Long Island Alewife Restoration Efforts with Emphasis on the Peconic River – 2019/2020

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This report summarizes the Long Island alewife restoration efforts and presents alewife (*Alosa pseudoharengus)* biological data collected primarily from the Peconic River since 2010. In addition, incidental Alewife biological data collected from other spawning runs around Long Island are also reported here.

The history of the Peconic River restoration effort commenced in 1995 with the support of a Peconic Estuary Program Demonstration Grant to explore the feasibility of augmenting alewife passage in the Peconic River. The Peconic Estuary covers the lands draining into Little Peconic Bay, Great Peconic Bay and Gardiners Bay (Figure 1). During 1995 and 1996, alewives were captured below Grangabel Park dam (Figure 2) by dip net and transferred upstream over the dam by bucket. In addition, during the spring of 1996, several hundred alewives were captured from Alewife Creek in Southampton (Figure 3) and stocked above Grangabel Park dam and Upper Mills dam. This effort was undertaken to augment the numbers of alewives captured and transferred at Grangabel Park. Following this effort, students from the Riverhead Middle Schools Science Program, under the guidance of Mr. Robert Conklin, captured alewives at the base of the Grangabel Park Dam and transferred upstream over the dam (1997 through 1999). Through these efforts and the interests of a local community effort (The Peconic River Fish Restoration Commission) using private funds purchased and placed an Alaska Steep Pass fish ladder in the north spillway of the Grangabel Park dam. Pursuant to permit conditions the Alaska Steep Pass was placed around March 1 and removed around May 1 annually from 2000 to 2009. A local environmental company, Miller Environmental Inc., Calverton, undertook this labor-intensive effort of placement and removal each year. In addition, Mr. Robert Conklin monitored the fish ladder and removed debris, a continuous task during the spawning run.

During the period of 2000 – 2009, a proposal was developed cooperatively between the Town of Riverhead, the Peconic Estuary Partnership, the State Department of Environmental Conservation and the Peconic River Fish Restoration Commission to install permanent fish passage at Grangabel Park. With guidance from the US Fish and Wildlife Service a preferred option was selected and an engineering Company with Fish Passage design experience (Malone and McBroom) was selected to prepare the final engineering designs for installation of a nature like fish pass (Rock Ramp). After a protracted permit application process a contactor was selected by the town of Riverhead to conduct the work. A local construction company (Terry Brothers) began the work on the North spillway, in October 2009 upon completion of the North spillway repairs, construction efforts moved to the South spillway and the placement of the rock ramp fish passage in early December 2009. The Rock Ramp fish passage project was completed on February 22, 2010 with the opening of the cofferdam. Alewives were observed ascending the new Rock Ramp three weeks later.

A volunteer monitoring program was initiated following the completion of a permanent Rock Ramp fish passage during the winter of 2009/2010. This report summarizes the basic biological data collected from 2010 through 2020 for the Peconic River and incidental biological data collected from other Long Island streams during the time period. Spawning alewives were captured by dip net, cast net and by hand at the base of Woodhull dam on Little River the first major tributary to the Peconic River and in Alewife Creek by dip net and by hand where it crosses under North Sea Road (Figures 2 and 3). The cast net became the major sampling gear during 2014 after modifications to the Woodhull dam spillway changed the contour of the pool below the dam. Dip nets and small mesh seine nets have been used to augment the cast net in other streams where the cast net was ineffective.

Several attempts have been made to census the Peconic River alewife spawning run using a video camera counting system. Early attempts were unsuccessful due to the heavy fouling conditions during the spring primarily due to the camera's inaccessible placement in the pool above the Rock Ramp. The camera and camera housing become fouled very quickly requiring daily maintenance. Due to the lack of permanent staffing the camera equipment and housing could not be properly monitored and maintained thus compromising the ability to capture images. The use of the video camera counting system was discontinued until the spring of 2019, when the camera housing was

placed directly into the Rock Ramp. Staff from the Peconic Estuary Partnership Program, Stony Brook University, Suffolk Community College and local College interns have maintained the camera, downloaded the data and conducted estimates of the spawning runs size during 2019 and 2020.

