American Shad Sustainable Fishery Plan Update 2017-2021

Prepared by the Delaware River Basin Fish and Wildlife Management Cooperative

Plan Summary

- The 2017 plan represents the 5-year update to the original Co-op plan approved in 2012 in response to Amendment 3 of the ASMFC Shad and River Herring IFMP
- This plan covers the entire Delaware River Basin contained within New York, New Jersey, Pennsylvania, and Delaware
- Co-op member states and organizations conduct multiple juvenile and adult fishery dependent and independent surveys and data collection efforts to develop yearly indices of abundance
- These indices are used to establish management benchmarks, triggers, and measures to maintain sustainable levels of harvest as approved in the 2012 Plan
- **Definition of Sustainability**
  - The Co-op judge these fisheries as sustainable while avoiding diminishing potential stock reproduction and recruitment as long as all five indices of stock condition remain within the defined benchmarks

Current Stock Status

- The Co-op considers the Delaware River Basin American Shad Stock to be at low but stable levels
- A combination of fishery dependent and independent surveys are used to develop yearly indices to track trends in adult and juvenile abundance

Survey	Index Units	Time Series Avg.	Ten Year Avg.	Since 2012 SFP Implementation
Smithfield Beach Gillnet Spawning Adult Collection	shad/net-ft-hr *10,000	**60.7** (1990-2015)	**46.6**	**57.7**
Tidal Juvenile Abundance Seine Survey	Geometric Mean Shad/haul	**7.07** (1987-2015)	**8.25**	**12.10**
Non-tidal Juvenile Abundance Seine Survey	GLM Shad/haul	**204.49** (1980-2007, 2012-2015)	**184.05**	**177.05**
Commercial Reporting	Lbs/year	**~165,000** (1985-2015)	**~50,000**	**~51,000***

*2014 saw an exceptionally high harvest of Delaware River Basin Stock Shad due to a switch to a smaller mesh size by Delaware commercial fishermen in an attempt to catch smaller, more abundant striped bass. The average not including 2014 landings has been ~27,000 lbs

Management Benchmarks and Triggers

Index	Benchmark Value	Years of Index for Benchmark	Benchmark Level	Management Trigger
Non-Tidal JAI (GLM of Big 3)	145.9	1988-2015	25th percentile	3 consecutive years below benchmark
Tidal JAI (GM)	4.00	1987-2015	25th percentile	3 consecutive years below benchmark
Smithfield Beach CPUE Index	37.5	1990-2015	25th percentile	3 consecutive years below benchmark
Ratio of Comm. Harvest to Smithfield Beach	36.5	1990-2015	85th percentile	3 consecutive years above benchmark
Mixed Stock Landings	47,650 lbs	1985-2015	75th percentile	2 consecutive years above benchmark

*No management actions were required during the tenure of the 2012 Plan

Harvest Restrictions

- Recreational
  - New York, Pennsylvania, New Jersey
    - Year long season, 3 American shad per day, no size limit
  - Delaware
    - Year long season, Up to 10 American shad per day, no size limit
- Commercial
  - New Jersey (Directed Fishery)
    - Limited entry shad permits with limited transferability, area restrictions with permits
    - Gear restrictions
  - Delaware (By-catch Fishery)
    - No shad specific restrictions
      - Area, gear, and time of year restrictions are associated with the striped bass fishery
    - Limited entry gill net licenses

Management Actions

- **If either JAI benchmark is exceeded**:
  - Option 1: closure of commercial fishery; recreational catch and release only
  - Option 2: reduce commercial fishery by 50% through gear restrictions, seasons, trip limits, or quota reduction; reduce recreational fishery to 1 fish bag limit
  - Option 3: reduce commercial fishery by 25% through gear restrictions, seasons, trip limits, or quota reduction; reduce recreational fishery to 2 fish bag limit

- **If the Smithfield Beach adult CPUE benchmark is exceeded**:
  - Option 1: closure of commercial fishery; recreational catch and release only
  - Option 2: reduce commercial fishery by 50% through gear restrictions, seasons, trip limits, or quota reduction; reduce recreational fishery to 1 fish bag limit
  - Option 3: reduce commercial fishery by 25% through gear restrictions, seasons, trip limits, or quota reduction; reduce recreational fishery to 2 fish bag limit

