Forage fish monitoring and management by the ASMFC

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Atlantic States Marine Fisheries Commission

STAC Forage Workshop

November 12-13, 2014

Outline

- Current approaches to monitoring and assessing forage fish
- Future of forage fish management at the ASMFC
- Data and research needs

Atlantic States Marine Fisheries Commission

- 15 states from Maine->Florida, PRFC, DC, NMFS, USFWS
- 0->3 miles offshore
- Interstate management of over 25 nearshore migratory fish or species groups, including…

Atlantic States Marine Fisheries Commission

- Atlantic menhaden
- Atlantic herring
- Shad and river herring (alewife and blueback herring)
- Others:
  - Spot
  - Atlantic croaker
  - Scup
  - American eel
  - Spanish mackerel
  - Northern shrimp
  - American lobster

Atlantic States Marine Fisheries Commission

- Atlantic striped bass
- Bluefish
- Weakfish
- Summer flounder
- Black drum
- Black sea bass
- Smooth and spiny dogfish

Past/Present

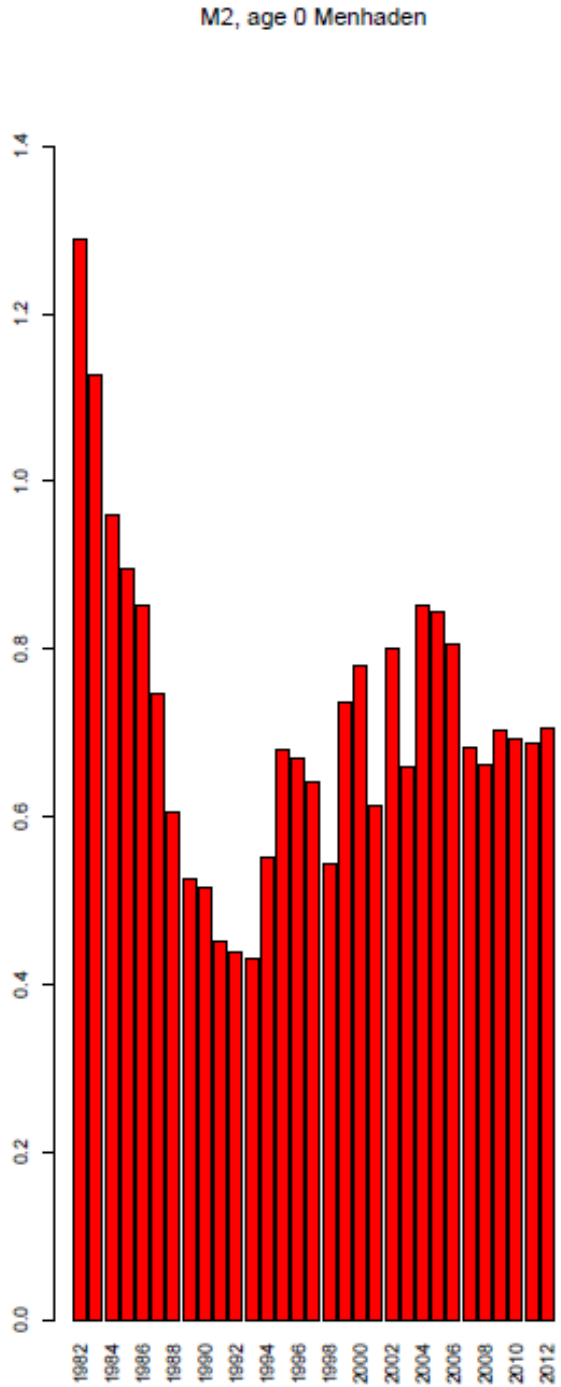
- Single species assessments for most managed forage species
- Visit: www.asmfc.org

