



ILLINOIS NATURAL HISTORY SURVEY

T E C H N I C A L R E P O R T

THE LONG-TERM ILLINOIS RIVER FISH POPULATION MONITORING PROGRAM

Project F-101-R-18

Annual Report to the Illinois Department of Natural Resources

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The Long-Term Illinois River Fish Population Monitoring Program

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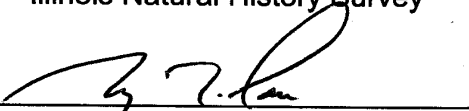
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DISCLAIMER

The findings, conclusions, and views expressed herein are those of the researchers and should not be considered as the official position of the United States Fish and Wildlife Service or the Illinois Department of Natural Resources.

ACKNOWLEDGMENT OF SUPPORT

The Long-term Illinois River Fish Population Monitoring Program (F-101-R) is supported by the Federal Aid in Sport Fish Restoration Act (P.L. 81-6814, Dingell-Johnson/Wallop-Breaux).

EXECUTIVE SUMMARY

Between 24 August and 17 October 2006, 27 sites on the Illinois River waterway and one site in Reach 26 of the Mississippi River were electrofished to monitor fish communities. A total of 7,205 fishes representing 60 species (plus 2 hybrids) from 13 families were collected during 26.29 hours of sampling. Collections made in 2006 indicated continued high catches of gizzard shad, emerald shiners, and bluegill throughout most of the Illinois River waterway. Common carp and goldfish which were once dominant, continue to exhibit relatively low in catch rates throughout the Illinois River waterway, contributing only 1.4% of the total catch and 2.1% of the Illinois River Waterway catch. Hybrid yellow bass x white perch were collected for the first time during project F-101-R sampling along the waterway in 2006. Two yellow bass x white perch hybrids were collected from two sites (one specimen at each site), Turkey Island (RM 148.0, La Grange Reach) and Pekin (RM 155.1, La Grange Reach). Silver carp were again collected during project F-101-R sampling at most lower and middle river sites. Two silver carp were collected at one new site, Lambie's Boat Harbor (RM 170.3, Peoria Reach). Banded killifish, grass carp, and round goby were also collected at new sites. Two banded killifish were collected at Bull's Island Bend (RM 241.5, Starved Rock Reach) and one each of grass carp and round goby were collected at Bull's Island (RM 240.8, Starved Rock Reach). The sample from Bull's Island yielded the highest collection of total fish (919, 12.8% of the total collected from all 28 sites), while the sample from Turkey Island produced the lowest total fish (39, 0.5% of the total collected from all 28 sites). Fish species richness at sites ranged from 26 at Chillicothe Island (RM 180.6, Peoria Reach) to 9 species at Johnson Island (RM 249.6, Marseilles Reach). Fish species richness of the lower, middle, and upper waterway was 28, 53, and 34 respectively. Emerald shiners were the most abundant species collected overall in 2006 with 1,874 specimens collected comprising 26.0% of the total catch. Cyprinid catches continued to remain relatively high in the upper waterway, with emerald shiners being the most abundant cyprinid, making up 46.7% of the total upper waterway catch. Emerald shiners also ranked highest overall in relative abundance over all species (71.3 fish per hour, 26.0%) and for the entire upper waterway (600.5 fish per hour, 47.4%). Emerald shiner catch percentages for Dresden, Marseilles, and Starved Rock reaches were 13.2%, 34.8%, and 62.4%, respectively. Important sport fish species such as bluegill, largemouth bass, and channel catfish were collected in all six waterway reaches in 2006. Bluegill catch per unit effort in number of fish collected per hour ($CPUE_N$) ranged from 64.4 in Peoria Reach (middle waterway) to 11.6 in La Grange Reach (middle waterway). Largemouth bass $CPUE_N$ ranged from 8.5 in Dresden Reach (upper waterway) to 1.5 in La Grange reach. Channel catfish $CPUE_N$ ranged from 6.5 in Starved Rock reach (upper waterway) to 1.6 in Marseilles Reach (upper waterway). In terms of pounds of fish collected per hour ($CPUE_w$), the collection from Peoria Reach yielded the highest biomass at 106.9 pounds per hour while the collection from Marseilles Reach yielded the lowest biomass at 11.8 pounds per hour. Silver carp ranked first over all reaches at 16.6 pounds per hour, comprising 24.3% of the total biomass. Silver carp also ranked first in La Grange Reach $CPUE_w$ at 65.3 pounds per hour and comprised 63.1% of the total catch in weight. Bigmouth buffalo ranked first and comprised 23.0% of the total catch in weight for Peoria reach with a $CPUE_w$ of 24.6 pounds per hour. Grass carp ranked first and comprised 35.2 % of the total catch in weight for Starved Rock reach with a single specimen. Common carp ranked first in Marseilles and Dresden reaches and comprised 19.2% and 40.6% of the total catches in weight, respectively. Twelve fish were observed to have externally visible abnormalities in 2006. Abnormalities were found in fish of the upper and middle waterway, with no abnormalities observed in the lower waterway.

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^aJob numbers and titles refer to the F-101-R-18 annual work plan dated January 2006

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INTRODUCTION

This report presents a summary of data collected in 2006 during segment 18 of federal aid project F-101-R, The Long-term Illinois River Fish Population Monitoring Program. Previous summaries of the long-term data set, begun in 1957, were given by Sparks and Starrett (1975), Sparks (1977), Sparks and Lerczak (1993), Lerczak and Sparks (1994), Lerczak et al. (1994), Koel and Sparks (1999), and McClelland and Pegg (2004). The annual reports for project F-101-R will continue to build upon previously collected data with major analyses of the long-term data set scheduled at five-year intervals. The next summary is due at the end of segment 20. The format used in this report is patterned after previous annual reports of this project (Lerczak et al. 1993, 1994, 1995, and 1996; Koel et al. 1997 and 1998; Koel and Sparks 1999; Arnold et al. 2000; McClelland and Pegg 2001, 2002, 2003, 2004, 2005; McClelland and Cook 2006) to allow for easy comparisons of data among years.

STUDY AREA AND METHODS

Twenty-seven sites were sampled for fish at fixed locations along the Illinois Waterway. Twenty-six of the site locations were defined by Sparks and Starrett (1975) and Lerczak et al. (1994). In 1999, a twenty-seventh site was added at Moore's Towhead in Alton Reach, Illinois River mile 75.3, to more closely monitor fish communities near The Nature Conservancy's (TNC) floodplain restoration project (Spunky Bottoms Merwin Preserve). Twenty-five of the sites were located on the Illinois River, with two additional sites on the lower Des Plaines River. The Des Plaines River, along with the Illinois River forms part of the Illinois Waterway. One additional site was

located on the Mississippi River (Figure 1). Seventeen of the sites were in side channels; the remaining sites were in other habitats, including the main channel border, or in a combination of habitat types (see Lerczak et al., 1994).

Following water quality measurements (e.g., dissolved oxygen) at each site, fish populations were sampled by electrofishing from a 16-ft (5-m) aluminum boat using a 3000-watt, three-phase AC generator. Sampling at each site typically lasted one hour. Stunned fish were gathered with a dip net (1/4-in [0.64-cm] mesh) and stored in an oxygenated livewell until sampling was completed. Fish were then identified to species, measured (total length and weight), inspected for externally visible abnormalities, and returned to the water. Additional details on the electrofishing method and equipment were given by Lerczak et al. (1994).

