

Fish-Habitat Associations in the Middle Detroit River



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Abstract

We sampled a 10 km reach of the Detroit River near Fighting Island during the summer of 2003 to examine fish-habitat associations. Using underwater video and Ekman grabs, we classified the substrate at 300 locations in depths < 3 m as either mud, sand, gravel, weeds on a soft substrate, or weeds on a hard substrate. Thirty sites with homogeneous substrates were selected at random. Fishes were then sampled at these sites in July and August using minnow traps, Windermere traps, hoop nets, trap nets, seine nets, and boat electrofishing. Based on species richness and abundance, minnow traps and trap nets were found to be inefficient sampling methods, whereas seine netting captured the highest species diversity (32 species). Overall, 42 species were found in the study area including Spotted Sucker (*Minnytrema melanops*), a species at risk. Yellow Perch (*Perca flavescens*), Spottail Shiner (*Notropis hudsonius*), Bluntnose Minnow (*Pimephales notatus*), Rock Bass (*Ambloplites rupestris*), and Largemouth Bass (*Micropterus salmoides*) were the most common species. Cyprinids (Spottail Shiner and Bluntnose Minnow) were spatially distinct from Largemouth Bass, Pumpkinseed (*Lepomis gibbosus*) and Yellow Perch.

Introduction

Little is known about the habitat preferences of fish in large rivers, or of the current distribution of fish species in the Detroit River^{1,2}. My objectives in this study were to determine:

- which species were present in the study area
- if substrate could be used to predict the presence of these fish species
- which sampling methods were most efficient in capturing the highest number of fish species

Methods

In June and July 2003, substrate was determined at 300 shallow (< 3 m) sites on a 10 km long section of the 51 km long Detroit River, near Fighting Island (Fig. 1). Substrates found included:

- Mud
- Sand
- Gravel
- Weeds on a soft substrate (Mud or other fine sediments)
- Weeds on a hard substrate (Gravel, sand or packed clay)

Fishes were sampled at a subset of 30 randomly selected sites with homogeneous substrates (Fig. 2). Abiotic variables measured at these sites included:

- Depth and turbidity (by Secchi disk)
- Conductivity
- Flow
- Air and water temperature
- Cloud cover
- Wind speed and Direction

Gear types included:

- Hoop Nets: 24 h set
- Windermere Traps: 24 h set, baited with cat food
- Seine Net: Used in triplicate, 1/4" mesh
- Electrofishing: Stationary, one minute



Figure 1: Initial Substrate Sampling Sites on the Detroit River

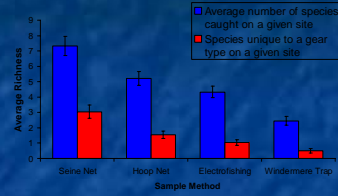


Figure 3: Gear Efficiency by Average Number of Species Captured

Table 1: Species List for 2003 Fish Sampling of the Detroit River

Scientific Name	Common Name	Total Occurrences (Out of 111 Sampling Events)	Total Abundance (Out of 2500 Fishes)	Status ^{1,2,3}
<i>Perca flavescens</i>	Yellow Perch	74	402	I
<i>Pimephales notatus</i>	Bluntnose Minnow	58	441	I
<i>Notropis hudsonius</i>	Spottail Shiner	57	722	I
<i>Ambloplites rupestris</i>	Rock Bass	49	102	I
<i>Lepomis gibbosus</i>	Pumpkinseed	35	68	I
<i>Micropterus salmoides</i>	Largemouth Bass	35	92	I
<i>Lepomis microlophus</i>	Bluegill	23	78	I
<i>Micropterus dolomieu</i>	Smallmouth Bass	20	42	I
<i>Labidesthes sicculus</i>	Brook Silverside	18	84	I
<i>Lepomis fry</i>	Sunfish Fry	16	103	I
<i>Catostomus commersoni</i>	White Sucker	15	33	I
<i>Cyprinus carpio</i>	Common Carp	14	23	NI
<i>Morone americana</i>	White Perch	14	47	NI
<i>Notropis atherinoides</i>	Emerald Shiner	14	51	I
<i>Notropis volucellus</i>	Mimic Shiner	9	62	I
<i>Cyprinella spiloptera</i>	Spottin Shiner	8	18	I
<i>Dorosoma cepedianum</i>	Gizzard Shad	8	59	I
<i>Lepidosteus osseus</i>	Largemouth Gar	8	16	I
<i>Amia calva</i>	Bowfin	7	8	I
<i>Essax masquinongy</i>	Muskellunge	6	6	I
<i>Luxilus cryscophthalmus</i>	Striped Shiner	6	10	I
<i>Morone chrysops</i>	White Bass	6	6	I
<i>Pogonias melanostomus</i>	Roanok Goby	5	10	NI
<i>Percina caprodes</i>	Logperch	5	8	I
<i>Carassius auratus</i>	Goldfish	4	6	NI
<i>Notropis buchanni</i>	Ghost Shiner	4	3	NR
<i>Pomoxis nigromaculatus</i>	Black Crappie	4	5	I
<i>Ameiurus melas</i>	Black Bullhead	3	3	I
<i>Esox lucius</i>	Northern Pike	3	3	I
<i>Etheostoma nigrum</i>	Johnny Darter	2	5	I
<i>Fundulus diaphanus</i>	Banded Killifish	2	2	NR
<i>Hypentelium nigricans</i>	Northern Hogsucker	2	3	I
<i>Ictalurus punctatus</i>	Channel Catfish	2	3	I
<i>Moxostoma valenciennium</i>	Silver Redhorse	2	1	I
<i>Notemigonus crysoleucas</i>	Golden Shiner	2	18	I
<i>Protoperca marmarostriata</i>	Tubenose Goby	2	2	NI
<i>Stizostedion vitreum</i>	Walleye	2	2	I
<i>Ameiurus natalis</i>	Yellow Bullhead	1	1	I
<i>Ameiurus nebulosus</i>	Brown Bullhead	1	1	I
<i>Bufo terrestris</i>	Bulltoad	1	1	I
<i>Aplodinotus grunniens</i>	Freshwater Drum	1	1	I
<i>Hybrid - Goldfish/Carp</i>	Hybrid - Goldfish/Carp	1	1	I
<i>Minnytrema melanops</i>	Spotted Sucker	1	1	SAR
<i>Moxostoma valenciennium</i>	Honeyhead Chub	1	2	I
<i>Percina umacostata</i>	Trout Perch	1	1	I

