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■ THE SHAD FOUNDATION'S ■

SHAD JOURNAL

"For the study, protection, and celebration of shad around the world"

Parker River Alewives Count in Massachusetts

VOLUME 4, NUMBER 1, WINTER 1999

COURTESY OF THE PARKER RIVER CLEAN WATER ASSOCIATION

A PARKER RIVER VOLUNTEER peers into the Central Street fishway, counting the number of alewives *(Alosa pseudoharengus)* returning to the Parker River to spawn. To learn more about the Parker River alewife run, please turn to page 3.

President's Note:

This issue features an article on the Parker River alewife (*Alosa pseudoharengus*) run in Massachusetts. Volunteers count alewife to help determine the status of the spawning population. While most fish counts of anadromous species are paid for by taxes through the limited budgets of federal and state agencies, the Parker River alewife has a small army of unpaid workers who add crucial numbers to the data roster used by scientists, managers, and conservationists. This is a program that will, I hope, serve as a model for others.

Alewife fans will be pleased to learn that the 40th anniversary edition of "The Run" by John Hay was released in March 1999 ($23 U.S., Beacon Press). In his charming book, Hay, a laureate nature writer, ponders the mysterious migration and life history of Cape Cod's alewife run. Hay describes the alewife as "a life that shone with vibrant persistence, one of nature's particularized energies, a wild texture as old as the animal world, a food that was the beneficent matter of all struggle and greed." Hay does not answer the mystery of the alewife run, but he tries and succeeds in his failing. As he wrote, "Is there any man who knows the length and breadth of anything, let alone a creek?"

-R. Hinrichsen

INSIDE

SHAD FORUM

In the "Shad Forum" department, we publish letters and comments on issues surrounding shad and their fisheries. Your contributions are welcome.

Hilsa Introductions in the U.S.?

To the Editor:

It gives me great pleasure to know that there is a Shad Foundation. My own interest and enthusiasm for this species stems from the fact that I grew up in Calcutta, India, where the most prized food fish is the Hilsa ("Ilish" in the Bengali Language). This species is found predominantly in the estuaries of the Ganges, Padma and Meghna Rivers as they flow into the Bay of Bengal, in the Delta area encompassed by the Indian State of West Bengal and the whole of Bangladesh.

Having sampled American Shad once in the Washington, D.C. area of the United States, I am convinced that the Hilsa is unsurpassed both in flavor and texture and could develop into a popular gourmet delicacy if marketed suitably. (This is something the true Hilsa enthusiast would not like since that would drive the price of this fish sky high.)

We are fortunate to be able to get authentic Bangladesh Hilsa in the Greater Washington area at $1.99 (U.S.) per pound, thanks to blast-freezing and efficient transportation. I have found that the quality of the product here is as good as it would be had I bought it in Bangladesh.

I would be grateful if any of you could let me know the address at which an event called "shad planking" is held sometime in late April, possibly in Virginia or another Eastern seaboard state. I could take some Bangladesh Hilsa and subject it to the "planking" process, which I believe is a form of smoking the fish, so that I can discover this new gastronomic delight and give Americans a taste of the Hilsa.

I would also be interested in knowing whether anyone has tried to cultivate shad as a fish crop (by simulating running water and estuarine conditions, etc.). Although a huge quantity of shad is produced in the Bengal Delta area described above, there may come a time when it would have to be cultivated and/or introduced into other rivers. I suspect that the perfect habitat for the Hilsa shad in the U.S. would be the Mississippi Delta.

VIJAY TONSE
VTONSE@IX.NETCOM.COM

Historical Run Sizes Sought

To the Editor:

I am interested in information on the magnitudes of historical spawning runs of anadromous fish (of course shad, but information on other species would be useful as well) in terms of numbers or biomass, for as many rivers as I can get estimates of. It would also be interesting to know the upstream distance that spawning runs reached in the past. For instance, many rivers now are dammed well downstream of the historical spawning sites. If you happen to know these facts for a given river system, please send me a note.

I would also be very interested to hear about these historic runs outside of North America, most of which I presume will come from Europe, Asia, and the Middle East/India. I realize that these areas have been densely inhabited for so long that pristine spawning run sizes are unknown. But any information is welcome. If you do not feel comfortable writing me in English, try your native language and I will have it translated.