Alewives begin entering local eastern Long Island streams in the late winter or early spring each year to spawn. Once spawning is completed the adults return to the ocean. These local alewife-spawning runs have generally been self-sustaining albeit at very low levels. Interest in the alewife restoration efforts and the need to increase protection of this valuable prey resource has grown on Long Island over the past twenty years based upon the success of passage projects in the Peconic River, the Carmans River, Massapequa Creek, Argyle Lake, and Beaver Lake in Oyster Bay to name a few. The Peconic Estuary Partnership, the Long Island Sound Study, the South Shore Estuary Reserve and the Seatuck Environmental Association are promoting increased fish passage around Long Island through partnerships with dam owners and interested parties.

Following the installation of the Rock Ramp fish passage in 2010, alewives have been captured in the Little River at the base of Woodhull Dam in order to describe their biological characteristics, to develop a base line biological data set for the Peconic River and to present a first order assessment relative to the effectiveness of the rock ramp fish passage project at Grangabel Park dam in Riverhead. Limited sampling has been undertaken in other locations, Alewife Creek in Southampton, the Mill River in Rockville Center, and Massapequa Creek. This report summarizes the biological data for the Peconic River and Alewife Creek, along with recent biological data from two Nassau County streams (Massapequa Creek and Mill River).

Survey Objectives:

1. To determine the presence of spawning alewives upstream of the Rock Ramp;
2. Document the timing of the Alewife run through observations made at three locations on the Peconic River and two locations on Alewife Creek;
3. Visually attempt to estimate the size of the Peconic River spawning run;
4. Collect biological data from a sample of spawning adult alewives in the Peconic River and Alewife Creek; and

5. Assist other with other alewife restoration and survey efforts, as appropriate, around Long Island.

In addition to the collection of biological data an effort has been undertaken to document the number of Long Island streams supporting Alewife spawning runs. The Seatuck Environmental Association in conjunction with the Peconic Estuary Partnership, the Long Island Sound Study, and the South Shore Estuary Reserve have conducted a Citizen Science based program to search from remnant alewife spawning runs around Long Island. This program was advanced to identify remnant river herring spawning runs and to aid restoration efforts ongoing around Long Island. Table 1 summarizes the identity of confirmed remnant spawning runs on Long Island, to present.

Methods and Materials:

Long Island's two premier alewife spawning streams are found on eastern Long Island. The largest alewife spawning run occurs in Alewife Creek in Southampton. Alewife Creek runs un-impounded from North Sea to Big Fresh Pond a 64 acre lake (Figure 3). The Peconic River, Long Island's largest stream supports the second largest alewife spawning run. The Peconic River is heavily impounded with five dams blocking access to historic spawning ground (Figure 2). At the present time two fish passage projects have been completed, one at the head of tide (Grangabel Park) and one in the upper reaches of the river at Edwards Avenue. Currently, the fish passage at Grangabel Park provides access to approximately 30 acres of spawning habitat. Approximately, 300 acres of additional spawning habitat will be opened once fish passage projects are completed. The project at Woodhull dam on Little River leading to Wildwood Lake would open approximately 90 acres, while passage projects on the main stem of the Peconic River at Upper Mills and Forge Pond would open 158 acres of potential spawning habitat.

Beginning in late February each year the Peconic River is visited to determine the commencement date for the annual alewife spawning run. Once fish have entered the system efforts to capture fish from the base of Woodhull Dam on the Little River, commence. This report summaries those efforts.

Biological Data Collected:

Biological data collected include fork and total length, sex, and scale samples from a subsample of those fish measured. The collection of both fork length and total length was undertaken in order to provide a conversion factor when comparing these data to historic data records. Many of the historic records along the coast have used fork length as their primary length measurement.

Alewives were captured by dip net, cast net or by hand at the base of Woodhull dam on Little River, a tributary to the Peconic River (Figure 1). The dip net, or hand capture were the only methods used in Alewife Creek. A ¾ inch stretched mesh by four-foot diameter cast net has been the primary gear employed to capture alewives at Woodhull Dam since 2014. In addition, Long handled crab nets (7ft 8 in handle) with a 14 inch diameter ring with a 12 inches deep pocket bearing 2 ¼ inch stretched mesh, a 22-inch hoop by 24 inches deep with an 8 ft. 8 in handle and a 13 inch diameter crab, 12 inches deep with a four-foot handle are also available and employed at times when fish were running into the spillway. On occasion, fish are also captured by hand when running up into the shallow waters of the spillway.

