

Maine ASMFC River Herring Sustainable Fishing Plan

1. Introduction

The purpose of this sustainable fisheries management plan is to ensure that existing river herring resources within Maine continue to thrive and provide a source of forage for Maine's fish and wildlife and provide commercial fishing opportunities in coastal communities.

The State of Maine Department of Marine Resources (DMR) and municipalities that historically harvest river herring operate under cooperative river specific management plans that guide conservation and harvest of river herring resources within these municipalities. These plans promote and manage healthy commercial and non-commercial river herring resources where they occur within the state. Maine formalized mutual river herring management plan formats in 1950, though mutual management plans existed prior to this date

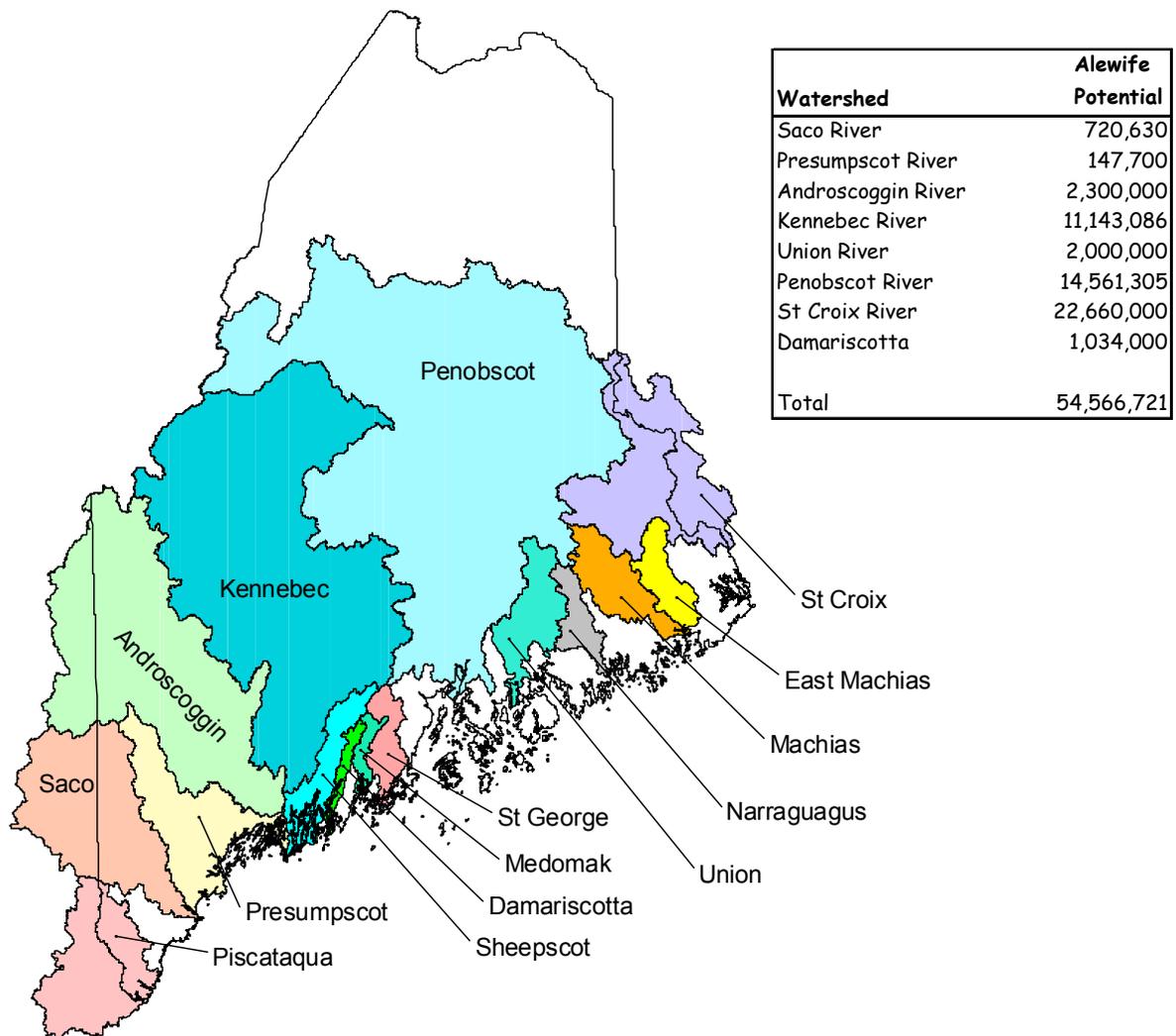
Maine has forty municipalities with exclusive right to harvest river herring. The State of Maine, in conjunction with the municipalities, and in accordance with cooperative river herring management plans, reviews these plans on an annual basis. Currently, twenty-four municipalities actively harvest river herring (Table 1). Joint fisheries operate through a cooperative agreement between municipalities with a shared waterway. One example is Winnegance Lake in mid-coast Maine. The three municipalities, Bath, West Bath, and Phippsburg, that border the spawning habitat along Winnegance Lake share management responsibilities and profits.

Directed municipal commercial harvest of alewife or blueback herring does not occur in nine of ten of Maine's largest rivers (Penobscot, Kennebec, Androscoggin, Saco, St. Croix, Presumpscot, Machias, Salmon Falls, and East Machias). There is a commercial fishery on the Sebasticook River, six miles above its confluence with the Kennebec. Maine limits directed harvest in these rivers through time/area closures and gear restrictions. These traditional conservation strategies allow alewife and blueback herring unrestricted access to spawning habitats upstream. To further conserve existing river herring populations in coastal waters this plan will prohibit the use of all gear types to fish for, catch, harvest, or sell blueback herring or alewife (*Alosa aestivalis*, *Alosa pseudoharengus*), collectively know as river herring in Maine territorial waters (inside three miles) with the exception of the permitted municipal fisheries. (Appendix)

There are ongoing efforts to restore commercial and non-commercial runs that once occurred throughout historic spawning habitats throughout the state. Dam construction during the last two centuries isolated river herring from many of the inland waters DMR is trying to restore through alewife reintroduction. The historical significance of anadromous fish to these waters was eventually lost, and freshwater fish communities, especially recreational game fish, began dominating these habitats. In the 1980s, DMR began restoring historic spawning habitats for anadromous fish in inland waters. Establishing a baseline for reintroduction was important to inland fisheries managers that manage fishing opportunities for salmon, trout, and bass. The interim restoration target for inland spawning habitats is six fish per surface acre for inland lake and pond locations stocked by truck. The State of Maine established this stocking rate as a result of a 10-year study conducted by MDMR, Maine Department of Environmental Protection, and Maine Inland Fisheries and Wildlife (Kircheis 2002). The

goal of the study was to quantify the effects of a spawning population of alewife on the resident fish species and zooplankton community within inland waters. A stocking rate of six fish per surface acre of lake or pond habitat exhibited no negative effects on growth rates of resident fresh water fish species. The DMR observes this stocking rate for all truck-stocked locations. It is important to note that the initial stocking rate for this study was arbitrary and the stocking density could perhaps be higher and still not demonstrate significant impacts to resident fish species. The potential alewife population based on historically available habitat and estimates of current production would exceed 54.5 million fish (Figure 1).

Figure 1. Estimates of potential alewife returns from historic alewife habitat by watershed (@235/fish/acre).



