STATE of the STRAIT

State Of The Strait
Monitoring For Sound Management






A Binational Conference on the Detroit River Ecosystem

Convened December 2004 by Great Lakes Institute for Environmental Research, University of Windsor, The Greater Detroit American Heritage River Initiative of Metropolitan Affairs Coalition, The Detroit River Canadian Cleanup, The Detroit River International Wildlife Refuge, The Detroit Water and Sewerage Department, and other organizations.

Cover photos: photos left and center (upper and lower): Recreational fishing in the Huron-Erie Corridor (lower center photo by Kurt Byers, Michigan Sea Grant Extension, courtesy of United States Environmental Protection Agency, Great Lakes National Program Office; other photos courtesy of OMNR); upper right: Scientist sampling water, benthic invertebrates and sediment in Lake Erie (photo courtesy of Environment Canada and University of Windsor); lower right: Longear sunfish (*Lepomis megalotis*) (photo courtesy of Nicolas Lapointe)

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MONITORING FOR SOUND MANAGEMENT

2004 Conference Proceedings

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6.17. Fish-Habitat Associations in Shallow Canadian Waters of the Detroit River

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Introduction

Proper management of a river and its fisheries requires knowledge of the habitat preferences of existing fish assemblages (Petts et al. 1989). However, current quantitative knowledge of the habitat requirements of fish in large rivers is limited, as sampling becomes difficult with increasing depth and flow (Grossman and Ratajczak 1998). There are few studies that examine the relationship between habitat and fish assemblages on large rivers (Lobb and Orth 1991), and there has been little research on the Detroit River in particular. In the early 1980s, the spawning areas of abundant and commercially important fish were studied (Goodyear et al. 1982). In the 1980s, the distribution of larval fish as well as the movement and harvest of fish was examined (Hatcher and Nester 1983; Hass et al. 1985). In the mid-1990s, the Ontario Ministry of Natural Resources (OMNR) conducted a fish species survey in three areas of the river using boat electrofishing (OMNR 1995). More recently, the Department of Fisheries and Oceans (DFO) sampled the Detroit River in 2003 and 2004 and resampled the OMNR sites. We conducted a pilot study on the Detroit River in 2003. The results of this study are summarized below as background for our main study of fish-habitat preferences in 2004.

Pilot Study

In 2003, we sampled a 10-km reach of the Detroit River near Fighting Island to examine fish-habitat associations (Lapointe, in progress). Using underwater video and Ekman grabs, substrate was classified at 300 locations in depths less than three meters as either mud, sand, gravel, or vegetation on a soft or hard substrate. Fishes were sampled at a subset of 30 sites using a variety of gear. Combined seine- and hoop-net samples yielded the highest fish species diversity and abundance. Because hoop netting is time-intensive, a combination of electrofishing and seining techniques was effective and efficient in obtaining fish diversity and abundance data. Overall, 41 species were found in the study area, including five non-indigenous species: common carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), round goby (*Neogobius melanostomus*), tubenose goby (*Proterorhinus marmoratus*), and white perch (*Morone americana*) (Table 1). One species at risk, spotted sucker (*Minytrema melanops*), was found. Banded killifish (*Fundulus diaphanous*) was a new finding for the Detroit River. None of the ten most common species was associated significantly with substrate habitat. In 2004, we expanded our study of fish-habitat associations to include all shallow Canadian waters of the Detroit River.

Table 1. Fish species found in middle Detroit River 2003 (Lapointe, unpublished data)