Each batch of fish captured is placed in a container(s) with fresh water. Fish are then removed individually from the container palpated to determine sex, measured to the nearest millimeter in fork length and total length and returned to the stream. Scales samples are collected from a subsample of fish measured for subsequent age analysis. Currently scale samples are being archived for future analysis when staffing and time allows. During the winter of 2020, Division of Marine Resources Staff received training on the proper preparation and aging methods for Alewife scales. Division of Marine Resources, Anadromous Fisheries Unit staff have begun the preparation and aging of archived scale samples. Biological sampling and alewife ageing protocols are outlined in the Quality Assurance Project Plan for Alewife Monitoring in the Peconic Estuary 2020-2024.

On each site visit an attempt was made to visually estimate a minimum and maximum number of alewives present. These estimates were used to gauge the strength of the spawning run. Unfortunately, due to variable conditions at a site it was not always possible to obtain anything more than a crude estimate of numbers and in some cases only presence or absence. Alewives at Woodhull Dam, if present, are generally visible attempting to ascend the downstream portion of the box culvert and around the edges of the pool. When the visibility allowed an estimate of abundance was calculated by counting fish in a portion of the pool and then extrapolating to the whole pool. This effort provides a crude estimate of the spawning run. Seatuck Environmental in cooperation with Cornell Cooperative Extension attempted to gather more precise counts of the spawning run utilizing a video counter. This effort has not been completely successful to date. The primary difficulties have been staffing to clean and maintain the camera set-up and manage the data.

Beginning during the spring of 2019, the Peconic Estuary Partnership in conjunction with NYSDEC, Seatuck Environmental Association, Cornell Cooperative Extension, Stony Brook University and Suffolk County Community College commenced a new video camera effort. The video camera housing was set up in the Rock Ramp where maintenance access was relatively unimpeded. The camera was monitored and maintained by interns and assistance from staff as needed. The results of this effort have been encouraging and provide a more robust estimate of the Peconic River Alewife spawning run.

Alewife observations made while collecting biological data are submitted to the Seatuck Environmental Volunteer Alewife monitoring program. Data were either recorded on standard data forms provided by the Seatuck Environmental Association and more recently entered directly into the Seatuck Environmental Association's web database.

Alewife observations were collected for spawning alewives at three locations in the Peconic River during this investigation (Figure 2). The Peconic River sites were Grangabel Park at the Rock Ramp and the North spillway; Upper Mills dam approximately 1 mile upstream from Grangabel Park; and Woodhull dam on Little River, which is the first major tributary upstream of the Rock Ramp flowing from Wildwood Lake. Two locations were used in Alewife Creek during this investigation (Figure 3). The Alewife Creek sites were the culvert under North Sea Road and the culvert under

Noyac Road. Data collected at each site followed the procedures established for the Long Island wide alewife survey conducted by the Seatuck Environmental Association (http://www.seatuck.org). To view go to the Seatuck Webpage, then proceed to the Conservation page and look for the Alewife project. All observational data collected here were reported using protocols established by the Environmental Defense Fund and the South Shore Estuary Reserve and maintained by Seatuck. This protocol is referenced in the Quality Assurance Project Plan for Alewife Monitoring in the Peconic Estuary 2020-2024. Standard data collections include date, time, location, water temperature (if possible) weather conditions, alewife presence or absence, and, if present, how many. Notes regarding other species observed at the site were also recorded.

Results:

Generally, the first signs of alewives occurs when scales were found along the shoreline below Woodhull Dam. Spawning alewives begin entering the Peconic River in late February or early March where they congregate at the base of Woodhull, on Little River providing relatively easy access. Table 1 presents a breakdown of the annual start and end dates along with the number of days the Peconic River was visited for the purpose of collecting biological data collection or observation. Site visits ranged from a low of 22 in 2015 to a high of 46 in 2014, with an average of 35 trips per year.

The peak spawning period based upon the numbers of alewives in the pool below Woodhull Dam varies annually (Table 2) based upon several factors, water temperature, river flow conditions and storm events. Typically, the first spawning fish will arrive in late February to early March with peak spawning usually from early April through mid-April. Alewives have been observed in the river as early as the third week in February (February 19, 2016). Alewives have been observed as late as the last week in May (May 29, 2014).

Spawning Run Estimates:

The successful operation of the video camera counting system in 2019 provided a more realistic estimate of the Peconic River Alewife spawning run. It also provided an opportunity to reexamine

the visual observations made during those two years. During 2019 and 2020, the weekly visual observations were averaged providing a weekly estimate. The resulting seasonal visual estimates using this method were more in line with the video camera counts (Table 2).