The Maine Department of Marine Resources must receive a permit from the Maine Department of Inland fisheries and Wildlife before stocking any state waters with river herring. The numbers of spawning fish allowed into some historic spawning habitats is limited, or not permitted at all, based on

perceived conflicts with rainbow smelt and recreational sport fish species such as landlocked salmon, smallmouth bass, and largemouth bass. Although there appears to be no basis for these concerns the number of river herring permitted into some historic spawning locations range from zero to six fish per surface area based on the Lake George Report. State legislation prohibits stocking river herring into several waters in the state. Most commercial runs could expand if they were not constrained by permitting or fish passage restrictions unrelated to the commercial harvest. One example is the Androscoggin River, Maine's third largest River where only 1/3 of the historic spawning area is open to river herring. Still, this is better than the present policy on the St. Croix River where the State of Maine closed all fishways to the passage of river into the St. Croix drainage. Soon after the state closed these fishways in the 1980s, the river herring run declined from 2.8 million returns to approximately 5,000 returns. The DMR has requested that the International Joint Commission review the status of passage on the St. Croix River and reopen the river to all anadromous species. The DMR is also working with the other state resource agencies to increase access to historic spawning habitats statewide.

Commercial harvesters and commercial harvest groups continue to advocate for increased passage for river herring into historic spawning habitat. All of the current municipalities that exercise commercial river herring fishing rights maintain and monitor up and downstream passage during the spring and fall. The past three years commercial fisherman collected scale samples from their respective commercial catches to meet the data objectives of Amendment 2. Where towns do not exercise the right to fish, river herring returns languish. In most cases, there is no local interest in providing/improving passage or monitoring these runs.

Table 1. Maine municipalities with directed commercial river herring fishing rights

Municipality	Fishery	Municipality	Fishery
Alna*	Long Pond	Lincolnville	Pitcher Pond
Arrowsic	Sewall Pond	Northport	
Bath*		Mount Desert	Somes Pond
Phippsburg*	Winnegance Pond	Newcastle*	Damariscotta Lake
West Bath*		Nobleboro*	
Benton*	Sebasticook River	Orland*	Orland River
Boothbay Harbor	West Harbor Pond	Pembroke*	Pennimaquan Lake
Breman	Webber Pond	Perry*	Boyden Lake
Bristol	Pemaquid Pond	Penobscot*	Peirce Pond
Cape Elizabeth	Alewife Pond	Phippsburg	Center Pond
Cherryfield*	Narraguagus River	South Berwick	Salmon Falls River
Columbia Falls*	Pleasant River	Steuben*	Tunk Lake
Dresden*	Mill Pond	Sullivan*	Flanders Pond
East Machias*	Gardiner Lake	Surry	Patten Pond
Ellsworth*	Union River	Tremont	Sea Cove Pond
Franklin*	Great Pond	Vassalboro*	Webber Pond
Gouldsboro*	West Bay Pond	Waldoboro	Medomak River
Hampden	Soudabscook Pond	Warren*	St. George River
Jefferson*	Dyer-Long Pond	West Bath	New Meadows Pond
Kennebunk	Alewife Pond	Woolwich*	Nequasset Lake

* Towns that currently harvest river herring

2. Current regulations

Commercial Fisheries

Local municipalities control access to most commercial quantities of river herring. These municipalities, in cooperation with the State of Maine, cooperatively manage the state river herring resources. The State of Maine requires municipalities with historic river herring harvest rights file an annual notification that they wish to maintain those rights. An annual harvest plan is required for each fishery prior to Department of Marine Resources approval. Most commercial harvest plans follow the model plan below, with some fisheries having additional requirements specific to an individual run. Each municipality restricts the number of harvesters to one individual that is responsible for harvesting fish under the municipality's rights and management plan. All commercial fisheries have a 72-hour closed period or conservation equivalency to insure proper escapement into spawning habitat. Individual river/stock specific plans were provided to ASMFC for review if additional information is required. Municipal fisheries that operate under Conservation Equivalencies are required to pass the minimum target number of spawning river herring upstream based on habitat availability at the rate of 35 fish per surface acre of spawning and nursery habitat or provide additional escapement periods.

Commercial Season

The river herring harvest begins the last week of April, though many runs do not commence until the first week of May. The run timing of commercial catches is progressively later as you move eastward along the coast. The river herring season ends June 5 unless the municipality requests a 10-day extension until June 15. The DMR will award an extension if environmental conditions delay run timing during the season and river herring are not available to the commercial harvester. Closed periods still apply, which effectively reduce the extension period to no more than seven and as few as five additional fishing days for the season. The June 15 end date, if an extension was awarded, typically coincides with the start of the blueback herring run in Maine rivers. Commercial harvesters capture some blueback herring toward the end of the alewife season at some locations (Orland, Benton, Warren). Most commercial alewife harvest locations do not have blueback herring populations. The blueback herring runs in Maine begin in early June and continue through the second week of July. Most blueback herring populations are found in the main stems of our large rivers and larger tributaries.

Model Harvest Ordinance for the Harvest of River Herring

- 1) A minimum unobstructed opening of two feet (2') shall be maintained at all times between the riverbank and the downstream end of the weir.

- 2) The maximum mesh size of wire, twine, or other material used in the weir shall not exceed one inch by one inch (1" x 1").

- 3) There shall be a 72-hour weekly closed season on alewives from sunrise each Thursday morning until sunrise the following Sunday morning. During the closed season, a minimum size unobstructed opening of three feet by three feet (3' x 3') shall be maintained in the upstream and downstream end of the trap to allow escapement of spawning alewives and other migratory fish.

4) Migratory fish such as salmon, shad, or other species except alewives and blueback herring that enter the trap shall be removed and allowed to pass upstream.

5) Fishing operations shall cease and all fishing gear obstructing the passage of fish shall be removed from the fishing waters not later than June 5. If late-run alewives are entering the river, the Town must seek approval from the Department of Marine Resources to extend the season up to but no later than June 15.

6) The total landings in pounds or bushels and value of the catch shall be made available to the Maine Department of Marine Resources and/or National Marine Fisheries Service on request by these agencies.

ADDITIONAL REGULATIONS FOR STREAMS WITH ATLANTIC SALMON RUNS

1) The entrance to the dipping pen or trap shall be covered by bars, slats, or spacers with a maximum width of two inches (2") between said bars, slats or spacers.

2) Dipping of alewives shall be confined to the dipping pen or trap.

The U.S Fish and Wildlife Service lists Atlantic salmon as endangered in the eastern two thirds of the State of Maine. There are no know conflicts with commercial alewife fisheries in the rivers where these fisheries currently exist. River herring may provide possible benefits to the Atlantic salmon smolts during emigration by increasing the numbers of forage fish within the system during migration. The U.S. Fish and Wildlife Service is currently testing the hypothesis that alewives provide a cover for migrating Atlantic salmon smolts, lessening the mortality during downstream migration to the sea.

Newly Enacted Legislation

The 124th Maine Legislature passed legislation presented as proposed legislation in the pervious Sustainable Fisheries Management Plan. This legislation crates a "Commercial Pelagic and Anadromous Fishing License and Establishes the Pelagic Fisheries Fund." This legislation will require mandatory reporting of all catch data within 60 days, track bycatch for river herring, and provide funding to conduct limited research (Appendix). This legislation will track river herring bycatch statewide and help identify fishing locations and gear types that have high incidence of river herring bycatch in coastal waters.

Recreational Fisheries

Limited opportunity exists for recreational river herring harvest in tidal and inland waters. Current state law allows recreational anglers to take one bushel of fish per day for personal use. Few locations in Maine permit recreational anglers to access fish in that number. Gear limitations restrict anglers to hook and line and dip net only. These gear types are permitted in areas outside and downstream of municipal commercial fisheries and does not affect escapement. Recreational gill netting is not an approved method to catch river herring for personal use. Proposed regulations will limit the number of river herring to 12 per person per day for personal use.

3. Brief Description - Current Status of the Stocks

The State of Maine manages individual runs as separate stocks according to commercial harvest plans. These stocks have separate, well-defined spawning habitats, migration routes, and run timing that make them unique compared to similar runs throughout the state. Commercial stocks are stable or increasing based on data presented in the ASMFC stock status report, though they reflect annual variation based on a number of factors related to environmental factors, upstream and downstream passage efficiency, annual harvest, escapement, and bycatch in other fisheries which are of particular concern to ASMFC. Data analyses compiled during the ASMFC stock status report indicate increasing trends in population and stable age structure during the past two decades.

