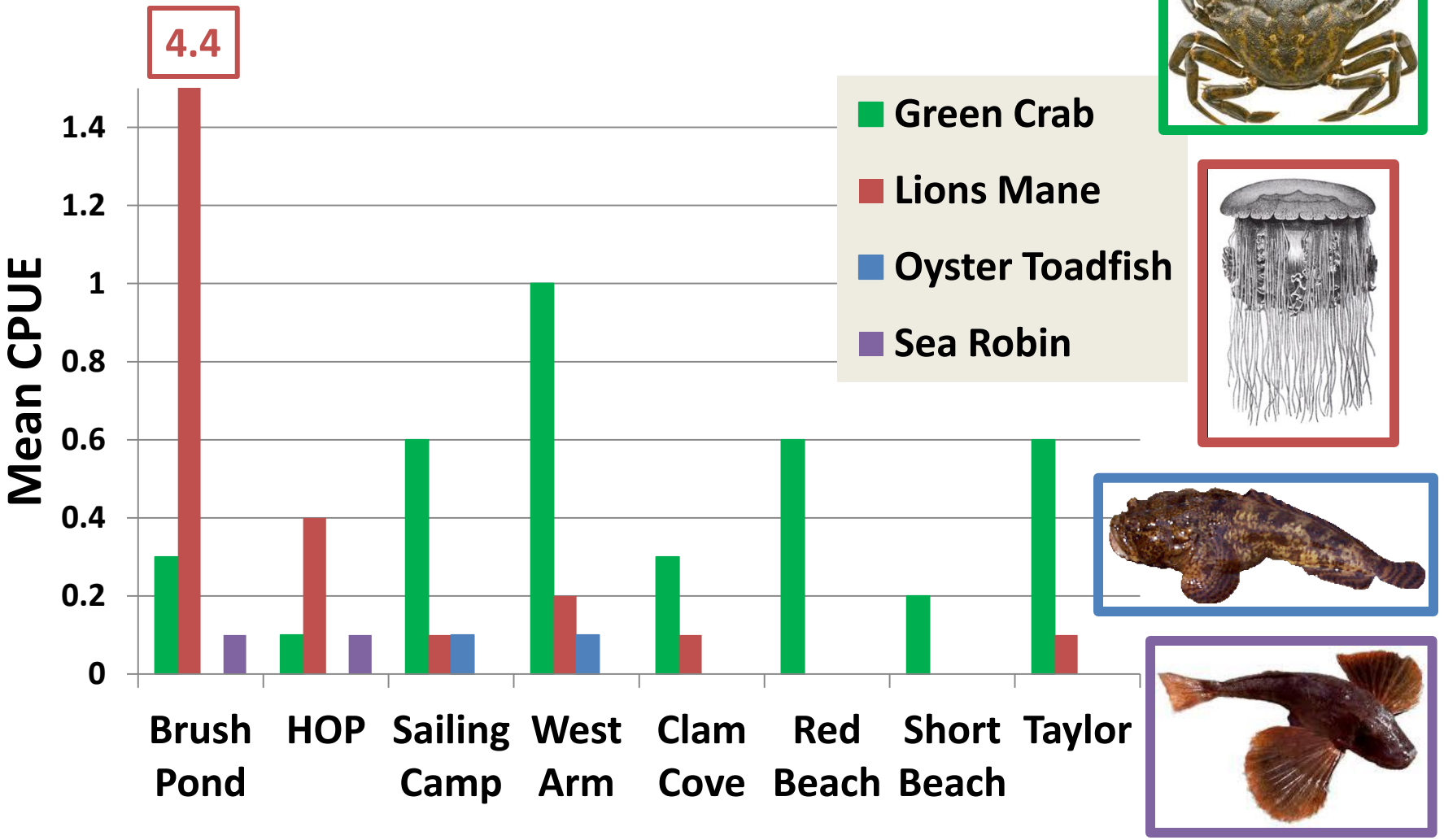
Determine Appropriate Stocking Strategies from Ecosystem Analyses

- Identify which season(s) and site(s) show promise for winter flounder stockings.
- Determine the most successful size-at-release for cultured winter flounder.
- Select best tag for released fish.





