

**North American Commission**

**NAC(08)3**

***Report on US Atlantic Salmon Management and  
Research Activities in 2007***



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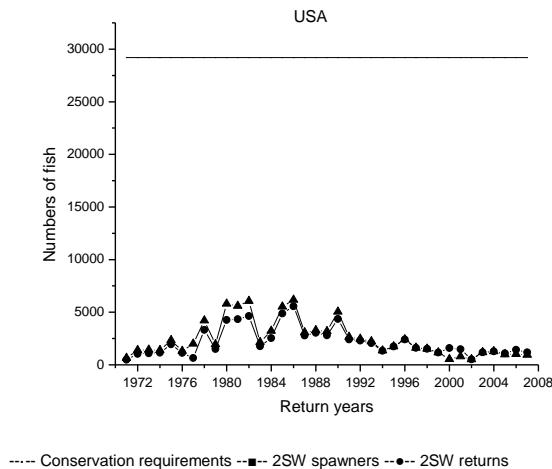
#### **Adult Returns**

In 2007, the total return to USA rivers was 1,255, a 15% decrease from 2006 returns and a 4% decrease from 2005 returns. In addition to catches at traps and weirs (1,218), returns were estimated for the eight core populations that comprise the federally endangered Gulf of Maine Distinct Population Segment (GOM DPS). Data on adult returns and redd counts collected from the Narraguagus, Pleasant, and Dennys rivers have been used to estimate returns to core populations within the GOM DPS using a linear regression. Fifty-three adult (90% CI = 39 - 72) fish were estimated to return to the GOM DPS.

Most returns occurred in Maine, with the Penobscot River accounting for 74% of the total return. Overall, 24% of the adult returns to the USA were 1SW salmon and 76% were MSW salmon. Most (74%) returns were of hatchery origin and the balance (26%) originated from either natural reproduction or hatchery fry. The adult return rate (1SW plus 2SW) of hatchery smolts released in the Penobscot River in 2005 was 0.17%, with the 2SW fish return rate 0.11%. Smolt survival on the Penobscot River correlates well with other large restoration programs in the Connecticut and Merrimack rivers. The estimated return rate for 2SW adults from the 2005 cohort of wild smolts on the Narraguagus was 0.73%, mirroring trends on the Penobscot.

As reported by the ICES Working Group on North Atlantic salmon, pre-spawning adults were stocked into USA rivers, however, even with these, all age classes of spawners (1SW, 2SW, 3SW, and repeat) in 2007 (1490 salmon) represented only 5.1% of the 2SW spawner requirements for all USA rivers combined (see Figure 1).

**Figure 1: US 2SW returns, 2SW spawners, and 2SW conservation requirements**



## **Stock Enhancement Programs**

During 2007 over 12 million juvenile salmon (92% fry) were released into 15 River systems. The number of juveniles released was slightly more than that in 2006. Fry were stocked in the Connecticut, Merrimack, Saco, Penobscot, and six rivers within the geographic range of the GOM DPS in Maine. The 363,500 parr released in 2007 were primarily the by-products of smolt production programs and included ages 0 and 1 fish. Smolts were stocked in the Penobscot (559,900), Merrimack (50,000), Connecticut (99,600), Dennys (56,500), and Pawcatuck (11,300) rivers. In addition to juveniles, 3,877 adult salmon were released into US rivers. Most were spent broodstock or broodstock excess to hatchery capacity. However, mature pre-spawn salmon released in the Sheepscot, East Machias, and Machias rivers and Hobart Stream produced redds. In the Merrimack River excess broodstock were released to support a recreational fishery and to enhance spawning in the watershed.

Mature adults stocked into Sheepscot, East Machias, and Machias rivers and Hobart Stream in the fall were added to USA 2SW returns to calculate spawners. Thus, spawners exceeded returns in 2007 with USA spawners totaling 1,490. Escapement to natural spawning areas was 687 (returns – broodstock + stocked pre-spawn adults).

