



Collection of Literature on Chesapeake Bay Forage Species

STAC Forage Workshop – November 12, 2014

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Chesapeake Research Consortium

Purpose

- Understand state of knowledge on Chesapeake Bay forage species and their interactions with predators and the ecosystem
- Determine scope of recent and past research
- Identify relevant case studies from other ecosystems/regions

Organization

- I. Predator-Prey Interactions
- II. Predator Diet Studies
- III. Forage Production
- IV. Environmental Impacts
- V. Harvest and Managed Species
- VI. Ecosystem-based Fisheries Management
- VII. Management Case Studies

**Major observations and takeaways
from each section...**

I. Predator–Prey Interactions

- Menhaden is the primary prey item of focus.
- Striped bass, weakfish, and bluefish are primary piscivore predators of focus.
- Recent studies model the effects of changes in forage populations on the rest of the food web.
- Importance of quantifying predation mortality in forage assessments.
- Importance of habitat and predation levels on densities of benthic prey

II. Predator Diet Studies

- Depth of study on striped bass diets
 - Recent investigations of striped bass nutrition and forage availability
- Focus on endangered species and economically important species
- Importance of forage availability and value in seabird diets
- Value of diet data over broad spatial and temporal scales

III. Forage Production

- Importance of physical/environmental factors on forage production and growth
- Influence of prey availability on forage species distribution
- Depth of study on bay anchovy and Atlantic menhaden population dynamics

IV. Environmental Impacts

- Water Quality
 - Complex responses dependent on species life stage
 - Low DO impacts on benthic habitats/species
- Climate Change
 - Temperature and flow changes can shift juvenile assemblages
 - Loss of nursery and forage habitat
- Habitat
 - Anthropogenic threats to important habitats

V. Harvest and Managed Species

- Data available include stock status, harvest levels, bycatch, stock projections etc.
 - Comprehensive stock assessments
- Evaluation of tradeoffs between the direct harvest value and indirect value as prey for predator species
- Management tools



Photo Credit: ASMFC

VI. Ecosystem-based Fisheries Management

- Species-specific analyses in Chesapeake Bay
- Importance of indicators to track ecosystem and forage health
- Incorporate both managed and unmanaged forage species in ecosystem-based management frameworks
- Sensitivity of forage species to environmental changes
- Emphasis on understanding predator-prey interactions

VII. Management Case Studies

- Regional examples of strategies to formally consider unmanaged forage species and predation-prey interactions in management frameworks



Final document

- Add literature throughout and after the workshop before posting

Purpose: Demonstrate the scope of the current knowledge on Chesapeake Bay forage species, their predators, and management approaches, including examples from other ecosystems/regions



Available Data on Chesapeake Bay Forage Species

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Purpose

- Identify current monitoring and data collection for Chesapeake Bay forage species and associated predator-prey interactions
- Understand current data availability and limitations

Organization

- I. Diet Analysis
- II. Abundance Data
- III. Habitat Data

I. Diet Analysis

Trawl surveys and stomach content analysis (VIMS)

- Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAAP)
 - >39,000 stomachs sampled
- Northeast Area Monitoring and Assessment Program (NEAMAP)
 - >44,000 stomachs sampled
- Both predator and prey perspective



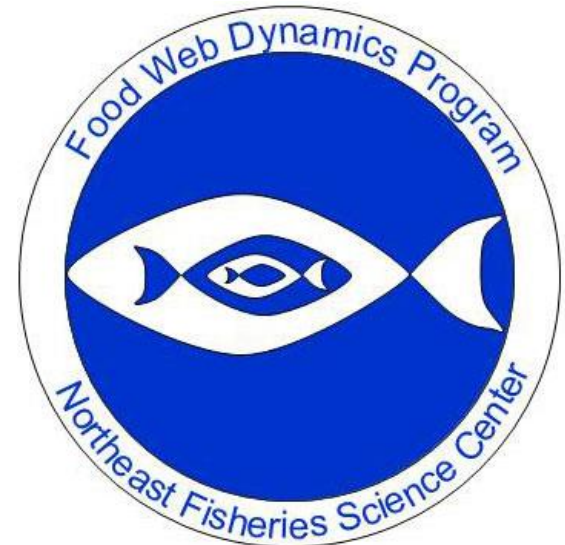
I. Diet Analysis

CHESFIMS

- Focused on juvenile fish

Trawl surveys and stomach content analysis (NOAA)

- NEFSC Bottom Trawl Survey Program
 - >550,000 stomachs sampled
 - Atlantic continental shelf



I. Diet Analysis

- Striped Bass Nutrition and Forage Availability Benchmarks (MD DNR)
 - Striped bass health data and gut content analysis to develop nutritional targets and thresholds
- Extended Multispecies Virtual Population Analysis (MSVPA-X) Model
 - Menhaden and primary predators (striped bass, weakfish, bluefish)
 - Annual estimates of predation rates at age for menhaden

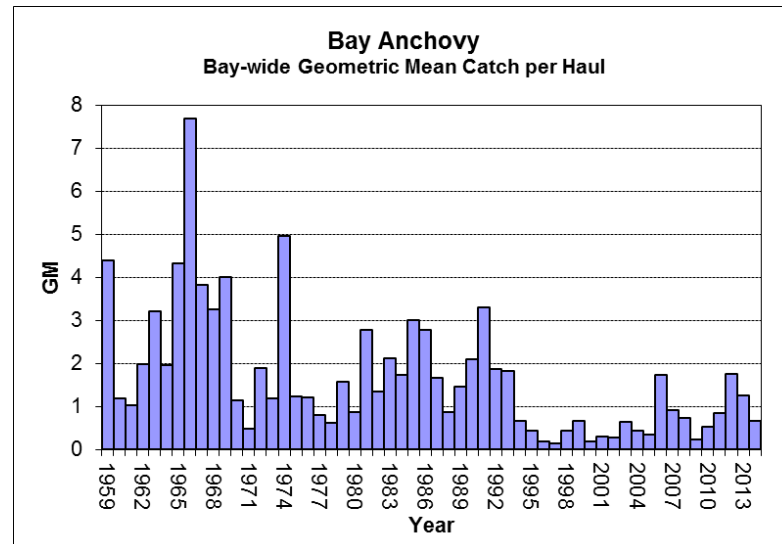
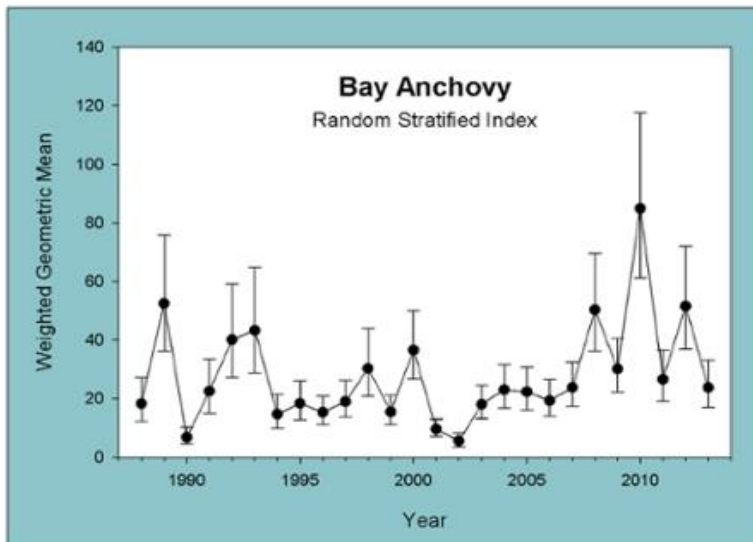


II. Abundance Data

YOY Abundance Surveys

- Annual indices of relative abundance for YOY fish species
 - Maryland Juvenile Striped Bass Survey (MD DNR)
 - Juvenile Fish and Blue Crab Trawl Survey (VIMS)
 - Predator and prey species

Virginia



Maryland

II. Abundance Data

Managed Species

- ASMFC Species Stock Assessments
 - Abundance/biomass estimates - stock status
 - Natural and fishing mortality estimates
- Potomac River Fisheries Commission Menhaden Pound Net Index
 - CPUE (lbs/net-days fished)

