Implementing a New Stocking Program in Unchartered Waters: Developing Optimal Release Strategies For Winter Flounder in Massachusetts, USA

Elizabeth Fairchild

University of New Hampshire, Dept. of Biological Sciences, Durham, NH, USA
Federal Waters:
- No possession of SNE fish for federal multi-species permit holders

Coastal Waters:
- Addendum I to FMP (ASMFC): help rebuild inshore stocks, protect spawning stocks
- Daily limits

If $F = 0$ for 2009-2014, only 1% chance stock can be rebuilt by 2014

(GARM III Report, NEFSC, 2008)
Winter Flounder Stock Enhancement Research at UNH

Bringing Back Winter Flounder

The winter flounder, Pseudopleuronectes americanus, is an important commercial and recreational fish along much of North America’s Atlantic coast. Insufficient habitat degradation and overfishing contributed to stock declines throughout their range, leaving catches at a fraction of historical levels. Reducing fishing mortality and protecting essential habitat have helped stocks to begin recovery, but they still have a long way to go.

To accelerate the recovery of winter flounder, researchers in New Hampshire, led by Dr. Elizabeth Fairchild, are developing and evaluating a stock enhancement program. They have established the culture techniques for winter flounder, determined the optimal size for releasing juveniles for predator avoidance, and evaluated release sites. They are now evaluating how well the released fish contribute to the natural populations and developing strategies to maximize post release survival.

An essential aspect of the investigation is the ability to identify individuals derived from the release program. This is achieved using NMT’s Visible Implant Elastomer (VIE). Critical characteristics of VIE include the ability to tag small fish, the capacity to identify different batches of fish, the rapid rate of tagging that can be achieved, and the low cost tag.

Please contact us to discuss our systems for tagging aquatic organisms.


Northwest Marine Technology, Inc.
www.nmt.us
Shaw Island, Washington, USA
Corporate Office
260.468.3375 office@nmt.us
Biological Services
260.596.9400 biology@nmt.us
Responsible Approach to Enhancement

- Core issues associated with developing and evaluating stock enhancement programs
- Broad, integrated view of how to do it
- Blankenship and Leber (1995) and Lorenzen et al. (2010)

1. Initial appraisal & goal setting
2. R & D, including field studies
3. Implementation & adaptive management
Research Phase - Experimental Releases

- Culturing techniques established
- Tagging studies completed
- Acclimation needs researched
- Acclimization benefits known
- Release strategies (mostly) determined

Next step...large-scale pilot releases to validate experimental studies
Overall Goals

- Determine if winter flounder stocking is a viable management tool
- Use Martha’s Vineyard, MA as the demonstration site
- Restore local winter flounder fishery
Determine Appropriate Stocking Strategies for Winter Flounder

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

Site- Specific
Two estuaries studied

Only 1 estuary will be stocked

UNH STUDY SITE
Project Locations

Two estuaries studied
Only 1 estuary will be stocked

UNH STUDY SITE
Martha’s Vineyard
Ecosystem Analyses

• Quantitatively determine optimal release strategy through extensive sampling program

• Site and Season
  – wild winter flounder populations
  – potential predators
  – available prey

• When and How – based on predators

• Size – determined by season

• Tag – determined by size
Sampling Sites

Lagoon Pond

Menemsha Pond

4 sites/estuary sampled biweekly for 12 months
Site and Season

Water quality

• Fixed stations and when sampling
• Temp, salinity, dissolved oxygen

Beam trawl and beach seine

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

Benthic Cores

- To know juvenile winter flounder food availability
- Carrying capacity (k)
Site and Season
(based on wild flounder)
“Timing is everything”
- When prey are most abundant
- Predators least abundant
- In synchrony with wild population

Will vary by latitude and the natural seasonal progression of wild populations
Conditioning/Acclimation Necessary?

Dependent on:

1. Predator complex and behavior
2. Release size
Size at Release

- Many predators
- Fewer predators
- Low survival post-release
- High survival post-release

Fish Size
Size at Release

Cultured Fish

Flounder Sizes (mm)

Predation Rate (no./d)

Carapace Width (mm)

Crab Carapace Width (mm)

(Fairchild & Howell 2000)

(Witting & Able 1995)
Size at Release

Optimal release size

Hatchery costs
Survival post-release

Low
High

Fish Size

Many predators  Fewer predators
Tags: T-bar

Hallprint Fish Tagging Solutions
Project Timeline

• Ecosystem Analyses
  – November 2010 through October 2011
  – Finishing 6th month
  – Analyses to be completed December 2011

• Hatchery Phase

• Large-scale Pilot Release

• Evaluate Success
Determine Appropriate Stocking Strategies from Surveys

• 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.
Large-Scale Pilot Release

• Rear, tag, and release 50,000 fish
• Test and compare two different release strategies (acclimated vs. direct)
• Evaluate success of the releases
Evaluate Success

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

LOTS OF POST-RELEASE SAMPLING!!!
Will it work???

STAY TUNED...

To be continued at the 5th ISSESIR!
Acknowledgements

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Town of Chilmark, MA
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Jon Pennock
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謝謝
XIE XIE
More Resources

1. [http://winterflounderenhancement.blogspot.com/](http://winterflounderenhancement.blogspot.com/) Blog about this project

2. [www.amac.unh.edu](http://www.amac.unh.edu)  
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