Non-commercial runs are stable, or in some instances, declining. Many of these runs are small by nature and experience passage issues that limit reproduction. Despite commercial closure, many of these runs maintain only remnant populations. Improved passage, both upstream and downstream, and initial stocking to rebuild the runs will enable these habitats to produce excess fish for commercial harvest in the future.

The ASMFC Stock Assessment Committee document *Atlantic States Marine Fisheries Commission 2008 River Herring Stock Status Report* concluded the following:

- Average Beverton-Holt estimates of Z for male and female river herring from fisheries-independent data from the Androscoggin and Sebasticook rivers averaged .7 for the period 2000 – 2007 for both male and female alewives. These were the result of a slight upward trend, indicating that these values were below .7 for some period prior to 2000. (Figure 2)(ASMFC 2008 RHSSR page 45) Estimates of age-based Z using three methods (Figures 3-4)

Figure 2. Fisheries independent Beverton-Holt Z-Estimates.

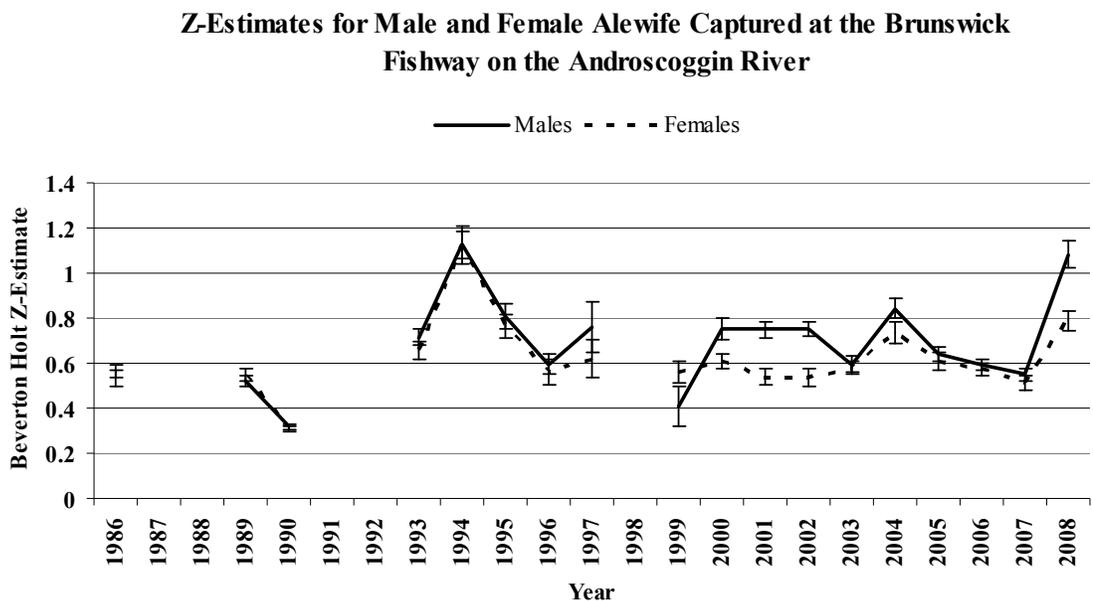


Figure 3. Fisheries independent estimates of male Z-values using Catch Curve, Heinke and Chapman-Robson.

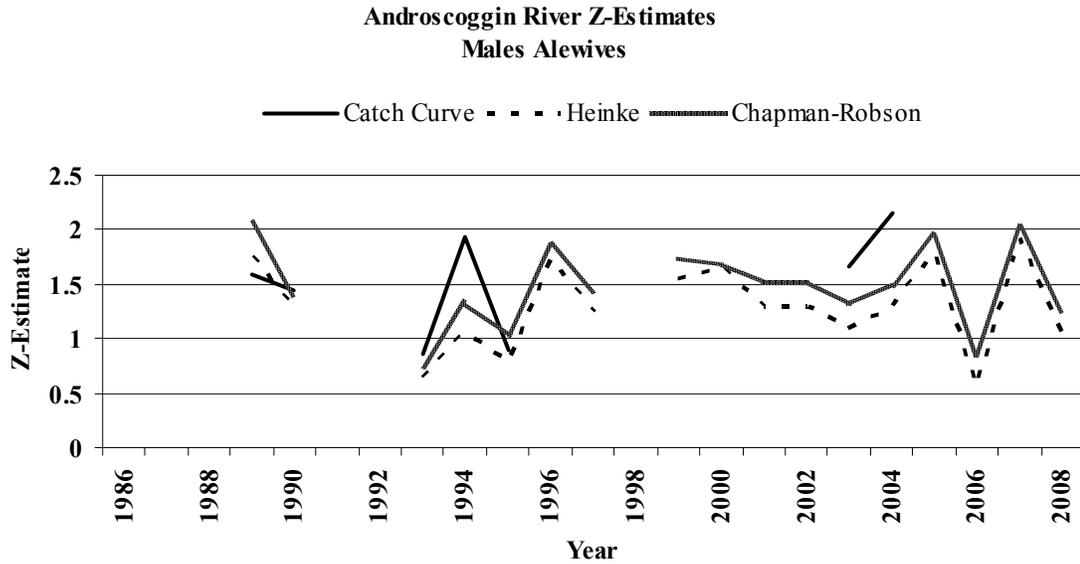
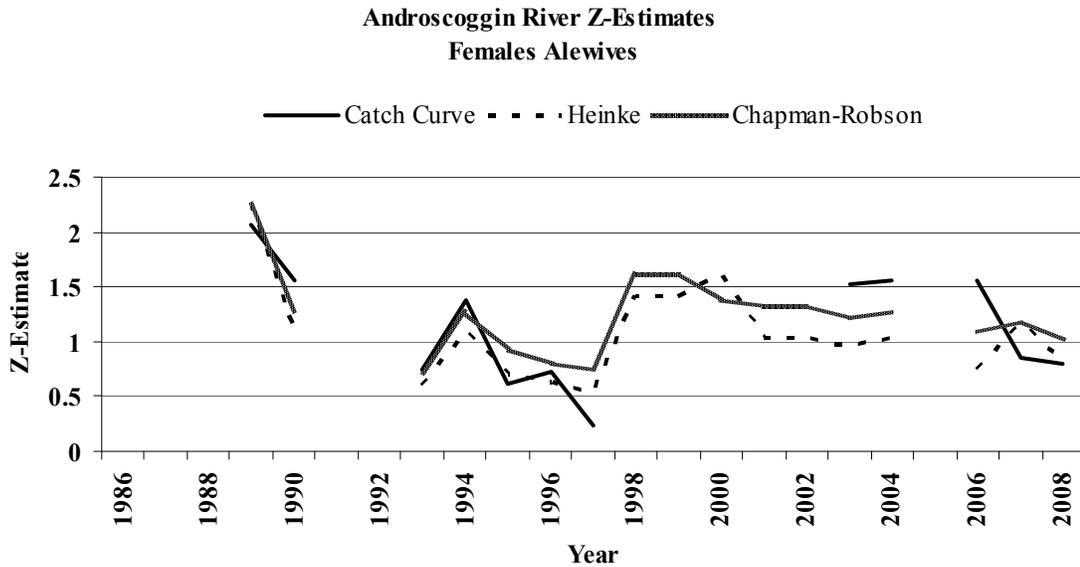


Figure 4. Fisheries independent estimates of female Z-values using catch curve, Heinke and Chapman-Robson.



