NEAMAP
Mid-Atlantic / Southern New England

A Collaborative, Fishery-Independent Trawl Survey Operating in the Coastal Ocean

Chris Bonzek, Rob Latour Ph.D., & Jim Gartland

February 2013
NEAMAP History

- Originally conceived and developed by ASMFC to SUPPLEMENT NEFSC sampling with the Albatross in the inshore M-A/SNE

- Became “ESSENTIAL” once NEFSC acquired the Bigelow and could no longer sample shallow coastal habitats

- VIMS has executed the survey since operations began in the fall of 2007 (5.5-year time-series)

- Funding has come from a variety of sources;
  2013 ☄ 2012
  80% MAFMC Multispecies RSA
  20% RI CFRF

~300 lb sea bass tow
Survey Area
2 Cruises per Year

- Spring Surveys
  - NEAMAP samples
    April 20 to late May
  - NEFSC samples M.A. in early-to-mid March

- Fall Surveys
  - NEAMAP samples Sept. 20 to late October
  - NEFSC samples in M.A. early-to-mid September
NEAMAP Field Operations

Sampling Layout – Spring 2012

Sampling Density is
> 1 Station per 30 sq. nm.

Mean Distance Between Stations: 6 nm
NEAMAP Field Operations

“Survey Vessel” - F/V Darana R
Collaboration in Action
NEAMAP Field Operations

Survey Trawl - 400 x 12cm, 3-bridle, 4-seam

* Technically, this is a model of a 200x12cm net
Monitoring Performance

1670 tows completed to date
- 5.4 m avg. headline
- 13.5 m avg. wingspread
- 32.5 m avg. doorspread

Flume Tank Specs
- 5.0 – 5.5 m headline
- 13.0 – 13.5 m wingspread
- 32.0 – 34.0 m doorspread

NEAMAP ‘Acceptable’ Tow Specs
- 4.7 – 5.8 m headline
- 12.3 – 14.7 m wingspread
NEAMAP Survey Gear

Monitoring Performance

• Implementing new net monitoring system in 2013
  - Lighter sensors, longer battery life
  - Parameters increase from 8 to 13

Standard Parameters
• Net Height & Width
• Door Spread
• ‘Secondary’ Height
• Catch
• Bottom Contact
• Wing & Door ‘Symmetry’

New Parameters
• Depth (continuous)
• Bottom Temperature (continuous)
• Door Pitch
• Door Roll
• Warp Lengths
### Catch Stats Per Station

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>By Number</td>
<td>30</td>
<td>4,390</td>
<td>151,600</td>
</tr>
<tr>
<td>By Weight (kg)</td>
<td>6.2</td>
<td>282.3</td>
<td>6,396</td>
</tr>
<tr>
<td>Number of Species</td>
<td>6</td>
<td>18.7</td>
<td>41</td>
</tr>
</tbody>
</table>
NEAMAP Catch Processing

Sort catch by species and size-class (ALL SPECIES)

- For *All Fishes & Most Inverts*
  - Record Aggregate Weight & Individual Lengths

<table>
<thead>
<tr>
<th>Number Measured</th>
<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Station</td>
<td>30</td>
<td>551</td>
<td>4,394</td>
</tr>
<tr>
<td>Per Cruise</td>
<td>50,618</td>
<td>83,704</td>
<td>142,422</td>
</tr>
<tr>
<td>Overall (11 Cruises)</td>
<td>920,744</td>
<td>77.3 NM of fish measured</td>
<td></td>
</tr>
</tbody>
</table>
NEAMAP Catch Processing

Sort catch by species and size-class (ALL SPECIES)

- “Priority Fishes” Subsample

Additional data:
- Length
- Weight
- Sex
- Maturity
- Diet
- Age

<table>
<thead>
<tr>
<th>“Full Workup” Number Processed</th>
<th>Min.</th>
<th>Avg.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Station</td>
<td>4</td>
<td>37</td>
<td>106</td>
</tr>
<tr>
<td>Per Cruise</td>
<td>4,608</td>
<td>5,629</td>
<td>6,573</td>
</tr>
<tr>
<td>Overall (11 Cruises)</td>
<td></td>
<td>61,923</td>
<td></td>
</tr>
</tbody>
</table>
NEAMAP Priority Fishes

