

Alewife Brook River Herring Monitoring – 2015 Pilot

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I. Background

Alewife Brook in Cape Elizabeth, Maine is a small coastal stream, approximately 1.2 miles long, that runs from Great Pond to Casco Bay. Alewife Brook's primary source is Great Pond, a 171 acre water body with a mean depth of four feet and a maximum depth of five feet (Maine DEP). Historic documents and anecdotes from local residents indicate that in past decades, the system has supported enough alewives (*Alosa pseudoharengus*) that local lobstermen harvested the anadromous fish during their annual migrations to Great Pond to spawn, for use as bait.



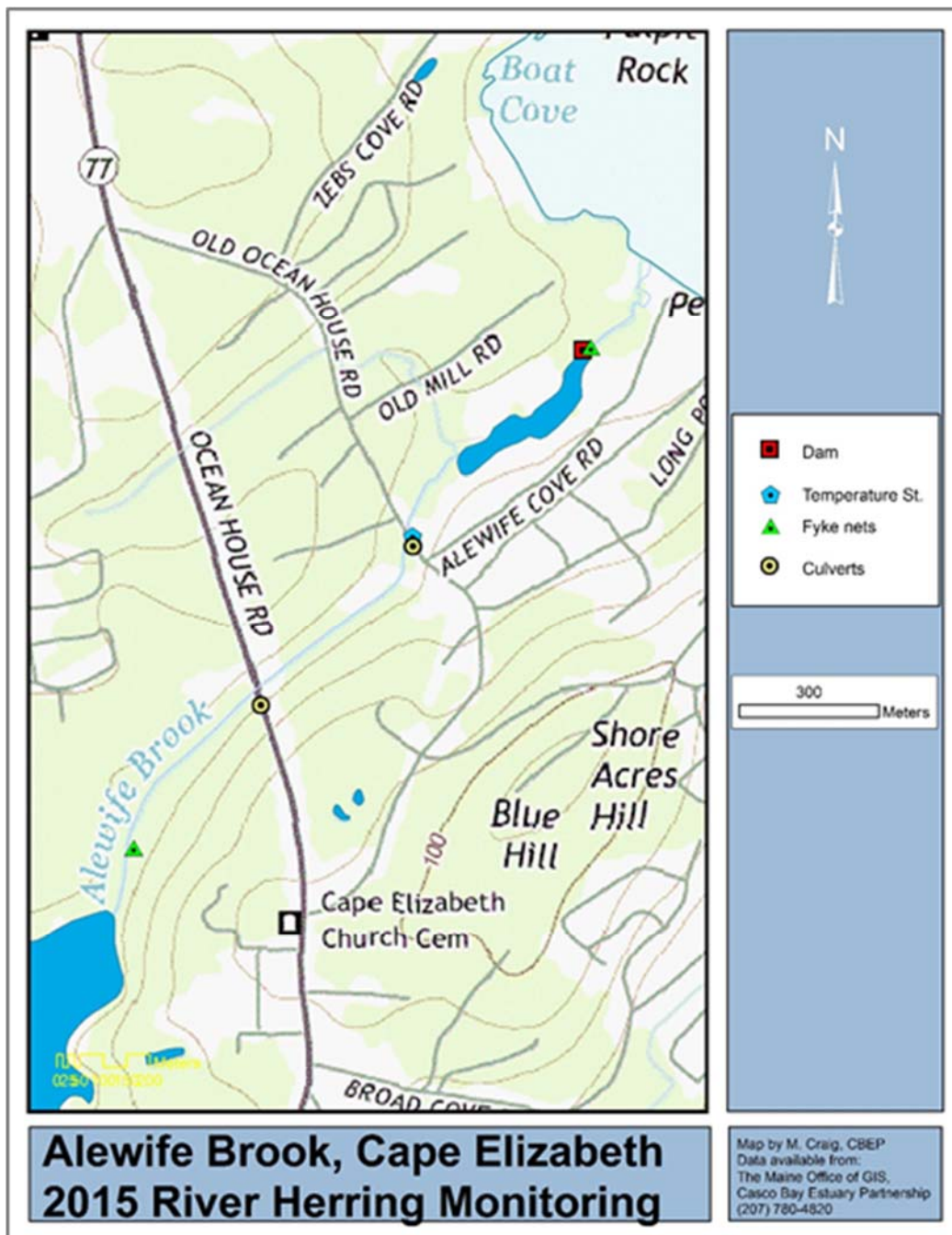
*River herring believed to be an alewife (*Alosa pseudoharengus*), netted in Alewife Brook.*