- Exploitation of the Damariscotta River was <5% for the period 1993-2000. Since 2004 the exploitation rate is > 37%. The exploitation rate in the Union River declined from 1988 – 2005 and currently remains at 46%. (ASMFC 2008 RHSSR page 47)
- Increasing trends in run size in Maine for Androscoggin, Damariscotta, and Sebasticook rivers. (ASMFC 2008 RHSSR page 48)
- Stable maximum age for alewife and blueback herring compared to historical observations. (ASMFC 2008 RHSSR page 48)

Age data collected by Rounsefell in 1943 indicate that two commercial fisheries, the Damariscotta and Orland, were dominated by single age classes of spawning fish. There were no data available for subsequent years, though Rounsefell's estimates of exploitation (90% for Maine fisheries) would indicate that there were few repeat spawning fish during the years immediately prior to or following 1943 (Rounsefell & Stringer 1943 p.6)

- Stable mean length at age for fisheries-independent data collected from the Androscoggin River. (ASMFC 2008 RHSSR page 48)

Historical data collected by the U.S Fish and Wildlife Service in 1943 at Damariscotta Lake and the Orland River support the current trends discussed in the Stock Status Report for Maine alewife populations. The U.S. Fish and Wildlife Service determined that the mean lengths of male alewives were 268.9 mm and 269.7 mm respectively. Mean female lengths for the same rivers were 275.0 mm and 278.2 mm respectively. These mean lengths are smaller than those observed in biological samples collected from the 2010 commercial fisheries at these locations. Damariscotta males averaged 274.2 mm and females averaged 286.7 mm, both longer than the lengths observed in 1943. Length data collected in 2010 from the commercial fishery on the Orland River show the same trends. Mean length for males is 278 mm and mean length for females is 294 mm (Rounsefell & Stringer 1943 p.7, 23)

- Repeat spawning rates based on fisheries-independent data collected at the Brunswick Fishway exceeded 50% for males during the three years data were collected. Female repeat spawning rates were similar to rates for males in 2006 and 2007, but were lower than male rates in 2005. (ASMFC 2008 RHSSR page 38)

a. Landings

The State of Maine requires mandatory reporting of annual municipal landings at the end of each fishing season. Trend analysis indicates an increasing trend in state landings for the period 1990 – 2009. The Department of Marine Resources tracks annual landings through time to observe trends by stock. Annual landings data may not be the best way to track the health of the commercial runs. Escapement numbers are unknown in most Maine river herring fisheries and are estimated using a ratio of closed days and reported commercial landings .

Fisheries independent estimates of annual escapement for commercial runs range from 15 – 80 percent annually. Data collected at the Brunswick Fishway indicate average escapement during the 72-hour closed period averages 46 percent of reported landings for the years 2001 - 2009 (Table 2). Fisheries staff bases this estimate on upstream passage at fisheries independent locations where daily counts provide total escapement numbers for that day.

Table 2. Fisheries independent estimate of annual harvest rates

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	01-09
Number passed at Brunswick Fishway (FI) during closed fishing days	18,196	104,520	53,732	113,686	25,846	34,239	60,577	91,859	44,725	547,380
Number passed at Brunswick Fishway (FI) during allowed fishing days	12,162	37,126	29,385	67,667	10,517	25,986	50,487	44,946	18,248	296,524
Estimated proportion of run harvested	0.67	0.36	0.55	0.60	0.41	0.76	0.83	0.49	0.41	0.54

b. Fisheries Independent and Fish Dependent Indices

Both fisheries independent and fisheries dependent data are available to provided relative measures of river herring run status and health. Most fisheries independent data come from beach seine surveys, fishway counts, or fish counts on rivers without commercial fisheries. Analysis of these data indicates that most commercial populations statewide are stable or increasing. Analysis of these data alone may not be the best way to determine the health of stock specific runs throughout the state. River/stock specific data for the runs below originate from reported landings data and scale samples collected by commercial fishermen and analyzed by Maine fisheries staff (Table 3).

Table 3. Fisheries independent and fisheries dependent estimates of Z for 2008 and 2009.

2009	Age Based Z-Estimates											
	Fisheries Independent Data				Age Based Z-Estimates							
	Catch Curve				Heinke				Chapman-Robson			
Fishery	Male		Female		Male		Female		Male		Female	
	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE
Androscoggin River	1.30	0.43	0.85	0.25	0.56	0.05	0.52	0.06	0.87	0.08	0.83	0.10
Card Mill	-	-	-	-	2.30	0.90	1.79	0.59	2.30	0.90	1.87	0.62
Medomak River	-	-	-	-	0.93	0.12	-	-	1.25	0.17	-	-
Sewall Pond	1.82	0.59	0.68	0.09	1.13	0.16	0.78	0.09	1.36	0.20	0.97	0.12

Sexes Combined

Fisheries Independent Data

Age Based Z-Estimates

2008	Catch Curve				Heinke				Chapman-Robson			
	Male		Female		Male		Female		Male		Female	
	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE
Androscoggin River	1.23	0.24	0.80	0.17	1.05	0.12	0.81	0.11	1.24	0.14	0.81	0.11
Card Mill Stream	1.67	0.16	1.43	0.19	1.89	0.38	1.68	0.29	1.85	0.37	1.65	0.28
Flanders Stream	-	-	-	-	1.79	0.83	1.10	0.67	1.79	0.83	1.10	0.67
Patten Pond	-	-	1.39	0.40	1.79	0.28	1.85	0.34	1.93	0.31	1.73	0.32
Sewall Pond	1.25	0.59	1.49	0.24	0.76	0.08	0.88	0.08	1.08	0.12	1.13	0.11

Fisheries Dependent Data

Age Based Z-Estimates

2009	Catch Curve				Heinke				Chapman-Robson			
	Male		Female		Male		Female		Male		Female	
	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE
Damariscotta	-	-	-	-	2.56	0.92	1.87	0.60	2.56	0.92	1.95	0.63
Dresden	1.12	0.23	0.92	0.13	0.67	0.09	1.13	0.23	0.93	0.13	1.18	0.24
E. Machias	2.00	0.63	-	-	1.22	0.15	-	-	1.44	0.18	-	-
Gouldsboro	1.00	0.31	-	-	0.73	0.15	-	-	0.96	0.20	-	-
Grist Mill	1.39	0.66	-	-	0.78	0.10	-	-	1.10	0.15	-	-
Jefferson	-	-	-	-	-	-	2.69	0.47	-	-	2.74	0.48
Orland	0.87	0.01	1.59	0.28	0.99	0.20	1.30	0.24	1.10	0.22	1.44	0.27
Perry	-	-	-	-	1.72	0.21	-	-	1.88	0.24	-	-
Sheepscot	-	-	-	-	1.54	0.20	-	-	1.73	0.23	-	-
Surry	-	-	-	-	2.04	0.36	2.64	0.66	2.14	0.38	2.67	0.67
Union	-	-	1.42	0.11	1.79	0.48	1.34	0.30	1.90	0.52	1.42	0.32
Vassalboro	1.70	0.72	1.70	0.72	0.92	0.13	1.10	0.25	1.20	0.18	1.17	0.27
Warren	1.22	0.49	0.80	0.25	0.99	0.13	0.80	0.10	1.16	0.15	0.86	0.11
Winnegance	1.47	0.38	-	-	1.22	0.15	2.44	0.65	1.37	0.18	2.48	0.66
Woolwich	-	-	1.35	0.38	-	-	1.79	0.48	-	-	1.66	0.44