Estimates derived during the period of 2010 through 2018 from daily observations summed across the season are not provided in this report but will be adjusted and reported in subsequent reports. Based upon the evaluation of the video counts during 2019 and 2020 those previous estimates were quite high.

Length Frequency Data:

Since the inception of this effort in 2010 biological data has been collected from a total of 9016 Peconic River alewives at Woodhull Dam (Table 3). A small sample of fish were collected at Grangabel Park Dam in 1995 and 1996 which would bring the Peconic River total to 9231. In addition, alewives have been captured and measured from Alewife Creek in Southampton (Table 4) and recently alewives have been captured and measured from Massapequa Creek and the Mill River in Nassau County (Table 5).

These data provide the bulk of the alewife biological information collected on Long Island. The author is aware of limited data set collected by the New York Department of Environmental Conservation, Region 1 Fisheries in the Carmans River, The Cornell Cooperative Extension's Marine Program also working in the Carmans River and the Marine Sciences Research Center also working in the Carmans River. These data are not reported here. In addition, Dr. Peter Daniels and his graduate students have been working with alewives at Beaver Lake in Oyster Bay and in the Mill River in Rockville Center. The alewives at Beaver Lake are transplants from the Peconic River.

Sex Ratio distribution:

The sex ratio for the data reported here is 1.40:1 (Male to Female). Table 6 presents the sex ratio by year for the Peconic River. These data are consistent with other reports from the Northeast where males dominate over females. While males and females both enter the Peconic River

system at the same time, males dominate early and late. The daily sex ratios, however, do vary greatly, with some days during the height of the spawning run being dominated by females.

Age Structure:

Beginning in 2011, scale samples were collected from a subsample of the alewives captured for age analysis. An attempt was made to collect a scale sample from every third fish measured and to collect a scale samples from across the size range of the fish captured. The scales samples were sent to the NYSDEC, Hudson River Fisheries Unit office in New Paltz for age analysis. Following techniques applied to the thousands of River Herring scales collected by the Hudson River Fisheries Unit, the staff then subset the collections further into size bins and aged a subset of these scale samples. Alewives ranged between 2 and 8 years of age (Tables 7 & 8) with ages 4, 5 and 6 being the dominant age groups. Since 2014, scale samples have been collected, however these samples are being archived for potential future analyses. The Hudson River Fisheries Unit, which graciously volunteered to age the early scale samples no longer, has the time to address our needs. Their current efforts on the Hudson River cover all three herring species, striped bass and sturgeon so their work schedule is very full. Their efforts in providing ages for three years is greatly appreciated and provide a glimpse into the age structure of the Long Island alewife population. During the spring of 2020, the Diadromous Fisheries Unit in the DEC's Division of Marine Resources, trained to age river herring scales. They have attempted to age some of the archived scales and will as time is available be analyzed for future reporting.

Discussion:

These data represent multi-year first order effort to quantify the timing and extent of the Peconic River Alewife run. The effort described above is a completely volunteer program operating on limited personnel funds and when available volunteer help. All data collected are provided to the New York State Department of Environmental Conservation's Fresh Water Fisheries Unit, per Scientific Collectors License conditions, for inclusion in the statewide fisheries database.

Additionally, the data and this report are made available to the Peconic Estuary Partnership, and all other interested parties.

These data provide evidence regarding the success of the Rock Ramp fish passage at Grangabel Park. All parties involved in this effort should take pride in their success. The apparent spawning run increase is great news for the Peconic River alewife stock and the restoration efforts underway. Since 2013, the alewife spawning run has shown a good deal of variability. Some of this variability may be due to prevailing spring weather conditions ranging from abnormal high temperatures to abnormally low temperatures. In addition, Long Island has experienced a prolonged period of low rain fall as evident by river flow data (Figure 14).

The collection of Peconic River alewife biological data will be undertaken again during 2021 with a target of 600 alewives for length and sex information, scales from approximately 200 fish, water temperature data collections, and another set of in the field observations. An attempt will be made to collect biological data from Alewife Creek during 2021, in cooperation with the Peconic Bay Keeper program with a target of 200 length and sex samples, scale samples from 1/3 of those fish. In addition, this effort will assist the Peconic Estuary Partnership efforts with monitoring the Video Camera, the collection of more refined biological data, and providing a resource for student volunteers and Suffolk Community College conducting additional monitoring and analysis.