DATA ANALYSIS (Job 4)

For each site, the number of individual fish and total weight (pounds) were tallied for each species. Fish catch rates were quantified as the number of individuals collected per hour of electrofishing ($CPUE_N$) and as weight in pounds collected per hour of electrofishing ($CPUE_W$). Catch data, both the number of individuals and pounds collected per sample and hour, were summarized and reported by collection site. Data from sites was also grouped into reaches defined by navigation dams (Figure 1) as follows: Alton Reach, river mile (RM) 0-80; La Grange Reach, RM 80-158; Peoria Reach, RM 158-231; Starved Rock Reach, RM 231-247; Marseilles Reach, RM 247-271.5; and Dresden Reach, RM 271.5-286 on the Des Plaines River. Data from reaches was also combined into three groups (lower, middle, and upper Illinois Waterway segments) defined by their location along the river (waterway) and by the

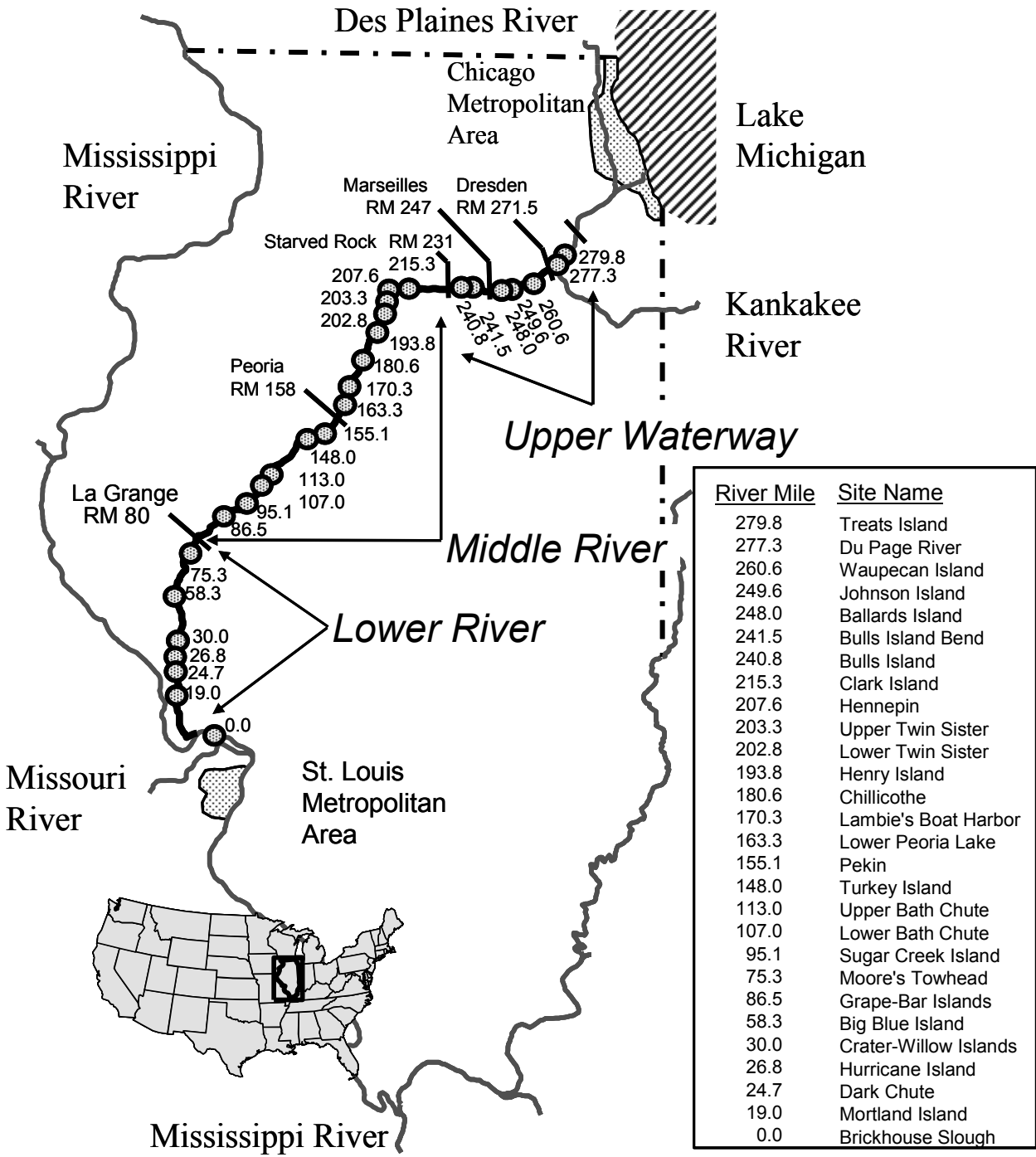


Figure 1. Map of the Illinois River waterway illustrating the three segments of the Illinois River Waterway sampled by electrofishing to monitor fish communities in 2006.

amount of off-channel habitat accessible to fish per unit length of river (Figure 1; Lerczak et al. 1994). Lerczak et al. (1994, 1995, and 1996) found that river fish communities of the three segments differed substantially enough to give segment designations biological meaning.

RESULTS AND DISCUSSION (Job 5)

All equipment was tested and repaired as necessary before the fish sampling season began, and staff was given a review in safety procedures and electrofishing methods (**Job 1**).

All 28 sites were sampled between 24 August and 17 October 2006 (**Job 2**); total electrofishing time was 26.29 h (Table 1). Collected data were entered into Microsoft ACCESS 2000 and verified against original field data sheets until no errors were detected (**Job 3**). The original data sheets from 2006 sampling and all of the other original data sheets of this project (1957-2006) are stored in flame-resistant cabinets at the Illinois River Biological Station at 704 N. Schrader Avenue, Havana (**Job 3**).

A. CONDITIONS DURING ELECTROFISHING RUNS

Sampling was conducted in full daylight between 7:35 AM and 4:25 PM central standard time (Table 1). The ranges for physical measurements collected during the 2006 sampling season were as follows: air temperature, 57.2-86.2 °F; water temperature, 52.2-81.9 °F; dissolved oxygen concentration, 4.58-11.90 ppm; Secchi disk transparency, 12.0-68.0 cm; conductivity, 480-816 $\mu\text{hos/cm}$; surface velocity, 0.02-0.49 ft/s; water depth, 0.5-7.0 ft.

Table 1. Station information and characteristics during sampling in 2006. All stations, except where noted, are on the Illinois River and are listed in downstream-to-upstream order. Site miles are the average river mile and refer to Figure 1.

Order	Date	Site Mile ^a	Name	Sample river mile			End time (CST)	Duration (h)	Temp (°F)		DO (ppm)	DO (% Sat)	Secchi (cm)	Cond. (umhos)	Volts	Vel. (ft/s)	Depth ^b (ft) Stage	
				lower	upper	mean			air	water							min	max
Reach 26: Mississippi River																		
27	6-Oct	0.0	Brickhouse Slough ^v	204.9	205.3	205.1	11:20	1.00	62.3	65.0	10.33	112.67%	32.0	480	190	0.09	0.5	6.5
Alton Reach																		
24	4-Oct	19.0	Mortland Island	18.1	19.5	18.8	17:25	1.00	74.1	69.4	9.26	113.97%	41.0	706	190	0.22	1.0	7.0
23	4-Oct	24.7	Dark Chute	24.5	25.5	25.0	15:20	1.00	80.1	70.2	9.44	122.91%	44.0	712	190	0.12	1.0	6.5
22	4-Oct	26.8	Hurricane Island	27.0	27.9	27.5	13:35	1.00	86.2	69.8	9.39	129.05%	49.0	716	190	0.23	1.0	7.0
21	4-Oct	30.0	Crater-Willow Island	29.2	30.8	30.0	11:45	1.00	80.1	69.2	9.21	119.91%	47.0	718	190	0.20	1.0	7.0
25	5-Oct	58.3	Big Blue Island	58.0	59.0	58.5	8:35	1.00	58.3	68.1	9.38	97.85%	44.0	747	190	0.24	0.5	6.5
26	5-Oct	75.3	Moore's Towhead				11:15	0.75	63.9	67.9	10.31	114.41%	36.0	746	190	0.24	0.5	5.0
La Grange Reach																		
5	28-Aug	86.5	Grape-Bar Islands	85.7	87.0	86.4	12:15	1.00	79.0	81.1	5.42	69.86%	30.0	741	160	0.23	1.0	7.0
4	28-Aug	95.1	Sugar Creek Island	94.5	95.0	94.8	9:40	1.00	74.2	81.3	4.58	56.42%	29.0	755	155	0.21	1.0	5.5
3	25-Aug	107.1	Lower Bath Chute	106.9	107.3	107.1	12:01	0.83	78.9	81.3	5.24	67.48%	21.0	738	150	0.18	1.0	6.0
2	3-Oct	113.0	Upper Bath Chute	112.8	113.2	113.0	9:13	1.00	78.6	81.9	5.39	69.22%	21.0	745	150	0.28	1.0	6.0
19	3-Oct	148.0	Turkey Island	148.0	148.3	148.2	10:45	0.58	80.0	69.1	9.55	124.23%	37.0	768	190	0.30	1.0	6.5
20	29-Aug	155.1	Pekin	154.5	155.3	154.9	12:50	0.75	86.2	70.0	11.90	163.55%	35.0	769	190	0.16	0.5	6.0
Peoria Reach																		
17	19-Sep	163.4	Lower Peoria Lake	163.5	163.6	163.6	11:40	1.00	57.2	63.9	8.04	82.82%	12.0	631	160	0.06	0.5	4.0
1	24-Aug	170.3	Lambie's Boat Harbor	170.6	170.8	170.4	10:18	0.88	79.7	78.8	8.95	116.10%	15.0	725	150	0.02	0.5	3.0
15	5-Sep	180.6	Chillicothe	180.6	181.1	180.9	10:20	1.00	66.4	75.3	7.47	85.11%	29.0	677	160	0.24	0.5	6.0
16	7-Sep	193.8	Henry Island	193.3	194.5	193.9	11:30	1.00	79.0	76.5	8.50	109.56%	32.0	684	160	0.25	1.0	6.0
7	29-Aug	202.8	Lower Twin Sister	202.4	203.2	202.8	12:40	1.00	72.3	77.9	6.27	75.83%	43.0	759	165	0.35	0.5	6.5
6	29-Aug	203.3	Upper Twin Sister	203.3	203.5	203.4	10:40	1.00	67.5	77.8	6.01	69.26%	40.0	756	165	0.39	1.0	7.0
18	21-Sep	207.7	Hennepin	207.6	208.1	207.9	10:55	1.00	66.9	65.8	8.71	99.75%	42.0	672	170	0.33	0.5	6.5
28	17-Oct	215.3	Clark Island	214.9	215.6	215.3	10:30	1.00	52.2	52.2	10.90	38.28%	41.0	816	200	0.42	1.0	7.0
Starved Rock Reach																		
9	30-Aug	240.8	Bulls Island	240.3	241.0	240.7	13:45	1.00	78.8	79.3	7.69	98.94%	31.0	672	170	0.35	2.0	7.0
8	30-Aug	241.5	Bulls Island Bend	241.1	241.6	241.4	11:40	1.00	71.6	79.3	7.60	91.28%	35.0	673	170	0.44	1.0	7.0
Marseilles Reach																		
10	31-Aug	248.0	Ballards Island	247.7	248.2	248.0	9:00	1.00	69.3	76.5	7.37	86.51%	32.0	670	160	0.28	1.0	5.0
11	31-Aug	249.7	Johnson Island	249.7	249.8	249.8	10:55	0.50	74.2	76.9	7.51	92.52%	45.0	638	160	0.38	1.0	4.5
12	31-Aug	260.6	Waupecan Island	260.2	261.1	260.7	13:40	1.00	79.5	77.2	8.27	107.08%	68.0	634	140	0.49	1.0	6.0
Dresden Reach																		
13	1-Sep	277.4	Du Page River ^e	276.8	277.8	277.3	8:35	1.00	68.9	79.5	7.41	86.62%	44.0	591	140	0.13	1.0	6.0
14	1-Sep	279.9	Treats Island ^e	279.6	280.1	279.9	11:05	1.00	72.4	77.3	7.46	90.31%	44.0	598	160	0.18	1.0	6.0
Minimum							0.42		68.0	73.8	4.8	61.11%	18	446	140	0.02	0.5	2.5
Maximum							1.00		87.1	86.4	9.6	128.77%	100	844	200	0.30	1	7.0
Mean							0.94		70.9	73.5	8.1	96.1%	37.54	698	170	0.25	0.9	6.1
Total time electrofished							26:29											