Sexes Combined

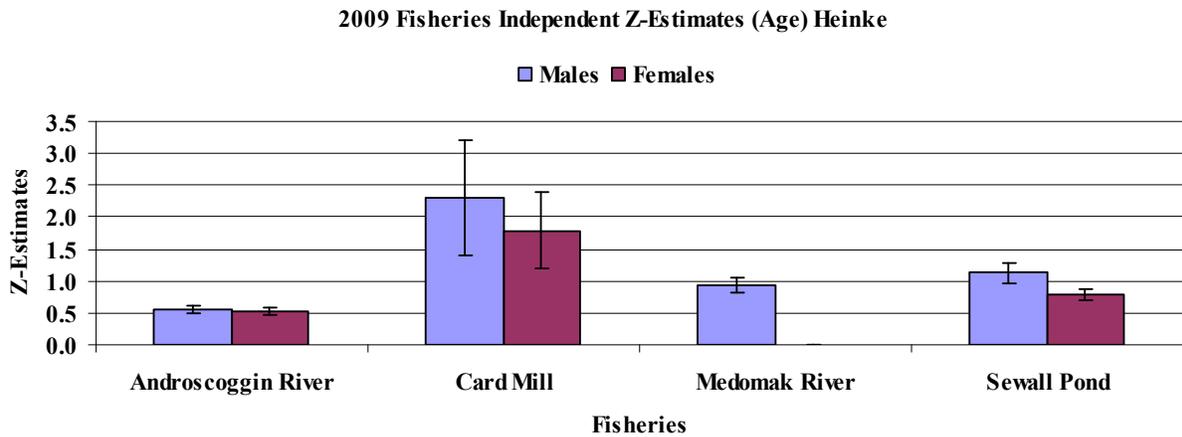
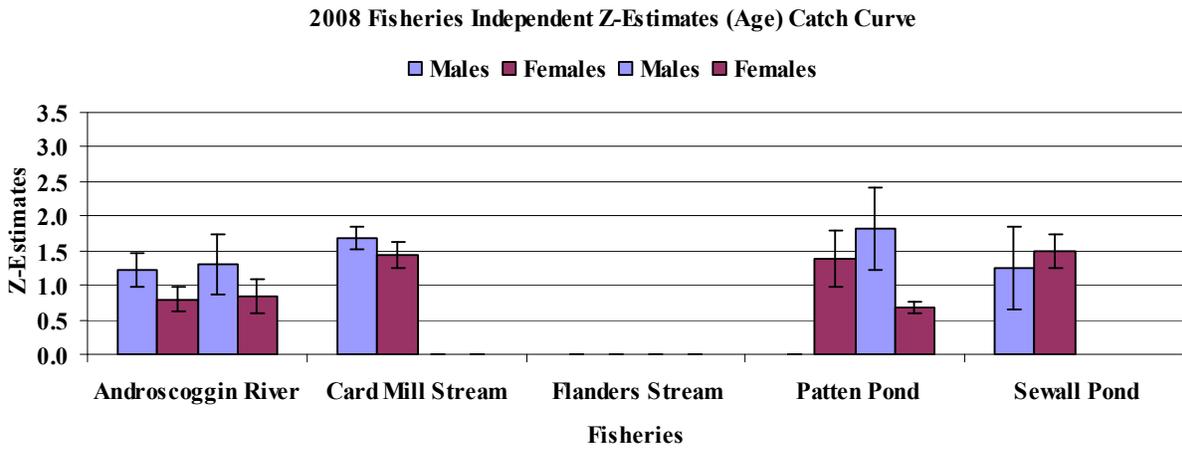
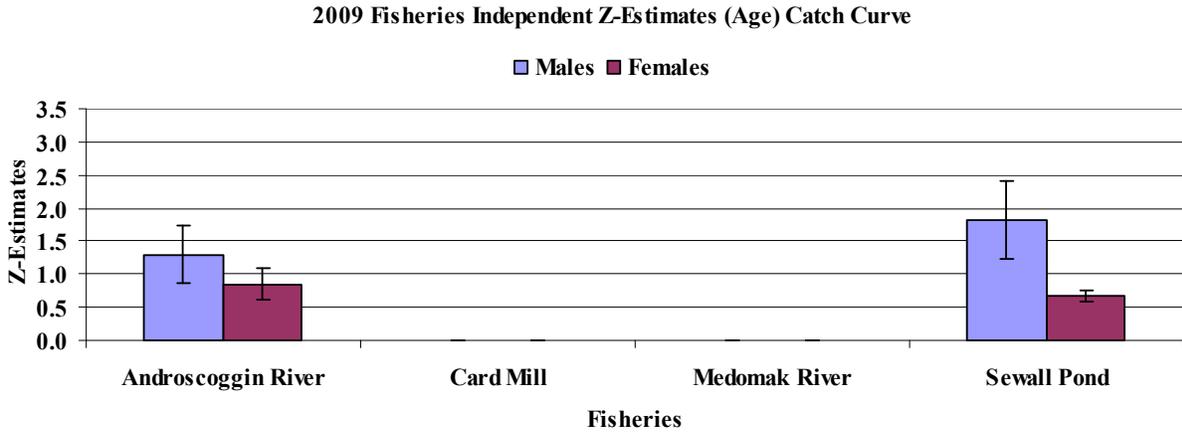
Fisheries Dependent Data

Age Based Z-Estimates

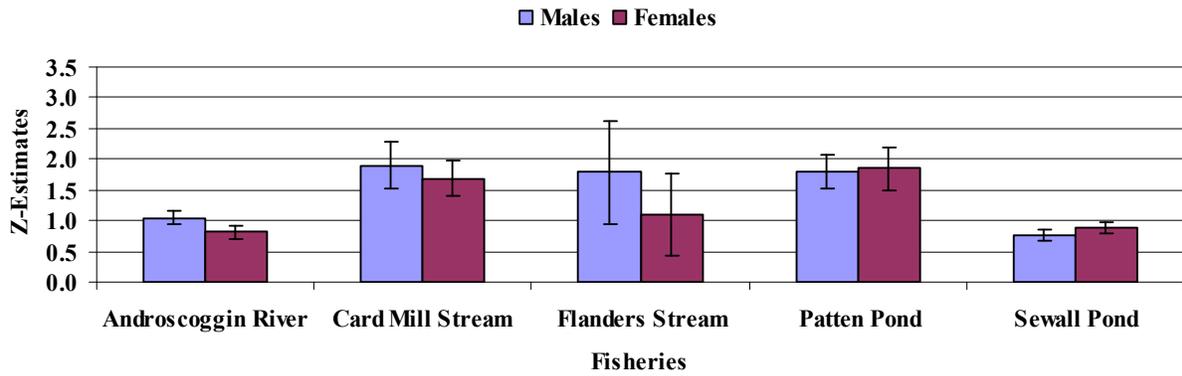
2008	Catch Curve				Heinke				Chapman-Robson			
	Male		Female		Male		Female		Male		Female	
	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE	Z	SE
Dresden	0.9	0.2	0.7	0.4	0.8	0.1	0.6	0.1	1.0	0.2	0.8	0.1
E. Machias	1.9	0.1	-	-	1.7	0.2	-	-	1.8	0.2	-	-
Flanders Pond	-	-	0.9	0.1	1.2	0.3	0.9	0.3	1.4	0.4	1.0	0.3
Gouldsboro	-	-	-	-	1.6	0.8	0.9	0.3	1.6	0.8	1.2	0.4
Grist Mill	1.1	0.1	1.1	0.2	0.9	0.2	1.3	0.2	1.1	0.2	1.2	0.2
Narraguagus	0.8	0.1	-	-	0.6	0.1	-	-	0.8	0.1	-	-
Orland	0.9	0.2	-	-	0.9	0.1	-	-	1.1	0.1	-	-
Perry	1.6	0.1	-	-	1.4	0.2	-	-	1.5	0.2	-	-
Sheepscot	1.3	0.4	-	-	0.6	0.1	-	-	0.9	0.1	-	-
Union	-	-	-	-	2.1	0.4	1.9	0.4	2.2	0.4	2.0	0.4
Warren	1.0	0.3	-	-	0.7	0.1	1.8	0.4	0.9	0.1	1.9	0.4
Woolwich	-	-	-	-	1.0	0.3	1.7	0.5	1.3	0.4	1.8	0.5