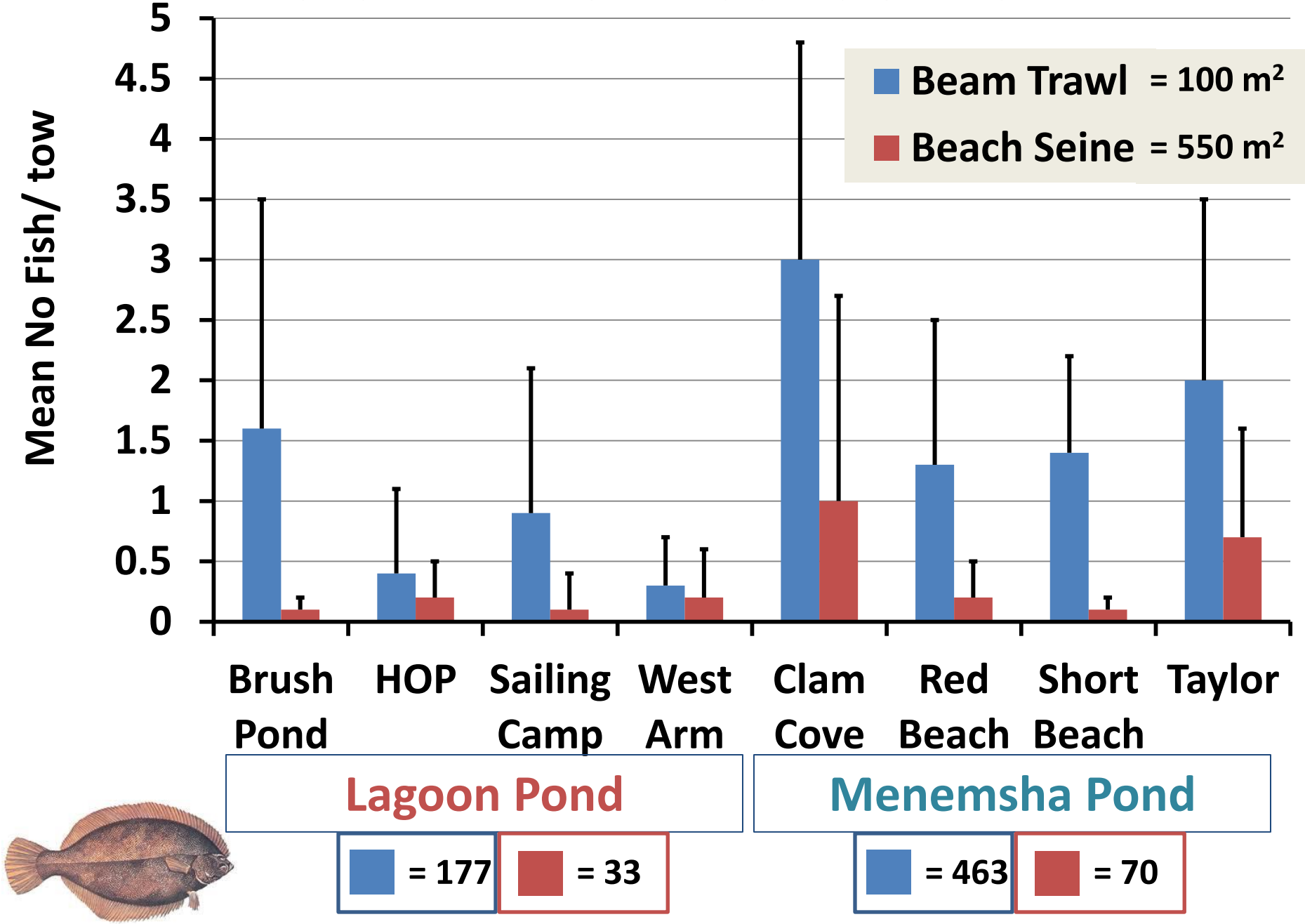
Potential Predators



Lagoon Pond

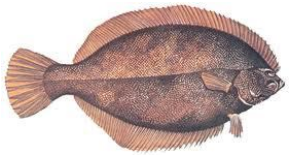
Menemsha Pond

Total Winter Flounder Catch

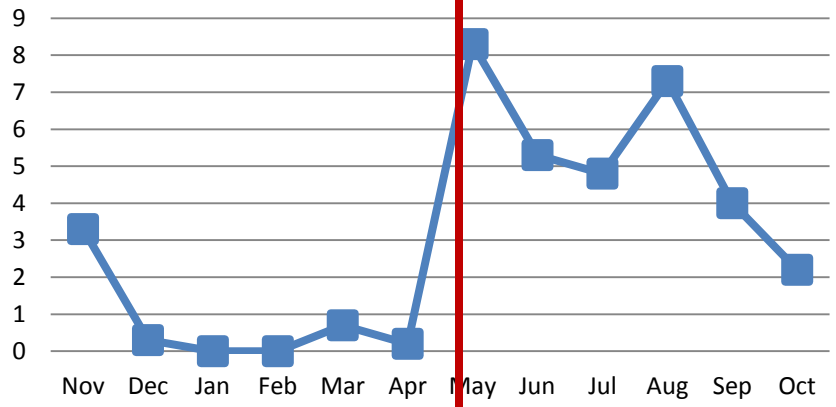


Winter Flounder Abundance in

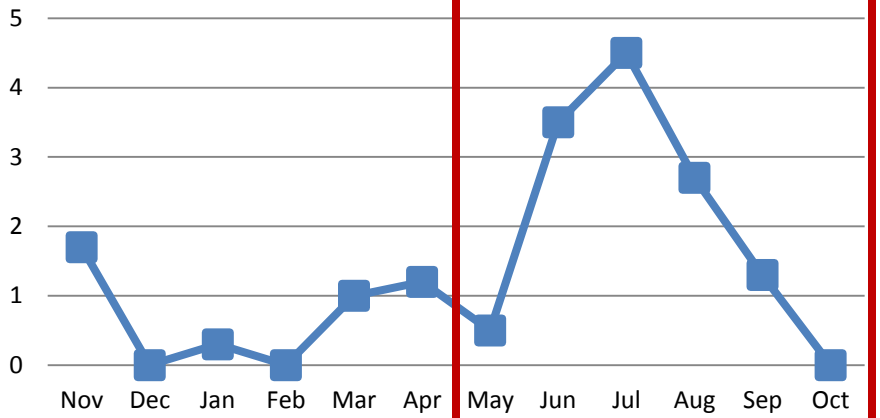
Menemsha Pond



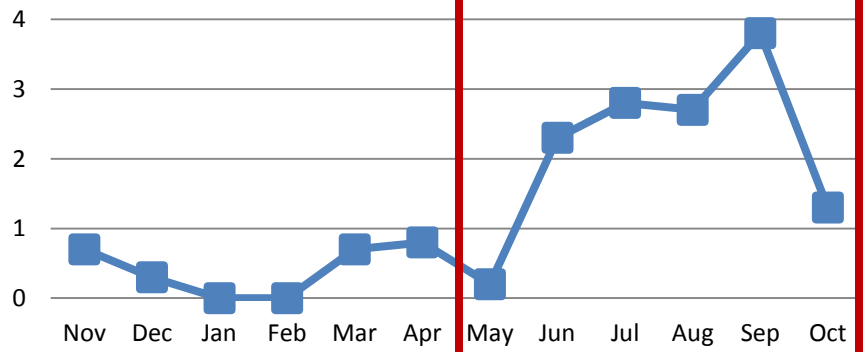
Clam Cove



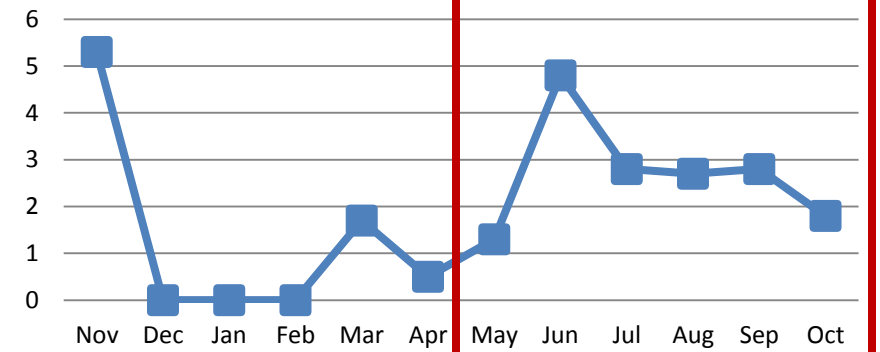
Short Beach



Red Beach



Taylor



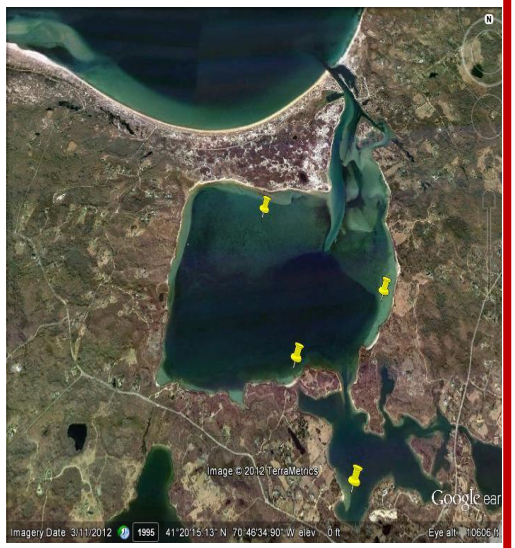
