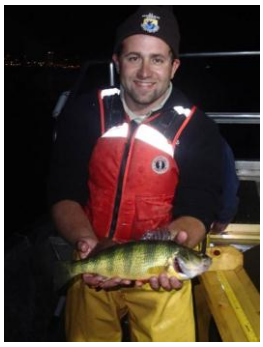
U.S. Fish and Wildlife Service

Early Detection of Aquatic Invasive Species in Lake Michigan: Milwaukee





Monitoring Summary No. 02 – December 2014

U.S. Fish and Wildlife Service
Green Bay Fish and Wildlife Conservation Office
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Lake Michigan

Great Lakes **RESTORATION**

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On the cover:

(Left photo): A large Round Goby caught in a fyke net in Milwaukee, Wisconsin.

(Middle photo): Foreground: Matt Petasek (USFWS) holds up an adult Chinook Salmon with an attached Sea Lamprey caught electrofishing. Back ground: Anthony Rieth (USFWS) processes fish.

(Right photo): Anthony Rieth (USFWS) with a large Yellow Perch caught while electrofishing in Milwaukee, Wisconsin.

Summary

The Milwaukee Harbor estuary was sampled as part of the 2014 U.S. Fish and Wildlife Green Bay Conservation Office (USFWS GBFWCO) Aquatic Invasive Species (AIS) early detection and monitoring program. Sampling occurred in the Milwaukee Harbor, South Shore Harbor, Milwaukee River, Kinnickinnic River, and Menomonee Rivers on September 15th through September 19th (Figures 13 to 16). All fish were identified to species, measured to the nearest mm (TL) and released. Twenty-five redhorse were not identified to species of which 23 were captured by shocking and two were captured by fyke netting. For each unit of effort if >50 individuals were captured for a species, the first 50 were measured and the remaining were counted. Sixty-eight units of effort captured a total of 1,948 fish and 31 different species (Table 1). Non-native species accounted for 10 of the 31 species present; no new nonnative species were caught in the Milwaukee Harbor estuary. All "rare" fish species (n<3) captured are listed in Table 3.

Electrofishing was conducted during nighttime hours (i.e., 30 min after sunset to 30 min before sunrise) from September 15th through 19th. Twenty-one shocking runs (≈ 10 min each) covered various habitats including sand flats, lagoons, weed beds, and areas near rocky break walls. Electrofishing yielded 816 fish from 28 different species for a total CPUE of 7 fish per min (Table 1). Fourteen of the twenty-eight species captured were unique to this sampling method (Table 1). Fin clips were noticed on 4 Lake Trout *Salvelinus namaycush*, and 3 Brown Trout *Salmo trutta*; adipose clips were found on 19 Chinook Salmon *Oncorhynchus tshawytscha* and 1 Rainbow Trout *Oncorhynchus mykiss* captured by electrofishing (Table 2).

Fyke net and mini-fyke net sets were deployed in the harbor and river areas from September 15th to 18th and fished overnight. Each set consisted of two nets joined together by their lead lines. Total catch from 10 paired fyke nets was 337 fish from 11 different species; CPUE was 28 fish per paired net night (Table 1). One Walleye *Sander vitreus* with a fin clip was captured, but no other tags were present or detectable (Table 2). Fourteen mini-fyke nets yielded a CPUE of 35 fish per paired net night (Table 1). Total catch consisted of 501 fish from 14 different species (Table 1). Fin clips were noticed on four Brown Trout (Table 2).

Experimental micromesh gill nets were deployed in Milwaukee Harbor on September 16th and 17th. Each net measured 1.52 m high by 12.19 m long. The nets were made up of four 3.05 m panels of different size monofilament gill netting (12 mm, 16 mm, 20 mm and 25 mm bar). Each net was fished independently for at least two hours. Eight sets yielded a total CPUE of 0.39 fish per net hr; the total catch consisted of eight fish from three different species (Table 1). Of the species netted, two Lake Trout and two Brown Trout had fin clips (Table 2).

Fifteen minnow trap arrays were deployed between September 16th and 19th. Every array consisted of five minnow traps positioned 7.62 m apart. The traps were randomly baited with cheese, hot dogs, or left empty before being fished overnight. Arrays were set parallel to the break walls, unique features or the shoreline. The arrays yielded a CPUE of 20 fish per array night; the total catch consisted of 297 fish from two different species (Table 1).

Table 1. Total number of fish caught in the Milwaukee Harbor estuary by species and gear type.

Species	Total Catch By Gear Type (CPUE)					Total
	Electrofishing (Fish / Min)	Fyke Net (Fish/ Paired Net Night)	Mini-Fyke Net (Fish/ Paired Net Night)	Exp. Gill Net (Fish / Net Hour)	Minnow Trap (Fish / Array Night)	
Alewife	12 (0.051)	7 (0.58)	186 (13.29)			205
Black Bullhead	4 (0.017)					6
Black Crappie	1 (0.004)					1
Bluegill	23 (0.097)	8 (0.67)				36
Brown Bullhead	1 (0.004)					1
Brown Trout	28 (0.118)		18 (1.29)	3 (0.15)		49
Chinook Salmon	29 (0.122)					29
Common Carp	14 (0.059)					14
Common Shiner	14 (0.059)					14
Emerald Shiner	16 (0.067)					16
Fathead Minnow	1 (0.004)		1 (0.07)			2
Gizzard Shad	44 (0.185)					44
Golden Shiner	2 (0.008)					2
Green Sunfish	2 (0.008)					2
Lake Trout	5 (0.021)			2 (0.1)		7
Largemouth Bass	27 (0.114)	1 (0.08)	6 (0.43)			34
Northern Pike	22 (0.093)		1 (0.07)			23
Pumpkinseed	7 (0.029)		2 (0.14)			9
Rainbow Smelt	1 (0.004)					1
Rainbow Trout	9 (0.038)					9
Rock Bass	96 (0.404)	82 (6.83)	34 (2.43)			212
Round Goby	47 (0.198)	149 (12.42)	212 (15.14)		292 (19.47)	700
Sea Lamprey	1 (0.004)					1
Shorthead Redhorse	1 (0.004)					1
Smallmouth Bass	45 (0.19)	3 (0.25)				48
Spottail Shiner	17 (0.072)	2 (0.17)	5 (0.36)	3 (0.15)	5 (0.33)	32
Walleye		1 (0.08)				1
White Perch		3 (0.25)				3
White Sucker	316 (1.331)	68 (5.67)	15 (1.07)			399
Yellow Bullhead			1 (0.07)			1
Yellow Perch	8 (0.034)	11 (0.92)	2 (0.14)			21
Total	793 (3.339)	335 (27.92)	490 (35)	8 (0.39)	297 (19.8)	1,923
Effort	237.47 Min. (21 runs)	10 Nights	14 Nights	20.35 Hours (8 Sets)	15 Nights	