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What is it?

To the Editor:

Most scap and dip netters, as well as bait fishermen, refer to alewives and bluc-back herring collectively as "herring." To the untrained eye they look nearly identical. We have created a brochure that helps fishermen differentiate these two species. We see this as more than an esoteric effort; we recognize the different life histories of these physically similar species, and their differing contributions to the Hudson river estuary/Mohawk River systems.

We believe that this brochure just might stir some curiosity, and foster an additional appreciation for the river and its fish. For further information, please write to the NYSDEC (New York State Department of Environmental Conservation), Hudson River Estuary Program, 3 Steinhaus Lane, Wappinger Falls, NY 12590-3927.

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The Shad Foundation is a Washington State nonprofit corporation that was established in 1996 to promote a greater understanding of shad for the purpose of restoration where depleted, or their responsible use where sufficiently abundant.

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Submissions. The editors welcome submission of articles on any aspect of shad. The Journal publishes letters, commentaries, histories, scientific articles, interviews, reviews, and philosophical and methodological items related to shad the world over. (Please see back cover.)

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“One Fish, Two Fish”

Community volunteers count Alewives in New England’s Parker River, adding important observations to biologist’s data rosters, and fostering community support for the alewife run and its ecosystem

by Robert D. Stevenson, David C. Mountain, and Becka C. Roolf

Introduction

In the spring, the rivers of New England, awakened by melting snows, flash silver with spawning alewives, shad, and salmon. Yet many fishermen and citizens have noticed over the years that the numbers of these fish are fewer. Are their memories of fish “so thick, you could catch them with a spoon” accurate or idealized? If the fish are really declining, how seriously?

This is the story of a community effort to find out.

In 1997 and 1998, the Parker River Clean Water Association, in conjunction with the Essex County Sportsmen’s Club and Massachusetts Audubon Society, launched a volunteer-based fish count, which mimicked studies done by graduate students in the early 1970s. The summary report was sobering. In the 1970s, runs between 12,000 and 38,000 fish were recorded when sampling for 10-minute periods over the course of the day. In the 1997 and 1998 counts, the alewives numbered only 6,396 and 4,242, respectively.

The run was only 25 percent of that recorded 25 years ago.