Mean No Fish/100 m^2

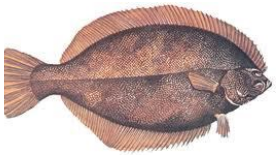
Time

Menemsha Pond

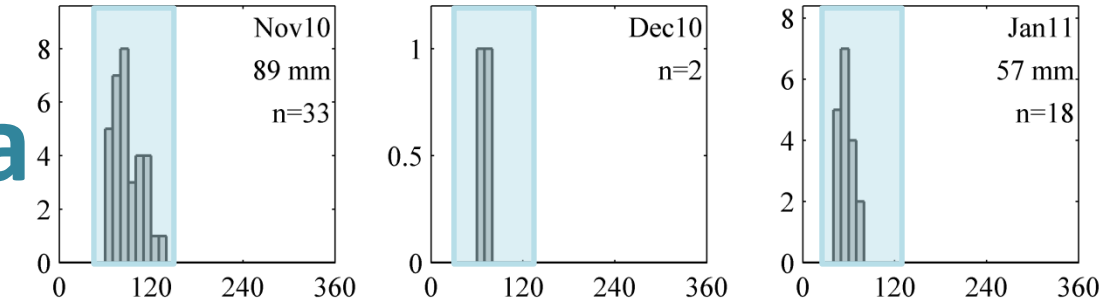
AGE 0

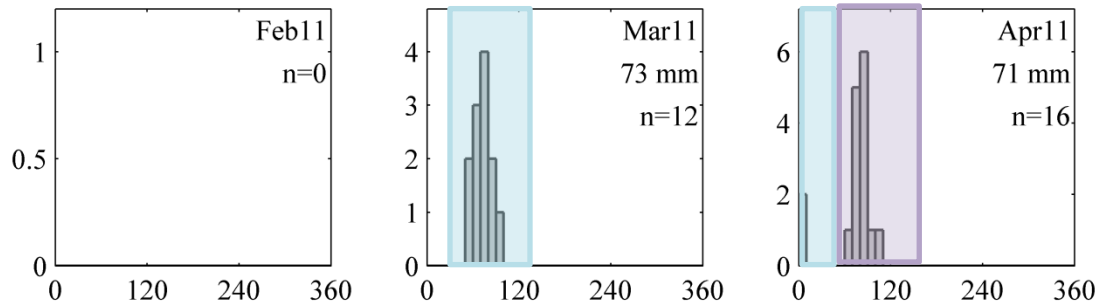
AGE 1

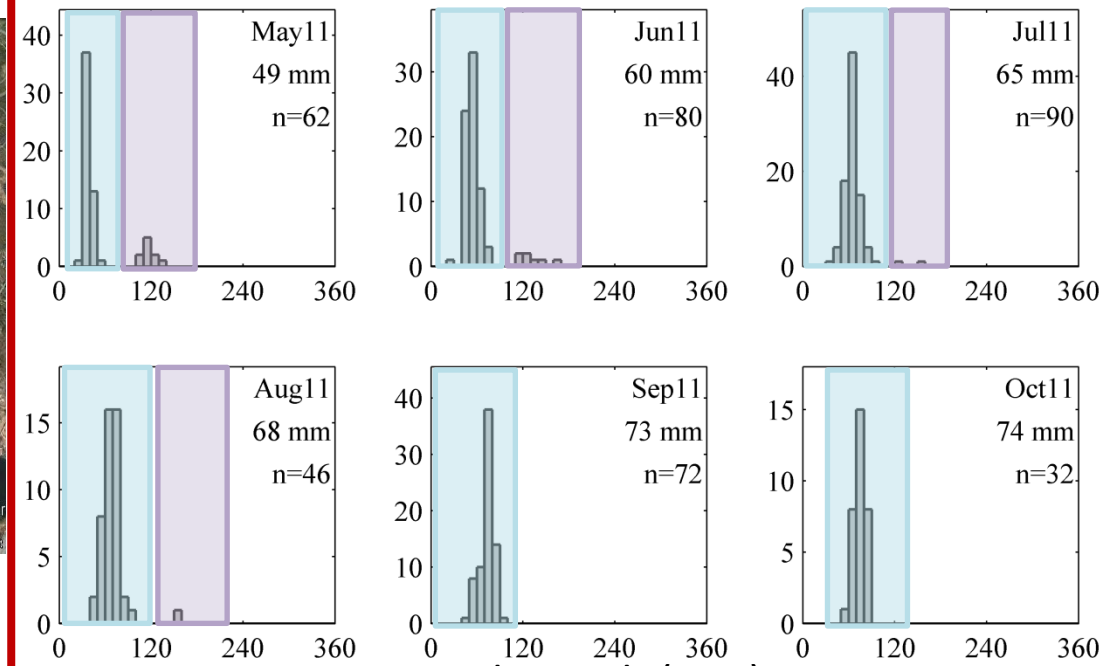




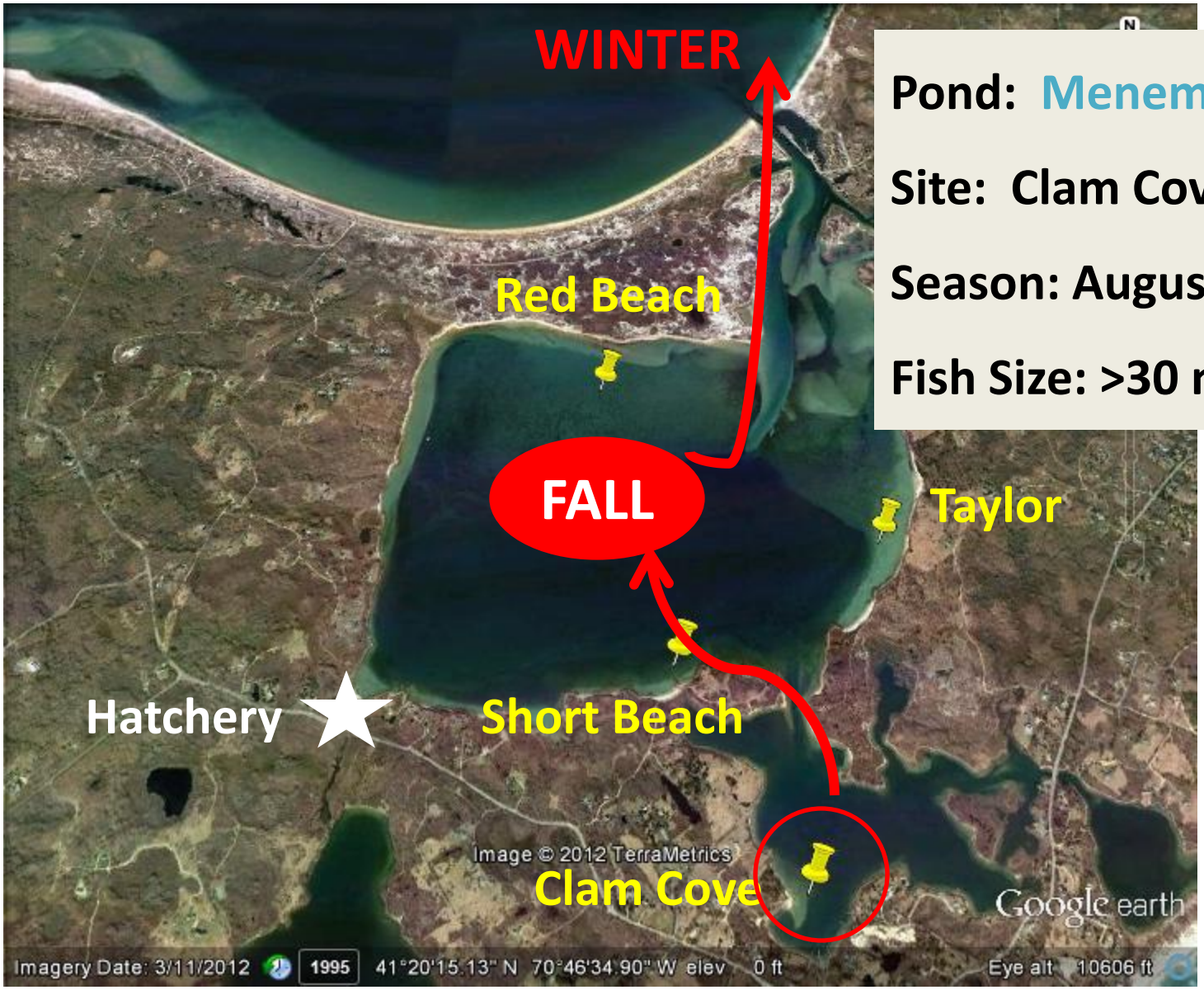
N = 463







2012 Optimal Release Strategy



Pond: Menemsha

Site: Clam Cove

Season: August

Fish Size: >30 mm TL

Producing Fish: PHASE 2

Hatchery Renovations