Although the alewife run has not been monitored consistently, and no records are available about the number of fish harvested historically, anecdotal reports from local residents suggest that the alewife run has decreased significantly, to the point where annual harvesting ceased years ago. In 2007, the Town of Cape Elizabeth and the Maine Department of Transportation modified existing culverts beneath Old Ocean House Road and Rt. 77 (Ocean House Road) with retrofits designed to improve fish passage beneath these two road crossings. For a year or two following these retrofits, the stream was monitored to determine effectiveness at passing alewife. Around this time, the alewife run was “seeded” by scientists at the Southern Maine Community College (SMCC) by transporting approximately 800 alewives into Great Pond from other runs in Maine over a span of multiple years. The alewife run was also periodically monitored by SMCC researchers but access to data was not available as of the date of this report.



Outlet of Alewife Brook beneath Old Ocean House Road.

In recent years local residents, resource agencies, researchers, town representatives and NGOs have expressed interest in continuing efforts to rebuild alewife returns. In the spring of 2015, a diverse group including representatives from the Town of Cape Elizabeth, Maine Department of Marine Resources (DMR), Casco Bay Estuary Partnership (CBEP), The Nature Conservancy (TNC), Maine Department of Transportation, Maine Department of Inland Fisheries and Wildlife, Stantec and interested citizens met with local landowners and visited several sections of the stream, including the reach from Casco Bay to Old Ocean House Road, the Route 77 crossing, and the outlet from Great Pond. These discussions revealed a shared interest in monitoring Alewife Brook for the presence of alewives. Later that spring, representatives from CBEP, TNC, and Maine DMR worked with volunteers to develop and implement a simple monitoring effort. All parties recognized that the results would be useful for identifying additional information needs, but that the monitoring was not likely to provide conclusive data about the status of the run or whether there were management responses that could increase returns. This report summarizes the results of 2015 monitoring activities.



Locations of monitoring activity.

II. Methods

Monitoring objectives were to: 1) determine whether river herring were currently utilizing the system; 2) collect information about which stream sections river herring were using; and 3) identify river herring species.

Monitoring was organized and conducted cooperatively by a ‘monitoring team’ that included Scarborough resident Dave Kesel, Cape Elizabeth resident and CBEP staff Matt Craig, and Portland resident Jon Kachmar. All were serving in a volunteer capacity for this effort. DMR biologist Claire Enterline provided guidance and permitting assistance. Chris Franklin of the Cape Elizabeth Land Trust assisted with sampling on one occasion. Permission to access the monitoring sites was provided by Alewife’s Brook Farm and the Sprague Corporation.

A special license was granted by Maine DMR for monitoring. Two methods were used to monitor fish: 1) setting fyke nets at pre-determined locations, and 2) visual counts/observations at various locations, sometimes wading the stream with dip nets.

Fyke nets

Two fyke nets were borrowed for this effort. Southern Maine Community College lent the team a black fyke net with a 2’ round opening and a single wing affixed to the center of the opening. Maine DMR provided a white fyke net with a 4’ x 4’ square opening and two 4’ tall wings that affixed to each side of the opening. With the exception of the initial deployment on May 2, in which the SMCC net was at the lower site, for the remainder of the monitoring period, the SMCC fyke net was deployed downstream of the outlet from Great Pond, and the DMR fyke net was deployed downstream of the dam near head of tide (map, previous page).



SMCC fyke net deployed at the upper site (view downstream).

Nets were set based on a 24:48 hour rotation, with a 24 hour soak time and 48 hours between the end of one set and the beginning of another, based on guidance provided by Maine DMR. Nets were arranged so that the opening was facing downstream in the thalweg, and the cod-end extended upstream. The nets and wings were affixed to the stream bottom with wooden stakes. Wings were arranged at an angle so as to guide fish into the net. A section of stream was left open beyond the end of the wings to enable fish passage moving downstream.

Nets were typically set by one individual between 7:00 – 8:00 AM, and pulled by one or two individuals 24 hours later. Fish were removed from the nets and immediately placed into five gallon buckets filled

with fresh water. Fish were counted, photographed, measured, and sexed as circumstances allowed. Scale samples were collected from a subset of the fish, with individual samples stored and labeled in separate envelopes provided by Maine DMR. Fish were immediately returned to the stream. Information was recorded on site specific data sheets (see appendix). At the end of the monitoring period, all scale samples were delivered to Maine DMR for species identification and aging.

Wading/dip nets

Visual counts/observations of river herring were recorded at several locations along the stream. Typically, these observations were associated with fyke net monitoring; for example, prior to setting or pulling a fyke net, an observer would walk along the adjacent stream bed or bank to check for the presence of fish. Monitors recorded observations at the base of the dam near head of tide, at the outlet of culverts beneath Old Ocean House Road, at the outlet of the culvert beneath Ocean House Road, and from the boardwalk near the outlet of Great Pond. Observations were recorded on site specific data sheets.

For the purposes of documenting all 2015 river herring observations in this report, this document includes the 5/2 observation of six fish below the dam. (The SMCC net was deployed for an undetermined length of time beginning in late April, and was pulled on May 2, downstream of the dam.) The 24:48 hour rotation, licensed by Maine DMR, began at the lower site on May 12, and for the upper site (outlet of Great Pond) on May 18. This rotation schedule continued until June 11.



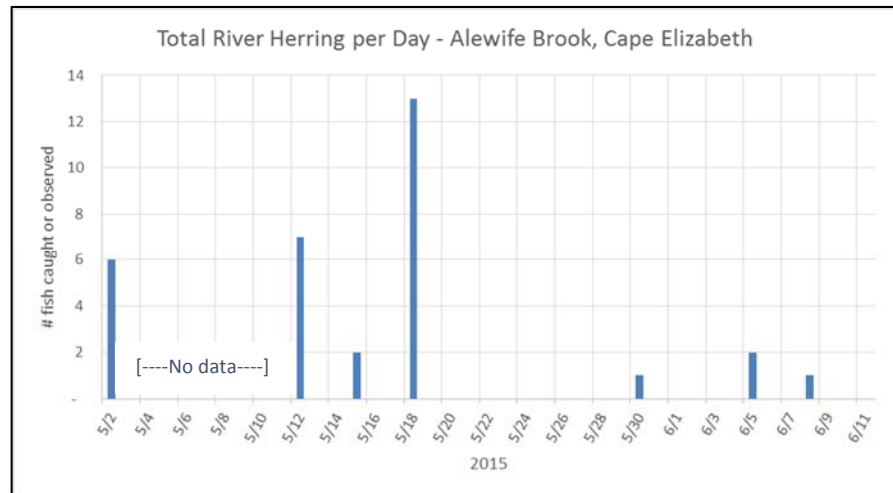
DMR fyke net deployed at the lower site (view upstream).

III. Results

A total of 32 river herring observations were recorded, with 28 observations occurring downstream of the dam, and 4 occurring upstream of the dam. Of the four upstream observations, 1 fish was observed immediately downstream of Old Ocean House Road, and the remaining 3 were observed near the Great Pond outlet.

Eleven river herring were found dead in the nets. Ten of these were snagged in the wings, (six of those were found on 5/2), and one fish died from what appeared to be a predation attempt. Scale samples were collected from 15 fish and mailed to DMR. Five river herring were positively identified as male, and four as female. The average length was 260 mm. The highest single monitoring count was 11 river herring on 5/18, at the lower site. See appendices for additional information.