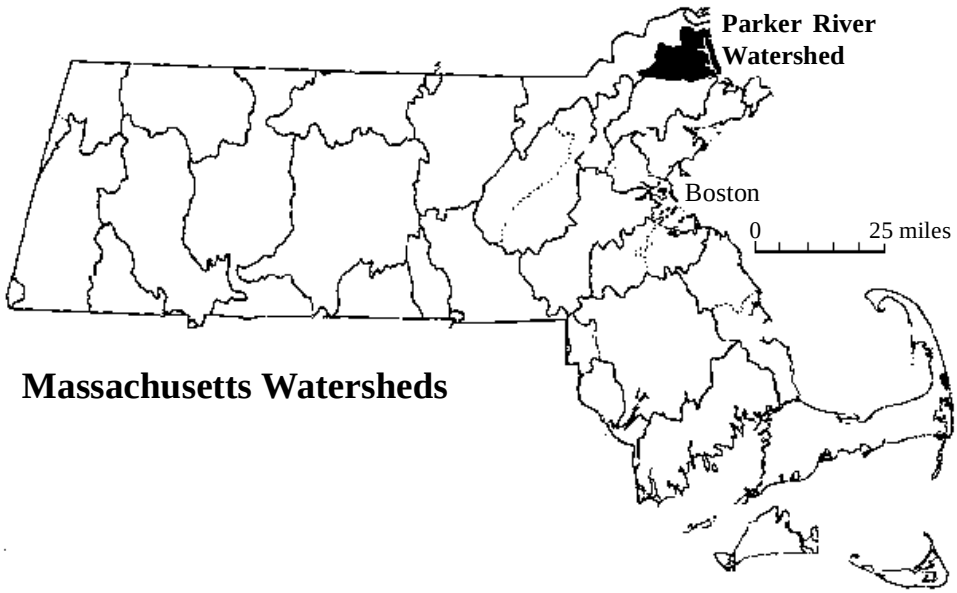
About Alewives

For centuries, migrating fish have provided a bountiful source of food to humans in North America, first Native Americans and then to European settlers. The alewife *(Alosa pseudoharengus)* has many common names—“branch,” “blear-eyed,” “big-eyed,” “wall-eyed,” “freshwater glut,” “gray herring,” “spring herring,” “golden shad,” “green shad,” “bang,” “ellwife,” “gaspereau,” “grayback,” “kiak,” “kiack,” “kyak,” “mulhaden,” “racer,” “sawbelly,” “seth,” “skipjack,” and “spreau.” The fact that it has so many names attests to its importance to people along the Atlantic coast from South Carolina to Newfoundland. Seabirds such as gulls, herons, hawks, and cormorants and fish—especially striped bass and bluefish—aggressively pursue and eat alewife.

Alewife is difficult to distinguish from its close relative the blueback herring *(Alosa aestivalis)*. Alewife, however, arrives earlier in the spring and migrates much further up river to breed. Alewife fry remain in fresh water until late summer or autumn when they migrate down stream to the ocean. Parker River fry grow to adult size (27-33 centimeters, 170 to 350 grams) during a 3- to 8-year period in saltwater before returning to their natal freshwater ponds (Rideout 1974).

Parker River History

The Parker River is a small coastal river in Essex County, Massachusetts, with a watershed of about 216 square kilometers. The river begins as a series of headwater ponds—Sperry’s Pond, Baldpate Pond, Rock Pond, Pentucket Pond, and Crane Pond—which are typical alewife spawning grounds. The freshwater portion of the river is about 13 kilometers long with a drop of 25 meters over its length,



THE PARKER RIVER WATERSHED is located in northeastern Massachusetts.

concentrated over a 3.5-kilometer stretch just above the head of the tide. The remainder of the river is tidal, and surrounded by extensive saltmarshes. The river flows into Plum Island Sound, much of which is protected by the Parker River National Wildlife Refuge. This area is relatively pristine, given its proximity (less than a one-hour drive) to metropolitan Boston. Plum Island Sound is renowned for recreational birding, duck hunting, striped bass fishing, and an active shellfishing industry.

Alewife and a number of other anadromous fishes, including the brook trout, blueback herring, rainbow smelt, shad, sturgeon, and perhaps even Atlantic salmon, have probably used the Parker for thousands of years. The glaciers retreated from the area about 12,000 years ago, and the alewife likely colonized the river as waters warmed.

People enjoyed counting as a community activity. Often they were rooting for the fish to make it through the fishways.

When Europeans first settled along the Parker River in the 1630s, alewife quickly became a source of food and fishing bait. Within a year of settlement, the first dam was built to take advantage of the river's water power. The herring run was important to local citizens, yielding approximately 100 barrels of fish (about 50,000 individuals) annually in the late 1700s (Belding 1921). From 1793 to 1808, the town of Newbury enacted laws to manage the harvest of alewives and ensure their passage around dams which powered mills for sawing wood, grinding corn, fulling cloth, making snuff, and even making chocolate.

We know little about how alewife runs fared during the 19th-century New England industrial revolution, but it is likely that they, as well as those of the other remaining anadromous species, were devastated as passage to spawning areas was blocked by dams. In 1921, three of the five dams on the Parker had no fish passage and there were few alewives (Belding 1921). This situation was remedied by the Works Progress Administration (WPA) in the 1930s when they constructed five fishways.

A very low dam (1 meter drop) at the outlet of Pentucket Pond remained fishway-less until the early 1960s. The Pentucket Pond fishway was destroyed by a flood in the late 1980s, but the spillway is small enough that alewives can swim over it. Our volunteers observed many of them doing just that, despite the availability of a make-shift plywood fishway. According to local tradition, Pentucket Pond is the primary spawning area for Parker River alewives, but our data do not necessarily support this.

Collectively, the six fishways provide alewives a passable route around the dams and access to their historic spawning grounds. Some of these fishways are nearly 70 years old and each is in disrepair. Each fall, volunteers from the Essex County Sportsmen's Club patch the fishways to keep them functioning.