The primary focus will remain on the Peconic River during 2021. The Peconic River has approximately 275 acres of impounded waters behind the four remaining dams remaining reconnection to the Marine environment. Fish passage efforts continue for the three remaining dams (Woodhull, Upper Mills and Forge Lake). The 2020 COVID-19 pandemic has stalled or slowed progress on these fish passage efforts.

Another, component of the greater Long Island Alewife Restoration effort is the Volunteer efforts to locate and document remnant alewife runs around Long Island and recently into New York City and Westchester County. This expansion of effort continues to uncover streams which support small alewife runs (Table 9).

The data reported here provide a glimpse into the biological characteristics of the Long Island Alewife spawning runs. It is encouraging to see increased interest in undertaking more robust studies at the University level. I am encouraged by the increase of involvement through cooperative research at the university level, additional data collections by management agencies in order to aid future management decisions related to this resource and a continuation of the cooperative discussions related to the diadromous fisheries of Long Island organized by Seatuck Environmental Association.

In conclusion, we continue to see positive results from the rock ramp fish pass at Grangabel Park. While progress may be slowed by the Coronavirus pandemic, fish passage efforts along the main stem of the Peconic River and at Woodhull dam on Little River continue. It is anticipated that once monies become available, plans and permits will be in place to begin construction on at least one of these efforts and maybe more than one. In addition, Alewife Creek in Southampton is due to receive some much need repairs to the culvert at Noyak Road which should aide the alewife upstream migration. In additions, volunteers continue to document remnant spawning runs around Long Island continues adding new streams each year through Seatuck Environmental Association, The South Shore Estuary Reserve, the Long Island Sound Study and the Peconic EstuaryPartnership. The Long Island Sound Sturdy program is looking to continue its efforts in Westchester County during 2021.

Acknowledgements:

This project has been a collaborative effort since its inception and continues with these data collection efforts. I wish is express my appreciation to the Peconic Estuary Staff for their continued support of this effort and for continuing to press forward on fish passage efforts in the Peconic River and throughout the Peconic Estuary. There is a long list of folks who have spent time assisting me with the collection and processing of Alewives at Woodhull dam since 2010. In particular I would like to thank Kyle Young for his help and interest in this effort. I do not have a complete list of folks who helped out with this effort but please understand that I appreciated your assistance. Some folks would simply wander by while I was working up fish and kindly assist, others would come down in bigger groups to see the spawning run and learn about the efforts to

improve alewife spawning runs around Long Island. I would like to thank everyone who shared some time helping over the course of this effort. The results presented in this report represent your interest and assistance.

Table 1. Peconic River Sample Dates, 2010 to 2020

Year	Start Date	End Date	Days Sampled
2010	16-Mar	16-May	32
2011	2-Mar	15-May	34
2012	26-Feb	5-May	39
2013	5-Mar	3-May	37
2014	1-Mar	24-May	46
2015	27-Mar	19-May	22
2016	19-Feb	14-May	39
2017	25-Feb	18-May	31
2018	21-Feb	10-May	34
2019	16-Mar	19-May	42
2020.	26-Feb	12-May	25

Table 2. Estimated Alewife Spawning Run Size, Rounded to the nearest Thousand.

Year	Estimated Minimum Spawning Population (Visual)	Estimated Maximum Spawning Population (Visual)	Grangabel Park Camera Count Estimates
2019	24000	33000	34,500
2020	29000	42000	58,000

Table 3. Mean Total Length for Spawning Peconic River Alewives, 2010 to present and 1995 and 1996.

Year	Number of Males	Mean Total Length	Standard Deviation	Range	Number of Females	Mean total Length	Standard Deviation	Range
1995	20	257.3	13.91	238-282	40	264.6	11.61	235-288
1996	85	266.2	14.09	234-283	78	279.9	11.13	249-308
2010	356	263.1	11.49	235-300	256	273.2	11.67	243-313
2011	252	260.5	10.12	232-289	158	272.2	10.85	234-298
2012	694	257.7	14.06	224-305	413	277.2	14.44	241-325
2013	515	268.8	8.63	236-304	320	281.0	9.66	256-318
2014	580	276.6	12.68	216-307	501	289.0	12.22	252-325
2015	410	275.3	14.58	232-317	307	287.5	13.20	246-324
2016	539	268.5	15.08	227-320	423	283.1	14.63	248-327
2017	447	259.7	12.02	228-294	295	273.5	13.04	235-318
2018	536	267.5	10.18	232-295	400	276.8	10.92	235-316
2019	796	269.9	12.46	234-308	590	283.9	12.78	244-320
2020	134	274.2	9.89.	242-301	86	284.5	9.40	263-310

Table 4. Mean Total Length for Spawning Alewife Creek Alewives, 2013, 2014 and 2017.