Sexes Combined

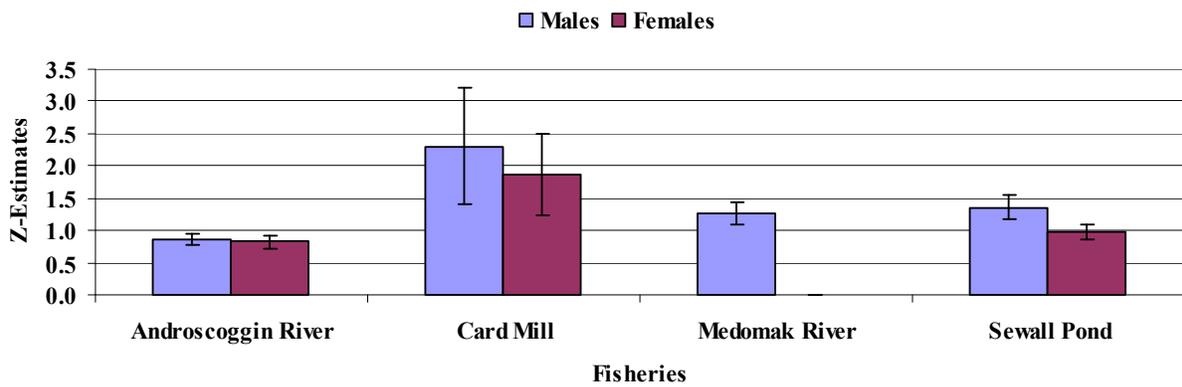
Figure 5. Fisheries independent and fisheries dependent estimates of Z for 2008 and 2009.



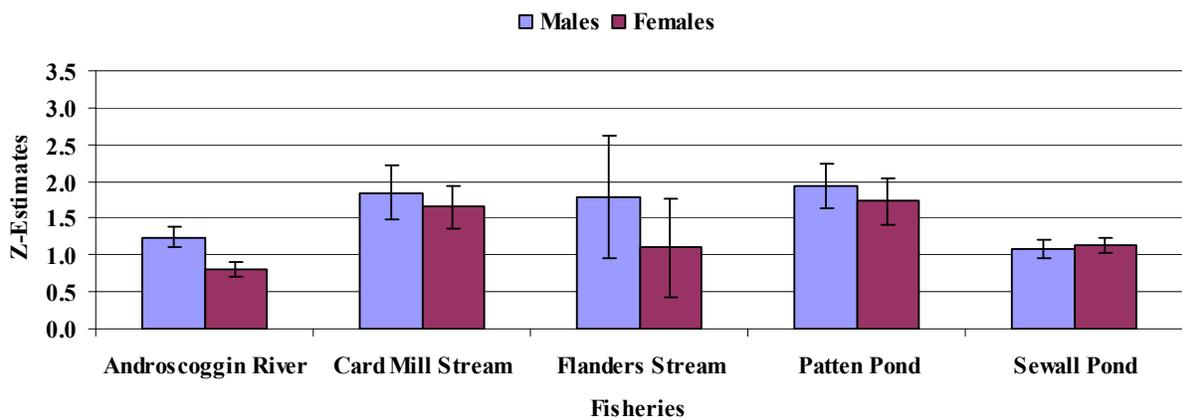
2008 Fisheries Independent Z-Estimates (Age) Heinke



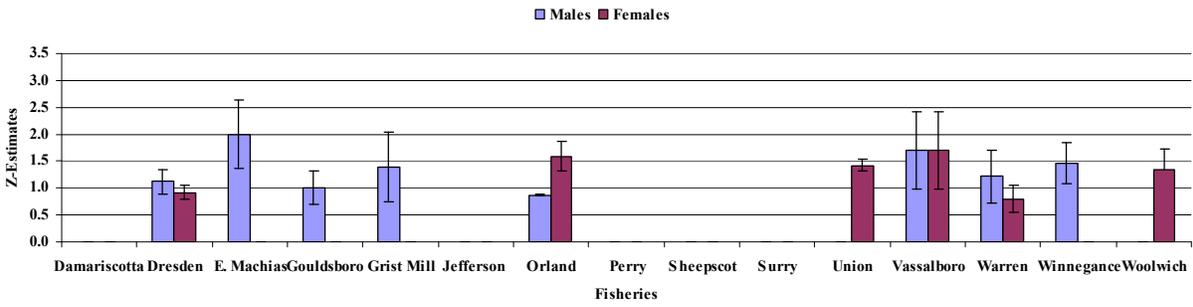
2009 Fisheries Independent Z-Estimates (Age) Chapman-Robson



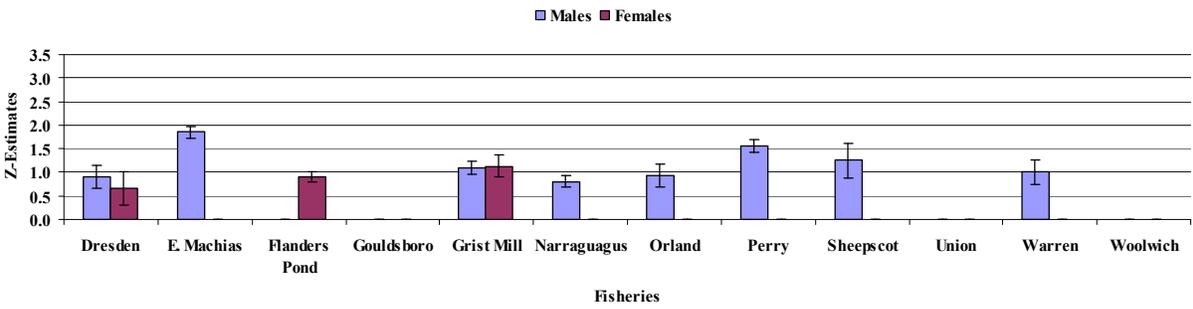
2009 Fisheries Independent Z-Estimates (Age) Chapman-Robson



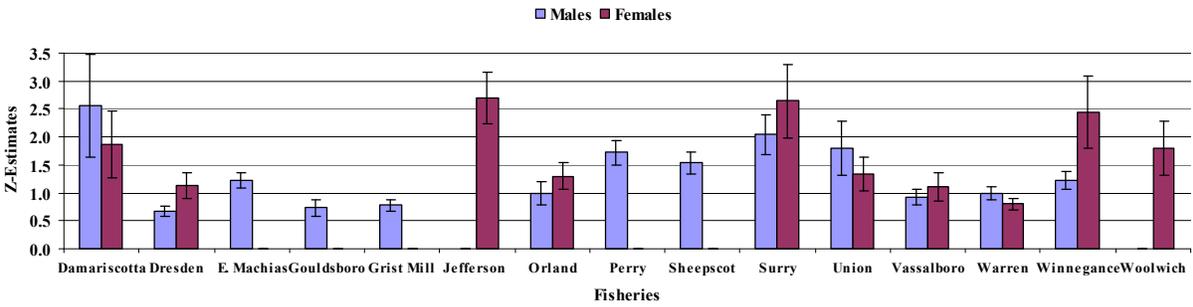
2009 Fisheries Dependent Z-Estimates (Age) Catch Curve



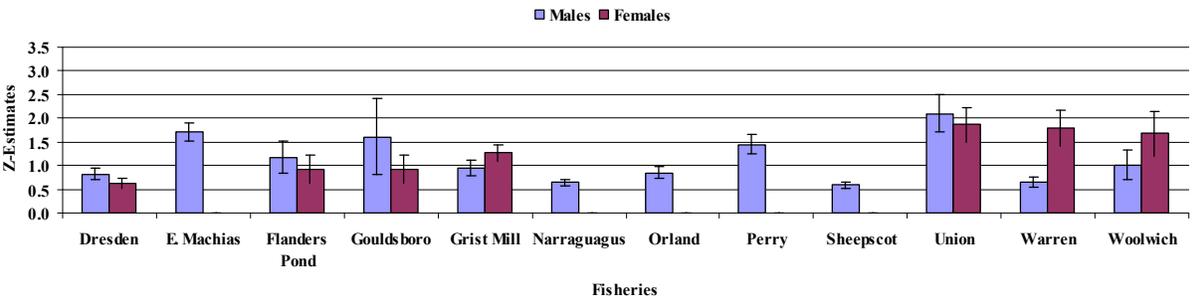
2008 Fisheries Dependent Z-Estimates (Age) Catch Curve