^aRefers to approximate average river mile electrofished at each site, 1957-2006.

^bEstimated during sampling.

^cFeet above sea level or river stage (ft) at the U.S. Army Corps of Engineers river gage nearest to the sampling site.

^dMississippi River.

^eDes Plaines River.

All physical values were within the ranges expected based upon previous sampling (Lerczak et al. 1994; Koel and Sparks 1999). All sites were sampled within established water temperature and river level criteria (Table 1; Lerczak et al. 1994).

B. ELECTROFISHING RESULTS

The following data summaries proceed through several levels of detail. First, data on the number of individual fish (by species) collected at each of the 28 sites are presented. Second, catch rates of the number of individuals collected per hour of electrofishing are calculated for each of the seven navigation reaches. Similar summaries are presented for fish weights. Results conclude with fish health as determined by external visual inspection. Fish common names used throughout this report follow Robins et al. (1991). Fish common and scientific names are listed in APPENDIX A.

Numbers of Fish Collected

We collected a total of 7,205 fishes representing 60 species (plus two hybrids) from 13 families during 26.29h of electrofishing at 27 sites on the Illinois River waterway and a single site on the Mississippi River in 2006. Emerald shiner were the most abundantly collected species, representing 26.0% of the total catch. Emerald shiner were followed by gizzard shad (16.0%), bluegill (14.2%), green sunfish (6.3%), freshwater drum (4.7%), and bullhead minnow (4.4%). Emerald shiner were collected at all 28 sites; gizzard shad were collected at 27 sites; bluegill, bullhead minnow, channel catfish, and freshwater drum were collected at 25 sites; smallmouth buffalo were collected at 24 sites; largemouth bass were collected at 22 sites. The collection

from Bull's Island (RM 240.8, Starved Rock Reach) yielded the most fish (919, 12.8% of the total collected from all 28 sites), while the collection from Turkey Island (RM 148.0, La Grange Reach) yielded the least fish (39, 0.5% of the total collected from all 28 sites). The most fish species collected at one site was 26, obtained at Chillicothe Island (RM 180.6) in Peoria Reach. The fewest species collected at a single site was nine from Johnson Island (RM 249.6) in Marseilles Reach.

Of the 60 fish species and two hybrid crosses, 15 species (banded killifish, brown bullhead, golden shiner, grass pickerel, johnny darter, logperch, mud darter, redear sunfish, rock bass, round goby, silverband shiner, silver redhorse, slenderhead darter, walleye, and yellow bass) were collected at only one site. Nine fish species and one hybrid (blackstripe topminnow, common shiner, central stone roller, highfin carpsucker, longear sunfish, silver chub, threadfin shad, white perch, yellow bullhead, and yellow bass x white perch hybrid) were collected at only two sites. Thirteen fish species (brown bullhead, golden shiner, grass pickerel, johnny darter, mud darter, rock bass, round goby, redear sunfish, slenderhead darter, silverband shiner, silver redhorse, walleye, and yellow bass) were represented by single individuals at sites. A maximum of two individuals were collected at sites for each of three fish species and one hybrid (banded killifish, common shiner, highfin carpsucker, and yellow bass x white perch hybrid).

On the 27 Illinois River waterway sites, we collected 6,938 fishes representing 60 species (plus two hybrids) from 13 families during 25.29 h of sampling. At Brickhouse Slough on the Mississippi River (RM 204.9), we collected 267 fishes representing 19 species from seven families (Table 2). Total catch from Brickhouse Slough in 2006 was

Table 2. Number of individuals of each fish species collected on the Mississippi River (Brickhouse Slough) and the lower Illinois Waterway (Alton Reach, RM 0-80) in 2006.

Species	Mile Effort	River Mile and Hours Fished							Total
		Miss. River	Lower Illinois River						
		0.0 1.00	19.0 1.00	24.7 1.00	26.8 1.00	30.0 1.00	58.3 1.00	75.3 0.75	
Lepisosteidae									
shortnose gar		0	0	0	0	1	0	0	1
Clupeidae									
gizzard shad		37	56	25	92	24	43	18	258
skipjack herring		0	0	1	1	0	1	2	5
Cyprinidae									
bluntnose minnow		0	0	0	1	0	0	0	1
bullhead minnow		7	0	3	3	1	2	6	15
common carp		2	1	6	0	2	5	0	14
emerald shiner		13	57	19	53	35	31	49	244
red shiner		0	0	0	0	1	1	0	2
river shiner		0	1	0	0	0	0	1	2
sand shiner		0	0	0	0	0	1	6	7
silver carp		0	2	1	0	3	1	0	7
silver chub		3	0	0	0	0	0	0	0
spotfin shiner		0	0	0	0	0	1	0	1
Catostomidae									
bigmouth buffalo		1	3	1	3	1	0	0	8
highfin carpsucker		0	0	0	0	0	0	1	1
quillback		0	0	0	0	0	0	1	1
river carpsucker		1	1	0	2	0	1	4	8
shorthead redhorse		1	1	1	0	0	2	0	4
silver redhorse		0	0	0	0	0	0	1	1
smallmouth buffalo		2	3	1	0	1	1	0	6
Ictaluridae									
channel catfish		5	1	6	1	8	6	9	31
flathead catfish		1	0	0	0	0	0	0	0
Moronidae									
white bass		5	3	7	3	11	5	5	34
Centrarchidae									
black crappie		2	2	2	2	0	0	0	6
bluegill		72	17	31	21	4	24	0	97
bluegill x green sunfish		0	0	1	1	0	1	0	3
green sunfish		32	1	6	1	2	1	0	11
largemouth bass		6	1	3	3	1	3	0	11
orangespotted sunfish		56	9	8	1	0	1	0	19
white crappie		1	0	0	0	0	0	0	0
Poeciliidae									
western mosquitofish		0	1	0	0	0	0	0	1
Sciaenidae									
freshwater drum		20	24	12	2	13	9	11	71
Total individuals		267	184	134	190	108	140	114	870
Total species/hybrids		20/0	19/0	18/1	16/1	16/0	20/1	14/0	28/1