II. Abundance Data

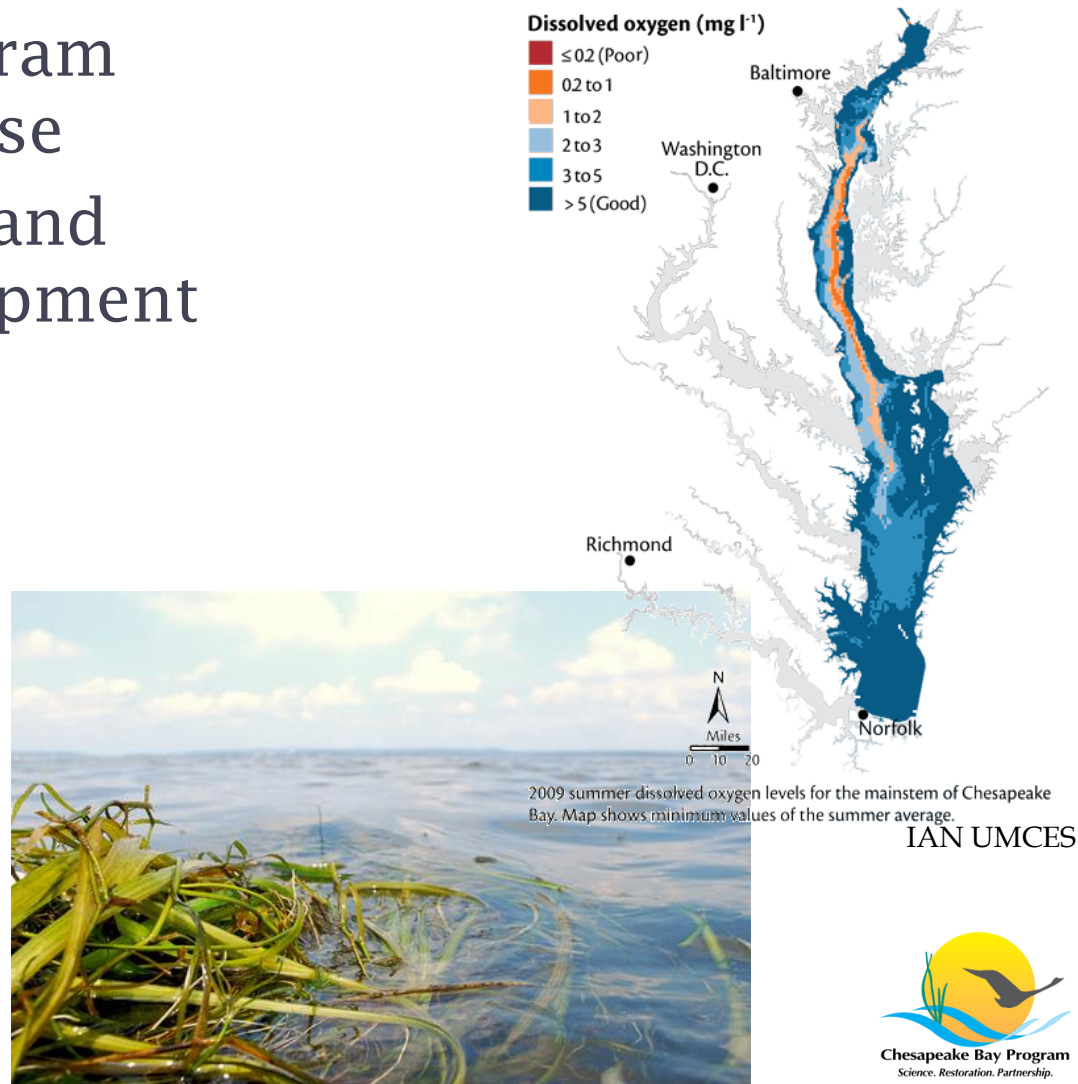
Baywide Benthic Database (CBP)

- Maryland and Virginia Benthic Count, Biomass, and Bottom Water Analyses Surveys

| PROJECT | PROJECT DESCRIPTION | START DATE | END DATE |
|----------|---|----------------------------|----------------------------|
| ANSP-LTB | MARYLAND LONG TERM BENTHIC MONITORING PROGRAM-ACADEMY OF NATURAL SCIENCES COMPONENT | 03/15/1977 | 12/10/1980 |
| CBL-LTB | MARYLAND LONG TERM BENTHIC MONITORING PROGRAM-CHESAPEAKE BIOLOGICAL LABORATORY COMPONENT | 06/18/1971 | 05/17/1977 |
| EMAP/VA | EPA EMAP VIRGINIAN PROVINCE SURVEY | 07/20/1990 | 09/18/1993 |
| ERDA-LTB | MARYLAND LONG TERM BENTHIC MONITORING PROGRAM-US ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION | 08/17/1971 | 10/26/1977 |
| MAIA | EPA MID-ATLANTIC INTEGRATED ASSESSMENT | 07/26/1997 | 08/29/1998 |
| MD/CBP | MARYLAND LONG-TERM CHESAPEAKE BAY BENTHIC MONITORING PROGRAM | 07/23/1984 | 09/26/2013 |
| MMES-LTB | MARYLAND LONG TERM BENTHIC MONITORING PROGRAM- MARTIN MARIETTA ENVIRONMENTAL SERVICES COMPONENT | 08/12/1976 | 06/20/1984 |
| NTS_CB | NOAA NATIONAL STATUS AND TRENDS PROGRAM-CHESAPEAKE BAY PROJECT | 08/24/1998 | 09/19/2001 |
| VA/CBAY | VIRGINIA DEQ COASTAL BAY MONITORING | 07/06/2005 | 08/11/2005 |
| VA/CBP | VIRGINIA LONG-TERM CHESAPEAKE BAY BENTHIC MONITORING PROGRAM | 03/12/1985 | 09/24/2013 |
| VA/EPMP | VADEQ ESTUARINE PROBABILISTIC MONITORING PROGRAM | 07/05/2007 | 09/24/2013 |
| VA/HIST | VIRGINIA HISTORIC DATA RECOVERY PROJECT | 02/11/1975 | 09/30/1981 |

III. Habitat Data

- Chesapeake Bay Program Water Quality Database
- Influence of upland land use/shoreline development on nearshore benthic infauna and fish communities
- SAV distribution and abundance



Final document

- Add additional data sources and finalize before posting

Purpose: Identify and understand current monitoring efforts and data availability for Chesapeake Bay forage species including diet analyses of their predators.