Table 2. Marked fish captured in the Milwaukee Harbor estuary.

Species	Marking	Length (mm)	Method of capture
Brown Trout	L PEC	558	Experimental Gill Net
Brown Trout	L PEC	592	Mini-Fyke Net
Brown Trout	L PEC	642	Electrofishing
Brown Trout	L PEC	770	Mini-Fyke Net
Brown Trout	L PEC	858	Electrofishing
Brown Trout	L/R PEC	691	Electrofishing
Brown Trout	R/L PEC	565	Mini-Fyke Net
Brown Trout	R/L PEC	580	Mini-Fyke Net
Brown Trout	R/L PEC	605	Experimental Gill Net
Chinook Salmon	AD CLIP	750	Electrofishing
Chinook Salmon	AD CLIP	755	Electrofishing
Chinook Salmon	AD CLIP	772	Electrofishing
Chinook Salmon	AD CLIP	780	Electrofishing
Chinook Salmon	AD CLIP	785	Electrofishing
Chinook Salmon	AD CLIP	800	Electrofishing
Chinook Salmon	AD CLIP	809	Electrofishing
Chinook Salmon	AD CLIP	822	Electrofishing
Chinook Salmon	AD CLIP	851	Electrofishing
Chinook Salmon	AD CLIP	861	Electrofishing
Chinook Salmon	AD CLIP	875	Electrofishing
Chinook Salmon	AD CLIP	881	Electrofishing
Chinook Salmon	AD CLIP	915	Electrofishing
Chinook Salmon	AD CLIP	915	Electrofishing
Chinook Salmon	AD CLIP	917	Electrofishing
Chinook Salmon	AD CLIP	935	Electrofishing
Chinook Salmon	AD CLIP	940	Electrofishing
Chinook Salmon	AD CLIP (SEL attached)	732	Electrofishing
Lake Trout	L PEC, R VENT	373	Electrofishing
Lake Trout	L PEC, R VENT	655	Experimental Gill Net
Lake Trout	L PEC, R VENT	769	Electrofishing
Lake Trout	L PEC, R VENT	825	Electrofishing
Lake Trout	L PEC, R VENT	835	Experimental Gill Net
Lake Trout	R PEC	825	Electrofishing
Rainbow Trout	AD CLIP	351	Electrofishing
Walleye	Pelvic Fin Clip	589	Fyke Net

Table 3. Milwaukee Harbor estuary rare fish species (n<3), fish lengths, and capture method.

Species	Length (mm)	Capture Method
Black Crappie	298	Electrofishing
Brown Bullhead	143	Electrofishing
Fathead Minnow	64	Mini-Fyke Net
Fathead Minnow	65	Electrofishing
Golden Shiner	53	Electrofishing
Golden Shiner	132	Electrofishing
Green Sunfish	134	Electrofishing
Green Sunfish	137	Electrofishing
Rainbow Smelt	45	Electrofishing
Sea Lamprey	410	Electrofishing
Shorthead Redhorse*	526	Electrofishing
Walleye	589	Fyke Net
Yellow Bullhead	213	Mini-Fyke Net

*an additional 25 redhorse were not identified to species.

Table 4: Abbreviations, common and scientific names of fish species caught in the Milwaukee Harbor estuary.

Common Name:	**Scientific Name:**	**Abbreviation:**
Alewife	*Alosa pseudoharengus*	ALE
Bullhead, Black	*Ameiurus melas*	BLB
Crappie, Black	*Pomoxis nigromaculatus*	BLC
Bluegill	*Lepomis macrochirus*	BLG
Trout, Brown	*Salmo trutta*	BNT
Bullhead, Brown	*Ameiurus nebulosus*	BRB
Carp, Common	*Cyprinus carpio*	CAP
Salmon, Chinook	*Oncorhynchus tshawytscha*	CHS
Shiner, Common	*Luxilus cornutus*	CNS
Shiner, Emerald	*Notropis athernoides*	EMS
Minnow, Fathead	*Pimphales promelas*	FHM
Shad, Gizzard	*Dorosoma cepedianum*	GIS
Shiner, Golden	*Notemigonus crysoleucas*	GOS
Sunfish, Green	*Lepomis cyanellus*	GRS
Trout, Lake	*Salvelinus namaycush*	LAT
Bass, Largemouth	*Micropterus salmoides*	LMB
Pike, Northern	*Esox lucius*	NOP
Pumpkinseed	*Lepomis gibbosus*	PUS
Smelt, Rainbow	*Osmerus mordax*	RAS
Trout, Rainbow	*Oncorhynchus mykiss*	RBT
Bass, Rock	*Ambloplites repestris*	ROB
Goby, Round	*Neogobius melanostomus*	ROG
Lamprey, Sea	*Petromyzon marinus*	SEL
Redhorse, Shorthead	*Maxostoma macrolepidotum*	SHR
Bass, Smallmouth	*Micropterus dolomieu*	SMB
Shiner, Spottail	*Notropis hudsonius*	STS
Walleye	*Sander vitrius*	WAE
Perch, White	*Morone americana*	WHP
Sucker, White	*Catostomus commersonii*	WHS
Bullhead, Yellow	*Ameiurus natalis*	YEB
Perch, Yellow	*Perca flavescens*	YEP