the highest collection ever recorded in F-101-R sampling. Previous high catches occurred in 1989 and 1991 when 230 fishes were collected both years (Lerczak et al., 1992; Sparks and Blodgett 1990). On the lower Illinois River waterway we collected 870 fishes representing 28 species and one hybrid (Table 2). In 2006, fish species richness ranged from 14 at Moore's Towhead (RM 74.3) to 20 at Big Blue Island (RM 58.3). Our 2006 observation matches the highest species richness recorded for Big Blue Island and for any site in the lower waterway in F-101-R sampling; 20 fish species were also collected at Big Blue Island in 2005 (McClelland and Cook 2006). Hurricane Island (RM 26.8) exhibited the highest catch in the lower waterway with 190 total fishes. This represents the third highest catch for Hurricane Island in F-101-R sampling; previous high catches of 304 and 255 fishes were collected in 2005 and 1997, respectively (Koel et al. 1998, McClelland and Cook 2005).

We collected 3,396 fishes representing 53 species and two hybrids on the middle Illinois River waterway (Tables 3 and 4). The six sites on La Grange Reach (RM 80-158) produced 935 fishes representing 31 species and one hybrid, while the eight sites on Peoria Reach (RM 158-231) produced 2,460 fishes representing 45 species and one hybrid. Fish species richness ranged from 12 species collected at Turkey Island to 26 species at Chillicothe Island in 2006. Our 2006 observation is the highest fish species richness ever recorded at Chillicothe Island in F-101-R sampling. A previous high fish species collection of 24 was recorded in 2005 (McClelland and Cook 2006). Fish species collections at Lambie's Boat Harbor (22 species; RM 170.3) in Peoria Reach were also the highest ever recorded for this location in F-101-R sampling. A previous high collection occurred in 1996 when 20 fish species were collected (Koel

Table 3. Number of individuals of each fish species collected on La Grange Reach (RM 80-158) of the middle Illinois Waterway (RM 80-231) in 2006.

Species	Mile Effort	River Mile and Hours Fished						La Grange	Middle
		86.5 1.00	95.1 1.00	107.1 0.83	113 1.00	148 0.58	155.1 0.75	Reach Total 5.16	River Total 13.04
Lepisosteidae									
shortnose gar		2	2	0	0	0	0	4	4
Clupeidae									
gizzard shad		79	67	37	33	0	8	224	770
skipjack herring		0	0	2	0	2	0	4	13
Cyprinidae									
bluntnose minnow		0	0	0	1	0	0	1	1
bullhead minnow		21	9	1	1	3	1	36	95
common carp		3	11	9	0	4	8	35	117
emerald shiner		72	34	9	45	3	1	164	368
goldfish		0	0	1	1	0	2	4	18
grass carp		0	1	0	0	1	0	2	6
red shiner		9	2	0	2	0	0	13	13
river shiner		1	0	0	0	0	0	1	1
silver carp		13	7	12	48	0	4	84	96
spottail shiner		0	0	0	0	1	0	1	25
Catostomidae									
bigmouth buffalo		0	0	0	0	2	0	2	77
quillback		0	0	0	0	0	1	1	2
river carpsucker		7	0	1	0	0	3	11	54
shorthead redhorse		2	5	0	0	0	1	8	12
smallmouth buffalo		5	2	4	1	3	3	18	132
Ictaluridae									
channel catfish		3	7	5	1	2	3	21	59
flathead catfish		1	6	9	0	0	0	16	16
Moronidae									
white bass		1	8	5	3	3	8	28	52
white perch		0	0	0	0	2	2	4	4
yellow bass		0	0	0	0	0	1	1	1
yellow bass x white perch		0	0	0	0	1	1	2	2
Centrarchidae									
black crappie		3	0	2	0	0	0	5	11
bluegill		10	13	30	7	0	0	60	568
green sunfish		0	2	0	1	0	0	3	318
largemouth bass		3	3	2	0	0	0	8	64
orangespotted sunfish		3	15	13	16	0	0	47	192
Percidae									
johnny darter		0	1	0	0	0	0	1	1
sauger		1	0	0	0	0	0	1	6
Sciaenidae									
freshwater drum		38	42	7	12	12	15	126	233
Total Individuals		277	237	149	172	39	62	936	3396
Total species/hybrids		20/0	19/0	17/0	14/0	12/1	15/1	31/1	53/2

Table 4. Number of individuals of each fish species collected on Peoria Reach (RM 158-231) of the middle Illinois Waterway (RM 80-231) in 2006.

Species	River Mile and Hours Fished									Peoria Reach Total	Middle River Total
	Mile Effort	163.3 1.00	170.3 0.88	180.6 1.00	193.8 1.00	202.8 1.00	203.3 1.00	207.6 1.00	215.3 1.00		
Clupeidae											
gizzard shad		17	293	13	77	91	17	13	25	546	770
skipjack herring		2	1	2	0	1	3	0	0	9	13
threadfin shad		0	0	0	0	5	0	0	0	5	5
Cyprinidae											
bullhead minnow		3	24	9	5	1	3	11	3	59	95
common carp		6	29	9	4	3	1	3	27	82	117
central stoneroller		0	0	0	0	0	0	1	0	1	1
emerald shiner		8	108	6	10	18	10	31	13	204	368
golden shiner		0	1	0	0	0	0	0	0	1	1
goldfish		0	0	9	5	0	0	0	0	14	18
grass carp		0	0	3	1	0	0	0	0	4	6
sand shiner		0	0	0	0	0	0	2	0	2	2
silverband shiner		0	0	0	0	1	0	0	0	1	1
silver carp		0	2	5	1	1	2	1	0	12	96
silver chub		0	1	0	0	0	0	0	0	1	1
spotfin shiner		0	0	2	1	4	0	1	0	8	8
spottail shiner		3	9	5	2	0	4	0	1	24	25
Catostomidae											
bigmouth buffalo		0	3	3	9	4	10	2	44	75	77
black buffalo		1	0	1	1	0	0	0	0	3	3
golden redhorse		0	0	3	1	0	4	3	0	11	11
highfin carpsucker		0	0	1	0	0	0	0	0	1	1
quillback		1	0	0	0	0	0	0	0	1	2
river carpsucker		14	9	3	0	0	2	2	13	43	54
shorthead redhorse		0	0	0	0	1	3	0	0	4	12
smallmouth buffalo		19	15	13	1	2	7	8	49	114	132
Ictaluridae											
brown bullhead		0	1	0	0	0	0	0	0	1	1
channel catfish		8	0	21	2	2	2	3	0	38	59
yellow bullhead		1	2	0	0	0	0	0	0	3	3
Moronidae											
white bass		5	0	5	8	3	0	0	3	24	52

Table 4. (continued)

Number of individuals of each fish species collected on Peoria Reach (RM 158-231) of the middle Illinois Waterway (RM 80-231) in 2006.

Centrarchidae										
black crappie	0	0	1	0	0	3	2	0	6	11
bluegill	152	139	54	15	14	20	112	2	508	568
bluegill X green sunfish	1	3	0	0	0	0	2	0	6	6
green sunfish	90	143	11	0	1	0	68	2	315	318
largemouth bass	4	7	22	8	0	6	9	0	56	64
longear sunfish	0	0	1	0	0	0	0	0	1	1
orangespotted sunfish	33	59	9	0	0	2	39	3	145	192
smallmouth bass	0	0	0	0	0	0	5	2	7	7
warmouth	0	1	0	0	0	1	1	0	3	3
white crappie	0	1	0	0	0	0	1	0	2	2
Percidae										
logperch	0	0	0	0	0	0	3	0	3	3
mud darter	0	0	1	0	0	0	0	0	1	1
sauger	0	0	0	0	1	0	3	0	4	6
slenderhead darter	0	0	0	0	0	0	1	0	1	1
walleye	0	0	0	1	0	0	0	0	1	1
Poeciliidae										
western mosquitofish	0	3	0	0	0	0	0	0	3	3
Sciaenidae										
freshwater drum	30	24	10	3	19	16	4	1	107	233
Total individuals	398	878	222	155	331	172	116	188	2460	3396
Total species/hybrids	18/1	22/1	26/0	19/0	18/0	19/0	25/1	14/0	45/1	53/2

et al. 1997). In addition to fish species richness, Lambie's Boat Harbor was also the site of the highest total catch on the middle Illinois River waterway with 878 fishes. Our collection was the second highest number of fishes ever collected in F-101-R sampling for the Lambie's Boat Harbor site. The current high total catch of 1142 fishes was recorded in 2002 (McClelland and Pegg 2003). In addition to the high numbers observed at Lambie's Boat Harbor, the Lower Peoria Lake site (RM 163.3, Peoria Reach) and Lower Twin Sister's Island site (RM 202.8, Peoria Reach) each recorded the second highest total catches in F-101-R sampling with 398 and 172 fishes, respectively.

Table 5. Number of individuals of each fish species collected on Starved Rock, Marseilles, and Dresden Reaches of the upper Illinois Waterway (RM 231-280) in 2006.

Species	Mile Effort	River Mile and Hours Fished							Upper Waterway Total
		Starved Rock		Marseilles			Dresden		
		240.8 1.00	241.5 1.00	248 1.00	249.6 0.50	260.6 1.00	277.4 1.00	279.8 1.00	
Clupeidae									
gizzard shad		41	1	13	9	2	11	12	89
threadfin shad		0	0	1	0	0	0	0	1
Cyprinidae									
bluntnose minnow		24	72	26	9	54	70	55	310
bullhead minnow		142	13	23	20	1	0	0	199
central stoneroller		0	0	0	0	5	0	0	5
common carp		0	0	3	0	0	2	12	17
common shiner		0	0	0	0	1	0	1	2
emerald shiner		546	402	44	77	119	41	20	1249
goldfish		0	0	0	0	0	2	0	2
grass carp		1	0	0	0	0	0	0	1
spotfin shiner		66	62	46	32	35	8	0	249
spottail shiner		0	0	1	0	1	1	1	4
Catostomidae									
golden redbreast		0	0	0	0	0	2	0	2
river carpsucker		2	0	0	0	1	0	0	3
shorthead redbreast		0	0	0	0	0	0	1	1
smallmouth buffalo		4	1	1	0	0	2	2	10
Ictaluridae									
channel catfish		5	8	2	0	2	6	4	27
flathead catfish		1	0	0	0	0	0	0	1
Moronidae									
white bass		1	1	1	0	0	0	0	3
Centrarchidae									
black crappie		1	0	5	0	0	1	1	8
bluegill		64	28	60	19	19	76	19	285
bluegill X green sunfish		0	1	2	3	0	6	13	25
green sunfish		9	2	8	1	7	21	46	94
largemouth bass		6	1	7	5	5	9	8	41
longear sunfish		0	0	0	0	5	0	0	5
orangespotted sunfish		1	0	1	0	0	1	0	3
redbreast sunfish		0	0	0	0	0	1	0	1
rock bass		0	0	0	0	0	1	0	1
smallmouth bass		3	2	0	1	1	2	0	9

Table 5. (continued)

Number of individuals of each fish species collected on Starved Rock, Marseilles, and Dresden Reaches of the upper Illinois Waterway (RM 231-280) in 2006.

Fundulidae								
banded killifish	0	2	0	0	0	0	0	2
blackstripe topminnow	0	0	3	0	0	0	2	5
Poeciliidae								
western mosquitofish	0	0	0	0	0	0	1	1
Gobiidae								
round goby	1	0	0	0	0	0	0	1
Esocidae								
grass pickerel	0	0	1	0	0	0	0	1
Sciaenidae								
freshwater drum	1	5	0	0	8	1	0	15
Total individuals	919	601	248	176	266	264	198	2672
Total species/hybrids	20/0	15/1	19/1	10/1	17/0	20/1	16/1	34/1

We collected 2,672 fishes representing 34 species and one hybrid cross (Table 5) on the upper Illinois River waterway in 2006. Fish species richness ranged from 10 at Johnson Island (RM 240.8, Marseilles Reach) to 20 at Bull's Island (RM 240.8, Starved Rock Reach) and the Mouth of the Du Page River (RM 277.4, Dresden Reach). The collections at Bull's Island and the Mouth of the Du Page River were the highest fish species catches observed for these sites in F-101-R sampling. The collection of 919 fishes at Bull's Island also represented the highest total catch in the upper Illinois River waterway in 2006 and the highest total catch at this site in F-101-R sampling. A previous high total catch of 838 fishes was recorded in 1995 (Lerczak et al. 1996). Collections at Johnson Island remained the lowest in the upper Illinois River waterway with 176 fishes collected in 2006.

Catch Rates in Numbers of Individuals Collected per Hour by Reach.

In the following data summary, most of the discussion was restricted either to species that each separately accounted for over 10% of the total catch or to species that were of special significance.

Alton (lower waterway, Illinois River). The 95% lists (fish species were added to the list until 95% of the total catch in numbers was obtained) for Alton, La Grange, and Peoria reaches remained similar to each other, as in past years, although total catch in numbers per hour ($CPUE_N$) varied among reaches. Thirteen fish species accounted for 94.4% of the total catch in Alton Reach (Tables 6 and 7) and overall $CPUE_N$ was 151.3 in 2006. The highest $CPUE_N$ for an individual fish species was 44.87 for gizzard shad. Gizzard shad comprised 29.7% of the total fish collected in this reach. Emerald shiner ranked second with a $CPUE_N$ of 42.43 (28.0% of the total); the highest $CPUE_N$ recorded for this fish species in Alton Reach. The previous high $CPUE_N$ for emerald shiner was recorded in 2005 (35.49; McClelland and Cook 2006). Bluegill ranked third with a $CPUE_N$ of 34.99 (15.6% of the total).

La Grange (middle waterway, Illinois River). Fourteen fish species accounted for 95.4% of the total catch in La Grange Reach (Tables 6 and 7). Overall, $CPUE_N$ was 181.16; the highest catch rate since 1996 when the highest recorded $CPUE_N$ of 315.09 was observed (Koel et al. 1997). In 2006, the highest $CPUE_N$ for any fish species was 43.35 for gizzard shad. Gizzard shad comprised 23.9% of the total fish collected in this reach. Emerald shiner ranked second with a $CPUE_N$ of 31.74 (17.5% of the total).

Table 6. Number of individuals of each fish species collected per hour of electrofishing (CPUE_N) on Reach 26 of the Mississippi River (Brickhouse Slough) and on six reaches of the Illinois Waterway in 2006.

Species	Reach and Hours Fished							Overall CPUE _N 26.29
	Reach 26 1.00	Alton 5.75	La Grange 5.16	Peoria 7.88	Starved Rock 2.00	Marseilles 2.50	Dresden 2.00	
Lepisosteidae								
shortnose gar		0.17	0.77					0.19
Clupeidae								
gizzard shad	37.00	44.87	43.35	69.26	21.00	9.60	11.50	43.90
skipjack herring		0.87	0.77	1.14				0.68
threadfin shad				0.63		0.40		0.23
Cyprinidae								
bluntnose minnow		0.17	0.19		48.00	35.60	62.50	11.87
bullhead minnow	7.00	2.61	6.97	7.48	77.50	17.60		12.02
central stoneroller				0.13		2.00		0.23
common carp	2.00	2.43	6.77	10.40		1.20	7.00	5.71
common shiner						0.40	0.50	0.08
emerald shiner	13.00	42.43	31.74	25.88	474.00	96.00	30.50	71.28
golden shiner				0.13				0.04
goldfish			0.77	1.78			1.00	0.76
grass carp			0.39	0.51	0.50			0.27
red shiner		0.35	2.52					0.57
river shiner		0.35	0.19					0.11
sand shiner		1.22		0.25				0.34
silverband shiner				0.13				0.04
silver carp		1.22	16.26	1.52				3.92
silver chub	3.00			0.13				0.15
spotfin shiner		0.17		1.01	64.00	45.20	4.00	9.81
spottail shiner			0.19	3.04		0.80	1.00	1.10
Catostomidae								
bigmouth buffalo	1.00	1.39	0.39	9.51				3.27
black buffalo				0.38				0.11
golden redhorse				1.40			1.00	0.49
highfin carpsucker		0.17		0.13				0.08
quillback		0.17	0.19	0.13				0.11
river carpsucker	1.00	1.39	2.13	5.45	1.00	0.40		2.51
shorthead redhorse	1.00	0.70	1.55	0.51			0.50	0.68
silver redhorse		0.17						0.04
smallmouth buffalo	2.00	1.04	3.48	14.46	2.50	0.40	2.00	5.71
Ictaluridae								
brown bullhead				0.13				0.04
channel catfish	5.00	5.39	4.06	4.82	6.50	1.60	5.00	4.64
flathead catfish	1.00		3.10		0.50			0.68
yellow bullhead				0.38				0.11
Fudulidae								
banded killifish					1.00			0.08
blackstripe topminnow						1.20	1.00	0.19
Poeciliidae								
western mosquitofish		0.17		0.38			0.50	0.19
Gobiidae								
round goby					0.5			0.04

Table 6. (continued)

Number of individuals of each fish species collected per hour of electrofishing (CPUE_N) on Reach 26 of the Mississippi River (Brickhouse Slough) and on six reaches of the Illinois Waterway in 2006.

Species	Reach and Hours Fished							Overall CPUE _N
	Reach 26	Alton	La Grange	Peoria	Starved Rock	Marseilles	Dresden	
Moronidae								
white bass	5.00	5.91	5.42	3.04	1.00	0.40		3.58
white perch			0.77					0.15
yellow bass			0.19					0.04
yellow bass x white perch			0.39					0.08
Centrarchidae								
black crappie	2.00	1.04	0.97	0.76	0.50	2.00	1.00	1.03
bluegill	72.00	16.87	11.61	64.44	46.00	39.20	47.50	38.87
bluegill X green sunfish		0.52		0.76	0.50	2.00	9.50	1.29
green sunfish	32.00	1.91	0.58	39.96	5.50	6.40	33.50	17.31
largemouth bass	6.00	1.91	1.55	7.10	3.50	6.80	8.50	4.64
longear sunfish				0.13		2.00		0.23
orangespotted sunfish	56.00	3.30	9.10	18.39	0.50	0.40	0.50	10.27
redecor sunfish							0.50	0.04
rock bass							0.50	0.04
smallmouth bass				0.89	2.50	0.80	1.00	0.61
warmouth				0.38				0.11
white crappie	1.00			0.25				0.11
Esocidae								
grass pickerel						0.40		0.04
Percidae								
johnny darter			0.19					0.04
logperch				0.38				0.11
mud darter				0.13				0.04
sauger			0.19	0.51				0.19
slenderhead darter				0.13				0.04
walleye				0.13				0.04
Sciaenidae								
freshwater drum	20.00	12.35	24.39	13.57	3.00	3.20	0.50	12.89
Total Number per hour	267.00	151.30	181.16	312.05	760.00	276.00	231.00	274.06
Number of species/hybrids	19/0	28/1	31/1	44/1	20/1	24/1	23/1	60/2

Table 7. Fish species ranks by relative abundance (number of fish collected per hour) for 2006 on the 6 reaches of the Illinois Waterway. Species were added to the list in descending order of abundance until 95% of the total catch for that reach was obtained. Percentages are in parentheses.

Species	Rankings by Reach					
	Alton	La Grange	Peoria	Starved Rock	Marseilles	Dresden
Clupeidae						
gizzard shad	1 (29.7)	1 (23.9)	1 (22.2)	6 (2.8)	6 (3.5)	5 (5.0)
Cyprinidae						
bluntnose minnow				4 (6.3)	4 (12.9)	1 (27.1)
bullhead minnow	8 (1.7)	7 (3.8)	10 (2.4)	2 (10.2)	5 (6.4)	
common carp	9 (1.6)	8 (3.7)	8 (3.3)			8 (3.0)
emerald shiner	2 (28.0)	2 (17.5)	4 (8.3)	1 (62.4)	1 (34.8)	4 (13.2)
red shiner		13 (1.4)				
silver carp		4 (9.0)				
spotfin shiner				3 (8.4)	2 (16.4)	10 (1.7)
spottail shiner			14 (1.0)			
Catostomidae						
bigmouth buffalo	12 (0.9)		9 (3.0)			
river carpsucker	11 (1.3)	14 (1.2)	12 (1.7)			
smallmouth buffalo		11 (1.9)	6 (4.6)			
Ictaluridae						
channel catfish	6 (3.6)	10 (2.2)	13 (1.5)			9 (2.2)
flathead catfish		12 (1.7)				
Moronidae						
white bass	5 (3.9)	9 (3.0)	14 (1.0)			
Centrarchidae						
bluegill	3 (11.1)	5 (6.4)	2 (20.6)	5 (6.1)	3 (14.2)	2 (20.6)
bluegill X green sunfish						6 (4.1)
green sunfish	10 (1)		3 (12.8)		8 (2.3)	3 (14.5)
largemouth bass	10 (1.3)		11 (2.3)		7 (2.5)	7 (3.7)
orangespotted sunfish	7 (2.2)	6 (5.0)	5 (5.9)			
Sciaenidae						
freshwater drum	4 (8.2)	3 (13.5)	7 (4.3)		9(1.2)	
Number of species accounting for 95 % of total catch	13	14	15	6	9	10

Freshwater drum ranked third with a CPUE_N of 24.39 and accounted for 13.5% of the total. Exotic silver carp, which were first collected in F-101-R sampling in the La Grange Reach in 2002, continue to increase. Silver carp ranked seventh in 2004, fifth in 2005, and rose to fourth in 2006 with a CPUE_N of 16.26 accounting for 9.0% of the total (McClelland and Pegg 2003, 2005; McClelland and Cook 2006). One of the two

hybrids collected on the Illinois Waterway in 2006 was new to F-101-R sampling. One specimen each of yellow bass x white perch hybrid was collected for the first time at two sites, Turkey Island and Pekin (RM 155.1).

Peoria (middle waterway, Illinois River). Fifteen fish species accounted for 95.1% of the total catch in Peoria Reach (Tables 6 and 7). Overall, CPUE_N was 312.05 representing the second highest catch rate ever recorded for Peoria Reach in F-101-R sampling. A previous high catch rates of 334.97 was observed in 2005 (McClelland and Cook 2006). The highest CPUE_N for any fish species was 69.26 for gizzard shad, which comprised 22.2% of the total fishes collected in this reach. Bluegill ranked second in Peoria Reach with a CPUE_N of 64.44 (20.6% of the total), which represented the highest catch rate ever recorded for this species in Peoria Reach for F-101-R sampling. Bluegill have ranked among the top two species since 1990 in the Peoria Reach (Lerczak et al. 1993, 1994, 1995, 1996; Koel et al. 1997, 1998, Koel and Sparks 1999; Arnold et al. 2000; McClelland and Pegg 2001, 2002, 2003, 2004, 2005; McClelland and Cook 2006). Green sunfish ranked third with a CPUE_N of 39.96 (12.8% of the total). Our 2006 collection represented the highest catch rate recorded for green sunfish in the Peoria Reach. A previous high catch rate of 24.74 was recorded in 1989 (Sparks and Blodgett 1990). Silver carp, which were first collected in F-101-R sampling in the Peoria Reach in 2004, were again collected in 2006. A total of 12 silver carp were captured at six sites. A new observation was made at Lambie's Boat Harbor where two specimens were collected. Silver carp have now been collected at every location in the lower and middle waterway since they were first recorded by F-101-R sampling in 2001.

Starved Rock (upper waterway, Illinois River). Six fish species accounted for 96.1% of the total catch in Starved Rock Reach (Tables 6 and 7). Overall, CPUE_N was 760.00 in 2006. Our 2006 catch rate was the second highest CPUE_N recorded for Starved Rock Reach in F-101-R sampling; the highest catch was recorded in 1995 with a CPUE_N of 867.50. The highest CPUE_N for any species was 474.00 recorded for emerald shiner, which comprised 62.4% of the total catch. This is the highest catch rate ever recorded for emerald shiner in Starved Rock Reach; the previous high of 438.5 emerald shiner per hour was observed in 1995 (Koel et al. 1996). Bullhead minnow ranked second in numbers of fish per hour with a catch rate of 77.50 comprising 10.2% of the total catch. Banded killifish, grass carp and round goby were collected for the first time in Starved Rock Reach in 2006. Two specimens of banded killifish were collected at Bull's Island Bend (RM 241.5) and one specimen each of grass carp and round goby were recorded at Bull's Island.

Marseilles (upper waterway, Illinois River). Nine fish species accounted for 94.1% of the total catch in Marseilles Reach (Tables 6 and 7) and overall CPUE_N was 276.00 in 2006. The highest CPUE_N for any species was 96.00 for emerald shiner. Emerald shiner comprised of 34.8% of the total fishes collected in this reach. Our 2006 sample was the second highest CPUE_N ever recorded for emerald shiner in the Marseilles Reach in F-101-R sampling. A previous high CPUE_N of 107.20 was recorded for emerald shiners in 2002 (McClelland and Pegg 2003). Spottfin shiner ranked second with a CPUE_N of 45.20 (16.4% of total), which marked the highest CPUE_N of this species in Marseilles Reach for F-101-R sampling. Bluegill ranked third

with a CPUE_N of 39.20 (14.2% of total). Largemouth bass again ranked in the top 95% CPUE_N in Marseilles Reach; a catch rate of 6.80 (2.5% of the total catch) was recorded for this species in 2006.

Dresden (upper waterway, Des Plaines River). Ten fish species accounted for 95.0% of the total catch in Dresden Reach (Tables 6 and 7). Overall, CPUE_N was 231.00 in 2006. In 2006, the highest CPUE_N for any species was 62.50 for bluntnose minnow, which made up 27.1% of the fishes collected. Bluegill ranked second with a CPUE_N of 47.50 (20.6% of total). Green sunfish ranked third with a CPUE_N of 33.50, which comprised 14.5% of the catch. Emerald shiner ranked fourth with a CPUE_N of 30.50 (13.2% of total). Redear sunfish were collected for the first time since 1991 in Dresden Reach at the Mouth of the Du Page River (RM 277.3; Lerczak et al. 1992). One redear sunfish was collected at this site.

Catch Rates in Weights (pounds) Collected per Hour by Reach.

The following data summary and discussion was restricted to fish species that individually accounted for over 10% of the total catch and to species that were of special interest. A 95% list was produced for each reach, in which species were ranked by relative biomass (pounds per hour) and added to the list until 95% of the total catch rate in weight for that reach was obtained. Overall, these data indicated that, in terms of biomass, the fish communities of the Illinois River waterway remained dominated by common carp, bigmouth buffalo, smallmouth buffalo, silver carp, and channel catfish.

Alton (lower waterway, Illinois River). Ten fish species accounted for 96.2% of the total catch by weight in pounds per hour (CPUE_w) in Alton Reach (Tables 8 and 9) in 2006. Overall CPUE_w was 32.52. Channel catfish CPUE_w ranked highest at 7.52 (23.1% of total). Silver carp ranked second with a CPUE_w of 6.97 (21.4% of total), which was down from catch weights recorded for this species in 2004 and 2005 (McClelland and Pegg 2005, McClelland and Cook 2006). Silver carp catches of 14.55 and 28.42 pounds per hour were recorded in 2004 and 2005, respectively. Common carp ranked third with a CPUE_w of 5.42 (16.7% of total) and bigmouth buffalo ranked fourth with a CPUE_w of 4.87 (15.0% of total).

La Grange (middle waterway, Illinois River). Eight fish species accounted for 94.9% of the total catch by weight in La Grange Reach (Tables 8 and 9) in 2006. Overall, CPUE_w was 103.50, which represented the second highest CPUE_w ever observed in La Grange Reach in F-101-R sampling. The highest CPUE_w of 108.00 was recorded in 1996 (Koel et al. 1997). Silver carp again ranked first in La Grange Reach catch by weight with a CPUE_w of 65.29 (63.1% of the total). Silver carp, first collected in 2002 in La Grange Reach, have increased annually in CPUE_w since. The catch weight observed for silver carp in 2006 was the highest recorded for this species in La Grange Reach and the second highest ever recorded for any species in F-101-R sampling. The catch in weight of 71.45 observed for common carp in 1996 remained the single highest CPUE_w (Koel et al. 1997). Common carp ranked second in total catch by weight in La Grange Reach with a CPUE_w of 14.63 (14.1% of total). Channel catfish and flathead catfish were the only sport fishes to rank in the top 95% for

Table 8. Pounds of each fish species collected per hour of electrofishing (CPUE_w) on Reach 26 of the Mississippi River (Brickhouse Slough) and on six reaches of the Illinois Waterway in 2005. Pounds per hour less than 0.01, but greater than zero, are indicated by 0.00.

Species	Reach and Hours Fished							Overall CPUE
	Reach 26	Alton	La Grange	Peoria	Starved Rock	Marseilles	Dresden	
	1.00	5.75	5.16	7.88	2.00	2.50	2.00	26.29
Lepisosteidae								
shortnose gar	0.09		1.14					0.22
Clupeidae								
gizzard shad	3.88	1.63	1.49	3.64	1.48	1.05	2.25	2.27
skipjack herring		0.05	0.03	0.05				0.03
threadfin shad				0.00		0.00		0.00
Cyprinidae								
bluntnose minnow		0.00	0.00	0.00	0.07	0.09	0.18	0.03
bullhead minnow	0.02	0.00	0.01	0.02	0.11	0.05		0.03
central stoneroller				0.00		0.01		0.00
common carp	5.87	5.42	14.63	20.65		2.26	18.88	12.13
common shiner						0.00	0.00	0.00
emerald shiner	0.04	0.11	0.05	0.06	0.39	0.25	0.09	0.11
golden shiner				0.00				0.00
goldfish			0.06	0.04			0.53	0.07
grass carp			1.59	1.67	11.41			1.68
red shiner		0.00	0.00					0.00
river shiner	0.18	0.00	0.00					0.00
sand shiner		0.00		0.00				0.00
silverband shiner				0.00				0.00
silver carp		6.97	65.29	7.59				16.63
silver chub				0.00				0.00
spotfin shiner		0.00		0.00	0.04	0.09	0.01	0.01
spottail shiner	0.02		0.00	0.02		0.01	0.01	0.01
Catostomidae								
bigmouth buffalo	2.12	4.87	1.24	24.59				8.76
black buffalo				0.68				0.20
golden redhorse				0.7			0.30	0.23
highfin carpsucker		0.04		0				0.01
quillback		0.03	0.01	0.07				0.03
river carpsucker		1.00	0.33	4.96	1.27	0.58		1.93
shorthead redhorse		0.10	0.25	0.27				0.16
silver redhorse		0.03						0.01
smallmouth buffalo		0.84	5.76	17.11	3.76	0.79	2.46	7.00
Ictaluridae								
brown bullhead				0.07				0.02
channel catfish	12.93	7.52	4.82	9.51	6.00	1.39	10.53	7.33
flathead catfish	0.01		2.96		2.48			0.77
yellow bullhead				0.19				0.06
Fundulidae								
banded killifish					0.00			0.00
blackstripe topminnow						0.00	0.00	0.00
Poeciliidae								
western mosquitofish		0.00		0.00			0.00	0.00
Gobiidae								
round goby					0.00			0.00

Table 8. (continued)

Pounds of each fish species collected per hour of electrofishing (CPUEw) on Reach 26 of the Mississippi River (Brickhouse Slough) and on six reaches of the Illinois Waterway in 2006. Pounds per hour less than 0.01, but greater than zero, are indicated by 0.00.

Species	Reach and Hours Fished							Overall CPUE
	Reach 26	Alton	La Grange	Peoria	Starved Rock	Marseilles	Dresden	
	1.00	5.75	5.16	7.88	2.00	2.50	2.00	26.29
Moronidae								
white bass	0.43	1.44	1.21	1.32	0.46	0.27		1.02
yellow bass			0.01					0.00
yellow bass x white perch		0.01						0.00
white perch			0.02					0.00
Centrarchidae								
black crappie	0.74	0.27	0.16	0.31	0.41	0.62	0.56	0.35
bluegill	5.34	0.52	0.62	3.39	1.71	1.54	3.47	2.00
bluegill X greensunfish		0.02		0.03	0.06	0.08	1.01	0.10
green sunfish	1.51	0.03	0.02	1.83	0.31	0.28	1.59	0.79
largemouth bass	8.54	0.81	0.05	5.03	1.24	1.96	3.10	2.54
longear sunfish				0.00		0.07		0.01
orangespotted sunfish	0.48	0.02	0.05	0.13	0.00	0.01	0.00	0.07
redeer sunfish	0.16						0.07	0.01
rock bass							0.08	0.01
smallmouth bass				0.14	0.65	0.02	0.15	0.11
warmouth	0.27			0.03				0.01
white crappie				0.03				0.03
Esocidae								
grass pickerel						0.01		0.00
Percidae								
johnny darter			0.00					0.00
logperch				0.00				0.00
mud darter				0.00				0.00
sauger			0.01	0.04				0.01
slenderhead darter				0.00				0.00
walleye				0.01				0.00
Sciaenidae								
freshwater drum	3.12	0.80	1.67	2.73	0.60	0.33	1.15	1.61
Total pounds per hour	45.73	32.52	103.50	106.95	32.47	11.78	46.53	68.39

Table 9. Fish species ranked by relative biomass in pounds of fish collected per hour for 2006. Species were added to the list in descending order of abundance until 95% of the total catch for that reach was obtained. Percentages are in parentheses.

Species	Rankings by Reach					
	Alton	La Grange	Peoria	Starved Rock	Marseilles	Dresden
Clupeidae						
gizzard shad	5 (5.0)	8 (1.4)	8 (3.4)	6 (4.6)	5 (8.9)	6 (4.8)
Cyprinidae						
common carp	3 (16.7)	2 (14.1)	2 (19.3)		1 (19.2)	1 (40.6)
grass carp		7 (1.5)		1 (35.1)		
silver carp	2 (21.4)	1 (63.1)	5 (7.1)			
Catostomidae						
bigmouth buffalo	4 (15.0)		1 (23.0)			
highfin carpsucker						
quillback						
river carpsucker	7 (3.1)		7 (4.6)	7 (3.9)	8 (4.9)	
shorthead redhorse						
smallmouth buffalo	8 (2.6)	3 (5.6)	3 (16.0)	4 (7.6)	6 (6.7)	5 (5.3)
Ictaluridae						
channel catfish	1 (23.1)	4 (4.7)	4 (8.9)	2 (18.5)	4 (11.8)	2 (22.6)
flathead catfish		5 (2.9)		3 (11.6)		
Moronidae						
white bass	6 (4.4)			11 (1.4)	11 (2.3)	
Centrarchidae						
black crappie					7 (5.3)	
bluegill			9 (3.2)	5 (5.3)	3 (13.1)	3 (7.5)
bluegill X green sunfish						9 (2.2)
green sunfish			11 (1.7)		10 (2.4)	7 (3.4)
largemouth bass	9 (2.5)		6 (4.7)	8 (3.8)	2 (16.6)	4 (6.7)
smallmouth bass				9 (2.0)		
Sciaenidae						
freshwater drum	10 (2.5)	6 (1.6)	10 (2.6)	10 (1.8)	9 (2.8)	8 (2.5)
Number of species accounting for 95% of total catch	10	8	11	11	11	9

CPUE_W. Channel catfish ranked fourth with a CPUE_W of 4.82 (4.7% of total) and flathead catfish ranked fifth with a CPUE_W of 2.96 (2.9% of total). The catch by weight for largemouth bass on the La Grange Reach prior to 1996 varied, but was typically above two pounds per hour (Lerczak et al. 1993, 1994, 1995, 1996). CPUE_W for largemouth bass has been below two pounds per hour for the last ten of eleven years (1996, 1997, 1998, 1999, 2001, 2002, 2003, 2004, 2005, and 2006) and below one pound per hour since 2001 (Koel et al. 1997, 1998; Koel and Sparks, 1999; Arnold et

al. 2000; McClelland and Pegg 2002, 2003, 2004, 2005; McClelland and Cook 2006). The catch by weight for largemouth bass (0.05) in 2006 was the second lowest ever recorded in La Grange Reach.

Peoria (middle waterway, Illinois River). Eleven fish species accounted for 94.5% of the total catch by weight in Peoria Reach (Tables 8 and 9). Overall, CPUE_W was 106.95. Our collection was the highest catch by weight recorded for all reaches of the Illinois River waterway in 2006. The highest species-specific CPUE_W was 24.59 for bigmouth buffalo, which made up 23.0% of the total catch by weight for this reach in 2006. Common carp ranked second with a CPUE_W of 20.65 (19.3% of total) and smallmouth buffalo ranked third with a CPUE_W of 17.11 (16.0% of total). Silver carp again ranked in the top 95% in CPUE_W for Peoria reach with a catch of 7.59 pounds per hour. Channel catfish catch weights were the highest recorded for Peoria Reach for this species in F-101-R sampling. CPUE_W in 2006 for channel catfish was 9.51; the previous high CPUE_W for channel catfish of 9.01 was recorded in 2005 (McClelland and Cook 2006).

Starved Rock (upper waterway, Illinois River). Eleven fish species accounted for 95.7% of the total catch by weight in Starved Rock Reach (Tables 8 and 9). Overall, CPUE_W was 32.47 in 2006. The highest CPUE_W for any species was 11.41 for grass carp, which made up 35.1% of the total. Our 2006 catch by weight represented the highest ever recorded for grass carp and it was the first year this species has been collected in Starved Rock Reach in F-101-R sampling. A single grass carp collected in Starved Rock Reach accounted for the total biomass. Channel catfish ranked second

with a CPUE_W of 6.00 (18.5% of total) and flathead catfish ranked third with a CPUE_W of 2.48 (11.6% of total). Bluegill catch by weight was the highest ever recorded for this species in Starved Rock Reach in F-101-R sampling. CPUE_W for bluegill in 2006 was 1.71; previous high catch by weight was 1.42 recorded in 2005 (McClelland and Cook 2006).

Marseilles (upper waterway, Illinois River). Eleven fish species accounted for 94.0% of the total catch by weight in Marseilles Reach (Tables 8 and 9). Overall, CPUE_W was 11.78 and was the lowest catch by weight obtained from this reach in F-101-R sampling. Common carp CPUE_W ranked highest at 2.26 (19.2% of total), which represented the lowest catch by weight ever recorded for this species in the Marseilles Reach. Largemouth bass ranked second with a CPUE_W of 1.96 (16.6% of total). Bluegill ranked third with a CPUE_W of 1.54 (13.1% of total) and channel catfish ranked fourth with a CPUE_W of 1.39 (11.8% of total).

Dresden (upper waterway, Des Plaines River). Nine fish species accounted for 95.5% of the total catch by weight in Dresden Reach (Tables 8 and 9). Overall, CPUE_W was 46.53. The highest CPUE_W for any species in Dresden Reach for 2006 was 18.88 for common carp, which made up 40.6% of the total. Channel catfish ranked second with a CPUE_W of 10.53 (22.6% of total). Bluegill ranked third with a CPUE_W of 3.47 (7.5% of total) and largemouth bass ranked fourth with a CPUE_W of 3.10 (6.7% of total).

Fish Health Determined by External Visual Inspection.

Twelve fishes were observed to have externally visible abnormalities in 2006. Abnormalities were found on fishes of the upper and middle waterway, with no abnormalities observed in the lower waterway. Abnormalities recorded were predominantly fin and barbel erosion of channel catfish and common carp. Fin infections were observed on two fishes, a channel catfish and goldfish, in the middle waterway. One largemouth bass was observed with a mouth sore in Peoria Reach; likely a wound from recreational fishing. One river carpsucker was observed to have a missing eye in Peoria Reach.

CONCLUSIONS

Samples collected by electrofishing on the Illinois Waterway during August through October 2006 provided evidence of continued increases in fish species richness, catch rates, and low incidence of visual abnormalities. Ninety-eight fish species and seven hybrids have been collected since William Starrett began this survey in 1957. Eighty fish species and six hybrids have been documented by project F-101-R sampling (1989-present); 60 species and two hybrids from 13 families were collected during 26.29 h of sampling in 2006. Yellow bass x white perch hybrids were collected for the first time during project F-101-R sampling along the waterway; two specimens were collected in La Grange Reach (middle waterway). Yellow bass x white perch hybrids were collected at two sites, Turkey Island and Pekin. Banded killifish, grass carp, and round goby were collected for the first time in Starved Rock Reach and silver

carp were collected at a new site in Peoria Reach in 2006. Single grass carp and round goby were collected at Bull's Island and two banded killifish were collected at Bull's Island Bend in Starved Rock Reach. Two silver carp were collected at Lambie's Boat Harbor in Peoria Reach. Silver carp have now been collected at each site in the lower and middle waterway since they were first collected in 2001. Peoria Reach continued to produce the highest number of species (45) along the Illinois River waterway and the highest total catch (2,460). This was likely due, in part, to a greater number of sites in this reach, varied site types (backwater and side channel), and its position along the waterway, which included the Great Bend (above Hennepin) of the Illinois River. Peoria Reach represents a transition from a river which is constricted, has few contiguous backwaters, and is high in gradient (upper river) to a large river floodplain system with low gradient (lower river) (Sparks 1977).

Catch rates in terms of number of fish collected per hour and total catch numbers along the Illinois Waterway were again among the highest ever recorded for all reaches. Catches of some species in several reaches were at their highest in 2006. Emerald shiner exhibited high catch rates for Alton and Starved Rock Reaches. Bluegill and green sunfish catches were highest for Peoria Reach and spotfin shiner catches were their highest for Marseilles Reach. Increased catches of individual species may be a result of numerous factors, many of which may be difficult to identify. The high catch rates observed among all reaches may be indicative of improved water quality conditions, coherent timing of hydrological events (flooding), and perhaps habitat improvements.

The catch in weight of fishes collected was again highest in Peoria Reach, where

CPUE_w was 106.95. