

CAPE COD COASTAL WATERSHEDS
2009 Fish Population Data

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Introduction

In late summer and early fall of 2009, fish population surveys were conducted in the Cape Cod Coastal Watersheds at seven stations using techniques similar to Rapid Bioassessment Protocol V as described originally by Plafkin et al. (1989) and later by Barbour et al. (1999) (See Table and Figure 1). Standard Operating Procedures are described in *Fish Collection Procedures for Evaluation of Resident Fish Populations* (MassDEP 2006). Fish surveys also included a habitat assessment component modified from that described in Barbour et al. (1999).

Methods

Fish Collections

Fish collections were conducted by electrofishing using a Smith Root Model 12 battery-powered backpack electrofisher. A reach of between 70m and 100m was sampled by passing a pole mounted anode ring side to side through the stream channel and in and around likely fish holding cover. All fish shocked were netted and held in buckets. Sampling proceeded from an obstruction or constriction, such as a waterfall or shallow riffle, upstream to an endpoint at another obstruction or constriction. Following completion of a sampling run, all fish were identified to species, and a sub-sample were measured and weighed, after which all fish were released.

Habitat Assessment

An evaluation of physical habitat quality is critical to any assessment of ecological integrity (Karr et al. 1986; Barbour et al. 1999). Habitat assessment helps to support understanding of the relationship between physical habitat quality and biological conditions, identifies obvious constraints on the attainable potential of a site, assists in the selection of appropriate sampling stations, and provides basic information for interpreting biosurvey results (US EPA 1995). Before leaving the sample reach during the 2007 fish population surveys, habitat qualities were scored using a modification of the evaluation procedure in Barbour et al. (1999). The matrices used to assess habitat quality are based on stream flow, key physical characteristics of the water body, and riparian area. Most parameters evaluated are instream physical attributes often related to overall land use and are potential sources of limitation to the aquatic biota (Barbour et al. 1999). The ten habitat parameters for moderate to high gradient streams are as follows: instream cover for fish, epifaunal substrate, embeddedness, sediment deposition, channel alteration, velocity/depth combinations, channel flow status, right and left bank vegetative protection, right and left bank stability, and, right and left bank riparian vegetative zone width. For moderate to low gradient streams, instream cover for fish is replaced with bottom substrate/available cover, epifaunal substrate is replaced with pool substrate characterization, embeddedness is replaced with pool variability, and velocity-depth combinations is replaced with channel sinuosity. Habitat parameters are scored, totaled, and when appropriate compared to a reference station to provide relative habitat ranking.

Results

Results of the fish population surveys can be found in Table 2. It should be noted that young of the year (yoy) fish from most species (with the exception of salmonids) were not targeted for collection. Young of the year fishes that were collected, intentionally or not, are noted in Table 2. Scientific names of fishes are taken from American Fisheries Society Special Publication 29 (Nelson et al. 2004). A total of seventeen species were collected. Sampling was reported as being poor at W1905, W1911, and W1918 due to thick macrophyte growth and depth at the first two sites and visibility issues relating to muck at the latter site. With regard to the habitat assessments, although all stations were scored using moderate to high gradient criteria it appears that at least five stations may have been more suited to low to moderate gradient criteria. Results of the habitat assessments can be found in Table 3.

The RBP V protocol (Plafkin et al. 1989 and Barbour et al. 1999) calls for the analysis of the data generated from fish collections using an established Index of Biotic Integrity (IBI) similar to that described by Karr et al. (1986). Since no formal IBI for Massachusetts currently exists, the data provided by this sampling may be used to qualitatively assess the general condition of the resident fish population as a function of the overall abundance (number of species or richness, as well as individuals) and species composition (classifications listed below).

Tolerance Classification - Classification of tolerance to environmental stressors similar to that provided in Plafkin et al. (1989), Barbour et al. (1999), and Halliwell et al. (1999). Final tolerance classes are those provided by Halliwell et al. (1999).

Macrohabitat Classification – Classification by common macrohabitat use as presented by Bain and Meixler (2000) modified regionally following discussions between MassDEP and Massachusetts Department of Fish and Game (MA DFG) fishery biologists.

Literature Cited

- Bain, M. B., and M. S. Meixler. 2000. Defining a target fish community for planning and evaluating enhancement of the Quinebaug River in Massachusetts and Connecticut. Final report by the New York Cooperative Fish and Wildlife Research Unit, Cornell University, Ithaca, NY to the New England Interstate Water Pollution Control Commission, Lowell, MA. 51 p.
- Barbour, M.T., J. Gerritsen, B.D. Snyder and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, DC.
- Halliwell, D.B, Langdon, R.W., Daniels, R.A., Kurtenbach, J.P., and R.A. Jacobson. 1999. Classification of Freshwater Fish Species of the Northeastern United States for Use in the Development of Indices of Biological Integrity, with Regional Applications. pp. 301-338 in T. P. Simon (ed.). Assessing the Sustainability and Biological Integrity of water Resources Using Fish Communities. CRC Press, Boca Raton, FL. 671 p.
- Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant, and I.J. Schlosser. 1986. Assessing Biological Integrity in Running Waters: A Method and Its Rationale. Special Publication 5. Illinois Natural History Survey. Champaign, IL. 28 p.
- MassDEP. 2006. *Fish Collection Procedures for Evaluation of Resident Fish Populations (Method 003/11.20.95) CN 75.1*. Massachusetts Department of Environmental Protection, Division of Watershed Management, Worcester MA.
- Nelson, J. S., E. J. Crossman, H. Espinosa-Perez, L. T. Findley, C. R. Gilbert, R. N. Lea, and J. D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society. Special Publication 29, Bethesda, Maryland.
- Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. EPA/444/4-89-001. Assessment and Watershed Protection Division, U.S. Environmental Protection Agency, Washington, DC.
- US EPA. 1995. Generic Quality Assurance Project Plan Guidance for Programs Using Community Level Biological Assessment in Wadeable Streams and Rivers. U.S. Environmental Protection Agency, Office of Water. 71 p.