Management Actions

- **If both the tidal JAI and Smithfield Beach adult benchmarks are exceeded**:
  - Option 1: closure of commercial fishery; recreational catch and release only
  - Option 2: reduce commercial fishery by 50% through gear restrictions, seasons, trip limits, or quota reduction; reduce recreational fishery to 1 fish bag limit
- **If the harvest to Smithfield Beach adult CPUE ratio benchmark is exceeded**:
  - Option 1: closure of commercial fishery; recreational catch and release only
  - Option 2: reduce commercial fishery by 50% through gear restrictions, seasons, trip limits, or quota reduction; reduce recreational fishery to 1 fish bag limit
  - Option 3: reduce commercial fishery by 25% through gear restrictions, seasons, trip limits, or quota reduction; reduce recreational fishery to 2 fish bag limit
- **If the mixed stock landings benchmark is exceeded**:
  - Option 1: Gill nets with stretch mesh greater than or equal to 4 inches and less than 7 inches will be prohibited below the mixed stock demarcation line during February 1st through May 31st. Harvest of American Shad as bycatch (American Shad < 50% of harvest by weight) is still permissible below the demarcation line from Bowers Beach, DE to Gandys Beach, NJ

Changes From Previous Plan

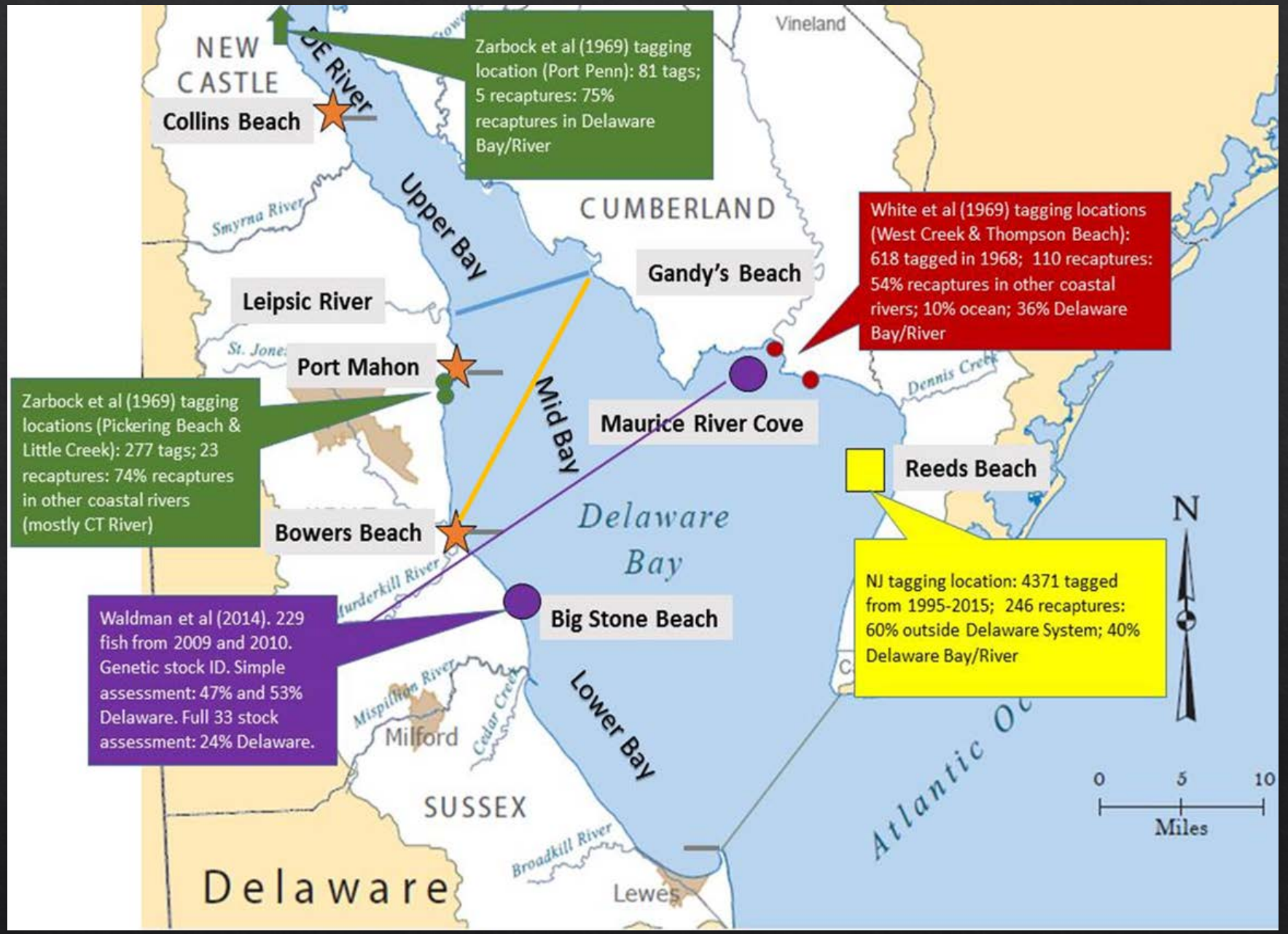
- The Non-tidal Juvenile Abundance Index will now be calculated using annual catch data standardized by environmental covariates using GLM methodology.
  - Only data originating from Phillipsburg, Delaware Water Gap, and Milford Beach (Big 3) are included in the JAI.
  - In the previous plan the index was calculated as a geometric mean based on catch data that also included the Trenton sampling site
  - A geometric mean will continue to be reported yearly as required by Amendment 3 but any management action will be based on the GLM Index
- A mixed stock management benchmark has been added to the plan
  - This new management benchmark was added in response to concerns that out of basin shad stocks are being harvested in Lower Delaware Bay
  - The development of the benchmark required determining a delimitation line for Upper and Lower Delaware Bay and assigning stock percentages based on that line
  - It imposes limits on the amount of shad that can be harvested from the mixed stock fishery and imposes gear restrictions in the lower bay if management actions are warranted

