



Productivity of juvenile Atlantic Salmon in Maine



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INTRODUCTION

Objective

- To assess the productivity of juvenile Atlantic salmon (*Salmo salar*) in Maine through a long-term electrofishing dataset.
- Atlantic salmon was the second largest fishery in New England for hundreds of years¹. Due to overfishing, the population declined, leading to the fishery's closure in 1948 and placement on the Endangered Species list in 2000².
- Juvenile Atlantic salmon inhabit freshwater inland streams until they smoltify, where they then migrate to the open ocean to feed and mature³. Size, including length and body condition, are often indicative of habitat quality and are predictive of juvenile productivity. Identifying correlates of increased size and condition will allow us to understand what limits juvenile productivity.
- Characterizing these relationships would allow managers to identify optimal locations for hatchery releases to maximize the impacts of stock enhancement that currently maintain Maine's populations.



Figure 1. Example electrofishing site in Maine.



Figure 2. Atlantic salmon parr (Wester Ross Fisheries Trust).

METHODS

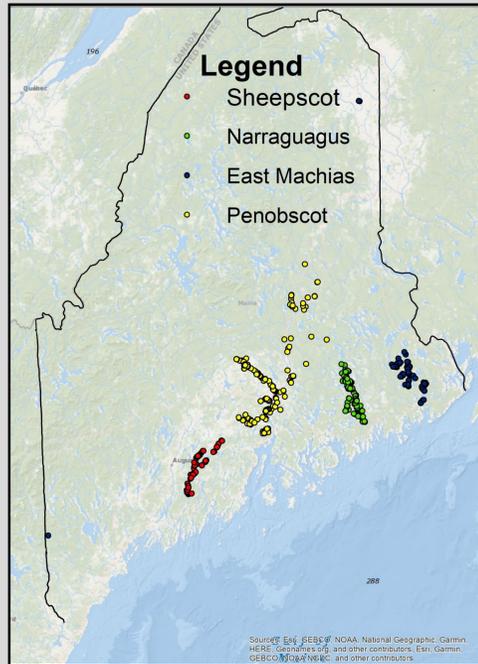


Figure 3. Map of electrofishing sites being used in analyses. Colors represent drainages.

- The dataset being analyzed was collected across sixty-eight years (1960 to 2017) by the National Marine Fisheries Service and the Maine Department of Marine Resources. Stream habitats were sampled via electrofishing to characterize juvenile Atlantic salmon occurrence and density. Each site was characterized for habitat information, the number of juvenile fish captured, and the weight and lengths of the individual juveniles.

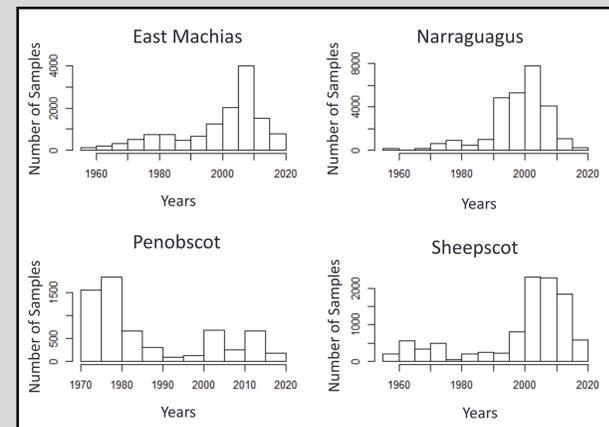


Figure 4. Number of fish sampled at all sites through time for the four drainages being analyzed.

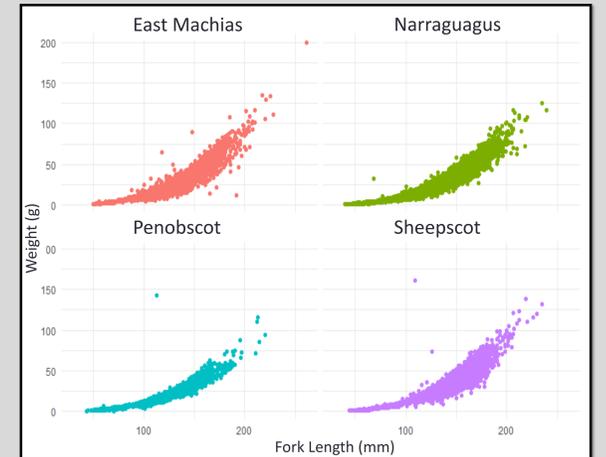


Figure 5. Weight-length relationship of the fish within each of the four drainages.

Summary of Data Being Used

- 1,079 Sites
- 3,631 Trips
- 56,515 Fish
 - With at least one measurement of weight or length
- 24,924 Fish
 - with both measurements of weight and length

FUTURE WORK

- Identify errors within the length and weight measurements.
- Identify sites within the database to focus analyses on, based on the intensity and regularity in sampling through time.
- Collect relevant environmental and geospatial information to pair with sites to be used in analyses.
- Use generalized linear mixed models (GLMM) or additive models (GAMM) to assess trends in lengths and condition among populations, through time, and across environmental conditions. Juvenile salmon density will be included in models as a covariate.

REFERENCES

Figure 2. Wester Ross Fisheries Trust [Online Image] (n.d) Retrieved March 26, 2018 from <http://www.wrft.org.uk/fishes/salmon.cfm>

¹Chase, S. (2003) "Closing the north American mixed-stock commercial fishery for wild Atlantic salmon", pp. 84-92.

²USFWS (U.S. Fish and Wildlife Service), and N. (National M. F. S. (2000) "Endangered and Threatened Species; Final Endangered Status for a Distinct Population Segment of Anadromous Atlantic Salmon (*Salmo salar*) in the Gulf of Maine", Niosh, 65(28), pp. 1-55. doi: 10.1093/acprof:oso/9780199540914.003.0011.

³Bigelow, A. F., Schroeder, W. C., Collette, B. B., Klein-MacPhee, G., & Bigelow, H. B. (2002). "Bigelow and Schroeder's fishes of the Gulf of Maine", Smithsonian Institution Press, pp. 174-179.

RESEARCH QUESTIONS

- How do juvenile Atlantic salmon length and condition (modified weight-length ratio) vary among four major salmon-bearing watersheds (East Machias, Narraguagus, Penobscot, and Sheepscoot)?
- How do the above metrics vary through time, between the years 1960 and 2017?
- What factors (i.e. water temperature, elevation, climate change velocity, etc.) are predictive of juvenile Atlantic salmon length and condition among and within these Maine watersheds?

IMPLICATIONS

- Identifying factors correlated with fish size and condition will help prioritize:
 - Stock enhancement sites
 - Ideal release sizes
 - Restoration sites

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