Assessing the Chesapeake Bay Forage Base:
Existing Data and Research Priorities

Scientific and Technical Advisory Committee Workshop

Solomons, MD

12 - 13 November 2014
What Managed Predators Should Be Our Focus?

What Forage Species Are Most Vital to Consider / Manage?

The Existing Data

Chris Bonzek, VIMS
Field and Lab Staffs for ChesMMAP, CHESFIMS, VIMS Trawl
Tom Ihde, NOAA
# Data Sources

## Surveys:

<table>
<thead>
<tr>
<th>Program</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>ChesMMAP</td>
<td>• Chesapeake Bay Multispecies Monitoring and Assessment Program</td>
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<tr>
<td>CHESFIMS</td>
<td>• Chesapeake Bay Fishery Independent Monitoring Survey</td>
</tr>
<tr>
<td>VIMS Trawl/CTILS</td>
<td>• Chesapeake Trophic Interactions Laboratory Services</td>
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</table>
ChesMMAP:

- 2002 - Present (Ongoing)
- Bottom Trawl Survey
- Design: Random Stratified
- Targets Late-Juvenile-to-Adult Fishes
- Bay Main-Stem (Baltimore to Bay Mouth)
- Five Cruises per Year (Mar-May-Jul-Sep-Nov)
- ~80 Stations per Cruise
- Counts-Biomass-Lengths-Sex-Maturity-Age-Diets (Nearly all species encountered)
Data Sources

CHESFIMS:

- 2001 - 2006
- Midwater Trawl Survey
- Design: Combination Random/ Fixed
- Primarily Juvenile Fishes
- Bay Main-Stem (Baltimore to Bay Mouth)
- Three Cruises per Year (Spring - Summer - Fall)
- ~40 Stations per Cruise
- Counts-Biomass-Lengths-Sex-Maturity-Age-Diets (Selected Species)
Data Sources

VIMS Trawl / CTILS:

- VIMS Trawl: 1955-Present
  CTILS: 2003-2007
- Bottom Trawl Survey
- Design: Random Stratified
- Primarily Juvenile Fishes
- Bay Main-Stem and Major Rivers
  CTILS Samples From the Rivers Only
- Twelve Cruises per Year
- ~110 Stations per Cruise
- Counts-Lengths
Representative Species / Summaries

Species:

Baywide Piscivores:
- Summer Flounder
- Striped Bass

Baywide Benthic Feeder:
- Atlantic Croaker

Upper Bay Species:
- White Perch

Lower Bay Species:
- Clearnose Skate

Analyses Presented:

Length Frequencies & Catch Maps
- By Survey if Available

Diets: All Data Pooled
- By Survey if Available

Diets: Annual Variability
- ChesMMAP Only

Diets: By Size/Age
- By Survey if Available

Diets: Upper v. Lower Bay
- ChesMMAP Only

Diets: Variability of Main Forage
- ChesMMAP Only
Summer Flounder

ChesMMAP

VIMS Trawl / CTILS
Summer Flounder
All Years/Months/Regions/Sizes
Summer Flounder
Annual Variability

By Year & Major Taxa

- Fishes
- Crustaceans
- Molluscs
- Worms
- Misc.

Summer Flounder
Annual Variability

By Year & Major Taxa

- Fishes
- Crustaceans
- Molluscs
- Worms
- Misc.


Graph showing the annual variability of Summer Flounder by major taxa from 2002 to 2012.
Summer Flounder - Size/Age Variability

Small (~Age-0)

ChesMMAP

Ages 0 n = 1498

- crustaceans (52.3%)
- fishes (44.0%)
- worms (0.1%)
- misc. (1.4%)
- molluscs (2.2%)

VIMS Trawl / CTILS

Fluke (<=250mm) n = 594

- crustaceans (50.0%)
- fishes (46.9%)
- worms (0.4%)
- misc. (0.4%)
- molluscs (0.2%)
Summer Flounder - Size/Age Variability

Small (~Age-0)

<table>
<thead>
<tr>
<th>Prey Species</th>
<th>Percent (by weight)</th>
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<tbody>
<tr>
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<td>Mysid shrimp</td>
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<td>Crustacea</td>
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<td>B. insculpta</td>
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<td>B. chrysostoma</td>
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</tr>
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Large (~Age-1 and older)

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VIMS Trawl / CTILS

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<th>Percent (by weight)</th>
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VIMS Trawl / CTILS

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<th>Prey Species</th>
<th>Percent (by weight)</th>
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<td>Crustacea</td>
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<tr>
<td>B. insculpta</td>
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<tr>
<td>B. chrysostoma</td>
<td>1.7</td>
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<tr>
<td>B. chrysostoma</td>
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<tr>
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<tr>
<td>B. chrysostoma</td>
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Forage Groups that Compose > 5% of Summer Flounder Diet in any Sample (ChesMMAP only)
Forage Groups that Compose > 5% of Summer Flounder Diet in any Sample (ChesMMAP only)

- Bay anchovy
- Mysids
- Sand shrimp
- Weakfish
- Spot
- Mantis shrimp
- Spotted hake
- Atl. croaker
Striped Bass
All Years/Months/Regions/Sizes