New Mixed Stock Benchmark

- The 2012 Plan acknowledged that a mixed stock fishery is being executed in the lower bay and is a source of mortality for out of basin shad
- A demarcation line from Leipsic River, DE to Gandys Beach, NJ was established. Landings above this line are considered to be 100% Delaware River American Shad stock and landings below were of mixed stock, with an estimated 40% of Delaware origin

- Upon further examination of reporting regions in the State of Delaware, it was determined that the four reporting regions (River, Upper Bay, Mid Bay and Lower Bay) do not allow for landings to be divided at the Leipsic River.
- A new line had to be selected that corresponded with Delaware's reporting region and percentages appropriating Delaware stock vs mixed stock to the commercial landings
- The Co-op Policy Committee selected Bowers Beach as the delineation between upper bay and lower bow and decided to assign 40% percent of commercial landings to Delaware stock for any shad harvested in the lower bay

  - The new line was proposed based on tag returns from shad tagged in the lower bay and its proximity to a 2014 genetics study (Waldman et al.) 6 miles downbay at Big Stone Beach, DE


NEW CASTLE
DE River
Collins Beach
Zarbock et al (1969) tagging location (Port Penn): 81 tags; 5 recaptures: 75% recaptures in Delaware Bay/River
Vineland
Upper Bay
Smyrna River
CUMBERLAND
Gandy's Beach
White et al (1969) tagging locations (West Creek & Thompson Beach): 618 tagged in 1968; 110 recaptures: 54% recaptures in other coastal rivers; 10% ocean; 36% Delaware Bay/River
Leipsic River
St. Jones
Port Mahon
Mid Bay
Dennis Creek
Maurice River Cove
Zarbock et al (1969) tagging locations (Pickering Beach & Little Creek): 277 tags; 23 recaptures: 74% recaptures in other coastal rivers (mostly CT River)
Reeds Beach
Bowers Beach
Delaware Bay
Murderkill River
NJ tagging location: 4371 tagged from 1995-2015; 246 recaptures: 60% outside Delaware System; 40% Delaware Bay/River
Waldman et al (2014). 229 fish from 2009 and 2010. Genetic stock ID. Simple assessment: 47% and 53% Delaware. Full 33 stock assessment: 24% Delaware.
Big Stone Beach
Mispillion River
Cedar Creek
Milford
Lower Bay
N
SUSSEX
Broadkill River
Atlantic Oc
0 5 10
Miles
Delaware
Lewes

TC Discussion

- The TC could not come to a consensus regarding a recommendation to the Board.
- Several members recommended moving the mixed stock demarcation point (on the Delaware coast) from the Leipsic River to Port Mahon (2 miles south), not Bower's Beach.
  - If this recommendation is approved, then the TC can evaluate the impact of moving the demarcation further south (to Bower's Beach) when more information about the mixed stock becomes available (e.g., after the results of a 2017 Delaware Bay genetic study are published).