## **Tagging and Marking Programs**

Tagging and marking programs facilitated research and assessment programs including: identifying the life stage and location of stocking, evaluating juvenile growth and survival, instream adult and juvenile movement, and estuarine smolt movement. A total of 424,805 salmon released into USA waters in 2007 was marked or tagged. Tags and marks for parr, smolts and adults included: Floy, Carlin, HI-Z Turb'N, PIT, radio, acoustical, fin clips, and visual implant elastomer. In addition, approximately 37,000 fry had thermally marked otoliths. About 24% of the marked fish were released into the Connecticut River watershed and 68% into the Penobscot River.

## **Description of Fisheries**

Commercial fisheries for sea-run Atlantic salmon are closed in US waters, including freshwater systems, coastal/ estuarine systems, and marine waters within the US Exclusive Economic Zone (EEZ). Except for a one-month recreational catch and release fishery on the Penobscot River, Maine and recreational fisheries for sea-run Atlantic salmon are closed in USA waters (including coastal waters). Estimated unreported catch is zero (metric tons). A total of 90 licenses were sold for the fall fishery, with about one third of the anglers complying with reporting requirements. A total of 83 angler trips were reported. Anglers had the opportunity to fish over at least 31 Atlantic salmon based on the catch of salmon at the Veazie trap. Three Atlantic salmon were captured and released. A fishery in the main stem of the Merrimack River and small reach of the Pemigewasset River was supported by the release of 1,081 broodstock in 2007. In Connecticut a recreational fishery for reconditioned broodstock is authorized on the

Shetucket and Nagautuck Rivers. Detailed information on all of these fisheries is available in the US Fisheries Focus Area Report.

### **Commercial Aquaculture Production**

During 2006, several US aquaculture companies merged into one large producer of salmon for Maine; Cooke Aquaculture. In 2006, 3 million smolts were stocked in hopes of increasing harvest totals for 2007/2008. Production of farmed salmon in Maine was reported to be 2,715 metric tonnes in 2007, about 60% of the 4,674 metric tonnes of production reported in 2006. Production in four the last six years has been less than half of the 13,202 t produced in 2001.

### **Habitat Conservation, Enhancement, and Restoration**

- In 2007 USFWS and Project SHARE completed 392 stream-road crossing surveys using Vermont assessment protocol (n=19 prior to June) and the new 2007 Maine Road-Stream Crossing Survey protocol (n=373 after June 2007). Surveys included: 380 culverts, 3 open bottom arches, 3 bridges, and 6 abandoned road crossings. Twenty-four of fifty-five (44%) culverts surveyed in the West Branch of the Machias River were classified as barriers to fish. One of the “potential” barriers was retrofitted with an Open Arch Culvert in 2007. USFWS and Project SHARE staff has plans to conduct fisheries assessments in the remaining 54 West Branch Machias sites in 2008.
- In 2007, 13 stream habitat connectivity projects were completed in four Downeast Rivers using funds from USDA-WHIP, USFWS, MASC-SCEP, Project SHARE, Washington County Soil and Water Conservation District, and private landowners. One stream-road crossings (culvert) was completely removed in the Machias River watershed. The remaining 12 projects replaced undersized or failing structures with open bottom arches that spanned 1.2 times bankfull stream width. Although the majority of these restoration projects were located above mapped juvenile Atlantic salmon habitat, the Harmon Brook site, in the East Machias watershed, was within mapped habitat. This location is routinely stocked with fry, although stocking was not conducted in 2007 in anticipation of culvert replacement. Pre-construction electrofishing collected 40 salmon parr just above and below the road in Harmon Brook. One restoration site, located 50 meters above the West Branch Machias River, contained both YOY and parr Atlantic salmon during the pre-construction fish removal efforts.
- Maine streams have large wood loads far below predicted levels, and notably low compared to other parts of the United States. Although extensive research has been done on the relationship between Pacific salmonids and wood, relatively little is known about the role wood plays in influencing juvenile Atlantic salmon populations. Two hypotheses were tested in Old Stream, Maine, via snorkel survey in sites with naturally occurring high and low wood densities: 1) the density of juvenile Atlantic salmon was higher in sites that contained high as opposed to low loading of wood, and 2) where wood was available, juvenile salmon tended to be associated with it within a site. LWD was added to two