Year	Number of Males	Mean Total Length	Standard Deviation	Range	Number of Females	Mean Total Length	Standard Deviation	Range
2013	36	265.9	7.47	252-285	38	289.1	13.31	264-315
2014	66	267.9	8.89	252-290	62	279.2	11.02	253-302
2017	25	261.1	16.97	236-277	17	275.7	8.49	258-288

Table 5. Mean Total Length for Spawning Massapequa Creek and Mill River Alewives, 2017.

Water Body	Number of Males	Mean Total Length	Standard Deviation	Range	Number of Females	Mean Total Length	Standard Deviation	Range
Massapequa Creek								
2017	30	253.9	28.28	224-282	31	276.1	2.12	246-299
2018	11	262.0	9.89	239-279	16	273.5	9.48	264-300
Mill River								
2017	50	257.0	21.21	226-301	15	266.5	20.51	240-289
2018	38	263.3	8.90	229-276	19	270.9	9.46	258-286

Table 6. Peconic River Alewife Sex Ratio, 2010 to 2014.

Year	Number of Males	Number of Females	Sex Ratio Male to Female
2010	356	255	1.4:1
2011	252	158	1.6:1
2012	654	413	1.6:1
2013	515	320	1.6:1
2014	580	501	1.2:1
2015	410	307	1.3:1
2016	539	423	1.3:1
2017	447	295	1.5:1
2018	536	400	1.3:1
2019	796	590	1.3:1
2020	134	86	1.6:1
Total	5219	3748	1.4:1

Table 7. Age Structure for Peconic River Male Alewives by Total Length, 2011 to 2013.

Total Length	2	3	4	5	6	7	8
220		2	1				
230		4	7	2			
240		2	11				
250			17	6	1		
260		1	11	14	2		
270			3	16	5		
280			5	7	7	2	
290				1	2	2	
300					2		
310							
320							

Table 8. Age Structure for Peconic River Female Alewives by Total Length, 2011 to 2013.

Total Length	2	3	4	5	6	7	8
220							
230	1						
240			1				
250		3	8	1			
260			7	8			
270		1	6	14	5		
280			6	16	6		
290			1	9	10	1	
300				1	10	4	
310					2	6	1
320					1		1

Table 9. Alewife Spawning Streams on Long Island and New York City

South Shore	Stream/Pond Outlet	Town	Confirmed
1	Carlls River	Babylon	
2	Carmans River	Brookhaven	2000, Probably earlier
3	Massapapequa Creek	Massapequa	2012
4	Swan River	Patchogue	2013
5	Bellmore Creek	Bellmore	2014
5	Mill River	Rockville Center	2015
6	Mill River	Wantagh	2015
7	Champlin Creek	Islip	2016
8	Orowoc Creek	Islip	2016
9	Valley Stream	Valley Stream	2017
10	Milburn Creek	Baldwin/Freeport	2017
11	Parsonage Creek	Baldwin	2017
12	Motts Creek/Doxey Pond	Woodmere/Valley Stream	2017
13	Sumpawams Creek	Islip	2020
14	Cammons Pond, Merrick Creek	Merrick	2020
15	Hook Creek	Valley Stream	
North Shore			
16	Fresh Pond/Baiting Hollow	Riverhead	2006
17	Mill River/Beaver Lake	Oyster Bay	2013
18	Sunken Meadow Creek	Smithtown	2011
19	Nissequogue River	Smithtown	2017
20	Setauket Mill Pond	Setauket	2015
21	Fresh Pond	Fort Salonga	2014
22	Stony Hollow	Centerport	
23	Wading River Creek	Baiting Hollow	2010

Table 9 (Cont.) Alewife Spawning Streams on Long Island and New York City

East End

24	Peconic River/Little River	Riverhead/Southampton	prior to 1995
25	Alewife Creek	Southampton	prior to 1995
26	Ligonee Brook	Sag Harbor	2010*
27	Big Reed Pond	Montauk	Prior to 1995
28	Halsey Neck Pond	Southampton	2017
29	Steeping Stone Pond.	Montauk	2018
30	Mill Pond/Mecox Bay	Southampton	2020

New York City/Westchester County

31	Bronx River	New York City	2012
32	Hutchison River	Scarsdale	2020

Figure 1. The Peconic Estuary.