Quotes from the Volunteers

"I recently read that the herring were a preferred food of the colonists and their roe was preferred to that of the shad."

"The fish were entirely airborne as they entered the bottom of the ladder. Very exciting."

"Hurray — after a month, five days a week, I have seen my first fish!!!! I was so excited I did three counts. Lots of fish at the bottom of the ladder as well as top."

"Very calm conditions. Still air. Above the falls, water appeared like a mirror. Below the falls, water was teeming with fish. We monitored both ends of the ladder simultaneously during the recording period. (32 passed out on top and 68 entered at the bottom.) An impressive show."

"A muskrat ambled along the edge of the ladder, came within a few feet of me and then slipped right into the ladder. Finally swam over the top step. Also, 1 downy woodpecker. Very exciting day biologically."

Population Studies

In the early 1970s, fisheries biologists from the University of Massachusetts Amherst coordinated a series of studies of the Parker River alewife populations. They studied their life history in freshwater including the spawning run, spawning itself, and the growth and development of fry. We have obtained two of the master's theses, one by Rideout (1974), who obtained data during 1972, and the other by Beltz (1974), who recorded data during 1973 and 1974.

In the spring of 1997 and 1998, the Parker River Clean Water Association (PRCWA) organized a team of local citizens to help count the alewife run. PRCWA is a community group that protects the waters and ecosystems of the Parker River and Plum Island Sound watersheds. PRCWA leaders thought that a fish monitoring project would spark interest among its members and other local citizens in the alewife run and in the preservation of the riverine ecosystem. In addition, PRCWA members needed data on the size of the alewife population.

The Essex County Sportsmen's Club had adopted the Parker River fish passages through the Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement's "Fishway Stewardship Program." Each spring, as sportsmen cleaned debris out of the ladders, and regulated the water levels, they saw migrating fish. The runs seemed smaller than in recent memory. However, there was no information about the actual numbers of fish migrating.

Furthermore, the sportsmen and PRCWA worried that the fish populations might be threatened by deteriorating fishways, by possible increases in pollution related to rapid growth of towns in the watershed, and by low flows during the juvenile outmigration. In 1997, there was no flow over the Pentucket Pond spillway from mid-August until mid-October, and the riverbed upstream of Rock Pond was dry. Local residents saw the juveniles heading downstream in October 1997, after a rain raised the level of the pond. The dry river in 1997 was the result of very low rainfall, possibly exacerbated by increased summer water use, drawing from town wells along the river, or changes in river hydrology from increased development in the watershed.

Organizing the Count

The PRCWA recruited volunteers for the fish count through articles in the local newspapers, and sent a flyer to its membership. The flyer was also posted in town shop windows, and sent to Massachu-

SAMPLING effort by volunteers at three counting locations. Note that the effort is most concentrated at the Central Street station (dam 1).

	Total 1998 Samples			*Samples per Day*		
Location	*Days*	*People*	*Samples*	*Average*	*Max.*	*Min.*
Central St.	53	45	324	6.3	12.0	2.0
River St.	35	11	98	2.8	6.0	0.0
Pentucket Pond	37	13	167	4.5	9.0	0.0

setts Audubon Society members in the area. Sportsmen's organizations, including the Essex County Sportsmen's Club, the Coastal Conservation Association, and Trout Unlimited, recruited additional volunteer counters. The volunteers attended a training session at a local elementary school, where they learned about the biology of alewives, their history in the river and current threats to their survival.

Participants were instructed to stand at the fishway for any 10-minute period of their assigned hour and record the number of alewives they saw passing upstream. They recorded the count and the precise time it was made. In 1998, they were asked to record weather conditions and any other observations on the fish, river or wildlife. They were given a small notebook with a data form pasted to the inside cover to record their observations.

Participants usually counted once a week at one of three dams, Central Street (dam 1), River Street (dam 5) or Pentucket Pond (dam 6). Three fishway coordinators kept the participants informed, found alternate counters when volunteers were unable to make their assignments, and tracked down missing data. The volunteers called in their data to a special fish count hotline (948-FISH), or sent results via e-mail. When the fish were running, PRCWA posted reports on the e-mail list and on an answering machine.