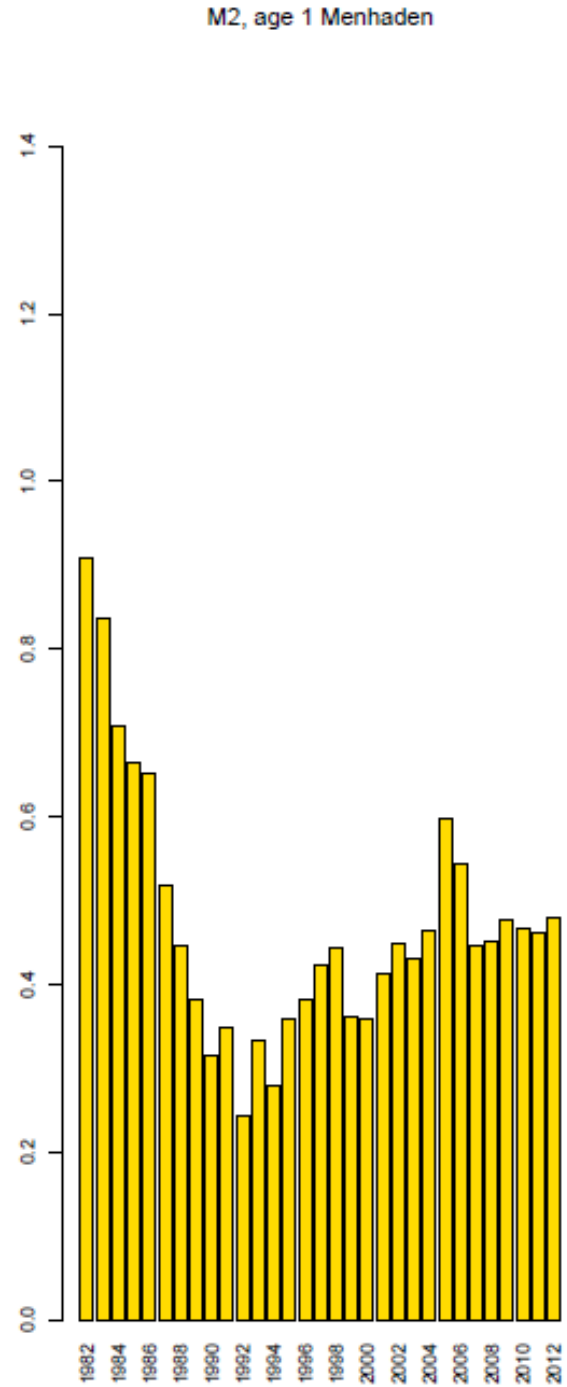
Past/Present

- Multispecies Virtual Population Analysis (MSVPA)
  - Reviewed in 2006 (SARC 42)
  - Garrison et al. 2010 ICESJMS
- Goal: to “support fisheries management decisions made in a multispecies context”
- Focused on menhaden, striped bass, bluefish, weakfish
- Additional alternate prey biomass trends included
- Spans North Carolina (Cape Hatteras) to Gulf of Maine
- Considers age-specific, spatial and seasonal overlap of pred/prey
- Prey preferences informed by diet data, literature
- Updated in 2008, 2010, 2012, and 2014

Past/Present

- MSVPA produced matrix of annual natural mortality-at-age estimates for input into our 2003, 2004, 2010, 2012 single species menhaden assessment models


M2, age 0 Menhaden
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012


M2, age 1 Menhaden
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
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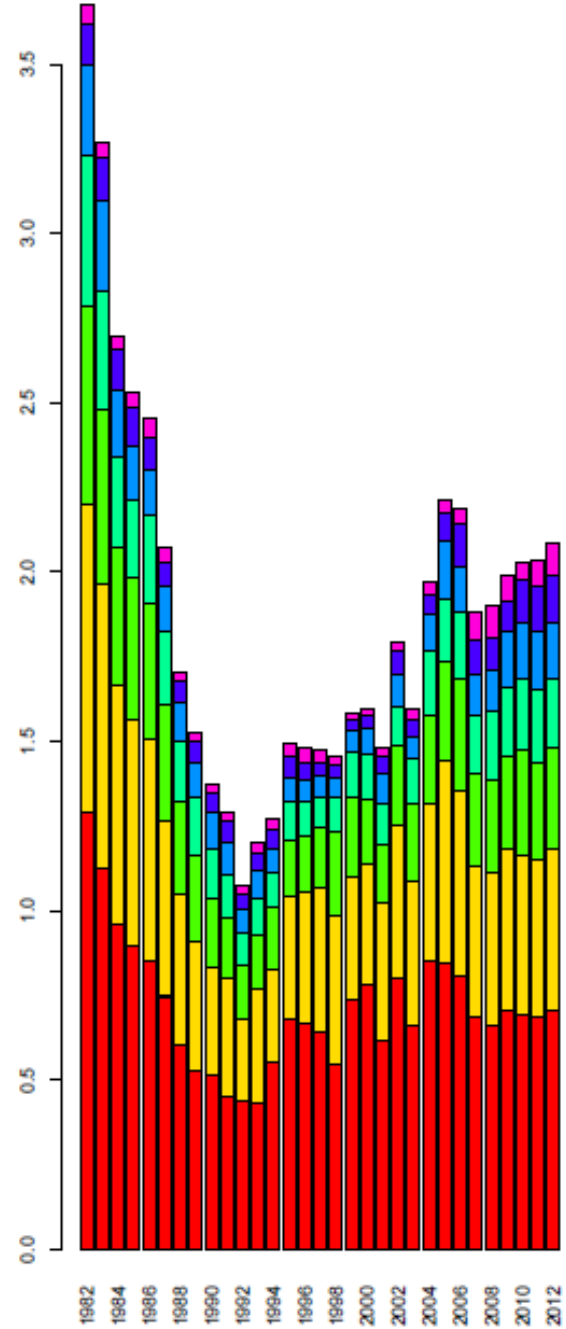
2004
2006
2008
2010
2012