sites, each with a paired control site, in Creamer Brook, East Machias Drainage in October, 2006. Results showed that age 1+ or older juveniles were at significantly higher densities in sites with high wood loading, but substrate coarseness was a more important factor. In addition, a significant proportion of both age 0+ and older juveniles associated with wood in sites where it was available. However, this association also interacted with substrate coarseness and weed cover. These findings suggest that wood is an important habitat feature for juvenile Atlantic salmon, but cannot be viewed in isolation of other habitat factors. In 2007, LWD was added to two sites, each with a paired control site.

- Fish Passage Improvements
  - Fisheries agencies in Maine continue to work to improve existing up- and down-stream fish passage, to have fish passage at dams where none exist, and to remove dams and other blocks of habitat connectivity. Thus, fish passage work in Maine focuses on dams licensed by the Federal Energy Regulatory Commission (FERC) on the Penobscot, Kennebec, and Saco rivers and on opportunities to enhance passage throughout historic Atlantic salmon habitat. This includes participating in activities associated with: the Penobscot River Restoration Project, passage facilities on the Kennebec at Lockwood (Florida Power and Light (FPL)), Hydro Kennebec (Brookfield Power), Shawmut (FPL), Weston (FPL), and Anson and Abenaki (Madison Paper Industries); on the Sebasticook River at Benton Falls (Benton Falls Hydro Associates), Burnham (Ridgewood Maine Hydro Partners), and Fort Halifax (FPL) projects, and replacing culverts on highways and logging roads. On the Presumpscot River, a Settlement Framework Agreement has been negotiated as a prelude to an agreement which would provide for passage at one FERC non-jurisdictional dam and at five additional hydro power dams. On the Narraguagus River, DMR-BSRFH and partners have been working with the Town of Cherryfield to repair the fishway at the ice control dam. The town has consulted with FWS for engineering plans and the most affordable plan, to line the wood fishway with aluminum, is being pursued. There has been progress resolving the conflicts associated with providing fish passage at the West Winterport Dam on the Marsh River, a tributary to the Penobscot River estuary.
  - In 2007, the multi-agency New Hampshire River Restoration Task Force (NHRRTF) continued to work on identifying dams for removal in the state and pursuing strategic alterations and/or modifications of dams. There are two dams in the Merrimack River watershed scheduled for removal, the Merrimack Village Dam, Souhegan River, Merrimack, NH and the Black Brook Dam, Black Brook, Manchester, NH. A number of other passage improvements on dams in the Merrimack also continue to be achieved. In the Connecticut, the Raymond Dam was removed and a number of passage improvements were made as well.

### **The Endangered Gulf of Maine (GOM) Distinct Population Segment (DPS)**

The federally endangered GOM DPS of Atlantic salmon, as listed in 2000, includes Cove Brook (a tributary to the lower Penobscot River) the Dennys, Machias, East Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers. Fifty-three adult (90% CI = 39 - 72) fish were estimated to return to the GOM DPS. Data on adult returns and redd counts collected from the Narraguagus, Pleasant, and Dennys rivers have been used to estimate returns to core populations within the GOM DPS using a linear regression.

The U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) collectively referred to as the Services, have joint responsibility for recovery of the endangered GOM DPS of Atlantic salmon. The Services work closely with the State of Maine on salmon management and conservation. Up until 2007, the Maine Atlantic Salmon Commission (MASC) was the state agency charged with the management and conservation of Atlantic salmon and coordinating with other state agencies to carry out these responsibilities. Over the past year, the MASC was merged with the stock enhancement division in the Maine Department of Marine Resources (MDMR) to form the Bureau of Sea Run Fisheries and Habitat.