Volunteer Experience

In 1998, more than 70 volunteers counted alewives during the seven-week period from 1 April to 24 May. Many volunteers brought along a friend. In all, we estimate that 200 people went out to observe the run. A wide range of local citizens participated: school groups, teachers, parents, children, retirees, environmental activists, and professional biologists. An entire first-grade class went to look, and they were delighted to see fish running.

A total of 638 10-minute counts were made; 505 of these recorded zero fish. Some participants became discouraged at not seeing fish, but they were reassured that checking regularly allowed PRCWA to have confidence that alewives were not slipping by unnoticed. We also tried to let people know when the fish were running so that they could go look, even if it was not their turn to count.

People enjoyed counting as a community activity. Often they were rooting for the fish to make it through the fishways. (One woman even admitted yelling suggestions to the fish.) Volunteers who did not see fish were likely to see other wildlife, even during rainy weather or when fish were absent. They saw muskrat, beaver, spotted turtles, snapping turtles, eels, lampreys, blue-back herring, trout, swallows, red-winged blackbirds, herring gulls, herons, and a Canada geese family with four goslings.

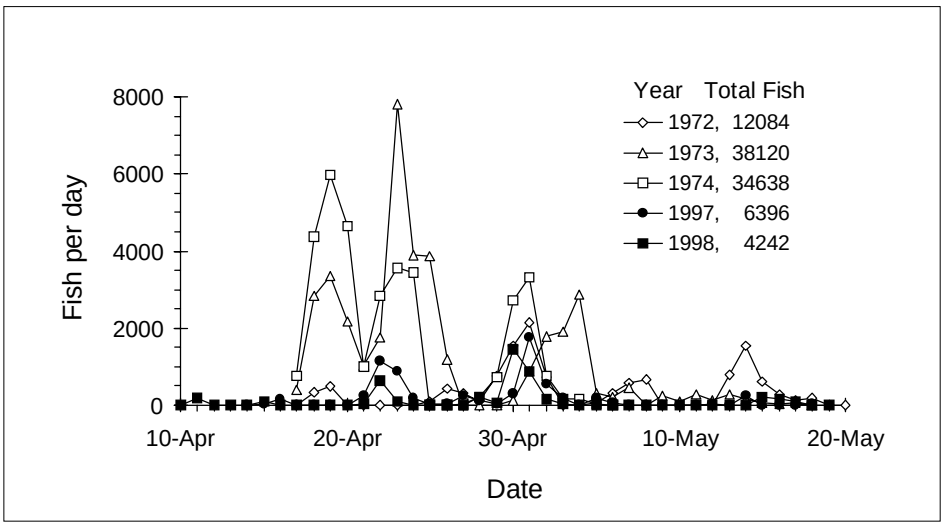
Analysis of Data

Each volunteer counted for 10 minutes. From the raw 10-minute counts, we estimated the hourly totals by multiplying each count by six. The same direct extrapolation method was used by the graduate students in the 1970s (Rideout 1974, Beltz 1975).

How accurate was this method?

The graduate students of the 1970s analyzed their confidence in their data by computing one confidence interval for the estimate based on the assumption that each sample was an independent observation. This approach yielded error estimates of more than 30 percent (quite large). The assumption that each sample period was independent was violated, so the approach was invalid. Rideout (1974) evaluated the errors associated with this approach by comparing a 10-minute count with two 5-minute counts. He multiplied the first 5-minute count by two to predict the 10-minute count. For a total of 82 samples, he came within 3.4 percent of the 10-minute count.

Rideout (1974) also used a simulation study based on the distribution of fish counted in five minutes to evaluate the relative importance of the sample frequency and sample duration. The simulation results suggested that using a 10-minute sample period over a 13-hour day yielded a mean estimate within 8 percent of the true



THE DAILY MIGRATION PATTERN of alewives at the Central Street fishway for three years in the early 1970s and two years in the late 1990s shows that the total number of fish is significantly lower now than it was 25 years ago. The run comes in several well-defined peaks, corresponding roughly to 19 April, 23 April, and 1 May.

value.