TC Concerns

- Could expand effort on the mixed stock fishery, given some shad that were previously in the mixed stock portion of the Bay would now be deemed 100% Delaware River stock if the proposed line is approved.
- The mixed stock landing benchmark is artificially high because it is derived from landings that stretch back to the eighties when harvest exceeded 100,000 lbs.
- The plan says low market values have caused a decline in landings, but Figure 41 suggests the price of shad is increasing. If price were to continue to increase it could lead to unsustainable harvest.
- Why was Bower's Beach chosen as the new Delaware demarcation point instead of Port Mahon.
- Acknowledgement of ocean bycatch in federal waters, combined with very little information on shad mixed stocks, were a concern.
- A new Delaware Bay genetic study is scheduled to begin in 2017, the TC could review the results of this study to make a more informed decision.

Maine Department of Marine Resources

Maine Municipal River Herring Harvest

Regulations:

- ✓ One fixed harvest location allowed per commercial run. Harvest can only occur within the trap area and only one harvest operation is permitted per run.
- ✓ No directed coastal fisheries for river herring.
- ✓ Required to purchase a Pelagic License to harvest river herring.

Commercial season:

- ✓ Season starts when fish arrive in the tributaries and ends June 5th.
- ✓ Harvest allowed only four days per week or conservation equivalent.
- ✓ Harvesters must collect biological samples.
- ✓ Mandatory harvest reporting by August 1 of each year.

Recreational Season:

- ✓ Year round with 25 fish per day limit. No fishing in watersheds above locations where exclusive commercial fishing rights are granted.

Brief Status of the River Herring Stocks

- Increased survival for the Androscoggin and Sebasticook river stocks since last river herring assessment (2008).
- Increasing trends in run size for rivers analyzed during the 2008 river herring assessment, for the 2017 river herring assessment (Androscoggin, Damariscotta and Sebasticook rivers) and most commercial runs.
- Stable maximum age for alewife and blueback herring compared to historical data. River herring as old as 9-years in Maine's commercial fisheries.
- Stable mean length at age for fisheries independent data collected from the Androscoggin River.

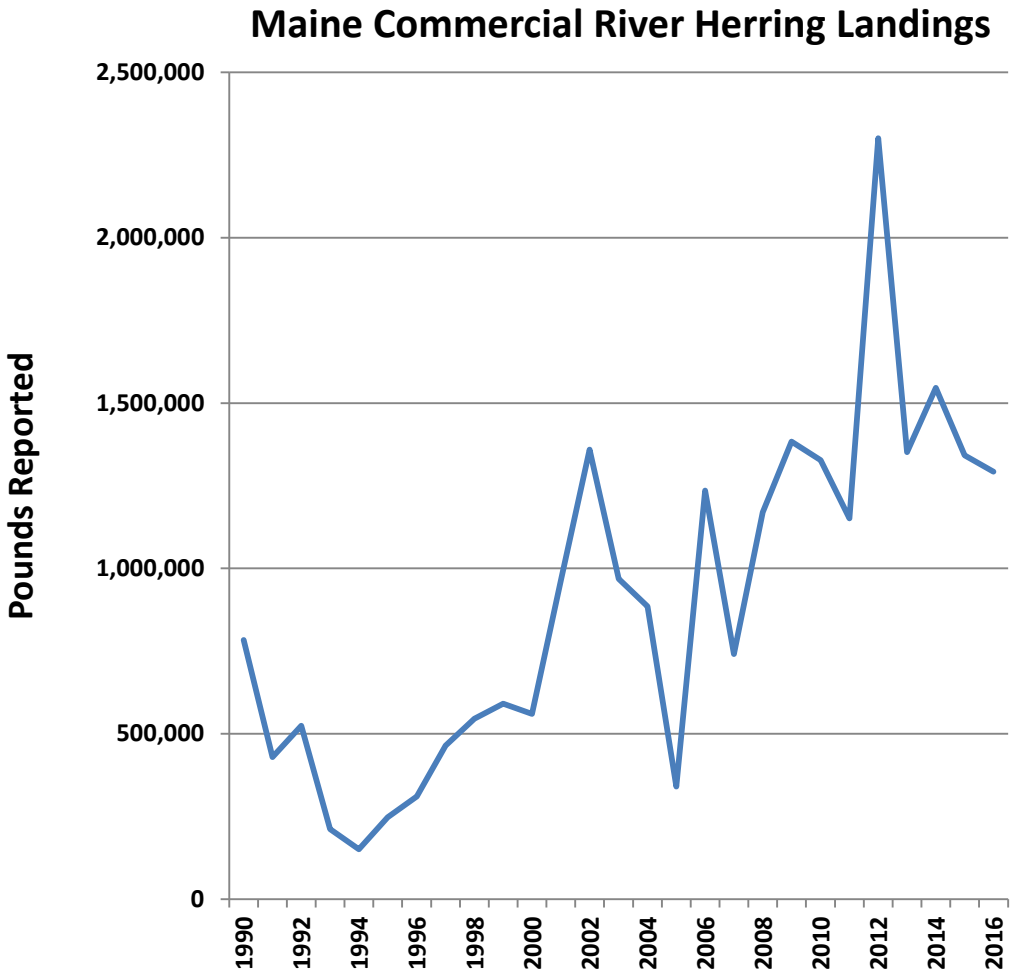
Trends in Maine's Commercial River Herring Harvest