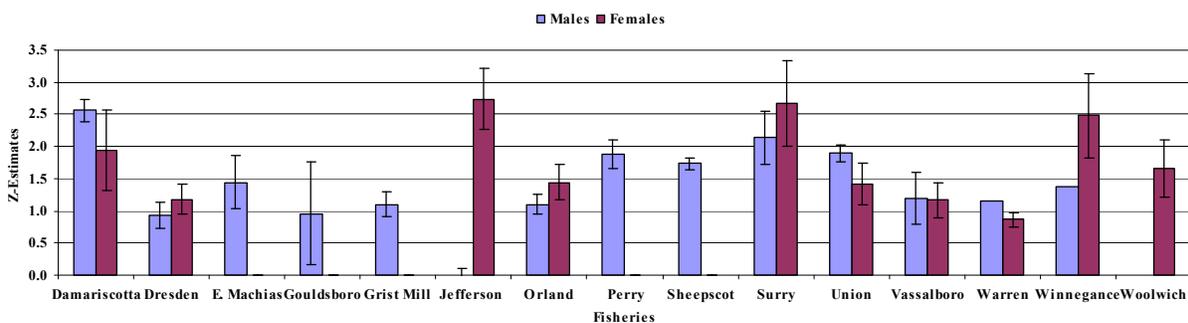
2009 Fisheries Dependent Z-Estimates (Age) Heinke



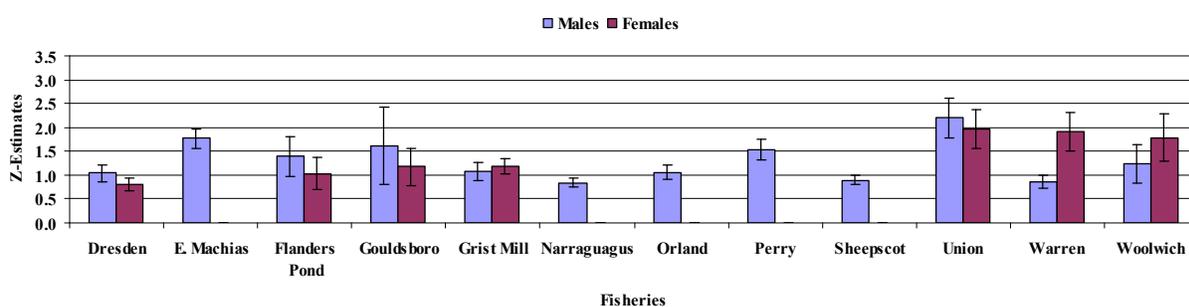
2008 Fisheries Dependent Z-Estimates (Age) Heinke



2009 Fisheries Dependent Z-Estimates (Age) Chapman-Robson



2008 Fisheries Dependent Z-Estimates (Age) Chapman-Robson



4. Fisheries to Remain Open

Municipality	Fishery	Municipality	Fishery
Alna	Long Pond	Jefferson	Dyer-Long Pond
Bath		Newcastle	
Phippsburg	Winnegance Pond	Nobleboro	Damariscotta Lake
West Bath			
Benton	Sebastcook River	Orland	Orland River
Cherryfield	Narraguagus River	Perry	Boyden Lake
Dresden	Mill Pond	Sullivan	Flanders Pond
East Machias	Gardiner Lake	Steuben	Tunk Lake
Ellsworth	Union River	Mount Desert	Somes Pond
Franklin	Great Pond	Vassalboro	Webber Pond
Gouldsboro	West Bay Pond	Warren	St. George River
Woolwich	Nequasset Lake		

Commercial Justifications for the Municipal Fisheries Listed Above:

In the commercial landings graphs provided below, years with extremely low landings or zero landings for one or more years indicate fishing during that year did not occur or occurred at very low levels. Two main reasons for zero landings are 1) the municipality decided to close the fishery for conservation or other purposes or 2) the harvester fished for a limited number of days due to weather, gear, price, or other factors that created unfavorable market conditions. In 2005, extreme high water prevented many commercial fishermen from conducting normal fishing operations during the season. The result was a major decline in reported landings for 2005 statewide. Biological data by river for most river systems, other than commercial harvest data, are unavailable for years prior to 2008. The data needs to address concerns presented in ASMFC Amendment 2 to the Shad and River Herring Management Plan are the reason data collection began in 2008.

Zero landings do not indicate that fish were not present or that the targeted escapement into spawning habitat did not occur. The sustainability target, established in 1984, for most commercial fisheries is 35 fish per surface acre of spawning habitat. Since 1984, MDMR has used 235 fish/acre to estimate alewife production. The Department established this unit production value from the commercial harvest in six Maine watersheds for the years 1971-1983. Based on these data, commercial yield was assumed to be 100 pounds/surface acre of ponded habitat. This value is slightly less than the average of the lowest yield/acre for all six rivers and within the range of yields experienced in other watersheds. Assuming a weight of 0.5 pounds per adult, the commercial yield equals 200 adults/surface acre. The commercial harvest was assumed to represent an exploitation rate of 85%, because most alewife runs were harvested six days per week. Exploitation rates on the Damariscotta River, for example, ranged from 85-97% for the years 1979-1982. When commercial yield is adjusted for the 15% escapement rate, the total production is 235 adult alewives/acre. This is a conservative estimate of the numbers of returns based on an average individual weight value of .5 pounds per return, including blueback herring.

The Maine Department of Marine Resources estimates escapement for commercial runs, where actual counts are not conducted, by multiplying landings by the ratio of closed days verses open days for the week. For most fisheries this will be (.43 * reported landings) for that year.

Fishery Specific Information

Alna Commercial Fishery:

The Maine Department of Marine Resources manages this system for a commercial escapement of 35 fish per acre. The spawning escapement needs for this system are 20,000 river herring passed upstream by the harvester throughout the season. The management plan has always achieved returns to meet the target escapement developed for this system or passed the entire run upstream. Harvesting occurs in the fishway just downstream of Long Pond, which is the only accessible spawning habitat on the east branch of the Sheepscot River. The Department of Inland fisheries and Wildlife will not permit alewives access to historical spawning habitat in Sheepscot Pond, or the watershed above, because of concerns with disease issues that may effect sport fish raised at a state own fish hatchery on Sheepscot Pond.

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.

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

Escapement levels of six fish per surface acre provide initial spawning populations of anadromous alewife in Maine lakes and ponds consistent with multi-species fisheries management plans developed with other Maine state agencies. This escapement number allows for a small commercial harvest or will allow managers to increase spawning stock by passing all returns upstream.

Method Used to Develop Spawning Target

The sustainability target of 35-fish per acre of spawning habitat is the result of a combination of studies, observations, and documented commercial catches over a number of years. Maine uses this sustainability target for continuing commercial fisheries that require escapement of broodstock from river specific populations.

Since 1984, MDMR has used 235 fish/acre to estimate alewife production. The Department established this unit production value from the commercial harvest in six Maine watersheds for the years 1971-1983. Based on these data, commercial yield was assumed to be 100 pounds/surface acre of ponded habitat. This value is slightly less than the average of the lowest yield/acre for all six rivers and within the range of yields experienced in other watersheds. Assuming a weight of 0.5 pounds per adult, the commercial yield equals 200 adults/surface acre. The commercial harvest was assumed to represent an exploitation rate of 85%, because most alewife runs were harvested six days per week. Exploitation rates on the Damariscotta River, for example, ranged from 85-97% for the years 1979-1982. When commercial yield is adjusted for the 15% escapement rate, the total production is 235 adult alewives/acre.