ChesMMAP
(no cluster)

Overall n = 2996

VIMS Trawl

Overall n = 691

CHESFIMS

Overall n = 79
Striped Bass
Annual Variability (ChesMMAP Only)
Striped Bass
Annual Variability (ChesMMAP Only)
Striped Bass - By Size/Age

These Surveys Do Not Lend Themselves to This Analysis for This Species
Striped Bass
Upper Bay v. Lower Bay (Proxy for Salinity)
Forage Groups that Compose > 5% of Striped Bass Diet in any Sample
(ChesMMAP only)
Forage Groups that Compose > 5% of Striped Bass Diet in any Sample (ChesMMAP only)

- Bay anchovy
- Mysids
- Nereis spp.
- Menhaden
- Polychaetes
- Amphipods & isopods
- Weakfish
- Spot
Atlantic Croaker

ChesMMAP

Total Length (cm)

Total Length (cm)

Total Length (cm)

VIMS Trawl / CTILS

Frequency

Frequency

Frequency
Atlantic Croaker
Annual Variability (ChesMMAP Only)
Atlantic Croaker Annual Variability (ChesMMAP Only)
Atlantic Croaker - By Size/Age

Small (~Age-0)

**CHESFIMS**

- Croaker (<=150mm) n = 16
- Percent by weight:
  - crustaceans (42.8%)
  - fishes (5.5%)
  - worms (44.0%)
  - misc. (9.2%)
  - molluscs (0.1%)

**VIMS Trawl / CTILS**

- Croaker (<=150mm) n = 1433
- Percent by weight:
  - crustaceans (50.6%)
  - fishes (4.5%)
  - worms (19.5%)
  - misc. (14.8%)
  - molluscs (14.9%)

**CMMAP**

- Age 0 n = 707
- Percent by weight:
  - crustaceans (25.9%)
  - fishes (3.7%)
  - worms (39.4%)
  - misc. (26.0%)
  - molluscs (10.0%)
Atlantic Croaker - By Size/Age

Small (~Age-0)

Large (~Age-1 and older)
Atlantic Croaker
Upper Bay v. Lower Bay (Proxy for Salinity)

Maryland n = 516

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Virginia n = 2879

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<td>other</td>
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<td>Forage Groups</td>
<td>Percentage of Diet</td>
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<td>10</td>
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<td>11</td>
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</table>

Forage Groups that Compose > 5% of Atlantic Croaker Diet in any Sample (ChesMMAP only)
Forage Groups that Compose > 5% of Atlantic Croaker Diet in any Sample (ChesMMAP only)

- Polychaetes
- Trumpet worm
- Mysids
- Nereis spp.
- Bloodworms
- Mantis shrimp
- Razor clams
- Amphipods
- Bay anchovy
White Perch

ChesMMAP

Frequency

Fork Length (cm)

0 0 6 8 10 12 14 16 18 20 22 24 26 28 30

10000
8000
6000
4000
2000
0

CHESFIMS

Frequency

Fork Length (cm)

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

1200
1000
800
600
400
200
0
White Perch
All Years/Months/Regions/Sizes

CHESFIMS

Overall n = 2034

Percent (by weight)

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<th>Overall n = 2034</th>
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<td>fishes (5.0%)</td>
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<td>worms (24.1%)</td>
<td>3.5</td>
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<td>molluscs (15.0%)</td>
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Prey Species

CHESFIMS

White Perch n = 775

Percent (by weight)

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<td>worms (14.7%)</td>
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<tr>
<td>molluscs (13.1%)</td>
<td>14.7</td>
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<tr>
<td>unid. material</td>
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<td>unid. material</td>
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Prey Species
White Perch
ChesMMAP - Annual Variability

By Year & Major Taxa

- Fishes
- Crustaceans
- Molluscs
- Worms
- Misc.
White Perch
ChesMMAP - Annual Variability

By Year & Major Taxa

- Fishes
- Crustaceans
- Molluscs
- Worms
- Misc.

Graph showing annual variability of major taxa over years 2002 to 2012.
White Perch - By Size/Age

**White Perch (<=110mm) n = 46**

- Chesfims: 43.2%
- Crustaceans: 39.6%
- Worms: 13.2%
- Miscellaneous: 1.9%

**White Perch (>110mm) n = 729**

- Crustaceans: 50.1%
- Fishes: 14.6%
- Worms: 13.1%
- Bivalves: 11.0%
- Bay anchovy: 3.6%
- Miscellaneous: 1.8%
- Animal organic matter: 4.5%
Forage Groups that Compose > 5% of White Perch Diet in any Sample (ChesMMAP only)
Forage Groups that Compose > 5% of White Perch Diet in any Sample (ChesMMAP only)

- Amphipods
- Polychaetes
- Nereis spp.
- Macoma spp.
- Isopods & copepods
- Mud crabs
- Bay anchovy
Clearnose Skate
ChesMMAP Only
Clearnose Skate
ChesMMAP - All Years/Months/Regions/Sizes

Overall n = 929

Percent (by weight)

- Crustaceans (41.8%)
- Fishes (39.4%)
- Worms (0.1%)
- Misc. (1.4%)
- Molluscs (17.4%)