1) Increased run size in the majority of Maine's commercial river herring fisheries since 1990.

2) Addition of a commercial run in the Town of Franklin.

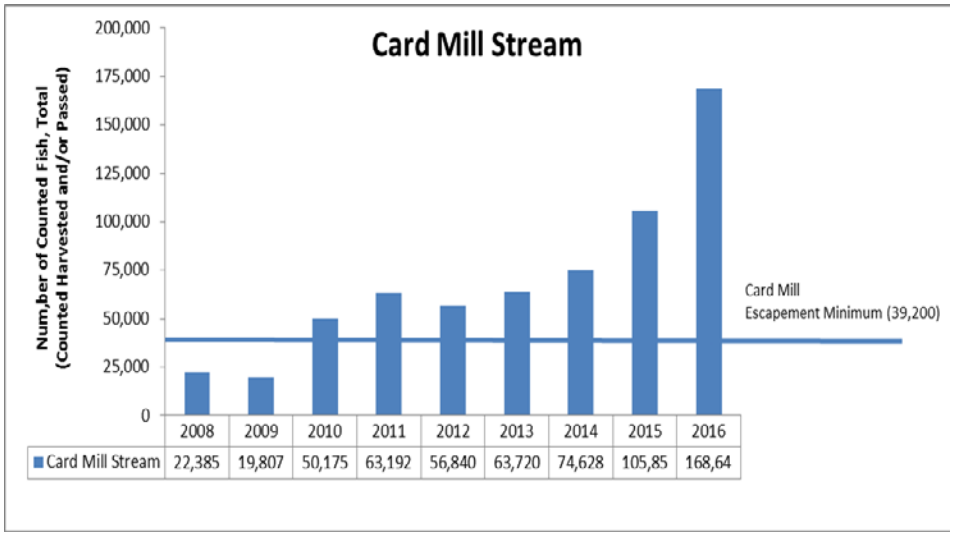
3) Stable mortality estimates for Maine's commercial fisheries.

4) Observing less harvest for resale and more harvest for personal use.



Justification to Add a Commercial Fishery in the Town of Franklin

- ✓ The Card Mill Stream commercial fishery was closed in 2012 due to lack of biological data required by ASMFC.
- ✓ Eight years of data collection indicate that run counts since 2010 are above the escapement threshold.
- ✓ Declining mortality estimates for alewives of both sexes (increased survival).
- ✓ Increased numbers of older fish in the population.