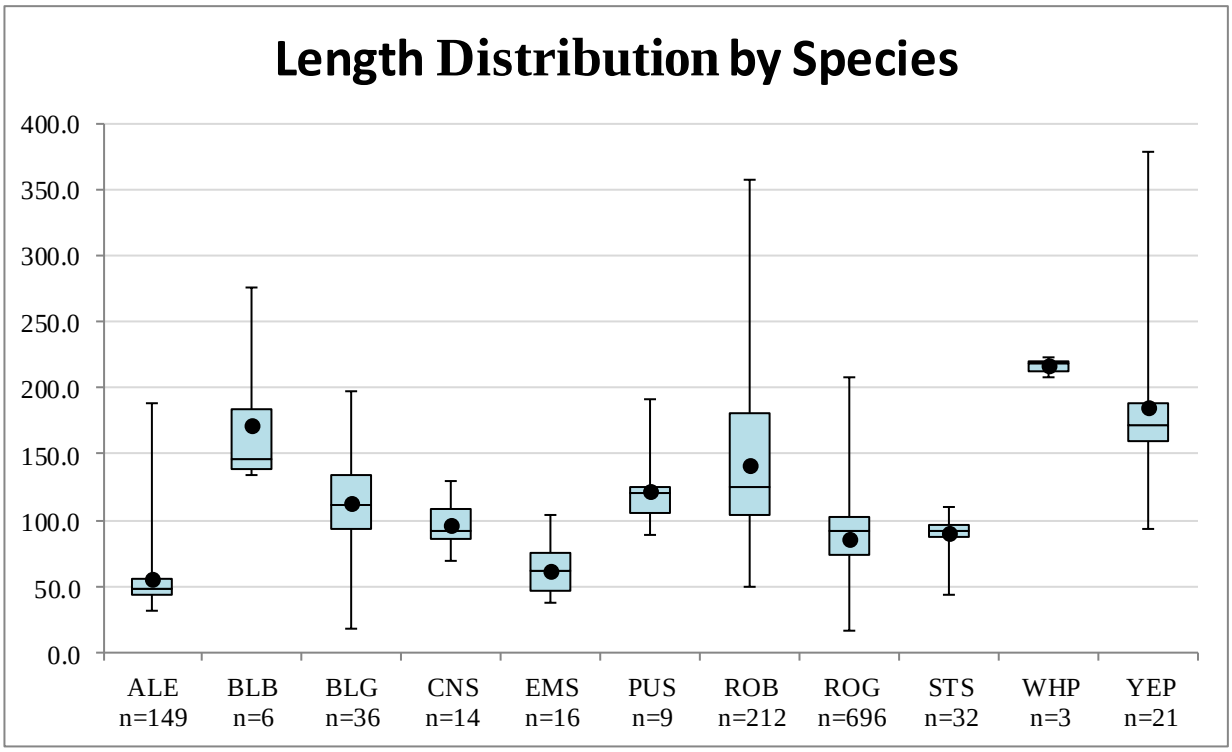

Figure 1. Length distribution of all species (n>3), with a maximum length less that 400 mm caught in the Milwaukee Harbor estuary. Maximum and minimum lengths are depicted by the upper and lower whiskers, while the box height represents the span from the 1st to the 3rd quartile. Mean length is depicted by the dot, while the median is represented by horizontal line for each species.