In 2003 the Services assembled an Atlantic Salmon Biological Review Team (BRT) to review and evaluate all relevant scientific information necessary to evaluate whether the population in the Penobscot River and other rivers should be included in the GOM DPS. The populations in the Penobscot and a few other rivers were not included in the GOM DPS at the time it was listed under the ESA in November of 2000 because there was not enough scientific information at that time to demonstrate that those populations were part of the same DPS or constituted a different DPS. Since the listing in 2000, new information has come to light which indicates that the GOM DPS should be re-evaluated to determine if any other populations should be included because they are closely related. The Draft Status Review was completed in January 2006 and underwent peer review. The Center for Independent Experts (CIE) completed the review and the BRT made revisions to the document based upon this critique. The Status Review was made available to the public during the fall of 2006. NMFS and the USFWS (collectively referred to as the Services) are currently considering the information presented in the 2006 Status Review, the comments from the peer reviewers, and the response of the BRT to the peer reviewers to determine if action under the ESA is warranted. The Services could determine that a change to the boundaries or conservation status of the existing GOM DPS is warranted, that a separate listing action is warranted, or that no action is warranted. If the Services determined that a modification to the existing listing or a new listing was warranted, then a proposed rule will be published along with the rationale for that proposal. A determination regarding the listing status of the expanded GOM DPS is expected in 2008.

The ESA also requires that the Services designate Critical Habitat for all species listed as endangered or threatened. The Services listed Atlantic salmon in the GOM DPS as endangered under the ESA in 2000, however, critical habitat has yet to be designated. Critical habitat is defined as habitat that includes physical and biological features

essential to the conservation of the listed species. Critical habitat can be designated in all areas currently occupied by the species, and may be designated in those areas not occupied by the species if those areas are deemed essential to the conservation and recovery of the species. Federal agencies must consult with the Services on any action they permit, fund or carry out that may adversely affect critical habitat. Currently NMFS is working on developing the source documents that describe the habitat features essential to the conservation of the species as well as those activities that likely affect the identified habitat features. The information in the source document will be used to conduct an economic analysis designed to assess the economic impact that a critical habitat designation may have and weigh the cost of designating critical habitat with the benefits to recovery. Areas can be excluded from a critical habitat designation if the costs are deemed to be too great, as long as the decision not to designate does not jeopardize the continued existence of the species. A proposal on critical habitat designation is planned for 2008.

In 2006 the MDMR, USFWS, and NMFS contracted Sustainable Ecosystems Institute (<http://www.sei.org/>) to conduct an independent program review to determine if current hatchery operations, protocols, and practices are scientifically sound, have potential to further recovery, and are integrated with population assessment and evaluation programs. One of the main questions posed during this review was: Is there integrated adaptive management of Atlantic salmon in Maine? A team of six scientists was convened to review the Maine program. The visit included a tour of CBNFH and two days of presentations by and discussions with agency staff and interested scientists (i.e. researchers, managers from other programs, and retirees). The report was provided to the Services and MASC in May 2007. In response to this review, the three agencies are developing a new governance structure for the Maine Atlantic salmon program. The new governance structure addresses needs highlighted by SEI such as (1) the hatchery program should be more fully integrated with the recovery program; (2) the agencies should develop a conceptual framework for recovery; and (3) this framework should guide all recovery efforts. The new governance structure is replacing the Maine Atlantic Salmon Technical Advisory Committee and the Recovery Team. It is based on an agreed recovery framework with the intent that: 1) recovery and restoration are done in accordance with the framework; 2) the framework and the program are based on best available science; 3) resources are made available to implement those actions or measures agreed to in any given cycle; 4) there is dispute resolution and continuity throughout the year; and 5) horizontal and vertical communication among and within agencies will improve. Action Teams related to estuarine, marine, and freshwater survival and production, conservation hatcheries, managing genetic diversity, population assessment, and outreach are the key component of the new Atlantic salmon program. Action Teams have just started the process of identifying the highest priority research and management actions to recover the Gulf of Maine Distinct Population Segment of Atlantic salmon. The finalization and implementation of a new Atlantic salmon recovery framework is not yet complete.