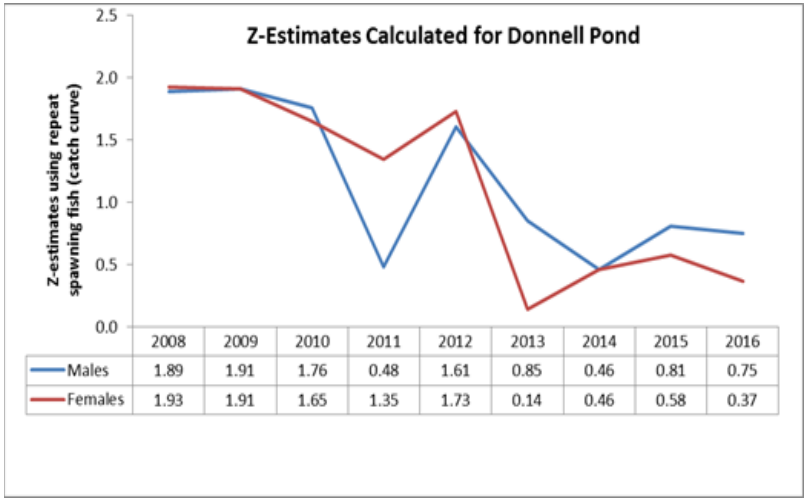


Table 3. Proportion at Each Age for Card Mill Stream/Donnell Pond

	Age-3	Age-4	Age-5	Age-6	Age-7+
Card Mill Stream					
2008	23.0%	63.0%	11.0%	3.0%	
2009	14.8%	70.4%	14.8%		
2010	2.5%	82.3%	12.7%	2.5%	
2011	3.5%	71.2%	25.4%		
2012		87.6%	11.1%	1.4%	
2013	4.4%	21.6%	66.1%	7.9%	
2014	9.0%	40.0%	7.0%	41.0%	3.0%
2015	8.5%	53.2%	21.3%	4.3%	12.8%
2016	1.0%	36.0%	48.0%	12.0%	3.0%
Mean	**8.3%**	**58.4%**	**24.2%**	**10.3%**	**6.3%**

Sustainability Definition and Sustainability Threshold for Maine's Commercial Fisheries

From Maine's 2010 Approved SFMP:

- **Sustainability Definition** - The number of alewife broodstock needed per surface area of spawning habitat in Maine to provide alewife populations capable of sustaining annual alewife runs at current levels while providing surplus broodstock for harvest or increasing run size in the future.

- **Sustainability Threshold -** The sustainability threshold will provide an escapement number equal to 35-fish per surface acre of spawning habitat. This plan will achieve escapements numbers through passage counts above commercial fisheries, closed fishing days, season length, gear restrictions or continuous escapement.

Data Collection to Support Sustainability Targets

The Department of Marine Resources reviews all commercial harvest plans on an annual basis. Biological data are collected from 19 commercial runs and 14 noncommercial runs statewide. Prior to approving a commercial harvest plan the following data analysis are conducted and results reviewed for each location.

- Calculate and review repeat spawning rates, annual mortality and escapement estimates for each commercial fishery.
- Review age structure and length frequency data where available.
- Conduct run counts at fisheries dependent and fisheries independent sites.
- Review environmental conditions and effects on commercial and noncommercial runs.
- Maintain commercial harvest time series.

Management Triggers and Management Actions

All Maine directed commercial river herring runs operate under a 72-hour closed period or conservation equivalent. The Maine Department of Marine Resources will extend closed periods, modify conservation equivalencies or close fisheries that cannot sustain existing commercial fisheries or meet the 35 fish per acre threshold.

- Additional management review and/or changes will occur based on decreasing trends in running three-year averages of annual landings, increasing time series trends in total mortality (z), and trends in repeat spawning rates for fishery dependent and fishery independent sites.

- Fisheries staff will review harvest and age data collected from annual returns to assess the need to increase the number of closed days in the fishery. Due to the variability of river herring runs in Maine under stable stocking rates, run size, and age class structure are expected to exhibit wide swings in annual values.

- The management objective is to ensure that the commercial fisheries maintain a minimum (35 fish/acre) spawning stock threshold into the future. A commercial fishery that does not meet the escapement threshold for that system will be required to close the following season and remain closed until the fishery meets the escapement threshold.

TC Recommendation

- The TC reviewed the revised SFMP, which includes a request to open the Card Mill Stream in the town of Franklin for commercial harvest.
- The TC recommends Board approval of the revised SFMP.
- Based on input from the TC, Maine will add a secondary sustainability threshold (repeat spawning ratio), as well as include biological sample sizes and evaluate suitable sample sizes for the next SFMP.