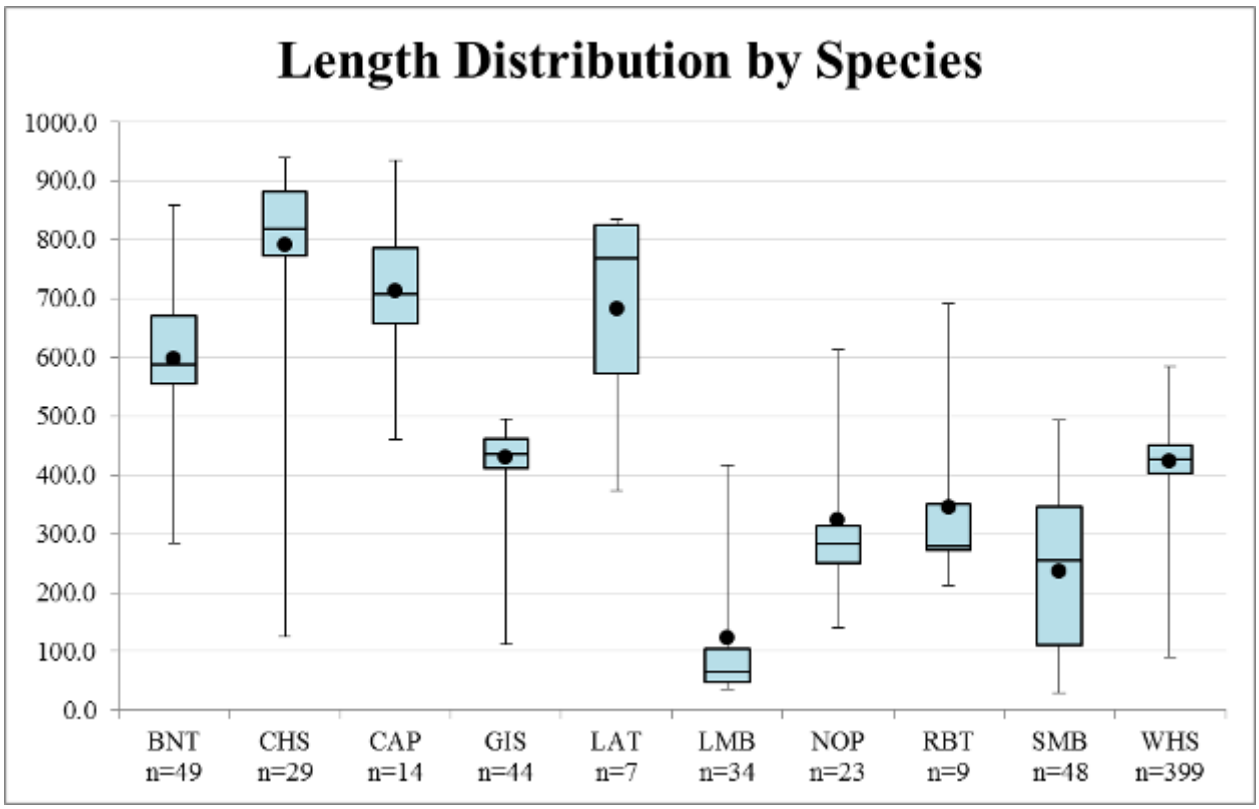

Figure 2. Length distribution of all species (n>3) with a maximum length greater than 400 mm caught in the Milwaukee Harbor estuary. Maximum and minimum lengths are depicted by the upper and lower whiskers, while the box height represents the span from the 1st to the 3rd quartile. Mean length is depicted by the dot, while the median is represented by horizontal line for each species.

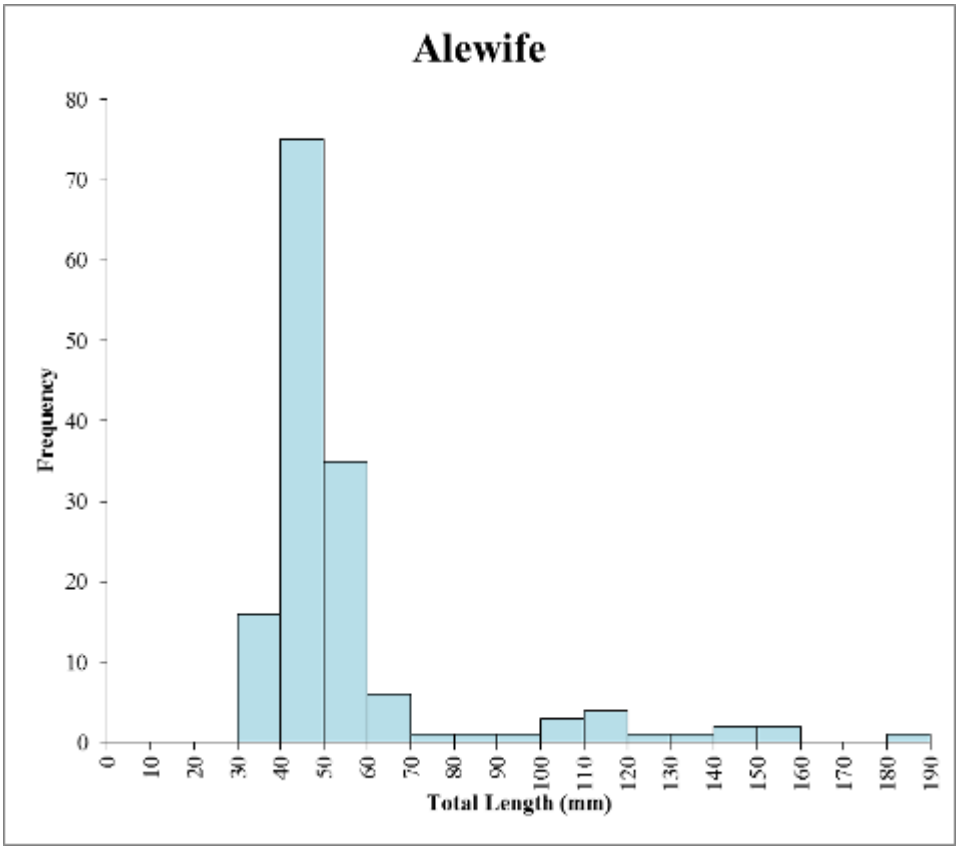

Figure 3. Alewife length distribution for the Milwaukee Harbor estuary.

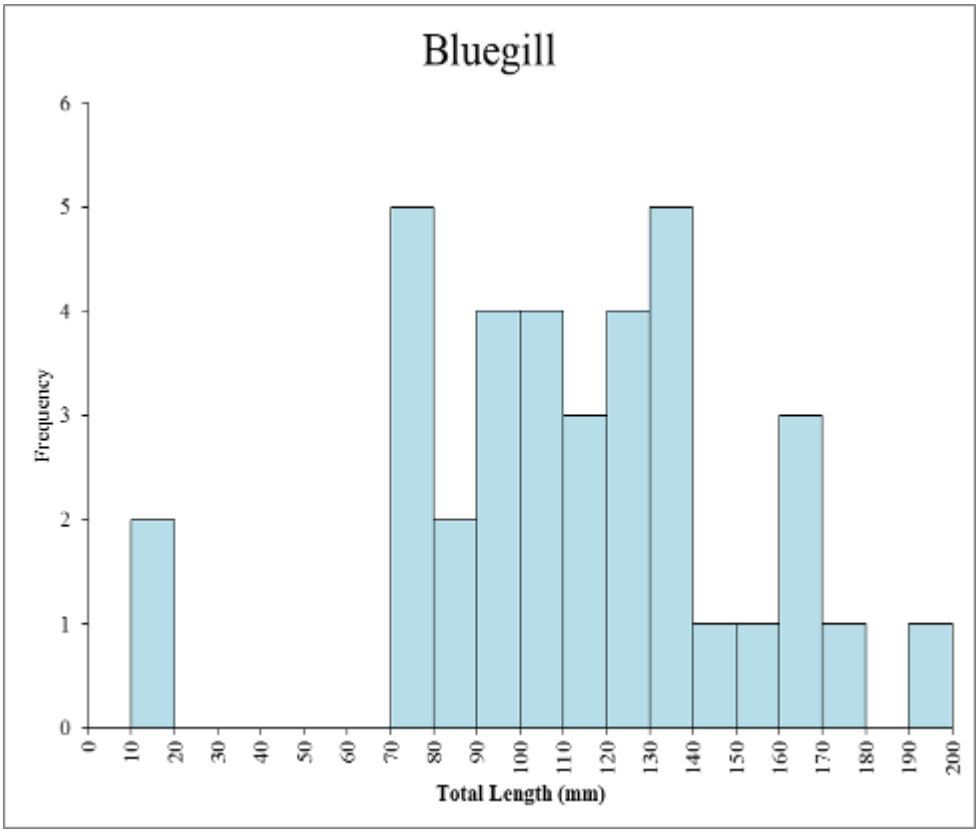

Figure 4. Bluegill length distribution for the Milwaukee Harbor estuary.