#### **Other Additional Items of Interest**

- Penobscot River Restoration and Multispecies Management Plan



- One of the most significant ongoing restoration projects is the Penobscot River Restoration Project. The Penobscot River Restoration Trust was formed in 2004 as part of a multi-party settlement agreement with dam owner PPL (Pennsylvania Power and Light) and the FERC. The settlement, which was signed by the U.S. Department of Interior's Bureaus of Fish and Wildlife and Indian Affairs, the National Park Service, the State of Maine, the Penobscot Indian Nation and several non-governmental organizations, details conditions for dam removal, fish passage, and operational changes at eight hydroelectric projects on the lower Penobscot. The Penobscot Trust has a 3-5 year option period during which time the dams must be purchased. The Penobscot Trust and partners reached significant milestones in late 2007 by raising the \$25 million needed to purchase the Veazie, Great Works and Howland Dams. Ten million dollars of the raised money was from the FY08 Omnibus Appropriations Bill passed in December 2007 will be directed to the Penobscot River Restoration Project through the NMFS. The funding was part of the Commerce, Justice, Science Bill included in the omnibus funding measure. The Penobscot Trust continues to work with partners to raise the subsequent funding to implement the removals, alterations, mitigation and economic development elements of the project. In addition to the initial purchase price of \$25 million dollars, the preliminary estimate for project implementation, including dam removal and modifications, economic development and mitigation, is approximately \$30 million.
- In anticipation of the restoration potential of the Penobscot River Restoration Project, Maine Department of Marine Resource's (MDMR) Bureau of Sea-Run Fisheries and Habitat in conjunction with Maine Inland Fisheries and Wildlife (MIFW) have completed a draft strategic management plan for diadromous fish in the Penobscot. This plan includes four strategic goals: (1) coordinating management activities, (2) providing safe and effective upstream and downstream passage for diadromous fishes, (3) maintaining or improving abiotic (physical) and biotic habitat for diadromous fishes using ecosystem-based management, and (4) rebuilding diadromous fish populations. NMFS has provided comments on drafts of this plan and in November 2007 a public scoping meeting was held. In March 2008 the Penobscot Interagency Technical Committee (PNITC) was formed to develop operational management plans for diadromous fish within the basin. Members of the PNITC include managers and scientists from MDMR, MIFW, NMFS, the Penobscot Indian Nation (PIN) and FWS.
- The Penobscot River Restoration Project (PRRP) provides unique opportunities for restoration efforts. Many species will benefit from the PRRP directly, but many other passage impediments exist in the basin. Some diadromous fish species, such as Atlantic salmon, alewife, and shad, may require additional habitat improvements (barrier removal, fishways, etc.) or stocking. Thus, additional active restoration measures may be

required to realize the full potential of the PRRP. Due to the high profile of the project and the high costs involved, there is a need to prioritize restoration efforts in the basin to increase the probability for project success. There are many ways to determine what a “successful” PRRP would look like. The PNITC has been tasked with developing one set of restoration goals and priorities for the basin. To help facilitate this goal, NMFS has begun developing an ecologically-based GIS tool to help set goals and to help identify and prioritize various restoration efforts. The outputs of this tool will help to ensure that achievable goals are established, and that funding and restoration efforts are applied in the most appropriate manner.