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

NY River Herring SFMP 2017

Stock Status

- Consistent spawning stock sampling since 2012
  - Mean length and mean length at age are increasing
  - Frequency of repeat spawning is increasing
  - Mortality estimates derived from age and repeat spawn data are stable or decreasing
- Regulation changes implemented in 2013
  - Reported commercial landings declined to roughly 50%
  - CPUEs increasing despite decline in effort

NEW YORK
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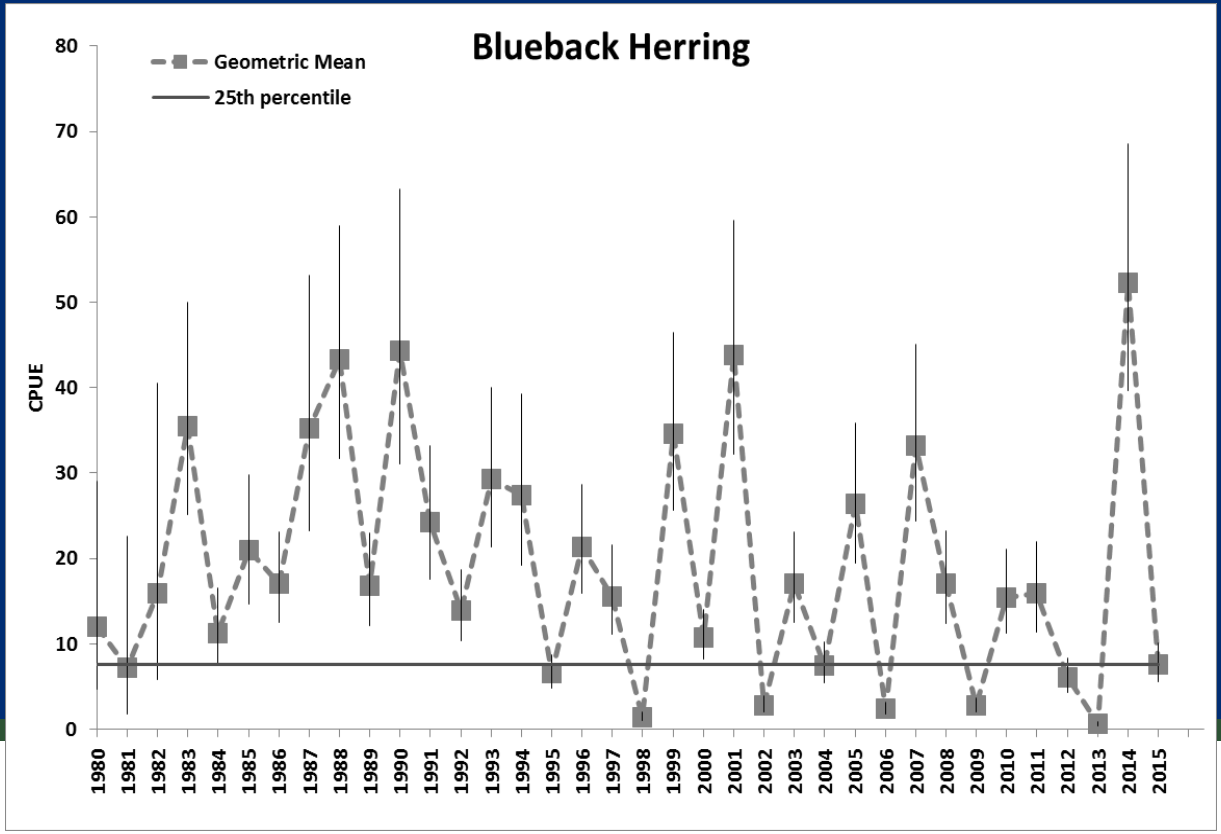