M2 all ages, by age
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012

Past/Present

- MSVPA produced matrix of annual natural mortality-at-age estimates for input into our 2003, 2004, 2010, 2012 single species menhaden assessment models
- Time-varying M matrix included in alternate run of 2014 menhaden assessment

Present/Future

- Atlantic menhaden Technical Committee tasked with developing Ecological Reference Points (ERPs) for Atlantic menhaden that “account for predation”
- Report for peer review will be available in December here:
  - http://www.sefsc.noaa.gov/sedar/
  - Click on SEDAR 40 – Atlantic menhaden
- Will be presented to Management Board in February 2015
- Preview of contents…

ERP report – technical approaches

- Annual EBFM monitoring report
  - Coast/range-wide environmental indicators
  - Important forage and predator trends
  - Predator/prey ratios (potential ERPs)
- Predator nutrition reference points
- Management strategy evaluation of forage services reference points for Atlantic menhaden
- Multimodel comparison and evaluation
  - Production models
  - Multispecies Statistical Catch-at-Age (MSSCAA)
  - Ecopath with Ecosim (EwE)

ERP report – other recommendations

- Goal-setting workshops
- Development of a framework for review and implementation of ERPs

Data and research needs

- Diet data
  - Diet database: over 500 diet composition records assembled from 28 unique data sources, representing over 42,000 individual stomach samples
- Nutrition data
- Biomass trend estimates for alternate prey items

Number of Diet Studies

Striped Bass

R	S	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13+
GM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GM	2	0	1	1	2	2	2	1	1	1	1	1	1	1	1
GM	3	0	1	2	3	3	3	3	3	3	3	3	3	3	3
GM	4	0	0	1	2	2	2	1	1	1	1	1	1	1	1
NE	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2
NE	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2
NE	3	0	0	1	2	2	2	2	2	2	2	2	2	2	2
NE	4	1	0	1	1	1	1	1	1	1	1	1	1	1	1
MA	1	1	1	2	3	3	3	3	3	3	3	3	3	3	3
MA	2	1	2	2	1	1	1	1	1	2	1	2	2	2	2
MA	3	0	0	1	2	2	2	2	2	2	2	2	2	2	1
MA	4	0	0	1	3	3	3	4	3	3	3	3	4	4	3
CB	1	0	3	4	5	6	6	5	4	4	4	4	4	4	3
CB	2	1	3	4	4	5	5	4	3	3	3	3	3	3	2
CB	3	2	3	3	3	3	3	2	1	2	2	2	2	1	2
CB	4	2	3	4	5	6	6	5	4	4	4	4	4	4	3
NC	1	0	1	3	4	4	4	4	4	4	4	4	4	4	3
NC	2	0	1	2	2	2	2	2	2	2	2	2	2	2	1
NC	3	1	1	1	1	1	1	1	1	1	1	1	1	1	0
NC	4	1	1	1	1	1	1	1	1	1	1	1	1	1	0

Bluefish

R	S	S	M	L
GM	1	0	0	0
GM	2	0	0	0
GM	3	1	2	2
GM	4	1	1	1
NE	1	0	0	0
NE	2	2	2	2
NE	3	7	4	4
NE	4	3	2	2
MA	1	0	0	0
MA	2	5	3	1
MA	3	8	4	3
MA	4	5	4	2
CB	1	0	0	0
CB	2	3	2	0
CB	3	3	3	1
CB	4	3	2	1
NC	1	1	1	2
NC	2	2	1	1
NC	3	2	2	2
NC	4	2	2	1