Scientific Name	Common Name	Total Abundance (Out of ~2500 Fishes)	Status[1,2,3]
Notropis hudsonius	Spottail Shiner	722	I
Pimephales notatus	Bluntnose Minnow	441	I
Perca flavescens	Yellow Perch	402	I
Lepomis fry	Sunfish Fry	103	I
Ambloplites rupestris	Rock Bass	102	I
Micropterus salmoides	Largemouth Bass	92	I
Labidesthes sicculus	Brook Silverside	84	I
Lepomis macrochirus	Bluegill	78	I
Lepomis gibbosus	Pumpkinseed	68	I
Notropis volucellus	Mimic Shiner	62	I
Dorosoma cepedianum	Gizzard Shad	59	I
Notropis atherinoides	Emerald Shiner	51	I
Morone americana	White Perch	47	NI
Micropterus dolomieu	Smallmouth Bass	42	I
Catostomus commersonii	White Sucker	33	I
Cyprinus carpio	Common Carp	23	NI
Cyprinella spiloptera	Spotfin Shiner	18	I
Notemigonus crysoleucas	Golden Shiner	18	I
Lepisosteus osseus	Longnose Gar	16	I
Luxilus chrysocephalus	Striped Shiner	10	I
Neogobius melanostomus	Round Goby	10	NI
Amia calva	Bowfin	8	I
Morone chrysops	White Bass	8	I
Percina caprodes	Logperch	8	I
Esox masquinongy	Muskellunge	6	I
Carassius auratus	Goldfish	6	NI
Pomoxis nigromaculatus	Black Crappie	5	I
Etheostoma nigrum	Johnny Darter	5	I
Ameiurus melas	Black Bullhead	3	I
Esox lucius	Northern Pike	3	I
Hypentelium nigricans	Northern Hogsucker	3	I
Ictalurus punctatus	Channel Catfish	3	I
Fundulus diaphanus	Banded Killifish	2	NR
Proterorhinus marmoratus	Tubenose Goby	2	NI
Sander vitreus	Walleye	2	I
Nocomis biguttatus	Hornyhead Chub	2	I
Moxostoma anisurum	Silver Redhorse	1	I
Ameiurus natalis	Yellow Bullhead	1	I
Ameiurus nebulosus	Brown Bullhead	1	I
Aplodinotus grunniens	Freshwater Drum	1	I
Minytrema melanops	Spotted Sucker	1	SAR
Percopsis omiscomaycus	Trout-Perch	1	I