Wampanoag Tribe's Shellfish Hatchery, Aquinnah, MA

Broodstock Acquisition

Photo Credit: A. Jacobs

Photo Credit: B. Armstrong

Photo Credit: A. Jacobs

Photo Credit: A. Jacobs

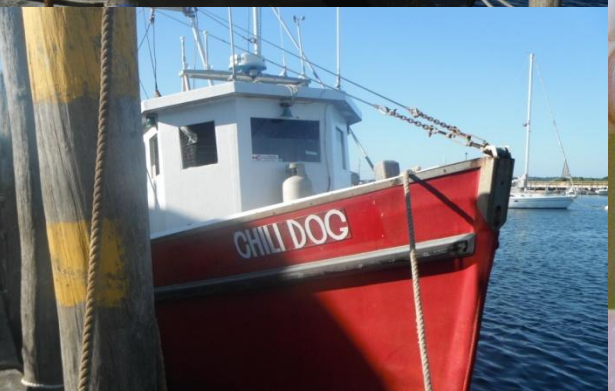
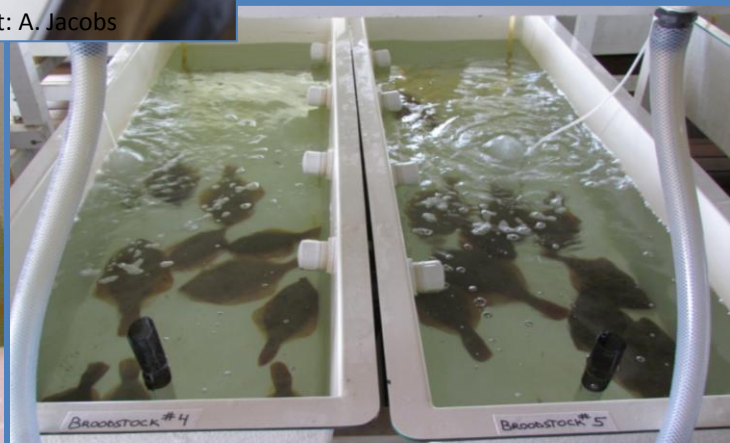
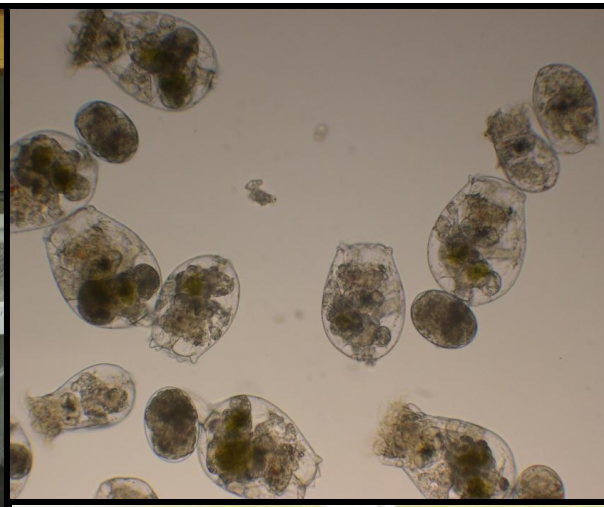
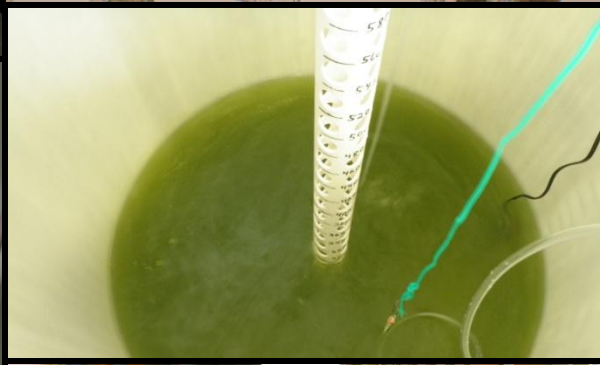


Photo Credit: A. Jacobs



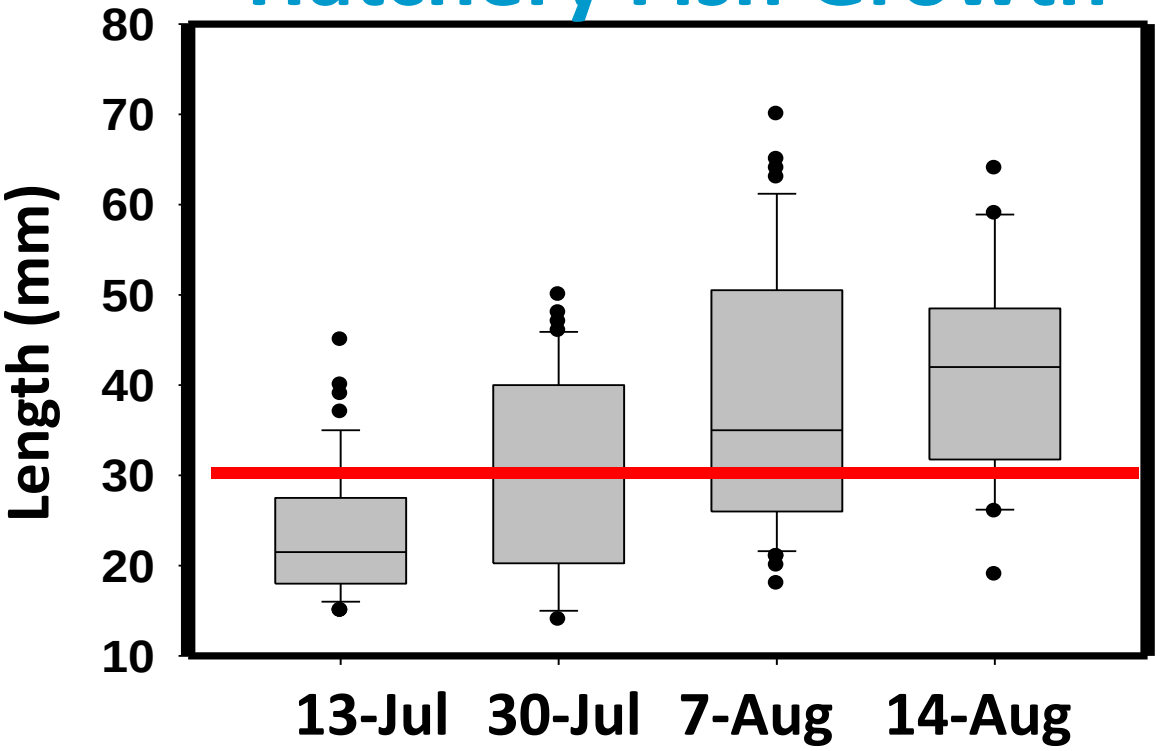
Crash Course in Finfish Larviculture: *first rotifers*





Crash Course in Finfish Larviculture: *then Artemia*

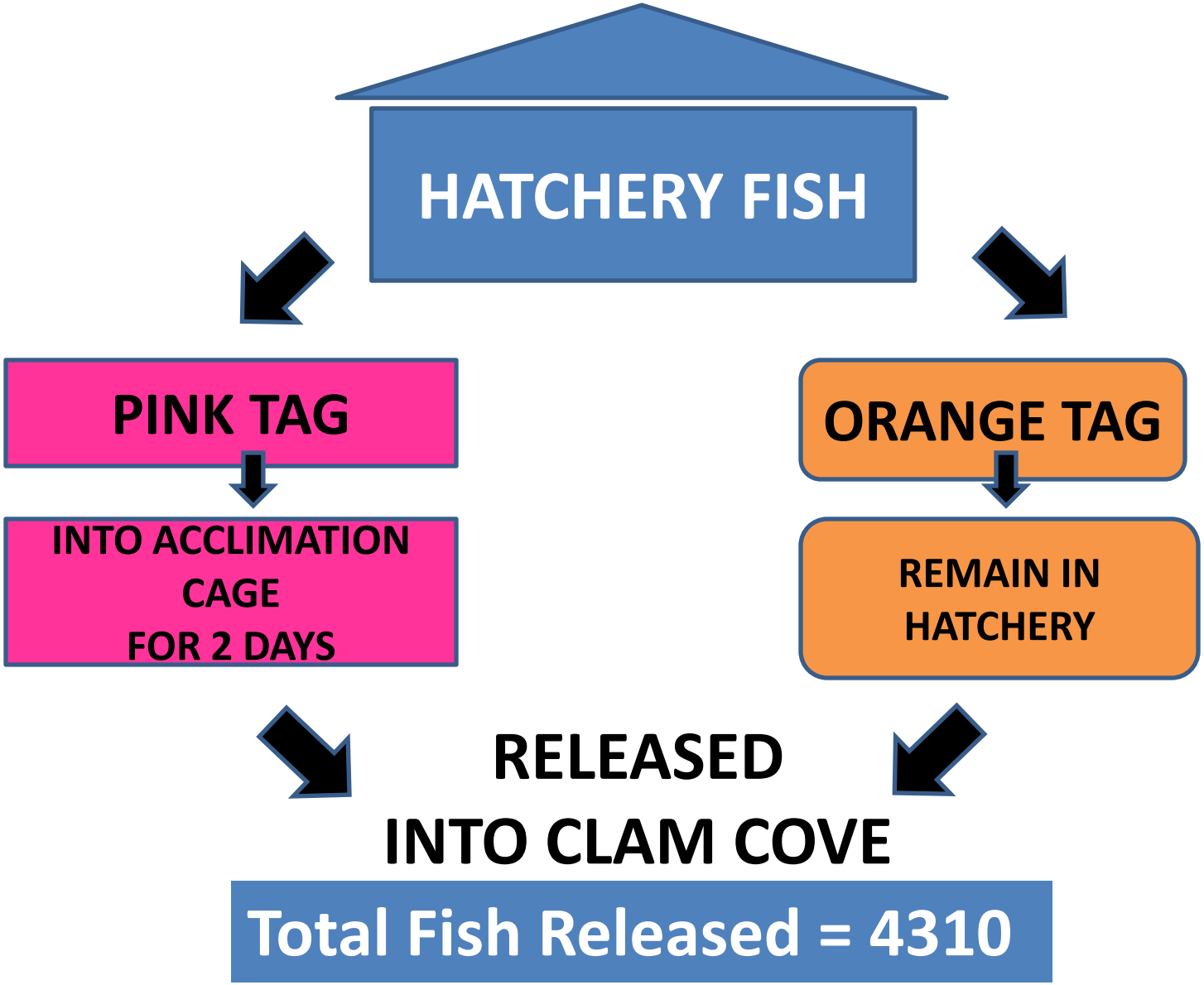
Hatchery Fish Growth

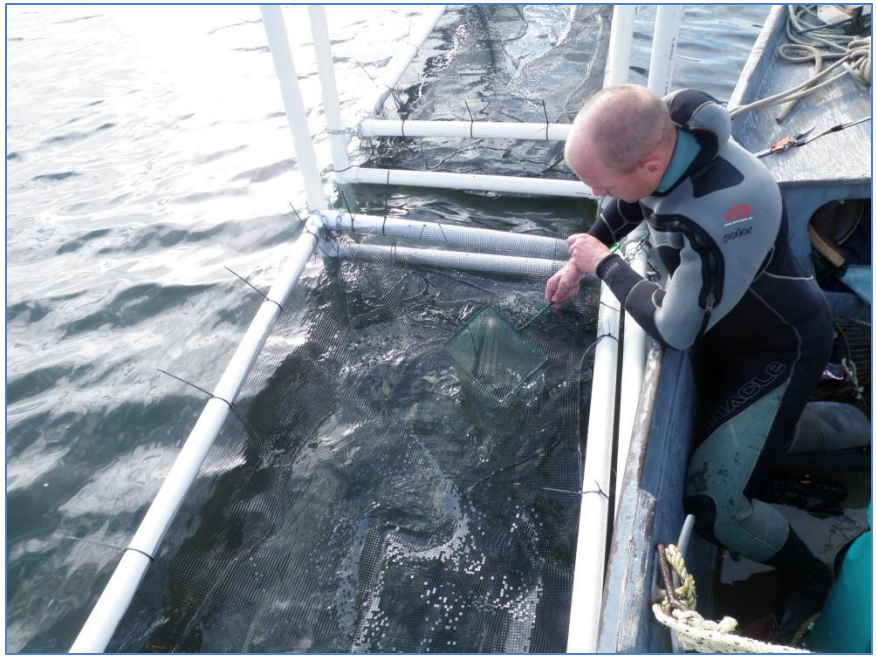


Get ready for tag & release!

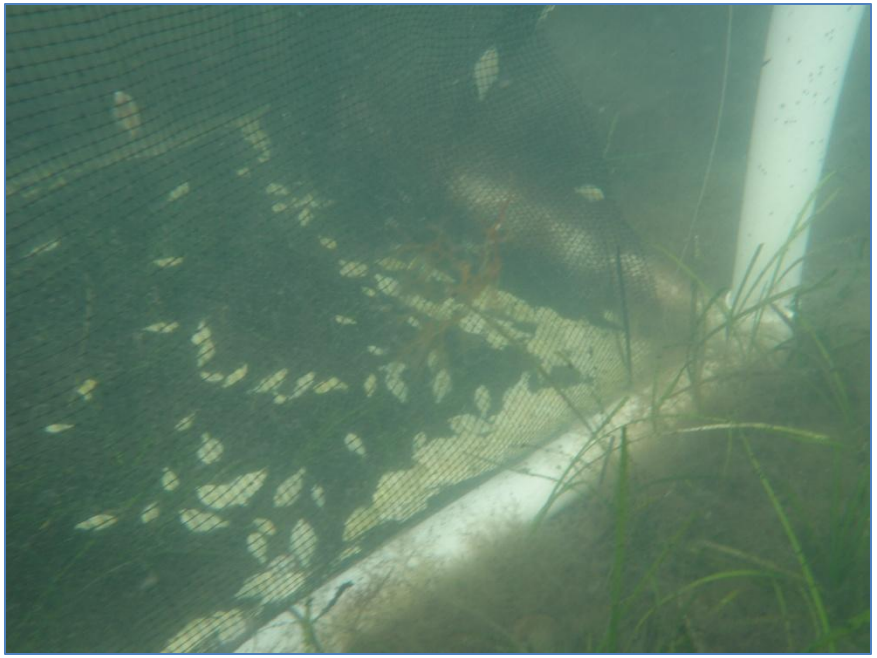
The Release: PHASE 3

Release Strategy





PINK TAGGED FISH = 2487
CONDITIONED FISH
put into cages at Clam Cove for 2 days, then released



ORANGE TAGGED FISH = 1823
UNCONDITIONED FISH

released directly into Clam Cove right after caged fish let go

Post-Release: Evaluate Success

- Estimating the mortality (survival) of released fish.
- Describing the diet transition in released fish.
- Studying the movements of released fish.




Dedicated Post-Release Sampling So Far…

Sampling Date	Days Post Release	Hatchery Fish Caught
Aug. 30	1	6
Aug. 31	2	3
Sept. 2	4	2
Sept. 3	5	1
Sept. 13	15	0
Sept. 20	22	0
Oct. 13	44	0

Oct. 31 = SuperStorm Sandy AND end of dedicated funding for Vineyard!

Incidental Sampling Continues via Bay Scallopers…

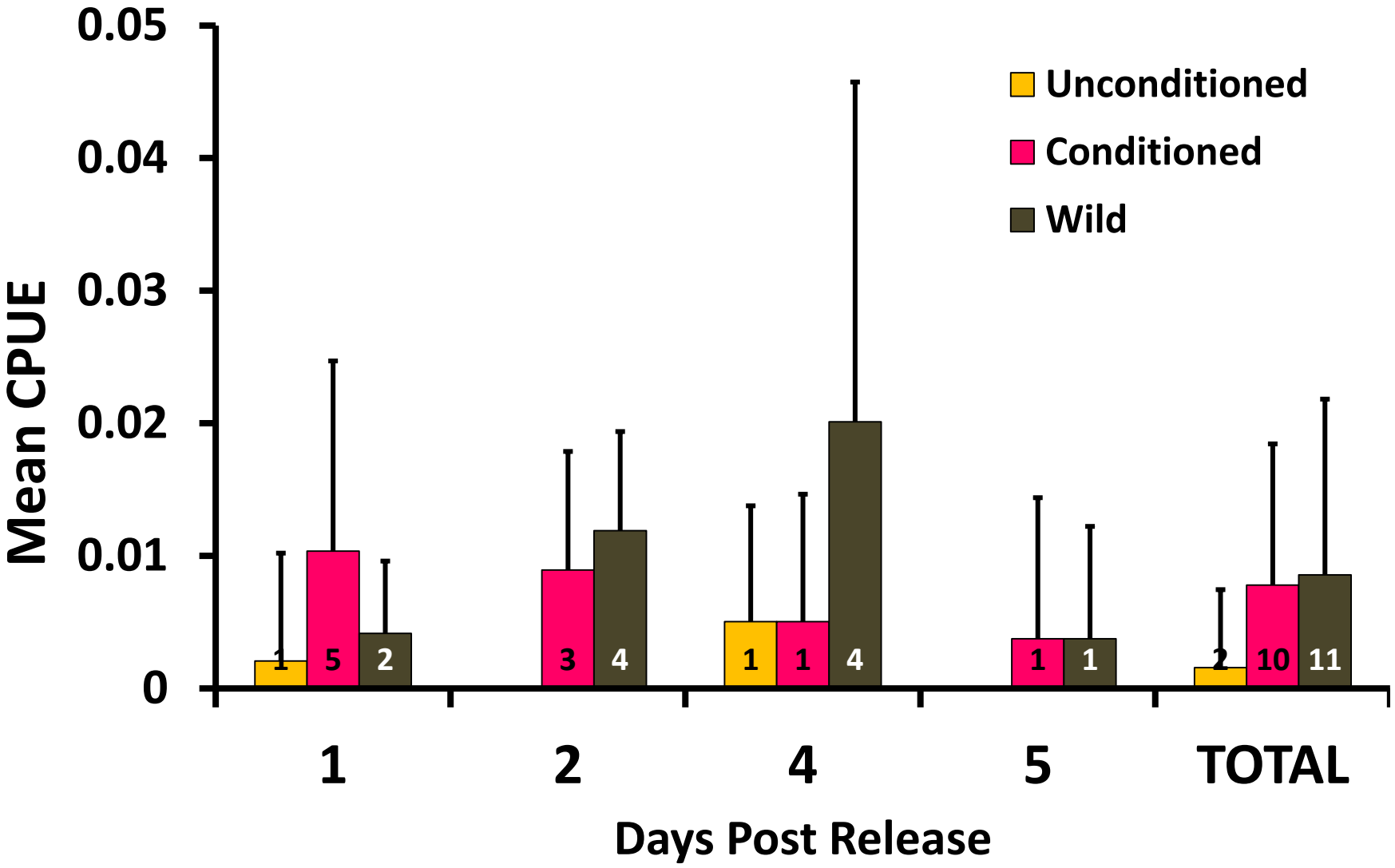
- Nov-March season
- Lottery incentive for recaptured & returned hatchery flounder

Images: MV Gazette

What we know so far…

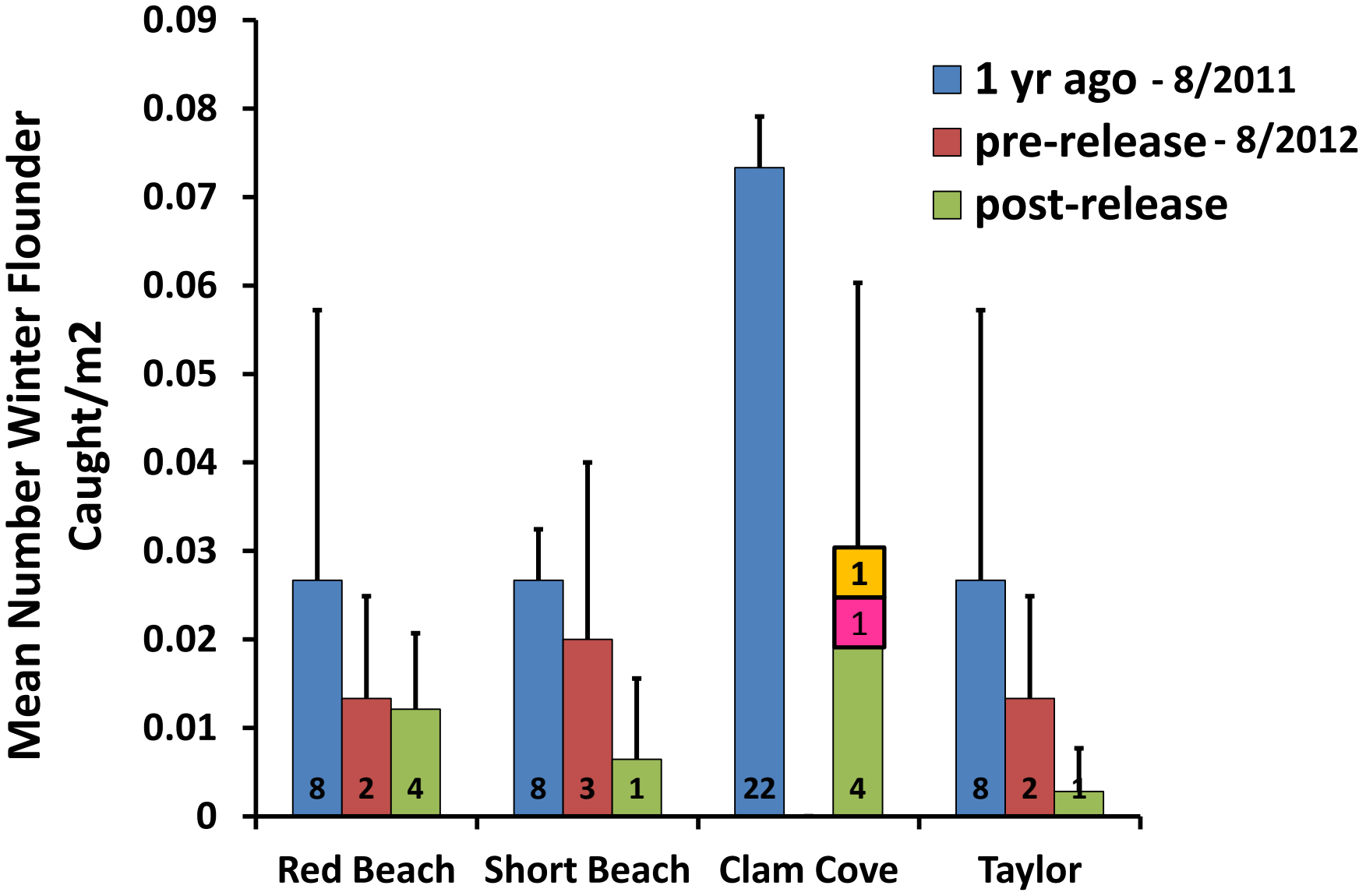
- Based on recaptures during first week post release (n=12)
- Obviously not very robust data…