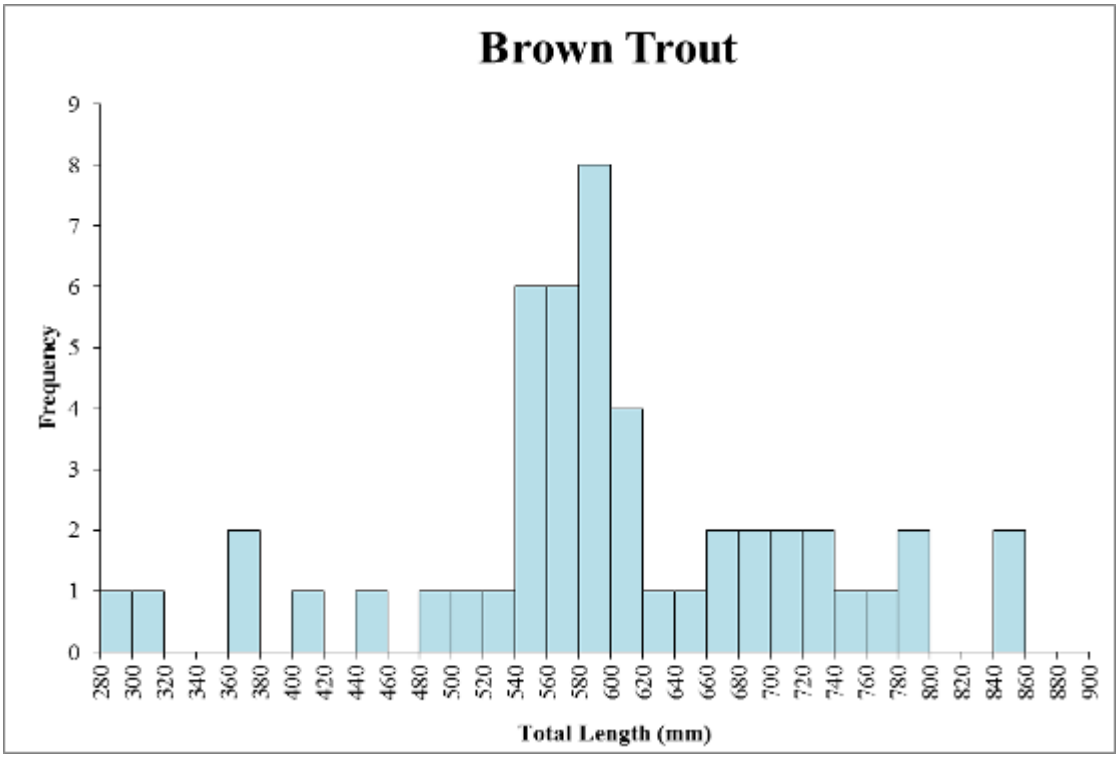

Figure 5. Brown Trout length distribution for the Milwaukee Harbor estuary.

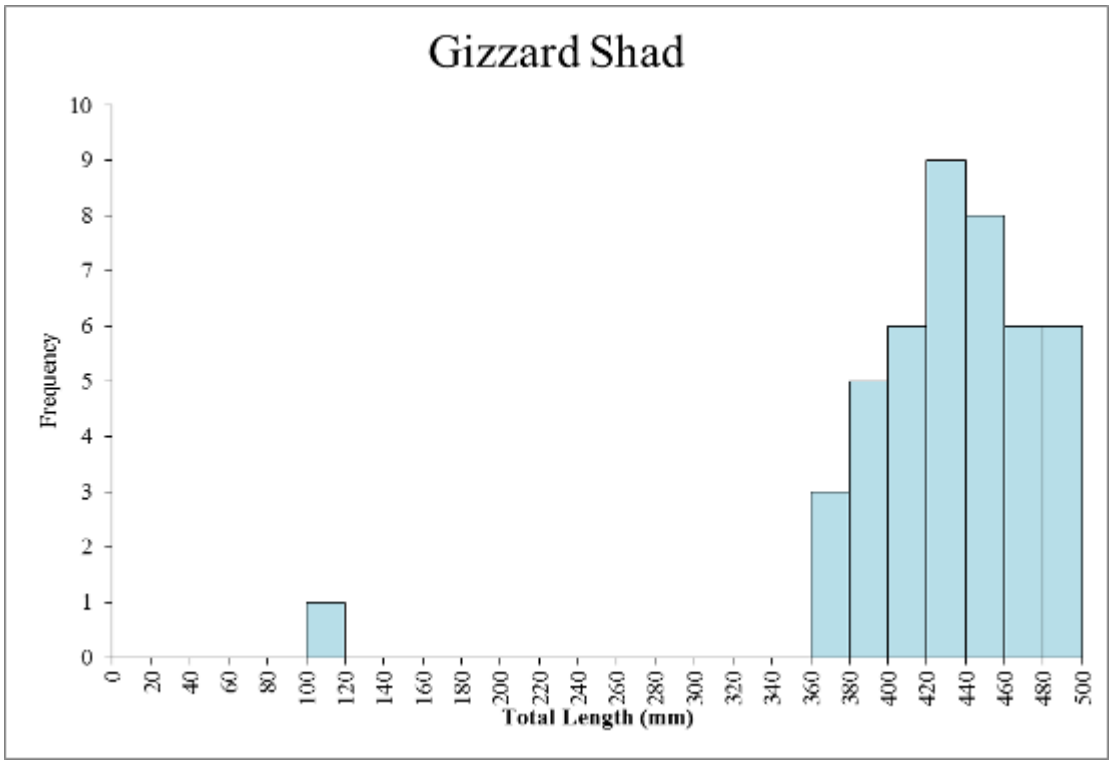

Figure 6. Gizzard Shad length distribution for the Milwaukee Harbor estuary.