[1] I = Indigenous

[2] NI = Non-indigenous

[3] SAR = Species at risk

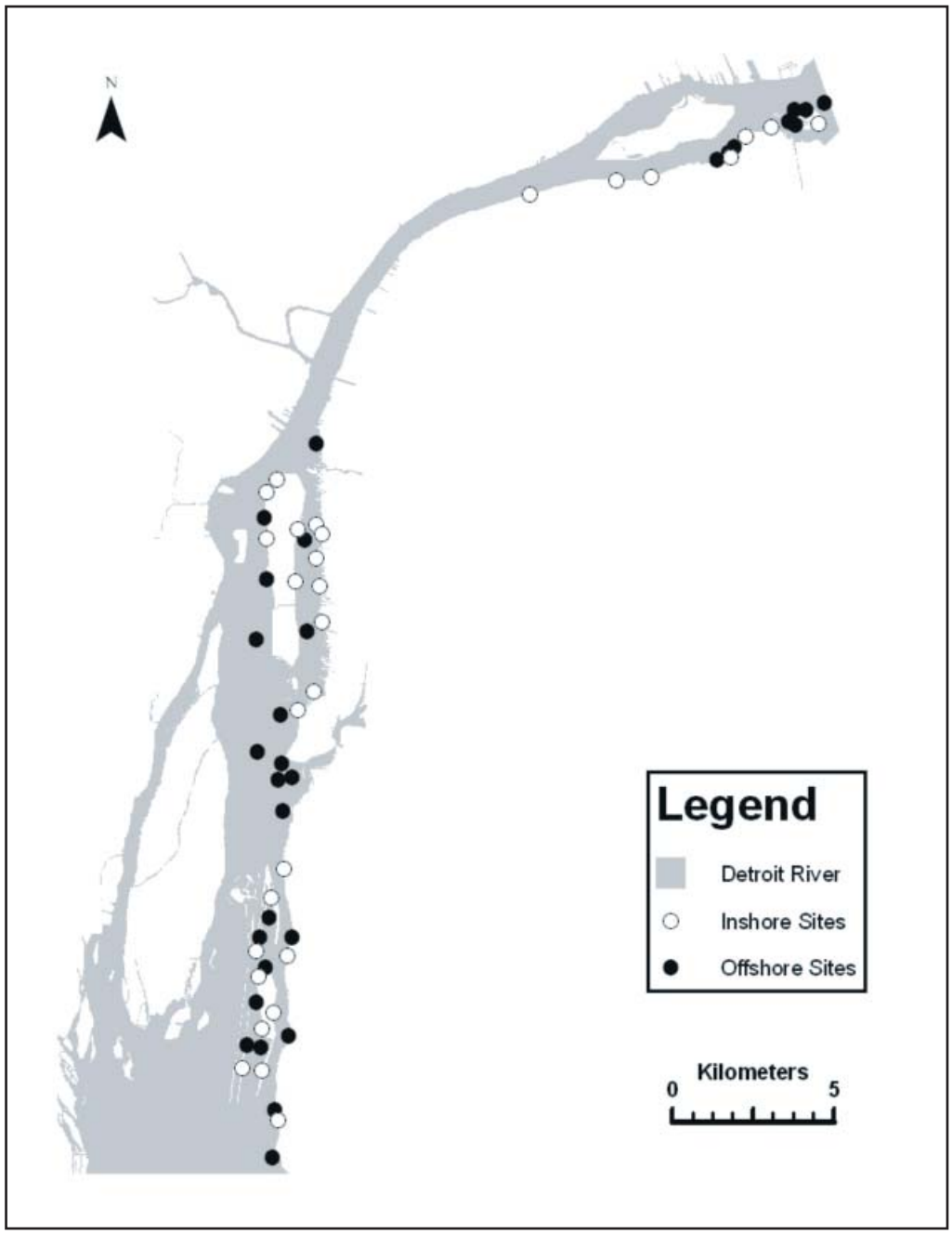

Figure 1. Inshore and offshore (> 15 m from shore) fish sampling sites in shallow Canadian waters of the Detroit River by river segment. (Lapointe, unpublished data).

Objectives

Habitat preference must be studied at multiple spatial scales, as habitat choice by fishes depends on both small and large scale processes (Lamouroux et al. 1999). Assessing the impacts of human development of waterways on fishes requires quantitative assessments of habitat preferences (Bain 1995). To correct for anthropogenic modifications and invasions, native species habitat should be enhanced and invasive species habitat should be reduced (Gido and Prost 1999).

Our objectives in 2004 were to evaluate the microhabitat and macrohabitat preferences of fishes throughout the Canadian waters of the Detroit River. Our results will be

published in the primary literature, and will be potentially useful for conservation or restoration projects in the Detroit River. We hypothesized that spatially distinct river segments influenced by different tributaries would have different fish assemblages (Figure 1). We predicted that inshore areas would show higher fish diversity and abundance than offshore areas of similar depths (Figure 1). On the microhabitat scale, we hypothesized that a suite of abiotic factors (flow, substrate, macrophytes, temperature, etc.) could be used to predict fish distributions. We also predicted that natural shorelines would have higher fish diversity and abundance than modified shorelines (retaining walls, bank armouring, lawns, etc.). Finally, we expected changes in fish distribution with season due to macrophyte growth and shifts in relative abundance of fishes with the appearance of juveniles.

Methods

In 2004, fishes were sampled at 60 randomly selected sites, 30 inshore (located along a shoreline) and 30 offshore (>15 m from shore) (Figure 1). These represented three (upstream, middle, and downstream) segments of the Detroit River and were sampled in May, July, and September. Where possible, sites from 2003 were included in the study. Coordinates were recorded using a GPS unit at each site. Shoreline features and riparian zone land use were recorded for inshore sites, and microhabitat features were measured at all sites. Fishes were sampled using seine nets and boat electrofishing. Captured fishes were counted and identified by species. The length of up to 30 fish of each species was measured at each site.

Results

Currently, data are being prepared for analysis. However, initial results suggest different assemblages are associated with microhabitat features, season, and distance from shore (i.e. inshore versus offshore sites). Associations with river segment and riparian features do not appear to be as strong. Spring seining data showed higher abundance and species diversity at inshore versus offshore sites, and lower species diversity and abundance in the upstream segment compared to downstream areas. Overall, 45 species were found in 2004, including three additional non-indigenous species not found in 2003: alewife (*Alosa pseudoharengus),* rainbow smelt (*Osmerus mordax*), and threespine stickleback (*Gasterosteus aculeatus*) (Table 2). Two species at risk, spotted sucker (*Minytrema melanops)* and pugnose minnow (*Opsopoeodus emiliae*), were found. Longear sunfish (*Lepomis megalotis*) was recorded as a new finding for the Detroit River.