More conditioned fish recaptured at release site in 1st week post-release

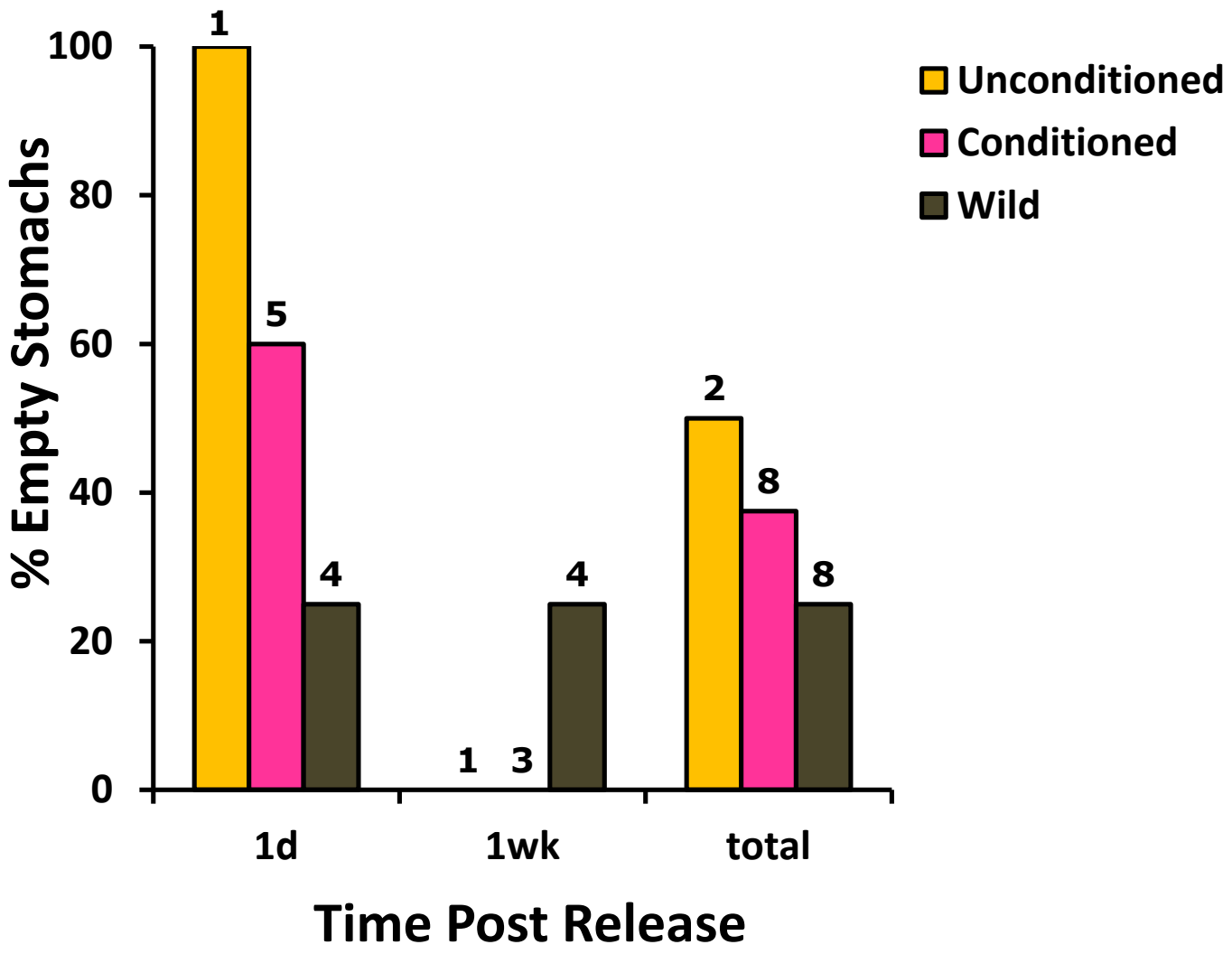


Hatchery fish did not displace wild fish

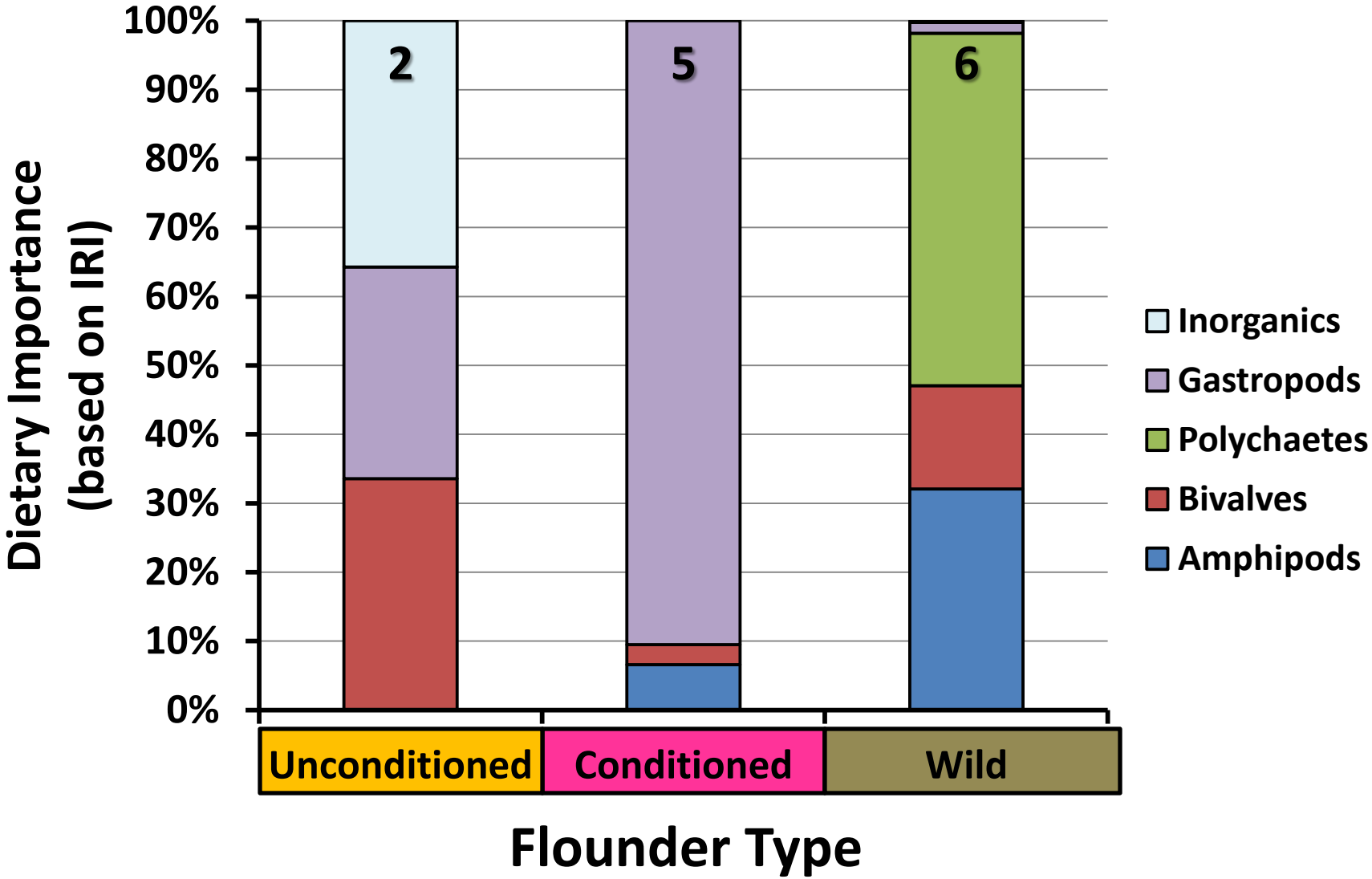
Abundance of wild fish had decreased pre-release



Conditioned fish had feeding advantage over unconditioned fish: *earlier feeding onset*



Conditioned fish had feeding advantage over unconditioned fish: *better predators*