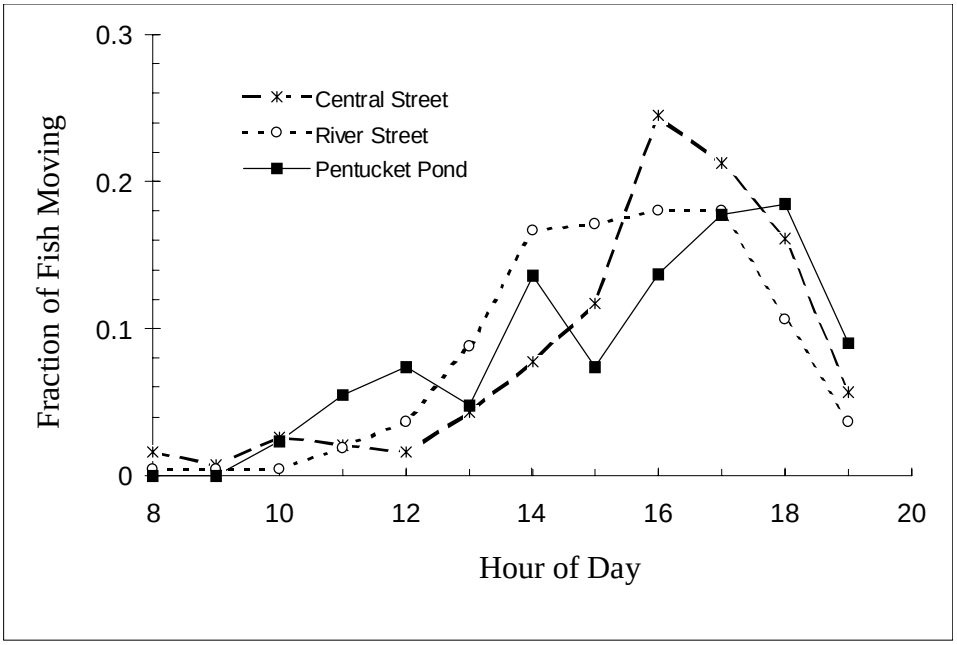
While it is likely that better statistical methods are available, it seems that a 10-minute sampling interval is a good, practical approach to counting fish for a community-based project. Several individuals reported counts over intervals longer than the standard 10 minutes. Data from these multiple counts were consistent but there was not enough information to attempt a more rigorous statistical analysis.

Two additional errors in our approach are important to describe.

The first is that not every hour is sampled (See above table). The plan called for people to visit 9 hours per day from 11 a.m. to 7 p.m. We had the most volunteers at the Central Street fishway; sampling activity there came closest to achieving that goal. At Pentucket Pond, several dedicated individuals sampled multiple times per day, producing a higher average than at River Street. In cases where no data were collected in a given hour, a simple linear interpolation was used to fill in the missing data. In most cases, this was a zero.

The second error in our approach stems from the fact that people have different abilities to concentrate for 10 minutes, or to see the fish in the water. Peering into the fish ladder, one volunteer might see seven fish in the water, but another would see only three. Until we devise a systematic approach to determining counting error among observers, we do not know if this is a significant source of error. Several volunteers and Beltz (1975) noted that fish tend to move in small groups of three to 12, and individuals can pass in a minute or two. This observation will be important in designing a more sophisticated sampling scheme.

What, then, is the accuracy of the run size estimates presented here? From Rideout's work, the error can be no less than eight percent of the mean. Because of extrapolations and counting error it is likely to be greater than 15 percent of the mean.



ALEWIVES MIGRATED THROUGH THE FISHWAYS mainly during 2-6 p.m over the 1998 migration season from 11 April to 24 May. The fraction of the run in each hour was found by summing the estimated run for each hour of all days when the fish were migrating. Total sampled days were 14, 9, and 8 for Central Street, River Street, and Pentucket Pond, respectively.

Results and Commentary

The total migration estimate at Central Street for 1998 was 4,242 fish. This is about 70 percent of the 6,396 fish estimated to have used the fishway in 1997, and significantly lower than estimates in 1972-1974, which ranged from 12,084 to 38,120. This low number of fish is cause for concern.