Figure 2. Sampling Location on the Peconic River.

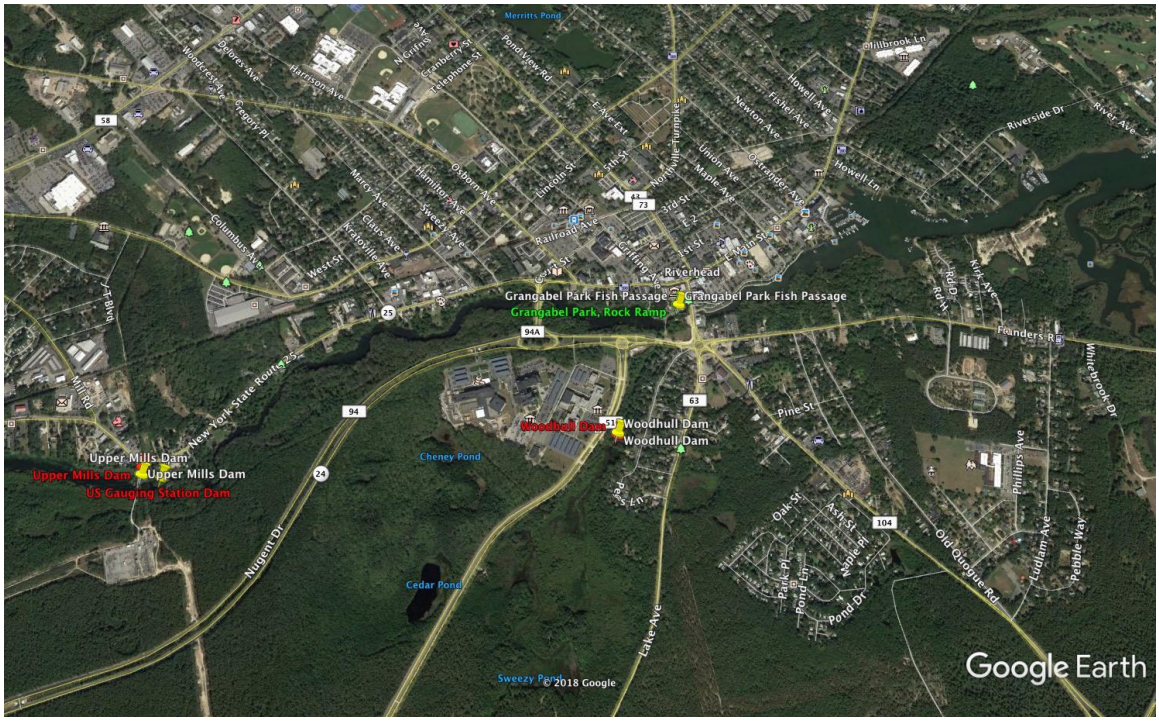

Figure 3. Observation sites on alewife Creek and Big Fresh Pond.