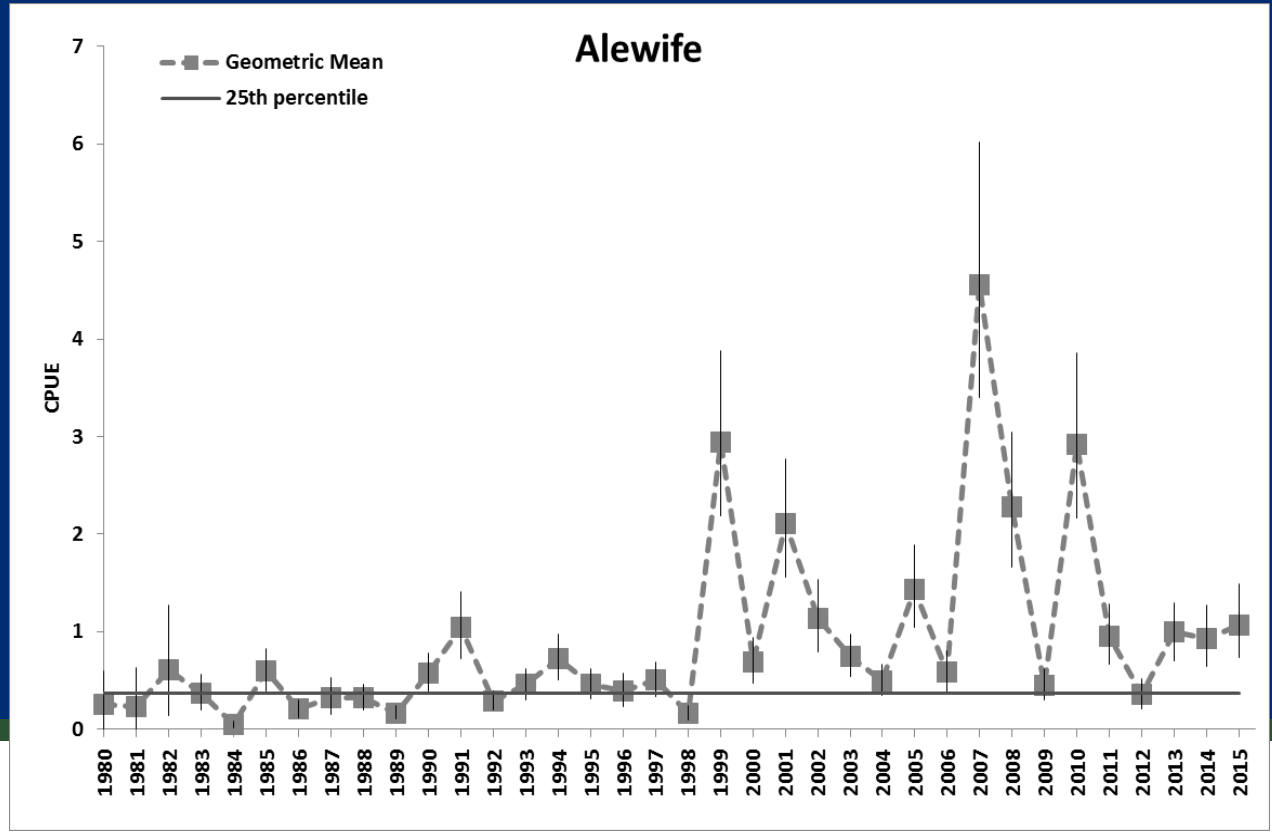

- YOY indices are erratic but no recruitment failure

Proposed Fishery 2017-2021

Status Quo

- Continuation of the following:
  - Restricted fishery in the main-stem Hudson
  - Regulations implemented in 2013
    - No nets in tributaries (including Mohawk River)
    - Gear size and area restrictions
    - 36 hour escapement period for all gears
    - Recreational possession limit of 10 fish per person
    - Moratorium in all other state waters

Proposed Sustainability Metrics

- Sustainability targets
  - Young-of-year indices
    - Recruitment failure: three consecutive years below the 25th percentile of the time series (1983-2015)
- Sustainability measures:
  - Mean length and mean length at age
  - Total mortality and frequency of repeat spawning
  - CPUE of commercial harvest
- Develop additional sustainability targets with a longer time series

Proposed Management Actions

- New York will take immediate management action following recruitment failure
- Potential management actions include but not limited to:
  - Area closures
  - Gear restrictions
  - Permit fee restructuring
- Corrective actions will remain in place until the juvenile index value is above the recruitment failure level for three consecutive years

TC Recommendation

- The TC reviewed the updated New York SFMP to harvest river herring in the Hudson River and some of its tributaries. The plan includes recent data and brings forward more restrictive management measures that were implemented in 2013. The sustainability benchmark remains unchanged from the 2012 SFMP.
- The TC recommends Board approval of the updated New York SFMP.