- Alewife
- American shad
- Atlantic cod
- Atlantic croaker
- Atlantic herring
- Atlantic mackerel
- Atlantic menhaden
- Black drum
- Black sea bass
- Blueback herring
- Bluefish
- Butterfish
- Haddock
- Monkfish
- Pollock
- Red drum
- Scup
- Silver hake
- Skates (all species)
- Smooth dogfish
- Spanish mackerel
- Speckled trout
- Spiny dogfish
- Spot
- Striped bass
- Summer flounder
- Tautog
- Weakfish
- Windowpane flounder
- Winter flounder
- Yellowtail flounder
<table>
<thead>
<tr>
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<tr>
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<tr>
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<tr>
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</tr>
<tr>
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<tr>
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<tr>
<td>Tautog</td>
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NEAMAP Catch Processing

Priority Invertebrates

- Additional data collected varies by species
- Several parameters added in recent years

Horseshoe crab
- Sex
- Maturity (2012)
NEAMAP Catch Processing (continued)

- “Priority Invertebrates”
  - Additional data collected varies by species
  - Several parameters added in recent years

American lobster
- Sex
- Maturity
- Egg stage (2012)
- Shell disease (2010)
- AGE (2013)
NEAMAP Catch Processing

(continued)

• “Priority Invertebrates”
  - Additional data collected varies by species
  - Several parameters added in recent years

Blue crab
• Sex
• Maturity
• Egg stage
• “Priority Invertebrates”
  - Additional data collected varies by species

- Several parameters added in recent years

Long-finned squid
• **Sex** (new in 2013)
• **Maturity** (new in 2013)
NEAMAP Data Products

Butterfish Example
NEAMAP
Butterfish Distribution - 2012
NEAMAP
Butterfish Abundance Indices

Spring Index: All Ages

- Index by Number
- Index by Biomass

Survey Year:

Geometric Mean Numerical Index:
- 0.00 to 140.00

Geometric Mean Biomass Index:
- 0.00 to 8.00

Table:

<table>
<thead>
<tr>
<th>State</th>
<th>Region</th>
<th>Depth (Nominal)</th>
<th>Spring Index</th>
<th>Fall Index</th>
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<tbody>
<tr>
<td>RI</td>
<td>NS</td>
<td>5-10</td>
<td>20-40</td>
<td>20-40</td>
</tr>
<tr>
<td>RI</td>
<td>NS</td>
<td>10-20</td>
<td>20-40</td>
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<td>NY</td>
<td>NY</td>
<td>5-10</td>
<td>20-40</td>
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<td>NY</td>
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<td>20-40</td>
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<td>20-40</td>
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<tr>
<td>NJ</td>
<td>NJ</td>
<td>10-20</td>
<td>20-40</td>
<td>20-40</td>
</tr>
</tbody>
</table>

Legend:
- Red: Used for abundance indices
- Gray: Not used for abundance indices
NEAMAP
Butterfish Abundance Indices

Spring Index: All Ages
- Index by Number
- Index by Biomass

Fall Index: All Ages
- Index by Number
- Index by Biomass

Survey Year Indexes:
- Geometric Mean Numerical Index
- Index by Number
- Index by Biomass

Survey Years:
- 2007 to 2012

States and Regions:
- RI
- CT
- VT
- MA
- NY
- VA
- PA
- MD

Depth Sectors:
- 0-20
- 20-40
- 40-60
- 60+
NEAMAP Butterfish Length-Frequency
NEAMAP Butterfish

**Sex-ratio by size**

<table>
<thead>
<tr>
<th>Inch-class</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>5</td>
<td>423</td>
<td>545</td>
<td>652</td>
<td>774</td>
<td>985</td>
<td>411</td>
<td>161</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100.0</td>
<td>100.0</td>
<td>98.8</td>
<td>23.4</td>
<td>7.4</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.0</td>
</tr>
</tbody>
</table>

**Length-weight**

![Length-weight graph](image)

Females: \( \text{Weight(g)} = 0.6233 \times \text{Length(cm)}^{2.9547} \) (n = 2427)
Males: \( \text{Weight(g)} = 0.0197 \times \text{Length(cm)}^{3.0108} \) (n = 2488)

**Size-at-maturity**

![Size-at-maturity graph](image)
NEAMAP Butterfish

Age-specific abundance

Length-at-age
NEAMAP Data Products

Long-Finned Squid Example
NEAMAP
L-f Squid Distribution - 2012
NEAMAP
L-f Squid Abundance Indices