Results from studies conducted at one of these lakes in the 1970s-1980s, Damariscotta Lake, located in mid-coast Maine, indicate that increasing escapement of spawning alewives ranging from 40 to 60 fish per acre caused the parent progeny relationship to trend downward. (Walton, C.J. 1987. Parent-Progeny relationship for an Established Population of Anadromous Alewives in a Maine Lake. American Fisheries Society Symposium 1:451 – 454, 1987)

The relationship between increased number of spawning individuals and returns 4-5 years later does not support increased stocking rates for many Maine runs. Analysis of escapement numbers and commercial catches in fisheries with a sustained level of stocking over a number of years indicates large variation in run size unassociated with the number of spawning fish.

The State of Maine uses an alternative 6-fish per acre target for runs under restoration or when establishing new or existing runs. The 6-fish per acre target was established through fisheries work

conducted to examine the effect of anadromous alewives on existing fish populations in lakes without anadromous alewives (Lake George Study).

A 10-year study conducted by the Maine Department of Inland Fisheries and Wildlife, Department of Environmental Protection, and Department of Marine Resources, named the “Lake George Study” determined that stocking six prespawn fish per surface acre does not negatively effect growth of inland game-fish species including trout, landlocked salmon, or rainbow smelts. There were indications that increased numbers of alewives changed the zooplankton structure in the nursery habitat. This study is the basis for multispecies fisheries management plans in lakes that have anadromous alewives.

Monitoring to be Conducted to Support Target(s)

Fisheries staff will continue to use landings data, escapement counts, mortality estimates, escapement estimates, and scale sample data to track relative health of river specific stocks. Additional data comes from the JAI survey conducted in Merrymeeting Bay and associated rivers to track populations of river herring possibly spawning in the Merrymeeting Estuary. These monitoring efforts will continue for all commercial fisheries and will occur for all directed commercial fisheries that wish to open in the future.

7. Proposed Rule-Making to Support Target(s)

Fisheries that cannot support commercial harvest levels will remain closed for conservation. In addition, this plan proposes to eliminate the directed harvest, possession, and sale of any river herring within state waters other than the approved directed fisheries contained within this plan. The state rulemaking process will occur prior to the 2011 fishing season for river herring and will proceed once this plan is approved. A draft of our proposed regulatory changes can be found in the Appendix. The state has recently enacted statutory changes to our commercial fishing license and has created a Pelagic and Anadromous Fisheries Fund (see Appendix). Funds from this license will allow MDMR to monitor existing small mesh fixed and mobile gear fisheries that focus on catching bait for the commercial lobster fishery. Monitoring of these fisheries will give us improved data needed to make additional changes, such as time and area closures if bycatch of river herring remains an issue.

8. Adaptive Management

a. Evaluation schedule

The Maine Department of Marine Resources reviews all municipal fisheries plans annually. Many plans carry over year to year because they provide adequate protection for the river herring resource. Plan reviews incorporate landings data, escapement counts, broodstock needs, and effort controls. There is no plan to change the review schedule for river herring management plans at this time.

b. Consequences or control rules

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.

- 1) 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.
- 2) 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.
- 3) The management objective is to ensure that the commercial fisheries maintain a minimum (35 fish/acre) spawning stock goal into the future. A commercial fishery that does not meet the minimum spawning stock escapement established for that system will be required to close the following season until fishery achieves the escapement goal for that year.

The 2012 ASMFC River Herring Stock Assessment may provide additional guidelines to review and monitor river herring fisheries coastwide.

References:

- Kircheis, F.W., J.G. Trial, D.P. Boucher, B. Mower, Tom Squiers, Nate Gray, Matt O'Donnell, and J.S. Stahlnecker. 2002. Analysis of Impacts Related to the introduction of Anadromous Alewife into a Small Freshwater Lake in Central Maine, USA. Maine Inland Fisheries & Wildlife, Maine Department of Marine Resources, Maine Department of Environmental Protection. 53 pp.
- Rounsefell, G.A., L.D., Stringer. 1943. Restoration and Management of the New England Alewife Fisheries with Special Reference to Maine. United States Department of the Interior Fish and Wildlife Service Fishery Leaflet 42.
- Walton, C. J. 1987. Parent-progeny relationship for an established population of anadromous alewife in a Maine lake. American Fisheries Society Symposium 1: 451-454.

Appendix

Sec. 1. 12 MRSA §6041, is enacted to read:

§6041. Pelagic and Anadromous Fisheries Fund

1. Uses of fund. The commissioner shall use the fund for research directly related to Pelagic or Anadromous fishery management and the processing of landings data information. The commissioner may authorize the expenditure of money in the fund for research and development programs that address the restoration, development, or conservation of Pelagic or Anadromous resources.

2. Sources of revenue. The fund is capitalized by surcharges assessed under **Section 2. 12 MRSA §6503**. In addition to those revenues, the commissioner may accept and deposit in the fund money from any other source, public or private.

Sec. 2. 12 MRSA §6503, is enacted to read:

§6503. Commercial Pelagic and Anadromous Fishing License

1. License required. A person may not engage in the activities authorized under this section without a current:

A. Pelagic and Anadromous fishing single license for a resident operator;

B. Pelagic and Anadromous fishing crew license for a resident operator and all crew members;

C. Nonresident Pelagic and Anadromous fishing license for a nonresident operator and all crew members.

2. Licensed activity. The holder of a Pelagic and Anadromous fishing license may fish for or take or possess, ship, transport or sell pelagic or anadromous fish that the holder has taken. The license authorizes crew members aboard the licensee's boat when it is engaged in Pelagic or Anadromous fishing to undertake these activities, if the license provides for crew members.

3. Exemptions. The licensing requirement under subsection 1 does not apply to activities described in this subsection.

A. A person may fish for, take, possess or transport any species of pelagic or Anadromous fish if they have been taken by speargun, harpoon, minnow trap, or hook and line and are only for personal use.

4. Eligibility. A Pelagic and Anadromous fishing license may be issued only to an individual.

5. Fees. Fees for Pelagic and Anadromous fishing licenses are:

A. Forty-one dollars for resident operator;

B. One hundred eleven dollars for resident operator and all crew members; and

C. Seven hundred and fifty-dollars for nonresident operator and all crew members.

6. Surcharges. The following surcharges are assessed on Commercial Pelagic and Anadromous fishing licenses issued by the department:

A. For a resident Pelagic and Anadromous fishing license, \$150;

B. For a resident Pelagic Anadromous fishing license with crew, \$100; and

C. For a non-resident Pelagic and Anadromous fishing license with crew, \$100.

7. Definition. For the purposes of this chapter, "pelagic fish or Anadromous fish" means Atlantic herring, Atlantic menhaden, whiting, spiny dogfish, alewife, Atlantic mackerel, blueback herring, and squid, butterfish, scup, black sea bass, smelt and shad.

8. Violation. A person who violates this section commits a civil violation for which a forfeiture of not less than \$100 nor more than \$500 may be adjudged.

Proposed rule-making to prohibit the harvest, sale, and possession of river herring bycatch from Maine territorial waters.

Chapter 55: Gear Restrictions

55.04 Maine Gillnet Bait Fishing Regulations

E. Use of a bait gillnet to catch, harvest, or fish for blueback herring or alewife (*Alosa aestivalis*, *Alosa pseudoharengus*), collectively know as river herring in Maine territorial waters is prohibited.

1) A municipality, or a single person appointed by a municipality, fishing in accordance with alewife fishing rights granted pursuant to 12 M.R.S.A. 6131 are not subject to Chapter 55.04 (E) Gear Restrictions.

55.05 Use of purse, drag or stop seines or other gear types in certain waters prohibited; regulation of fishing therein

F. The use of all gear types to catch, harvest, or fish for blueback herring or alewife (*Alosa aestivalis*, *Alosa pseudoharengus*), collectively know as river herring in Maine territorial waters is prohibited.

1) A municipality, or a single person appointed by a municipality, fishing in accordance with alewife fishing rights granted pursuant to 12 M.R.S.A. 6131 is not subject to Chapter 55.05 (F) Use of purse, drag, or stop seines or other gear types in certain waters.