I – Indigenous Species; NI – Non-Indigenous Species; NR – New Record; SAR – Species at Risk

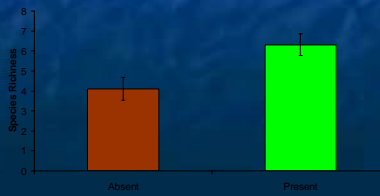


Figure 4: Average Number of Species Caught by Hoop Nets on Sites With and Without Vegetation

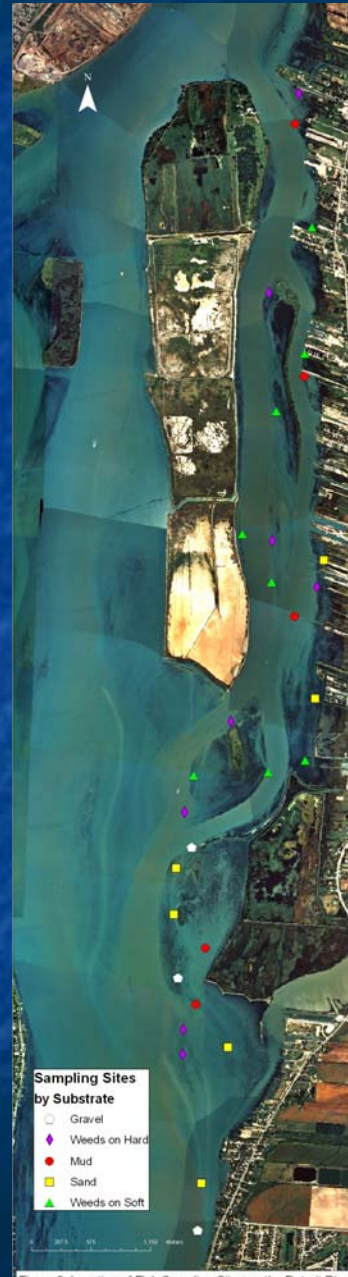


Figure 2: Location of Fish Sampling Sites on the Detroit River

Results

42 species were found in the study area including (Table 1):

- 5 non-indigenous species
- 1 species of special concern
- 2 species which had not previously been reported

Substrate:

- Richness did not change between substrate classes (ANOVA, $p=0.21$).
- Using principal component factor analysis (followed by multiple linear regression analyses), no significant correlations were found between factors (location, F1; depth, F2; and time of day, F3) and the abundance of the 10 most common fish species caught by seine net.
- Particle size and the amount of vegetation had no significant effect on the abundance of the 10 most common fish species caught by seine net (multiple linear regression analyses).

Gear types:

- Seine nets captured significantly more species per site, and more unique species at a given site than any other method (ANOVA, $p<0.001$) (Fig. 3).
- Hoop nets captured significantly more species at sites with vegetation than at non-vegetated sites ($t_{10}=2.802$, $p=0.01$) (Fig. 4).
- In most cases, Windermere traps captured significantly fewer species than other methods (Fig. 3).

Conclusions

• Previously, 77 fish species had been recorded on the Detroit River^{1,2,3}. This study confirms 2 additional species, *Fundulus diaphanus* and *Notropis buchanni* (Table 1).

• Fish species were not significantly correlated with particle size or vegetation.

• Though seine nets were most efficient, each gear type caught at least one unique species overall, and several unique species with respect to site.

• Hoop nets captured more species at sites with vegetation than without vegetation (Fig. 4).

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