

The “Curley Report” Revisited: Fisheries Habitat Investigations of Wellfleet Harbor

A proposal to the Wellfleet Natural Resources Advisory Board

Contact:

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Project Significance:

Wellfleet Harbor is an ecologically and economically important habitat for fish and shellfish, subject to a variety of anthropogenic stressors. In order to understand the effects of human impacts on the system, baseline data and long-term monitoring are necessary. To collect baseline data and develop a framework for a monitoring program, we propose to replicate the survey methods used during the comprehensive study of Wellfleet Harbor’s marine resources conducted in 1968-69 by Curley *et al.* (1972), which has not been duplicated since. The Center for Coastal Studies (CCS) conducted a comprehensive study of Pleasant Bay in 2014-2017 (Hughes and Mittermayr, 2018), and has been conducting benthic habitat mapping throughout Wellfleet Harbor and Herring River using similar methods. We propose to conduct a finfish and shellfish survey using methods similar to those used by Curley *et al.* (1972), to be conducted from Spring 2021 through Winter 2022. This project is timely due to its potential to contribute baseline data immediately following the Wellfleet Harbor dredging project and prior to the beginning of the Herring River restoration project, as well as its timing relative to recent CCS habitat mapping work, which will help place this project in much broader ecological and management contexts. This study will build upon a pilot intertidal seine survey currently underway, funded by a Donald Palladino Fellowship from the Friends of Herring River. This project will generate a comprehensive species inventory while revisiting the Curley *et al.* (1972) study, and quantify relationships between the Harbor’s species and their habitats, contributing to a framework for a long-term monitoring program of Wellfleet Harbor’s marine resources.

Methods:

Contingent upon weather and ice cover, monthly subtidal surveys will be conducted in Wellfleet Harbor from April 2021 to March 2022, consisting of 1.5 days of trawl and dredge sampling at four stations sampled in a previous study in 1968-69 (Curley *et al.* 1972) and a subset of four benthic habitat stations sampled by CCS, following the standardized methods of Nichols *et al.* (2020). Surveys will be conducted on board R/V *Kingfisher*, a 20’ (~7 m) center-console v-hull vessel with a 90 hp outboard engine, using a small trawl net and a commercial bay scallop dredge. The net is a 30’ (9.1 m) sweep Wilcox shrimp trawl with a 8.2 m head rope, 3.8 cm stretched mesh in the wings and cod end, and a 6.4 mm knotless mesh cod-end liner,

similar to that used by Curley et al. (1972) and Nichols *et al.* (2020). The bay scallop dredge is a standard commercial design consisting of a 26" (66 cm) wide lightweight frame with a 4' (122 cm) sweep chain, and a catch bag made of 2" (5 cm) steel rings and 1.5" (3.5 cm) square mesh. Both the trawl net and scallop dredge will be deployed in a standardized manner, with consistent tow times and speeds (trawl: 5 minutes at 2 knots, dredge: 3 minutes at 3 knots). Tow start and end locations and depths will be recorded using the boat's GPS and sounder, and a duplicate tow will be conducted immediately adjacent to the location of the first, in the opposite direction. Additional sampling to be conducted at a subset of the 8 stations will include benthic grab samples, baited traps, and baited remote underwater video (BRUV).

Data from the pilot seine study and this project will be analyzed for comparison with previous studies and to develop an understanding of relationships between fish/shellfish species and their habitats. Species diversity (Shannon's H') and abundance from seine and trawl samples will be summarized and compared to that observed by Curley *et al.* (1972) as well as a more recent seine survey conducted at a single sampling station nearby (Estey, 2013). Relationships between benthic habitat type and species communities will be analyzed using multivariate statistics following the approach of Legare *et al.* (2020).

Application of Results, Additional Nested Studies:

We will integrate all data collected to develop a comprehensive species inventory, quantify patterns in habitat use, and develop a framework for a long-term-monitoring program. This project will create a valuable baseline from which to assess changes in the Wellfleet Harbor system due to activities such as habitat restoration and dredging, as well as longer-term processes such as climate change. In partnership with the community and with supplemental funding (small grants, etc.), additional nested studies could be conducted concurrently with the above surveys, focusing on shellfish habitat and species abundance/diversity around shellfish aquaculture sites.

Outreach and Dissemination of Results:

Principal Investigator Owen Nichols will engage with the community throughout this project, gathering information on which to base nested studies and providing updates on the work underway. Owen will deliver presentations to town boards/committees as appropriate, and present study results at the 2022 Wellfleet Oysterfest and Wellfleet Harbor Conference. A technical report will be produced for the town, and a scientific manuscript will be drafted for submission to a peer-reviewed journal.

Budget:

Funds totaling \$63,495 are requested.

Budget Narrative:

Principal Investigator (PI) Owen Nichols will require 3 months salary (1.5 months in the field over the 12 month field season, 1 month for data entry, analysis and reporting, and 0.5 month for conducting outreach). Total Salary (includes 20% fringe): \$21,600

A stipend of \$500/month is requested for a part-time intern to assist with fieldwork and data entry. Total Intern Stipend: \$6,000

A new trawl net will be purchased for this study. All other sampling gear will be contributed to the project at no additional cost. Total Equipment: \$2,000

Subtidal sampling will require 18 days of research vessel time (\$1000/day), including captain, fuel and all operating costs. Total Vessel Cost: \$18,000

CCS will apply its 53.7% indirect cost rate to salary and equipment purchases. Total Indirect Cost: \$15,895

Project Timeline:

Project Start: April 2021

Project End: November 2022 (Wellfleet Harbor Conference Presentation)

Year	2021												2022										
Month	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11			
Fieldwork	█																						
Analysis and Reporting													█										
Presentations													█										

Research Permits:

The principal investigator holds a Massachusetts Division of Marine Fisheries scientific collection permit as well as multiple National Park Service (NPS) research permits; an application is in process for an additional NPS research permit for this project.

References:

Curley, J.R., R.P. Lawton, D.K. Whittaker, and J.M. Hickey. 1972. A study of the marine resources of Wellfleet Harbor. Massachusetts Division of Marine Fisheries Monograph 12. 37 pp.

Estey, E.D. 2013. Distribution characteristics and ecology of the near shore marine finfish assemblage inhabiting northeast U.S. waters. Ph.D. thesis, University of Rhode Island. 121 pp.

Hughes, P.E. and A. Mittermayr, eds. 2018. Interdisciplinary Multi-scale Marine Ecosystem Assessment: Pleasant Bay, Cape Cod, Massachusetts. Final Report to the Friends of Pleasant Bay. August 2018.

Legare, B.J., O.C. Nichols, L. Sette, A. Mittermayr, and M. Borrelli. 2020. Relationships between species communities as determined by analysis of data from multiple surveys of Pleasant Bay, Cape Cod, Massachusetts. *Northeastern Naturalist* 27(Special Issue 10): 114-131.

Nichols, O.C., B.J. Legare, T. Famulare, E. Sgarlat, and T. Lucas. 2020. Seasonal occurrence and relative abundance of fishes and macroinvertebrates in Pleasant Bay, Cape Cod, Massachusetts. *Northeastern Naturalist* 27(Special Issue 10): 76-97.