Council

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2007 US Emerging Threats and Opportunities

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Opportunities

Estuarine and Coastal Migration and Survival of Wild Atlantic Salmon Smolts in Maine Using Ultrasonic Telemetry

NOAA's National Marine Fisheries Service (NMFS) used telemetry to assess smolt survival and migratory behavior with the objective of determining survival, speed of passage, behavior and choice of migratory pathway through river, estuary and bay. About 100 wild smolts were collected annually from rotary screw traps in the Narraguagus River and then surgically implanted with Pinger tags from 1997-1999 and 2002-2004. The smolts were collected near the peak of the emigration and were only slightly larger than the average outmigrating smolt. The second period of releases coincided with a change of equipment that increased receiver resolution in the estuary and bay. Results indicate a mean transit speed of 0.87 kilometers per hour. The slowest transit speeds were documented in the river (0.38 kilometers per hour) and speed generally increased from the river through the estuary, middle and outer bay. Speed of passage was influenced (decreased) by the number of times the smolts reversed direction while moving downriver. Multiple reversals were possible and did not appear to impact survival. It is interesting that the smolts were observed to move into the bay through a pathway that is narrower than the available options.

From 62-74% of the smolts survived to reach the estuary. About 41-54% of the smolts reached the middle bay and 36-47% reached the outer bay alive. Overall about half the salmon were lost as they moved from the river to the outer bay. The tags are generally not recovered so it can only be assumed that the tags may have stopped working (unlikely) or that the smolts have died and been removed from the system. The application for these study results could be to inform management decisions about the timing and location of approved dredging permits, for example, since the speed and migratory behavior is seen to be fairly predictable.

Feeding Ecology of Atlantic Salmon Postsmolts in Penobscot Bay, Maine – Does Origin Matter?

NMFS conducted this diet study in concert with a post-smolt trawling survey from 2001-2005 in Penobscot Bay. The trawling survey involved live capture and release of Atlantic salmon smolts in the upper, middle and outer bay and offshore in the Gulf of Maine. A total of 242 out of the 3,843 smolts collected were lethally sampled for stomach content analysis. The origin of these lethally sampled smolts varied. There were seven naturally reared (or wild) salmon (in river 24 months), nine parr (in river 20 months), 32 parr (in river 8 months), and 194 recently released smolts (in river less than one month). Results indicate the overall stomach content or diet composition as follows: 24% Atlantic herring, 24% fish remains, 6% miscellaneous fish, 30% Eupausiids, 7% miscellaneous crustaceans, 6% Polychaete worms, and 3% other. The diet composition shifts as the fish move from upper bay to the offshore sites. More herring were found in smolts in the upper bay while less herring and more miscellaneous fish were observed in the guts of fish offshore.

The most striking difference in the diet composition depended on smolt origin or how long the salmon had been living and feeding in the wild. Stomach composition for the naturally reared salmon and 20 month parr was about 75% fish whereas less herring and more Eupausiids were found in the 8 month parr and hatchery stocked smolts. The diet composition is important because the energy available from different prey items is significant: Atlantic herring 10.6 Kj/g, miscellaneous fish 6.1 Kj/g, Euphausiids 3.4 Kj/g, miscellaneous crustaceans 3.2 Kj/g, and Polychaete worms 3.7 Kj/g.

Generally the stomach weight to smolt weight ratio was higher for smaller fish and lower for larger fish (the hatchery smolts). So, the trend in available energy is greater for the smolts that spent the greatest amount of time in river and the least for the recently released hatchery smolts. In other words, smolt origin matters. It's not clear how much this matters – it is possible that recently released smolts haven't learned to eat live prey fish or that they are less motivated at first because of higher body fat content which might lead to a lag in feeding behavior. Still, these results may hold implications for stocking management.

Penobscot River Restoration and Multispecies Management Plan

The Penobscot River Restoration Trust was formed in 2004 as part of a multi-party settlement agreement with dam owner Pennsylvania Power and Light (PPL) and the Federal Energy Regulatory Commission (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 scientistists 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, NOAA 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.

Coastal Fish Communities

There are two ongoing Alosid restoration programs in the Gulf of Maine. One program mainly focuses on American shad restoration through culture activities, although it does conduct some adult river herring trapping, transport, and release for restoration in rivers with diminished runs. Most shad and river herring releases occur in the Merrimack River and drainage, but the program also has activities from the Kennebec River down to the Pawcatuck River. This program is seeing limited success, and major issues are shad egg production and survival at Nashua National Fish Hatchery (partially due to State regulations prohibiting formalin use), shad and river herring brood collection during large floods, lack of river herring brood sources because of the region wide population collapse that began in 1992, and the political resistance to stock river herring brood into some premium historical but extirpated habitat. As a result, there is some question whether restoration efforts should be focused on culturing shad at all in systems where shad exist and instead working harder to open up fish passage. The other restoration program focuses on trapping, trucking, and releasing alewife brood; pumping alewife brood around dams; and shad culture activities in the Kennebec River and drainage. This program is seeing more success with both culture activities and alewife transport, and the upper Kennebec River is experiencing a rapid shad population increase. Issues mostly revolve around increasing fish passage and political resistance to stock alewife brood into some premium historical but extirpated habitat.

US scientists and managers at the US Atlantic Salmon Assessment Committee agreed that restoration of all diadromous fish needs to be a priority for Atlantic salmon restoration; diadromous fish restoration and Atlantic salmon restoration need to be

integrated into a broader program in support of each other; strategic planning including all diadromous fish biologist / manager partners is needed; the sequence of stock and species rebuilding could effect results; expectations about Alosid restoration success needs to be managed; restoration activities and dam removals could complicate salmon assessment, requiring a shift in assessment and a need for different data collection; and a study of large waters is needed to examine restoration effects on lower river ecology.

Threats

Infectious Pancreatic Necrosis

Infectious pancreatic necrosis (IPN) is a viral disease that is transmitted both horizontally (fish to fish) and vertically (parent to offspring). IPN is widely distributed, but has not been a problem in the United States. Norway and Scotland have both experienced outbreaks. It was noted that in both cases the outbreaks occurred approximately 10 years after the first detections.

IPN was identified from two, pooled sea-run Atlantic salmon ovarian samples from Richard Cronin National Salmon Station (RCNSS) on October 15, 2007. The samples were a composite of ovarian fluid from 5 female Atlantic salmon. Samples were confirmed positive for IPN using cell culture and polymerase chain reaction assays. As a result, the entire year class of Atlantic salmon at RCNSS and eggs shipped to White River National Fish Hatchery were destroyed. Subsequent PCR assays and histology of kidney, spleen, blood and pancreatic tissue produce negative results. USGS Western Fisheries Research Center identified the IPN isolate to be similar to the Canada 3 genotype, which is different than IPN genotypes known from the Connecticut River. RCNSS has and continues take measures to isolate pools by using glass panels to reduce the possibility of transfer via splashing and vapors as well as measures to eliminate cross contamination.

IPN represent a critical threat to Atlantic salmon recovery. The introduction and discovery of IPN at any hatchery facility will result in loss of genetic diversity and the loss of one to three year classes. Current procedures for screening and isolating fish are inadequate to protect against an IPN outbreak. Options for IPN mitigation, prevention and screening need to be investigated.