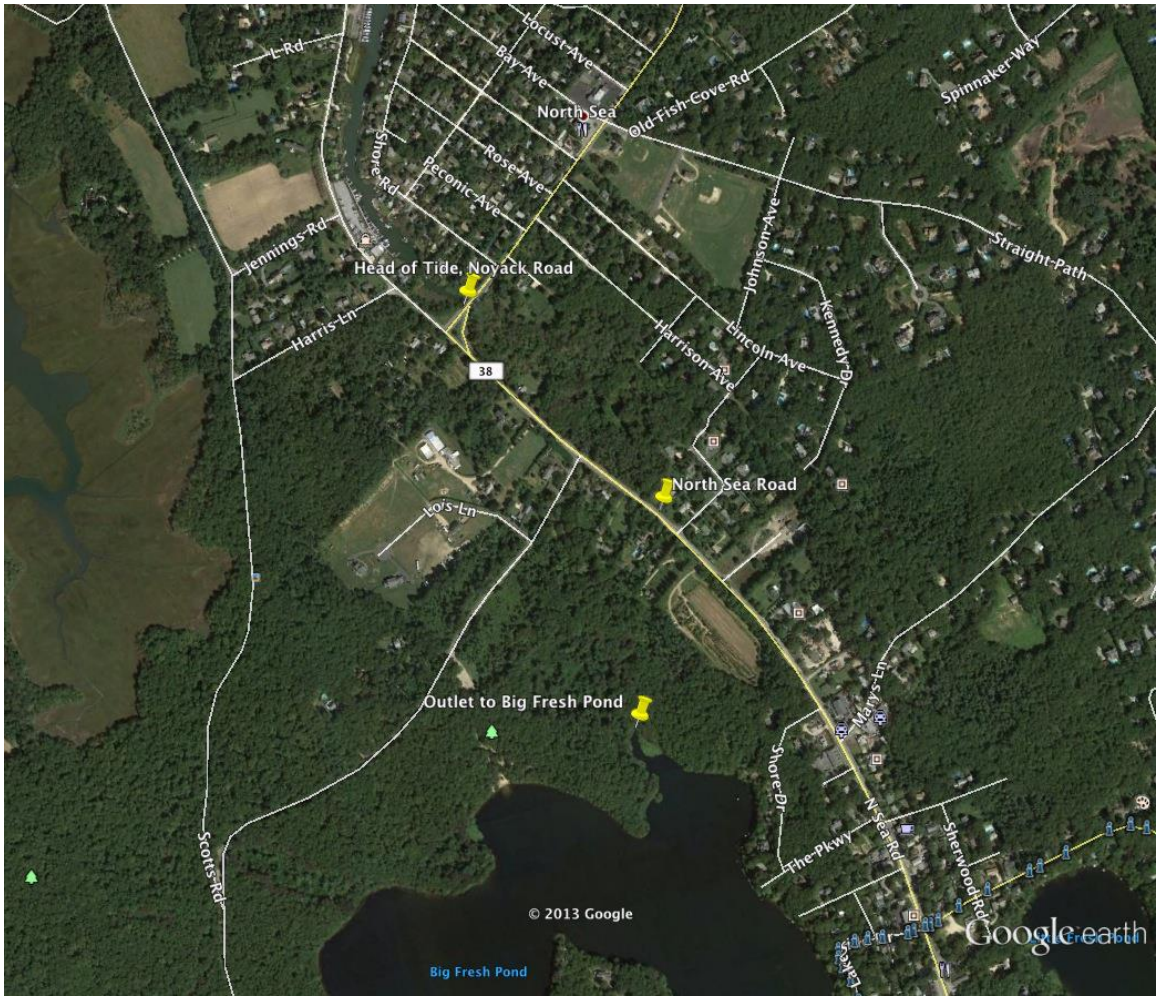

Figure 4. Estimate Abundance by time period for Woodhull Dam 2010 to 2020

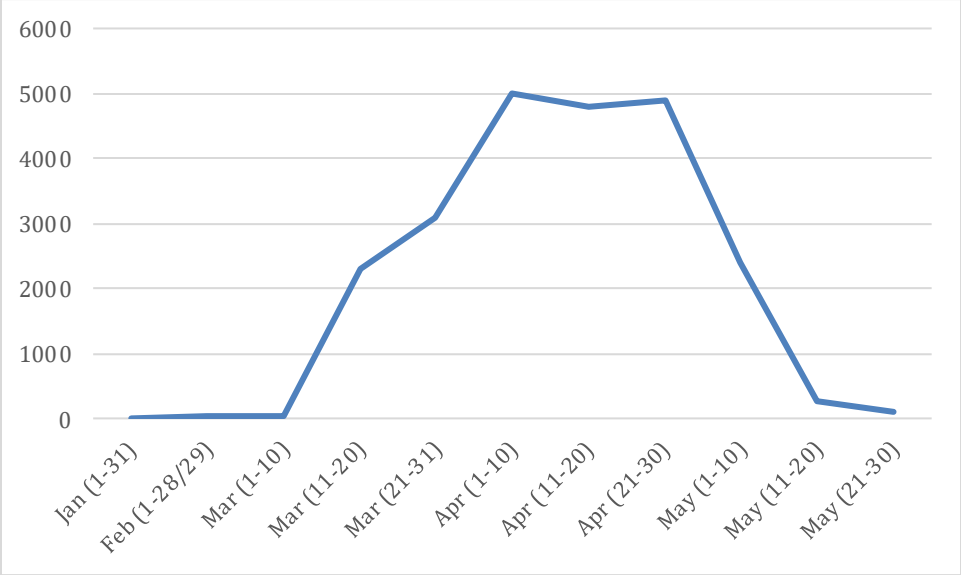

Figure 5. Peconic River Male and Female Alewife length frequency distribution, 2010 to 2018.