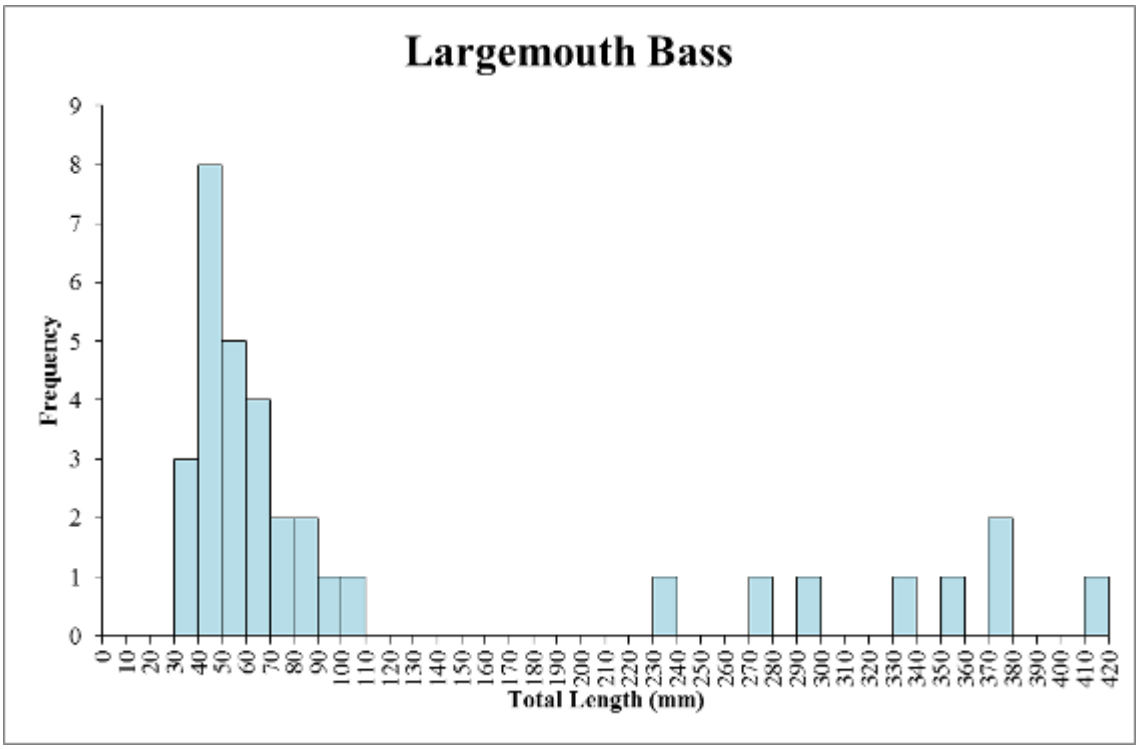

Figure 7. Largemouth Bass length distribution for the Milwaukee Harbor estuary.

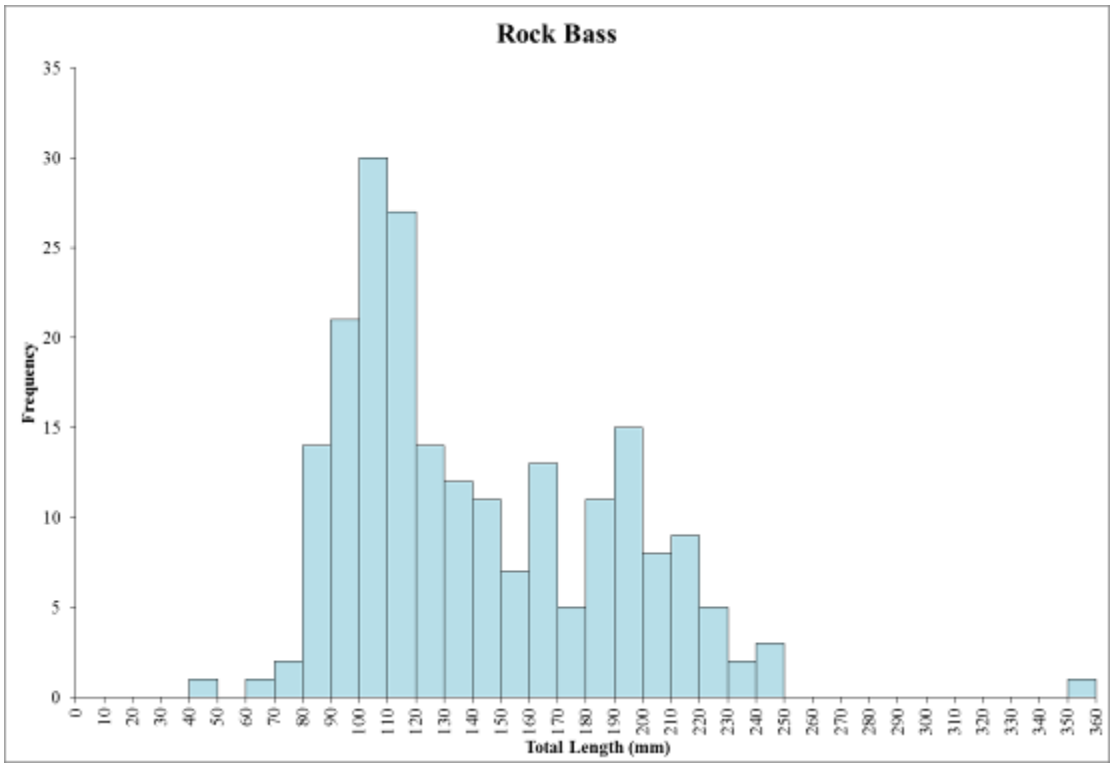

Figure 8. Rock Bass length distribution for the Milwaukee Harbor estuary.