Date	# fish below dam	# fish above dam	Total fish
5/2/2015	6	-	6
5/12/2015	7	-	7
5/15/2015	2	-	2
5/18/2015	11	2	13
5/19/2015	0	-	-
5/20/2015	0	-	-
5/21/2015	0	-	-
5/23/2015	0	-	-
5/24/2015	0	-	-
5/26/2015	0	-	-
5/27/2015	0	-	-
5/28/2015	0	-	-
5/30/2015	0	1	1
6/2/2015	0	-	-
6/5/2015	2	-	2
6/8/2015	0	1	1
6/11/2015	0	-	-
Sum	28	4	32



Other than snapping turtles, the only other species found in the fyke nets was a single pickerel, near the Great Pond outlet (below, not to scale).



River herring observed at the upper site.

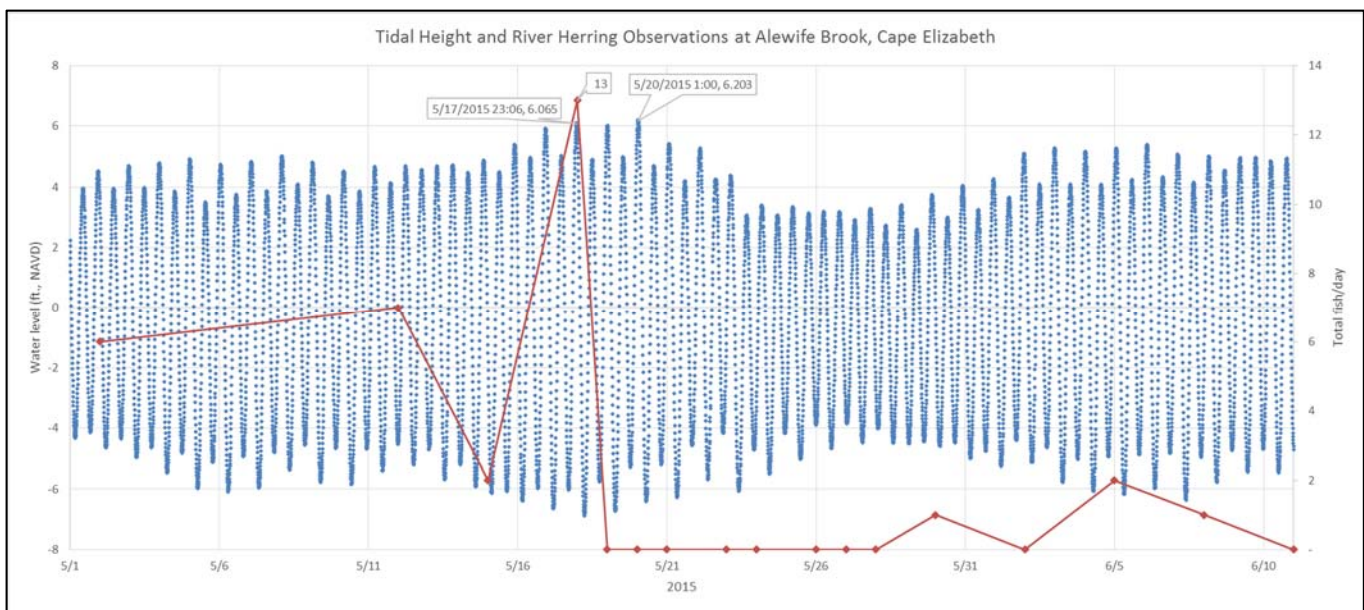


Pickerel observed at the upper site.

IV. Discussion

The monitoring results show that at least a small river herring population continues to utilize the Alewife Brook/Great Pond system, and that at least some of the fish are able to navigate the entire length of the stream to access Great Pond. The fish are presumed to be alewives but scale sample analysis by DMR would be necessary to confirm this. The difference in counts between the lower site (28 fish) and the upper site (4 fish) is worthy of further investigation, but cannot be explained by the 2015 data. Possible explanations include differences in methods (gear), fish passage issues at the dam or either of the two culverts, difficulty navigating the impoundment behind the dam, or predation. Another possibility may be that fish are spawning in the impoundment, with most not reaching the spawning habitat further upstream at Great Pond. Low water levels and the accompanying reduction in attractant flow also may have affected fish movement.