Prey Species:
- Lady crab
- Mantis shrimp
- Crustaceans - other
- Atlantic rock crab
- Crab parts
- Spider crabs
- Right-handed hermit crab
- Roughneck shrimp
- Fishes - other
- Atlantic croaker
- Weakfish
- Blackback tonguefish
- Spot
- Kingfishes
- Hogchoker
- Flounders
- Northern kingfish
- Razor clams
- Jackknife clams
- Tagus clams
- Molluscs - meat
- Molluscs - other
- Misc. - other
- Worms - other

Percent by weight:
- Lady crab: 10.8%
- Mantis shrimp: 6.9%
- Crustaceans - other: 6.1%
- Atlantic rock crab: 5.4%
- Crab parts: 3.5%
- Spider crabs: 3.3%
- Right-handed hermit crab: 1.9%
- Roughneck shrimp: 1.5%
- Fishes - other: 1.4%
- Atlantic croaker: 1.0%
- Weakfish: 0.85%
- Blackback tonguefish: 0.85%
- Spot: 0.82%
- Kingfishes: 0.82%
- Hogchoker: 0.82%
- Flounders: 0.82%
- Northern kingfish: 0.82%
- Razor clams: 0.62%
- Jackknife clams: 0.49%
- Tagus clams: 0.43%
- Molluscs - meat: 0.10%
- Molluscs - other: 0.10%
- Misc. - other: 0.14%
- Worms - other: 0.01%
Clearnose Skate
ChesMMAP - Annual Variability

By Year & Major Taxa

- Fishes
- Crustaceans
- Molluscs
- Worms
- Misc.
Clearnose Skate
ChesMMAP - Annual Variability

By Year & Major Taxa

- Fishes
- Crustaceans
- Molluscs
- Worms
- Misc.

Forage Groups that Compose > 5% of Clearnosed Skate Diet in any Sample (ChesMMAP only)
Forage Groups that Compose > 5% of Clearnosed Skate Diet in any Sample (ChesMMAP only)

- Lady crab
- Mantis shrimp
- Sand shrimp
- Atl. Croaker
- Atl. Rock crab
- Razor clams
- Tagelus clams
- Blackcheek tonguefish
- Atl. Jackknife clam
- Spot
- Weakfish
- Kingfish
- Flounder
Soooooo…..What’s Important?
Representative Species / Summaries (ChesMMap)

Species:

Baywide Piscivores:
- Summer Flounder
- Striped Bass

Baywide Benthic Feeder:
- Atlantic Croaker

Upper Bay Species:
- White Perch

Lower Bay Species:
- Clearnose Skate

Summer Flounder:
- Bay anchovy
- Mysids
- Sand shrimp
- Weakfish
- Spot
- Mantis shrimp

Striped Bass:
- Bay anchovy
- Mysids
- Nereis spp.
- Menhaden
- Polychaetes
- Amphipods & isopods
- Weakfish
- Spot

Atlantic Croaker:
- Polychaetes
- Trumpet worm
- Mysids
- Nereis spp.
- Bloodworms
- Mantis shrimp
- Razor clams
- Amphipods
- Bay anchovy

White Perch:
- Amphipods
- Polychaetes
- Nereis spp.
- Macoma spp.
- Isopods & copepods
- Mud crabs

Clearnose Skate:
- Lady crab
- Mantis shrimp
- Sand shrimp
- Atl. Croaker
- Atl. Rock crab
- Razor clams
- Tagelus clams

- Blackcheek tonguefish
- Alt. Jackknife clam
- Spot
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## Representative Species / Summaries

### Species:

#### Baywide Piscivores:
- **Summer Flounder**
- **Striped Bass**

#### Baywide Benthic Feeder:
- **Atlantic Croaker**

#### Upper Bay Species:
- **White Perch**

#### Lower Bay Species:
- **Clearnose Skate**

### Summer Flounder:
- Bay anchovy
- Mysids
- Sand shrimp
- Weakfish
- Spot
- Mantis shrimp
- Spotted hake
- Atl. croaker

### Striped Bass:
- Bay anchovy
- Nereis spp.
- Weakfish
- Mysids
- Menhaden
- Spot
- Polychaetes
- Amphipods & isopods
- Spot
- Polychaetes

### Atlantic Croaker:
- Polychaetes
- Nereis spp.
- Razor clams
- Amphipods
- Bay anchovy
- Bloodworms
- Mantis shrimp
- Atlantic Rock crab
- Blackcheek tonguefish
- Alt. Jackknife clam

### White Perch:
- Amphipods
- Polychaetes
- Mysids
- Nereis spp.
- Macoma spp.
- Isopods & copepods
- Mud crabs

### Clearnose Skate:
- Lady crab
- Mantis shrimp
- Sand shrimp
- Atl. Croaker
- Atl. Rock crab
- Razor clams
- Tagelus clams
- Blackcheek tonguefish
- Alt. Jackknife clam
- Spot
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- Polychaetes
- Nereis spp.
- Razor clams
- Amphipods
- Bay anchovy

### White Perch:
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- Mysids
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