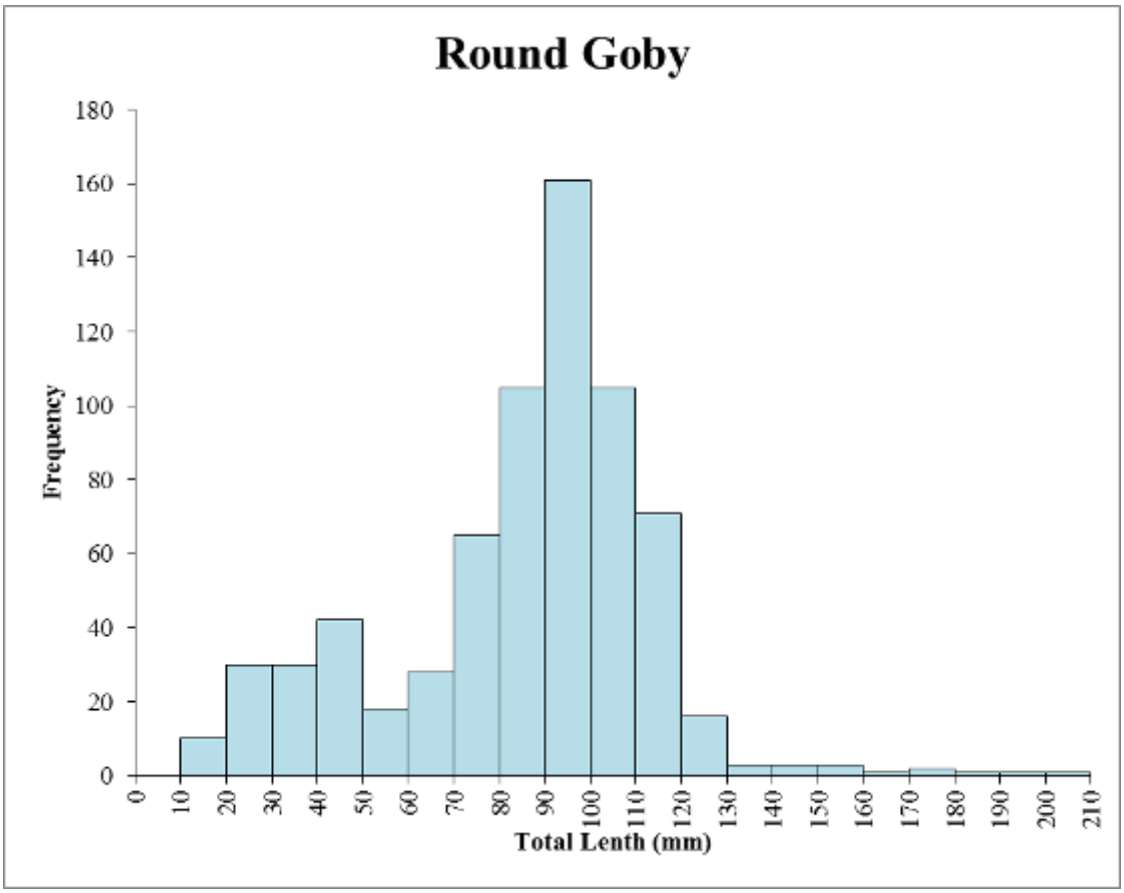

Figure 9. Round Goby length distribution for the Milwaukee Harbor estuary.

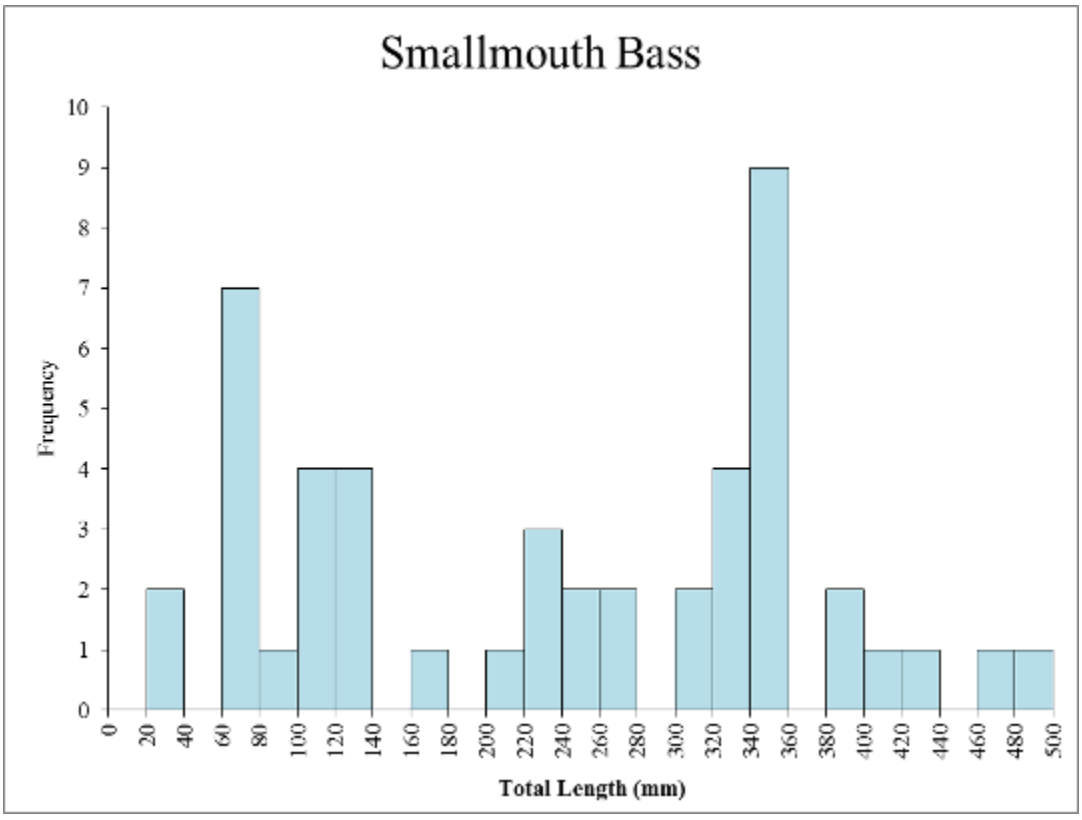

Figure 10. Smallmouth Bass length distribution for the Milwaukee Harbor estuary.