Spring Index: All Ages

- Index by Number
- Index by Biomass

Fall Index: All Ages

- Index by Number
- Index by Biomass

Survey Year

Geometric Mean Numerical Index

Survey Year

Geometric Mean Numerical Index

Survey Year

State (Nominal) | Region | Depth (meters) | Spring Index | Fall Index
--- | --- | --- | --- | ---
DE | 06 | 20-40 | 0.60 | 0.60
MD | 06 | 20-40 | 0.60 | 0.60
VA | 06 | 20-40 | 0.60 | 0.60
FL | 07 | 20-40 | 0.60 | 0.60
NC | 14 | 20-40 | 0.60 | 0.60

NEAMAP
L-F Squid Length-Frequency
Winter Flounder
NEAMAP Winter Flounder

Age-specific abundance

Length-at-age
Data Accessibility

• Annual Reports
  www.vims.edu/fisheries/reports

• Indices of Relative Abundance
  www.vims.edu/fisheries/indices

• Catch Data
  www.vims.edu/fisheries/fao

• Diet Data
  www.vims.edu/fisheries/fishfood
Data Accessibility – Annual Reports
www.vims.edu/fisheries/reports

NEAMAP Annual Progress Reports


Data Accessibility – Abundance Indices

www.vims.edu/fisheries/indices
Data Accessibility – Catch Data

www.vims.edu/fisheries/fao
Data Accessibility – Catch Data

www.vims.edu/fisheries/fao
Data Accessibility – Diet Data

www.vims.edu/fisheries/fishfood
**Data Accessibility – Diet Data**

www.vims.edu/fisheries/fishfood

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**Fish Food Habits**

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**VIMS Multispecies Research Program**

**Prey-Centered Data Report**

*longfin inshore squid*

<table>
<thead>
<tr>
<th>Survey</th>
<th>Diet By</th>
<th>Predator</th>
<th>% in Predator Diet</th>
<th># Predator Stomachs Analyzed</th>
<th>Predator Clusters Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEAMAP</td>
<td>Number</td>
<td>Atlantic sharpnose shark</td>
<td>6.1</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>black sea bass</td>
<td>9.5</td>
<td>748</td>
<td>356</td>
</tr>
<tr>
<td></td>
<td></td>
<td>goosefish</td>
<td>11.6</td>
<td>48</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>spiny dogfish</td>
<td>8.6</td>
<td>639</td>
<td>304</td>
</tr>
<tr>
<td></td>
<td></td>
<td>summer flounder</td>
<td>3.2</td>
<td>2172</td>
<td>983</td>
</tr>
</tbody>
</table>

| Weight   |          | Atlantic sharpnose shark  | 6.2                | 6                          | 2                         |
|          |          | black sea bass            | 10.1               | 748                        | 356                       |
|          |          | clearnose skate           | 1.2                | 1585                       | 670                       |
|          |          | goosefish                 | 9.8                | 48                         | 42                        |
|          |          | little skate              | 1                  | 1846                       | 721                       |
|          |          | spiny dogfish             | 14.3               | 639                        | 304                       |
|          |          | summer flounder           | 5.5                | 2172                       | 983                       |
Data Accessibility – Diet Data

www.vims.edu/fisheries/fishfood
## VIMS Multispecies Research Program
### Fish Food Habits Report

<table>
<thead>
<tr>
<th>Survey: NEAMAP</th>
<th>Predator: black sea bass</th>
<th>Year: All</th>
<th>State: All</th>
<th>Age: All</th>
<th>Diet By: Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Total # Caught: 1,810 | Stomachs Analyzed: 748 | # of Clusters Sampled: 356 |

#### Taxon: crustaceans
- Atlantic rock crab: 11.80%
- sand shrimp: 8.10%
- crustaceans - other: 5.90%
- flatclaw hermit: 4.20%
- crabs and shrimp - crab parts: 9.20%
- amphipods: 3.00%
- mysids: 2.30%
- right-handed hermit crabs: 2.10%
- cancer crab: 1.90%
- long-armed hermit crab: 1.00%
- acadian hermit crab: 1.70%
- crabs and shrimp - crab - unidentified: 1.70%
- isopods: 1.30%
- bristled longbeak: 1.10%
- mud crabs: 1.10%

Total By Taxon: 51.30%

#### Taxon: fishes
- butterfish: 7.10%
- fishes - other: 6.00%
- bay anchovy: 3.80%
- fishes - unidentified fish: 3.80%
- gobies: 1.10%
- soup: 1.00%