Table 1. List of biomonitoring stations sampled for fish during the 2009 Cape Cod Coastal Watersheds survey.

Station ID	Unique ID	Waterbody Name	Site Description	Sampling Date
W1905	P0163	Coonamessett River	just upstream from flow structure at Sandwich Road, Falmouth	28-Sept-2009
W1910	P0164	Quashnet River	just upstream from Route 151, Mashpee	28-Sept-2009
W1911	P0167	Mashpee River	just downstream from Quinaquisset Avenue and Route 28 at old bridge crossing, Mashpee	28-Sept-2009
W1925	P0144	Hawes Run	approximately 200 meters downstream from Buck Island Road, Yarmouth	28-Sept-2009
W1924	P0166	White's Brook	just upstream from Route 6A, Yarmouth	29-Sept-2009
W1920	P0168	Herring River	just upstream from Main Street, Harwich	29-Sept-2009
W1918	P0165	Red River	west of the Shirley Drive cul-de-sac, Chatham/Harwich	29-Sept-2009

Table 2. Species and counts for fish collected during the 2009 Cape Cod Coastal Watersheds biomonitoring survey. Refer to Table 1 for a listing and description of sampling stations. The number in parentheses indicates the number of young of the year and is included in the total count.

Common name	Scientific name	Tolerance ¹	Macrohab. Class. ²	Station						
				W1905	W1910	W1911	W1925	W1924	W1920	W1918
American brook lamprey	<i>Lampetra appendix</i>	I	FD			16				
American eel	<i>Anguilla rostrata</i>	T	MHG	4	11(1)	4	6	6	8	>18
alewife or blueback	<i>Alosa</i> sp.	M	MHG or FS		(>200)					
golden shiner	<i>Notemigonus crysoleucas</i>	T	MHG						1	
white sucker	<i>Catostomus commersonii</i>	T	FD		1	7			16	
brown bullhead	<i>Ameiurus nebulosus</i>	T	MHG						1	
chain pickerel	<i>Esox niger</i>	T	MHG			1			1	
brook trout	<i>Salvelinus fontinalis</i>	I	FS		18	4				
banded killifish	<i>Fundulus diaphanus</i>	T	MHG							13
threespine stickleback	<i>Gasterosteus aculeatus</i>	T	MHG							1
fourspine stickleback	<i>Apeltes quadracus</i>	T	MHG	4	1	16		1	3	45
ninespine stickleback	<i>Pungitius pungitius</i>	T	MHG					42		3
bluegill	<i>Lepomis macrochirus</i>	T	MHG					3		
pumpkinseed	<i>Lepomis gibbosus</i>	T	MHG			1	1		2	
largemouth bass	<i>Micropterus salmoides</i>	T	MHG		1				7	
tessellated darter	<i>Etheostoma olmstedii</i>	M	FS	20	20(4)				70	
yellow perch	<i>Perca flavescens</i>	T	MHG		1					

¹ Tolerance Classification from Halliwell et al. (1999).

T = tolerant, I = intolerant, M = moderately tolerant

² Macrohabitat Classification from Bain and Meixler (2000).

FD = fluvial dependant, MHG = macrohabitat generalist, FS = fluvial specialist

Table 3. Habitat assessment summary for fish stations sampled during the 2009 Cape Cod Coastal Watersheds survey. For within-reach parameters, scores ranging from 16-20 = optimal; 11-15 = suboptimal; 6-10 = marginal; 0-5 = poor. For riparian parameters, scores ranging from 9-10 = optimal; 6-8 = suboptimal; 3-5 = marginal; 0-2 = poor. Maximum habitat score for any site = 200. Refer to Table 1 for a listing and description of sampling stations.

Stations	W1905	W1910	W1911	W1925	W1924	W1920	W1918
PARAMETERS(within reach)							
Instream Cover for Fish	10	15	10	12	8	14	7
Epifaunal substrate (in sampled areas only)	9	16	4	8	14	7	10
Embeddedness (riffles and runs)	n/a	n/a	18	n/a	3	n/a	9
Channel Alteration	17	13	19	18	11	19	19
Sediment Deposition	19	n/a	n/a	n/a	20	n/a	11
Velocity Depth Combinations	**	20	13	13	3	16	8
Channel Flow Status	20	20	20	20	19	20	17
PARAMETERS (riparian)							
Bank Vegetative Protection-Left Bank	10	10	10	10	10	10	10
Bank Vegetative Protection-Right Bank	10	10	10	10	10	10	10
Bank Stability-Left Bank	10	10	10	9	7	10	10
Bank Stability-Right Bank	10	10	10	9	7	10	10
Riparian Vegetative Zone Width-Left Bank	10	10	10	10	9	10	8
Riparian Vegetative Zone Width-Right Bank	10	10	10	10	9	10	9
Total	135¹	144¹	144²	129¹	130	136¹	138

¹ of a possible 160

² of a possible 180

n/a not applicable