A clue to the mystery of the decline can be gleaned from comparing the peak run days. There were no fish running during 18-20 April and again from 22-24 April as there were in 1973 and 1974. If we assume that fish run on specific days each year using an internal circannual clock (much in the same way that the swallows return to San Juan Capistrano on 19 March of each year), one might argue that these fish have been lost from the river system—perhaps because breeding sites were missing or they were swallowed up *en masse* by a factory trawler. This argument would be stronger if the data from 1972 had the same pattern of peaks as the next two years. Instead, the 1972 pattern could be interpreted as being similar to 1973 and 1974, but delayed by two weeks. In determining when to migrate, the fish might combine the use of a circannual clock with local environmental conditions. To investigate these alternatives, we will need to collect more data over a series of years.

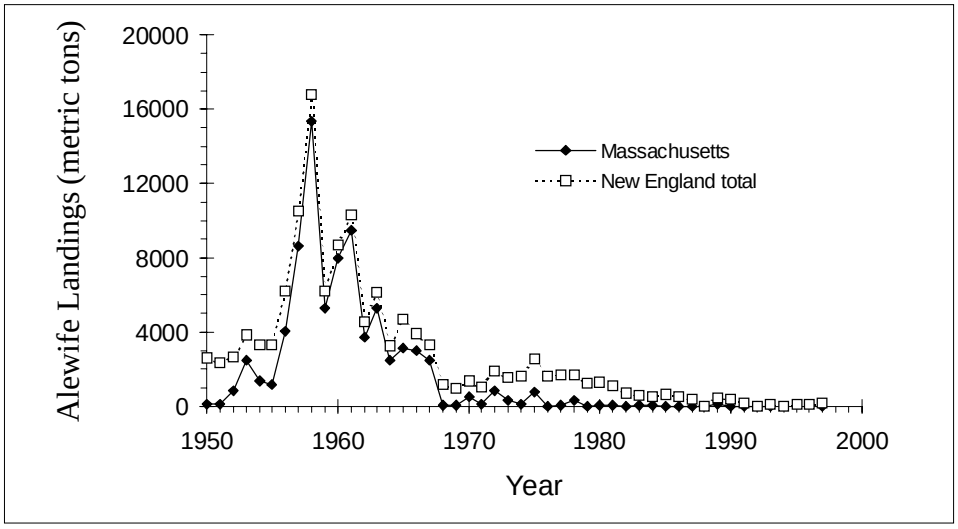
Fish migrated mainly during 2-6 p.m.—a pattern similar to that recorded and discussed by Rideout (1974) and Beltz (1975). Beltz (1975) noted that not all runs have a single peak in the late afternoon. Some showed two peaks.

When one compares the migration of fish at dams #1 and #6, run estimates suggest that only 28.6 percent of the fish swam all the way to Pentucket Pond in 1998. Beltz (1975) estimated that 39 percent of the fish that passed Central Street made the entire trip in 1973, while only 18.3 percent did in 1974. We conclude that there is significant variability from year to year.

The time for the trip may take several days as indicated by the peaks on 1 May at Central Street and the 4 May at Pentucket Pond. Similar data have been obtained by Rideout (1974) and Beltz (1975). They note that fish movement is inhibited by falling water temperatures and is influenced by the density of fish in pools. Tagging studies by Beltz found that half of the fish tagged at Central Street passed Pentucket Pond within four days, and that 95 percent passed dams #5 and #6 within eight days. There were examples of two fish that migrated the entire 10.7 kilometers in less than 24 hours. This is an average rate of less than 0.13 meters per second or about 1/3 of a body length per second.

One surprise of the 1998 count was that alewives did not use the ladder at the Pentucket Pond street dam but instead went up the face of the dam. This finding will be useful when the dam and spillway are redesigned.

A long-term goal of the alewife moni-



COMMERCIAL LANDINGS OF ALEWIFE in Massachusetts and New England show that landings have decreased across the region. After large catches of 8,000 to 16,000 metric tons in the late 1950s and early 1960s, landings declined to 2,000 metric tons in the mid-1970s and one-tenth of that in the mid-1990s.

toring project is to contrast the impact of the relative time spent in fresh water and marine ecosystems on the population levels of alewives. The decline in fish numbers that PRCWA documented in the last two years could be attributed to changes in one or both of these habitats. Ideas about changes that could have occurred on the freshwater side were discussed, but what about the ocean portion? Data from the U.S. National Marine Fisheries Service show that the alewife landings in New England have declined greatly in the last 50 years (*See figure above*). Declines are also evident in the Mid- and South Atlantic alewife landings. This large-scale decline does not bode well for the alewife.