Total By Taxon: 21.80%

#### Taxon: molluscs
- longfin inshore squid: 10.10%

Total By Taxon: 21.80%
<table>
<thead>
<tr>
<th>Species</th>
<th>Abundance</th>
<th>Length</th>
<th>Sex</th>
<th>Maturity</th>
<th>Age</th>
<th>Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic Sea Scallop</td>
<td>E</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skates (Clns., Little, Winter)</td>
<td>E</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter Flounder*</td>
<td>I</td>
<td>I</td>
<td>E</td>
<td>E</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>Spiny Dogfish*</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>Bluefish*</td>
<td>E</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td>E</td>
</tr>
<tr>
<td>Butterfish</td>
<td>E</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-Finned Squid</td>
<td>I</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Sea Bass*</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Scup*</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Summer Flounder*</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Atlantic Sturgeon</td>
<td>ESA</td>
<td>ESA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

- **E** = Evaluated
- **I** = Included
- **ESA** = Included in ESA Review
- **Legend**
  - = Not Collected
  - = Not Requested
  - E = Evaluated
  - I = Included
  - ESA = Included in ESA Review
## Data Use – NMFS Assessments

<table>
<thead>
<tr>
<th>Species</th>
<th>Abundance</th>
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<th>Maturity</th>
<th>Age</th>
<th>Diet</th>
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<td>E</td>
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<td>E</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
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<td>I</td>
<td>I</td>
<td>E</td>
<td>E</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>Spiny Dogfish*</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
<td>E</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Butterfish</td>
<td>E</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-Finned Squid</td>
<td>I</td>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Sea Bass*</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Scup*</td>
<td>NY</td>
<td>NY</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Summer Flounder*</td>
<td>NY / VA</td>
<td>NY / VA</td>
<td>E</td>
<td>E</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Atlantic Sturgeon</td>
<td>ESA</td>
<td>ESA</td>
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<thead>
<tr>
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<th>Abundance</th>
<th>Length</th>
<th>Sex</th>
<th>Maturity</th>
<th>Age</th>
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</tr>
<tr>
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</tbody>
</table>
Examine Possible Shifts and Expansions in Species Distributions (ASMFC Driven)
Quantify Capture Efficiency

Generate ABSOLUTE ABUNDANCE ESTIMATES

Start with Long-Finned Squid, working w. NEFSC

Trawl Camera

Scantrol Deep Vision
Ageing Studies

Hard Part Comparisons

Black Sea Bass

Scup
NEAMAP
Future Research

• Maintain awareness of assessment and management data needs, and continue to respond accordingly with additions to base sampling protocols

• Develop more of these “value-added” projects in an effort to answer specific survey-related and ecological questions

• Increase breadth of survey sampling to generate an even more holistic, “ecosystem-view” of the coastal ocean (bottom mapping, plankton collections, exploration of contaminant & disease pathways, etc.)
The Survey Team

Jim Gartland
Jameson Gregg
Chris Bonzek
Rob Latour
Gregg Mears
Deb Gauthier
Jimmy Ruhle
Evan McOmber
Melanie Chattin
Kevin Spanik
Jeff Eckert
Bobby Ruhle
Dustin Gregg
Cameron Ward
Black Sea Bass
NEAMAP
Black Sea Bass Distribution - 2012
NEAMAP
Black Sea Bass Abundance Indices

Spring Index: All Ages
- Index by Number
- Index by Biomass

Fall Index: All Ages
- Index by Number
- Index by Biomass
Bluefish
NEAMAP
Bluefish Distribution - 2012

SPRING 2012

FALL 2012
Scup
NEAMAP Scup Distribution - 2012

**Spring 2012**

**Fall 2012**
Spiny Dogfish
NEAMAP
Sp. Dogfish Abundance Indices

Spring Index: All Ages
- Index by Number
- Index by Biomass

Fall Index: All Ages
- Index by Number
- Index by Biomass

Survey Year
Geometric Mean Numerical Index

Table:
- States: DE, MD, VA, NC, NJ
- Regions: 00, 10-20, 30-40, 50-60, 70-80
- Depth Strata: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80

Survey Year
Geometric Mean Biomass Index

14.00
12.00
Summer Flounder
NEAMAP
Summer Flounder Distribution - 2012

Spring 2012

FALL 2012

Total Biomass (kg)

Region Boundaries

Depth Strata (ft)

0 - 5
5 - 10
10 - 20
20 - 30
30 - 100
No Catch

20 - 40
40 - 60
60 - 90
90 +

Kilometers

0 15 30 60 90 120

Atlantic Ocean