- Infectious Pancreatic Necrosis Virus (IPNV)
  - The viral pathogen IPNV was isolated from Connecticut River Atlantic salmon during routine brood stock health screening by the US Fish and Wildlife Service. No clinical signs of disease were noted in the fish. Two ovarian fluid samples were confirmed positive for IPNV using cell culture and polymerase chain reaction (PCR) assays. Each sample represented a pool of broodstock spawned at the Richard Cronin National Salmon Station. Thus, a minimum of two sea-run salmon females were infected. All the eggs and broodstock at the facility and eggs transferred to another facility were destroyed. This resulted in the loss of the entire year class of sea-run Connecticut River Atlantic salmon brood stock. Follow-up cell culture assays, PCR assays and histology were conducted on kidney, spleen, blood and pancreatic tissues from the killed brood stock. Infection and prevalence levels were low (3 of 121 positive) in the population and large scale horizontal transmission had not occurred while the fish were held in captivity at the station for eight months.
  - The US Geologic Survey Western Fisheries Research Center identified the isolate to be most similar in base pair structure to the Canada 3 genotype, which is significantly different from most other North American IPNV genotypes studied. Because this is not a typical North American isolate, pathologists speculate that the salmon were exposed during ocean migration.
  - IPNV represents a critical threat to Atlantic salmon recovery in the USA. The discovery of IPNV at any USA Atlantic salmon hatcheries will result in loss of genetic diversity for one or more stocks and from one to three spawning cohorts for a stock. Current procedures for screening and isolating fish at all the hatcheries are inadequate to protect against an IPNV outbreak. Enhancing bio-security protocols at each of the hatcheries seem to be the only way to reduce the risk of losses. A new bio-security plan for the sea run brood stock population at Richard Cronin includes isolating and increasing the number of holding tanks. Isolation will involve separate equipment, footbaths, barriers to prevent direct transfer of water from tank to tank, and using separate spawning and egg rinsing equipment for in each holding tank. Discrete egg incubation isolation units (fitted with enclosures for isolation) will be maintained for

each brood stock pool and separate egg equipment (rinsing counting shocking picking) will be used for each incubation unit. If there is mating of individuals in different pools, discrete paired pooled incubation isolation units will be utilized. Should IPN virus be isolated in a particular tank, broodstock and all resulting spawn from that tank will be destroyed. Eggs from broodstock tanks where spawners all tested negative will be carried through to hatch. Fry from these units will also be tested for all listed viruses prior to transfer/release.

- Fish Friends and Adopt a Salmon Family Programs
  - The use of salmon egg incubators in school as a tool to teach about salmon, watersheds and conservation continued to expand throughout the basin. The Connecticut River Salmon Association (CRSA) conducted their **Fish Friends Program** at schools in Connecticut. Trout Unlimited carried a similar message to schools in Massachusetts. Several cooperators including CRSA, USFS, USFWS, NHFG, VTFW and the Southern Vermont Natural History Museum cooperatively conducted the program in Vermont and New Hampshire. For the 2007-2008 school year 164 schools participated in this type of salmon education in the four states.
  - 2007 marked the fifteenth year in which the **Adopt-A-Salmon Family Program** has been providing outreach and education to school groups in Maine, New Hampshire, and Massachusetts in support of Atlantic salmon recovery and restoration efforts. The program is administered by the Central New England Fisheries Resources Office with support from the Nashua Nation Fish Hatchery, the Amoskeag Fishways, and a corps of very dedicated volunteers and SCA interns. Most participating schools implement the program throughout the school year with highlights including a visit to the hatchery (NNFH) for a ninety minute educational program in November, and incubating salmon eggs in the classroom beginning in January/February for release as fry into the watershed in the late Spring. In February 2007, 42 schools received 15,910 eggs to be reared in classroom incubators. Throughout the winter and spring, eggs were monitored by students until they hatched. In late Spring, fry were released into the Merrimack River watershed. In November 2007, 1,532 students and 150 teachers and parents from 24 schools throughout central New England participated in the educational program at NNFH. During the visit, participants learned about the effects of human impacts on migratory fish and other aquatic species and observed Atlantic salmon spawning demonstrations.