Weakfish

R	S	A0	A1	A2	A3	A4	A5	A6+
GM	1	0	0	0	0	0	0	0
GM	2	0	0	0	0	0	0	0
GM	3	0	0	0	0	1	1	1
GM	4	0	0	0	0	1	1	1
NE	1	0	0	0	0	0	0	0
NE	2	0	1	1	0	0	0	0
NE	3	3	3	3	2	2	2	2
NE	4	1	1	1	1	1	1	1
MA	1	1	1	1	1	1	1	1
MA	2	1	3	3	3	2	2	2
MA	3	4	3	3	3	3	3	3
MA	4	3	3	3	3	2	2	2
CB	1	0	1	1	1	1	1	0
CB	2	2	1	1	1	1	0	0
CB	3	3	3	3	2	2	1	1
CB	4	3	3	3	2	2	2	2
NC	1	2	3	3	3	3	2	2
NC	2	2	3	3	2	2	1	1
NC	3	3	3	3	3	3	2	2
NC	4	3	3	3	3	2	1	1

Data and research needs

- Diet data
  - Diet database: over 500 diet composition records assembled from 28 unique data sources, representing over 42,000 individual stomach samples
- Nutrition data
- Biomass trend estimates for alternate prey items

- Genny Nesslage (gnesslage@asmfc.org)
- Shanna Madsen (smadsen@asmfc.org)

Number of Stomachs Sampled

Striped Bass

R	S	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13+
GM	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GM	2	0	357	451	2068	2068	1974	1177	938	938	974	617	617	617	153
GM	3	0	357	476	2093	2093	1999	1255	1016	1016	1052	695	695	695	206
GM	4	0	0	25	822	822	822	77	77	77	77	77	77	77	52
NE	1	817	4	44	44	40	40	43	43	43	43	43	43	43	3
NE	2	817	4	45	45	46	59	67	52	57	45	46	41	45	6
NE	3	0	0	52	53	54	71	106	109	102	96	96	95	95	47
NE	4	813	0	52	52	52	52	93	93	93	93	93	93	93	41
MA	1	18	18	308	725	707	707	859	859	859	859	859	859	859	569
MA	2	18	19	306	305	287	287	435	435	436	435	436	436	436	153
MA	3	0	0	3	14	14	14	14	14	14	14	14	14	14	11
MA	4	0	0	3	457	457	457	458	457	457	457	457	458	459	456
CB	1	0	438	476	1031	744	679	563	526	455	449	458	443	443	445
CB	2	41	376	374	348	408	357	198	143	92	88	87	85	84	83
CB	3	156	293	379	239	127	113	40	16	9	12	8	8	5	6
CB	4	140	379	2664	2891	3003	3003	2864	2821	2702	2699	2696	2694	2694	2693
NC	1	0	1094	1115	1123	1138	1243	1444	1271	1309	1252	1273	1288	1243	137
NC	2	0	1094	1114	1114	1114	1114	1184	1184	1184	1184	1184	1184	1184	70
NC	3	467	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	0
NC	4	467	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	0

Bluefish

R	S	S	M	L
GM	1	0	0	0
GM	2	0	0	0
GM	3	13	329	462
GM	4	13	323	437
NE	1	0	0	0
NE	2	783	130	126
NE	3	2680	1091	665
NE	4	1096	944	609
MA	1	0	0	0
MA	2	2079	1359	4
MA	3	3536	2915	366
MA	4	2638	2863	390
CB	1	0	0	0
CB	2	212	33	0
CB	3	1085	45	1
CB	4	735	14	1
NC	1	16	40	35
NC	2	29	40	34
NC	3	313	351	38
NC	4	337	310	37

Weakfish

R	S	A0	A1	A2	A3	A4	A5	A6+
GM	1	0	0	0	0	0	0	0
GM	2	0	0	0	0	0	0	0
GM	3	0	0	0	0	3	3	3
GM	4	0	0	0	0	3	3	3
NE	1	0	0	0	0	0	0	0
NE	2	0	1	4	0	0	0	0
NE	3	499	608	549	222	307	307	307
NE	4	259	478	478	219	306	306	306
MA	1	2	14	14	12	14	14	14
MA	2	2	354	169	64	57	15	15
MA	3	1547	2589	2599	1162	1200	955	955
MA	4	2108	2857	2568	1053	1076	1001	1001
CB	1	0	1	4	9	3	1	0
CB	2	13	549	267	83	11	0	0
CB	3	941	1164	522	80	9	2	2
CB	4	1157	454	415	58	11	7	3
NC	1	914	997	997	900	907	90	90
NC	2	914	1073	1008	897	903	86	86
NC	3	1275	1461	1461	1003	1004	187	187
NC	4	1411	1485	1441	986	984	167	167