Questions Generated by the Project

Why do some alewife stocks migrate in the afternoon while other stocks migrate at night?

What is the error associated with our counting methods?

What effect will the invasion of fanwort *(Cabomba caroliniana)* in Pentucket Pond (thought to be an important spawning location) have on alewife populations? What would the consequences of treating fanwort with the aquatic herbicide Sonar (fluridone) be for the pond and river ecosystems?

Can the fishways be redesigned to better facilitate fish passage or will the dams collapse from neglect, returning the river to a more natural state which it has not experienced in hundreds of years?

Are the declines in alewife populations in the Parker River a result of changes in the freshwater portion of their life cycle? Or are decreases in population due to changes in the marine ecosystem where fish spend the majority of their lives?

How will human population growth and increased human use of water in the watershed influence flow patterns and non-point source pollution in the river?

Answering these questions will require continued sampling in the coming years. Thanks to the enthusiasm of the volunteers, we are hopeful that we can collect this information and use it to help understand the alewife's biology and behavior and to guide management decisions that will ensure the survival of these wonderful fish.

The Authors

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The Parker River Clean Water Association (PRCWA) <http://www.Parker-River.org> is a community group protecting the waters and ecosystems of the Parker River and Plum Island Sound watersheds in northeastern Massachusetts.

PRCWA appreciates and acknowledges financial support for this project from the Entrust Foundation and the Massachusetts Executive Office of Environmental Affairs.

Further Reading

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Book on Susquehanna American Shad Recently Released

Author Richard Gerstell has written "American Shad in the Susquehanna River Basin: A Three-Hundred-Year History," which details how the American shad was brought back from the brink of extinction in the Susquehanna River Basin. Gerstell draws on the state archives, government land records, private property deeds, early newspaper reports, and other primary documents to tell the tale of the American shad in the Susquehanna through three centuries. Gerstell is a former chief of the Division of Research for the Pennsylvania Game Commission.

The book is available from Penn State University Press in cloth ($35.00 U.S) or in paperback ($17.95 U.S.). To order, call toll free 1-800-326-9180, or write to Penn State University Press, 820 North University Drive, University Support Building 1, Suite C, Unversity Park, PA 16802-1003.

Herring Closures in Connecticut

On 30 April, Connecticut Department of Environmental Protection announced closures of all tributaries to the Connecticut River, Keeney Cove and the discharge canal of the Connecticut Resources Recovery plant in Hartford on the Connecticut River to alewife and blueback herring (river herring) fishing.

Source: Connecticut Department of Environmental Protection press release.

Submissions

Contributions should be double-spaced. Submissions via e-mail or on disk are encouraged. Direct your contributions to Editor-In-Chief, SHAD JOURNAL, P.O. Box 21748, Seattle, WA 98111-3748 or to the e-mail address: hinrich@accessone.com.

Letters to the Editor and Articles. The Journal publishes letters, commentaries, histories, scientific articles, interviews, reviews, and philosophical and methodological items related to shad the world over. There are no page limits but authors are asked to edit their submissions for clarity and precision. Previously published items from other sources can be republished in the Journal if the contributor obtains permission of the author and the copyright holder, and identifies the original publication.

Please do not include footnotes or references in the text. Choose four or five of the most relevant references for inclusion at the end of the article. References may include a World Wide Web address. Write a brief biographical statement which includes your interest in shad, and current work. Please include your e-mail address, fax number, phone number, and postal address.

News Briefings (Shad Bites). Submit news articles on developments relating to shad. For upcoming meetings, submit a brief description, including title, a short paragraph on objectives and content, dates, location, registration requirements, and the meeting contact person's name, street address, and phone/FAX/e-mail address.

Obituaries. The Foundation will honor the memory of members and friends through obituaries. The obituary should describe the person's history (date and place of birth, professional address and title) and his/her involvement with shad.