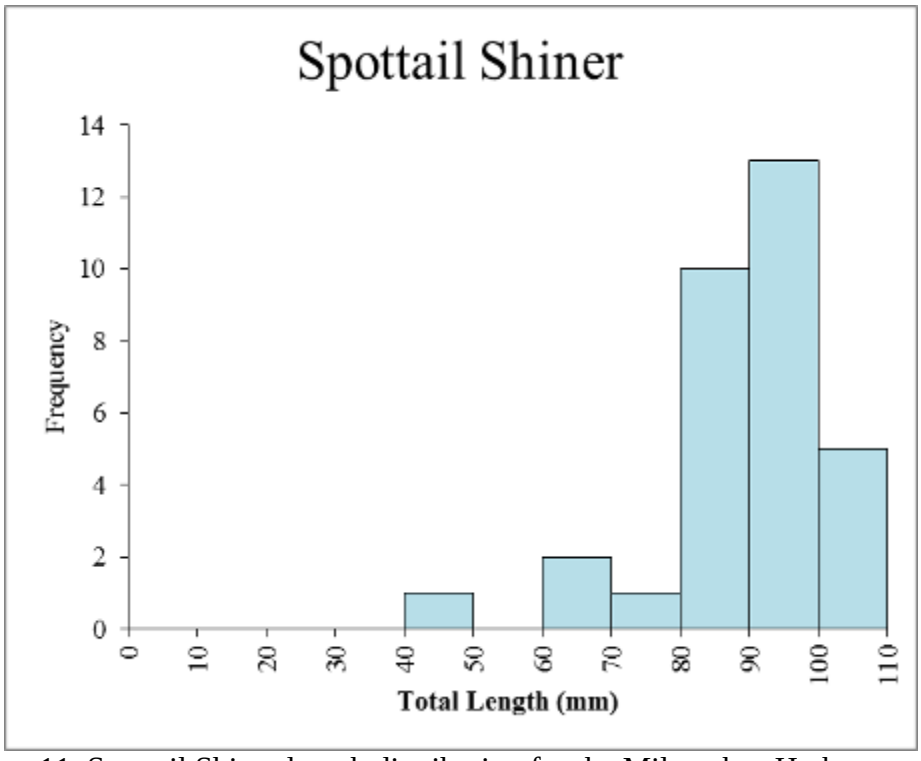

Figure 11. Spottail Shiner length distribution for the Milwaukee Harbor estuary.

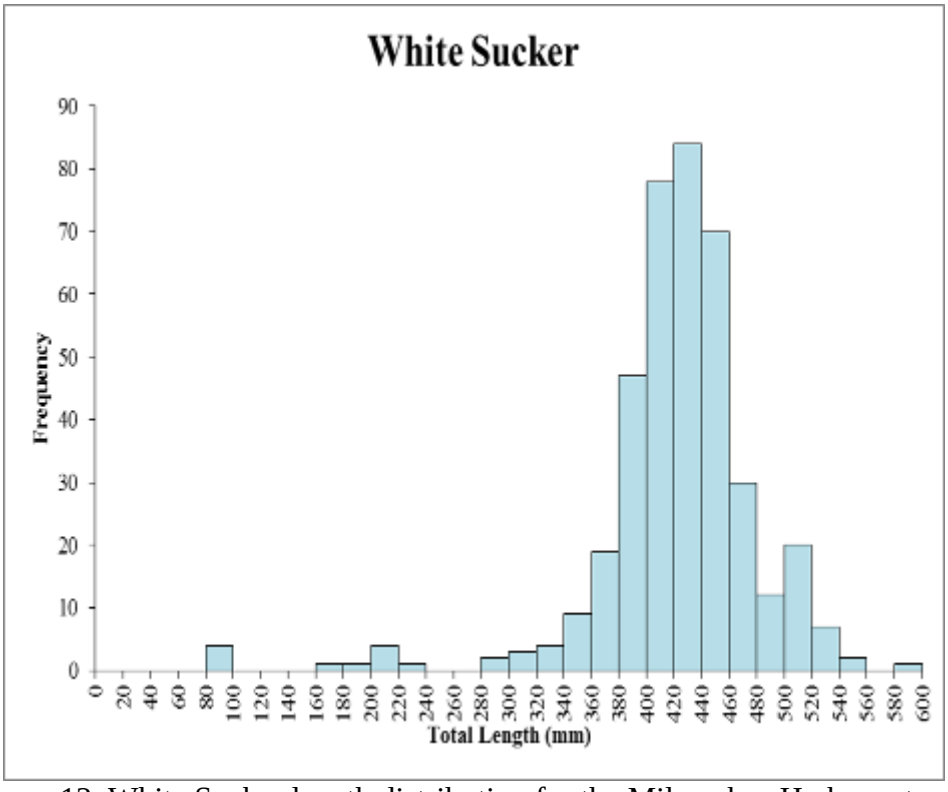

Figure 12. White Sucker length distribution for the Milwaukee Harbor estuary.

Figure 13. USFWS traditional gear sampling sites in the northern Milwaukee Harbor estuary.

Figure 14. USFWS traditional gear sampling sites in the mid-northern Milwaukee Harbor estuary.

Figure 15. USFWS traditional gear sampling sites in mid-southern Milwaukee Harbor estuary.

Figure 16. USFWS traditional gear sampling sites in the southern Milwaukee Harbor estuary.