Comparison with water level data from the Portland Tide Gauge suggest that river herring movement into Alewife Brook may be associated with astronomic high tides (see graph, below), consistent with anecdotes from local residents that describe the migration as co-occurring with full moons. A year round temperature monitoring station was installed in July 2015, but the data do not overlap with the river herring monitoring data. Comparison with other variables, including rainfall and stream temperature data, are inconclusive due to the limited data but may be informative in future years.



In several locations along the eastern seaboard, including the closest alewife run into Highland Lake in Westbrook/Windham, alewife runs were significantly lower in 2015 than in prior years (although runs continue to increase at some systems in Downeast Maine). In the case of the Highland Lake run, 2015 run estimates were 20% (about 8,000 fish) of levels for 2013 and 2014 (nearly 50,000 fish, annually). Alewife runs are cyclical and generational, and additional monitoring would improve understanding of what a “typical” run might look like in Alewife Brook.

Based on the limitations of methods, the frequency and duration of the monitoring, input from DMR biologists, and the fact that this was a “pilot” year of monitoring, it would be premature to attempt to estimate the size of the total run for this system. Additional monitoring is recommended.

Several factors may have influenced monitoring results, including predation, low water levels/lack of rainfall, timing, and methods.

Predation

Snapping turtles were found in the nets on multiple occasions at both fyke net sites and had to be removed from the nets by hand, typically after cutting a hole in the net. Snapping turtles were also found in nearby stream sections, including on one occasion, a mating pair observed in the very narrow channel formed in the rocky beach at the coast. Bite marks on individual dead fish, and holes in the net, raise the question of whether the turtles were preying on fish while they were trapped in the net. Great blue herons were also observed in the vicinity of the fyke nets on multiple occasions.



Snapping turtles mating in Alewife Brook near outlet to bay.

Low water

May and June were unusually dry, and water levels in Alewife Brook were described by one local resident as similar to conditions typical of late summer. Low water levels could have affected fish movement in a number of different ways. In particular, shallow water may have affected movement into the stream from the Casco Bay, where a braided stream bed crosses a rocky beach (photo).



Outlet of Alewife Brook to Casco Bay.

Timing

The permitted monitoring period lasted approximately one month, plus an additional observation event on 5/2. According to Maine DMR, alewife runs are known to vary in timing through Maine, and combined with low water levels, the primary push of alewives may have occurred before or after this monitoring period. This is consistent with other alewife runs in Casco Bay, which peaked later than usual in 2015.

Methods

The different size and wing configuration of the two fyke nets probably affected the number of fish caught at each site. Specifically, the DMR net, with two longer wings that funneled fish into the net opening (which sat flush with the stream bottom) seemed to be more effective than the single-wing SMCC net that led to the center of the net's round opening. The effectiveness of the nets likely also varied with water level, particularly when water levels rose quickly following rain, which led to the top of the SMCC net and wings being submerged for a period of time.

V. Recommendations

Overall:

Repeat monitoring for at least 3 more years to build understanding of variation in the run. Suggested objectives for future monitoring might address the following questions:

- Develop an estimate for the total size of the annual river herring run
- Determine whether river herring are spawning in the impoundment behind the dam at head of tide
- Estimate how many river herring make it into Great Pond to spawn
- Document whether there are barriers to river herring movement in the stream
- Determine whether there are correlating variables, such as astronomical high tides or stream temperature, that trigger fish movement in this system

Recommendations for future monitoring methods:

- If fyke nets are used, get identical nets with square bottoms and two sets of wings so that methods are comparable.
- Begin monitoring earlier in the spring, perhaps as soon as mid-April, and continue through June.
- Consider methods that allow for exclusion of turtles from fyke nets.
- Employ volunteers to assist sampling, particularly at the boardwalk near Great Pond, and at the weirs/entrance to culverts.

Appendices