Table 2. Fish species list, Detroit River 2004 (Lapointe, unpublished data)

Scientific Name	Common Name	Total Abundance (Out of ~ 40,000 Fishes)	Status[1,2,3]
Notropis atherinoides	Emerald Shiner	25083	I
Dorosoma cepedianum	Gizzard Shad	2654	I
Notropis hudsonius	Spottail Shiner	2365	I
Perca flavescens	Yellow Perch	1963	I
Notropis volucellus	Mimic Shiner	1562	I
Pimephales notatus	Bluntnose Minnow	1020	I
Neogobius melanostomus	Round Goby	917	NI
Morone chrysops	White Bass	466	I
Lepomis macrochirus	Bluegill	442	I
Micropterus salmoides	Largemouth Bass	423	I
Morone americana	White Perch	398	NI
Ambloplites rupestris	Rock Bass	365	I
Luxilus chrysocephalus	Striped Shiner	324	I
Cyprinella spiloptera	Spotfin Shiner	281	I
Labidesthes sicculus	Brook Silverside	273	I
Lepomis gibbosus	Pumpkinseed	263	I
Osmerus mordax	Rainbow Smelt	134	NI
Alosa pseudoharengus	Alewife	130	NI
Nocomis biguttatus	Hornyhead Chub	98	I
Notemigonus crysoleucas	Golden Shiner	89	I
Micropterus dolomieu	Smallmouth Bass	87	I
Lepomis megalotis	Longear Sunfish	72	I
Percina caprodes	Logperch	69	I
Cyprinus carpio	Common Carp	38	NI
Lepomis fry	*Lepomis* fry	35	I
Etheostoma nigrum	Johnny Darter	30	I
Fundulus diaphanus	Banded Killifish	23	I
Morone fry	*Morone* Fry	22	I
Proterorhinus marmoratus	Tubenose Goby	22	NI
Percopsis omiscomaycus	Trout-Perch	20	I
Pomoxis nigromaculatus	Black Crappie	15	I
Lepomis hybrid	Sunfish Hybrid	13	I
Catostomus commersonii	White Sucker	12	I
Aplodinotus grunniens	Freshwater Drum	10	I
Carassius auratus	Goldfish	6	NI
Esox lucius	Northern Pike	5	I
Moxostoma sp.	Redhorse sp.	5	I
Pimephales promelas	Fathead Minnow	5	I
Gasterosteus aculeatus	Threespine Stickleback	4	NI
Ameiurus melas	Black Bullhead	3	I
Minytrema melanops	Spotted Sucker	3	SAR
Moxostoma anisurum	Silver Redhorse	3	I
Opsopoeodus emiliae	Pugnose Minnow	3	SAR
Esox masquinongy	Muskellunge	2	I
Moxostoma erythrurum	Golden Redhorse	2	I
Amia calva	Bowfin	1	I

Lepisosteus osseus	Longnose gar	1	I
Moxostoma macrolepidotum	Shorthead Redhorse	1	I
Sander vitreus	Walleye	1	I

[1] I = Indigenous

[2] NI = Non-indigenous

[3] SAR = Species at risk

Recommendations

Habitat preferences of fishes in Canadian waters of the Detroit River will likely match those of fishes in American waters. However, before the results of this study can be applied to American waters, it must first be determined that habitats available in American and Canadian waters match. Any habitats unique to American waters would have to be studied separately before fish species preferences could be determined.

Habitat availability (and therefore fish species distributions) may change from year to year, along with relative abundance of fish species. It would therefore be beneficial to monitor a sub-sample of representative sites to study how changes in environmental conditions, flow, and water levels affect fish species distributions.

Despite these limitations, the results of this study will aid in determining which habitats are most important in preserving species diversity and abundant populations. Knowledge of the habitat preferences of individual species will provide opportunities for species-specific management, such as the reduction of invasive species.

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