Next steps (aka the sales pitch)…

$$
$$
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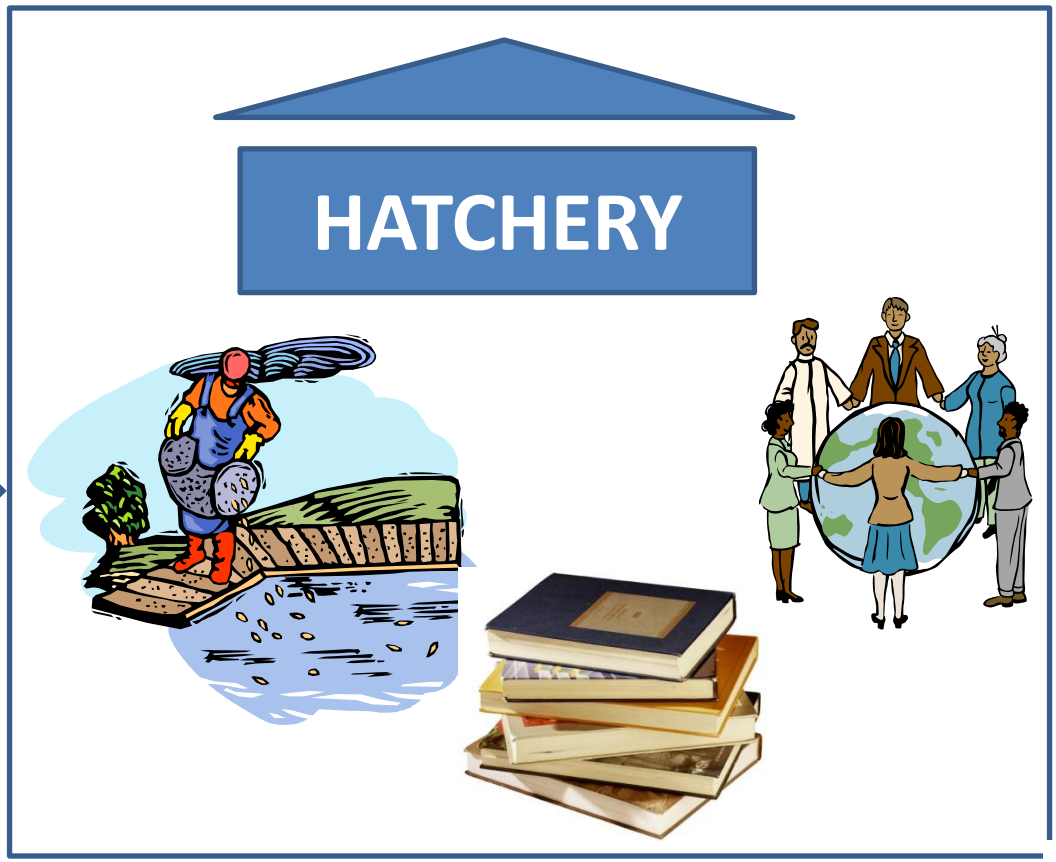

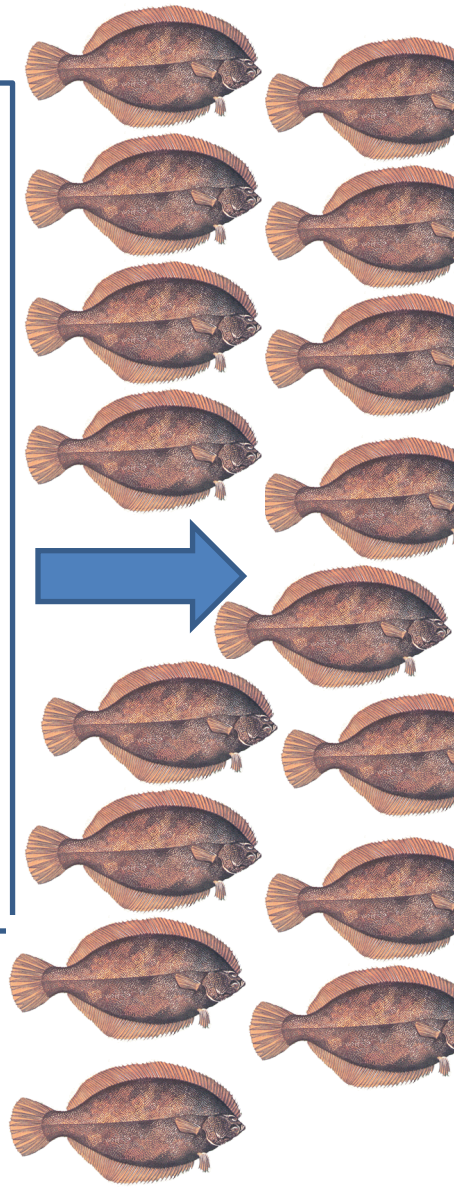

‘Shovel-Ready’ Project

Available at NH Sea Grant website

www.seagrant.unh.edu

Next Steps

The project tean
two years in gett
conduct analyse
A first-of-its-kin
leading the way
search and prov
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to keep these ad
funding would
the rearing prot
stocking efforts.
flounder popula
more detailed a
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operations to in
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Funding for this
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Andrew Jacobs,

Edited/designe
Publication #: U

For additional i
Elizabeth Fairch
elizabeth.fairchi
603.862.4475

www.sea

Highlights, cont.

4 Raised/releas

After almost two years of train
sands of winter flounder were
tribal hatchery. These fish we
caught adult winter flounde
mercial fishermen near Mar
hatchery-reared fish, approx
were tagged and released int

5 Determined be

While some of the winter flou
from the hatchery, the rest wer
for two days to get used to the
released into the wild. These tw
termine if one way resulted in
upon release. Researchers dete
conditioned in the underwate
the release area longer than th
may mean more of the cage-co

6 Brought peop

This project brought together
cluding academics, scientists,
tribe, municipalities, commerc
groups, students and shellfish
winter flounder in a positive w
munal merit in rebuilding an i
and put any differences aside t
– whether in the hatchery, on t
around town – and advocate f
nerships were created that will

7 Garnered med

This project garnered attentio
appeared in media outlets on
N.H., and in more widespread
Hatchery International and *Aq*

Project Highlights

1 Restored a former

In order to stock winter flounder,
a local hatchery where the fish coul
shellfish hatchery owned by the Wa
Aquinnah that had been offline for
prior to this project was available.
to get it back into working order to
The result: a hatchery retrofitted to
flounder.

2 Developed ecosy

Project technicians evaluated two
potential release areas for winter fl
Lagoon Ponds. Food availability fo
water quality, presence of wild wint
predators were examined at multip
aries for a year to make an educate
the winter flounder would have the
upon release. Based on these data,
Menemsha Pond would be the bet

"This is a model of how group
to accomplish meaningful res
the role that aquaculture can
nations fisheries truly sustain
-David Alves
Northeast Region Aqua
NOAA Aquaculture O
National Marine Fishe
Northeast Regional Off

3 Trained communi

This project helped train local mem
in finfish aquaculture, hatchery ope
stock enhancement surveys. A local
as the hatchery manager, and high
students, along with tribal member
selectman, comprised the hatchery

Bringing winter flounder back to Martha's Vineyard through community engagement

Martha's Vineyard has a long and rich history of recreational and commercial winter flounder fishing. However, current winter flounder populations in New England waters are at an all-time low and new regulations have closed all fishing activity for this species in federal waters. While it is hoped that these more stringent fisheries regulations will allow winter flounder populations to rebuild to historic levels, recovery will not happen quickly. Environmentally responsible enhancement techniques — stocking additional hatchery-reared fish in Vineyard waters, in this case — *may* help to jump-start their recovery.

A community-driven project

Officials and fishermen from Martha's Vineyard sought collaboration with researchers at the University of New Hampshire who have been involved in winter flounder restoration efforts elsewhere. The enthusiasm and good organization displayed by Vineyard municipalities highlighted their dedication to improving the winter flounder stock in their region. In addition, the island's historically large winter flounder populations, high-quality nursery areas, existing wild spawning stock and nearby aquaculture facilities made it an ideal candidate to scientifically test various winter flounder stocking strategies. This two-year project became a regional collaborative effort that included fishermen, scientists, a Native American tribe, the aquaculture industry and fisheries managers engaged in research to find ways of protecting and enhancing winter flounder and its fishery.

"We live in a place that recognizes sustenance as a means of survival. Our community recognizes fishing as a historic tradition. Our community cares about the seas and what lies beneath. Local restoration of winter flounder and perhaps other fish species is feasible and should be promoted."
-Bret Stearns
Director, Natural Resources Dept.
Wampanoag Tribe of Gay Head (Aquinnah)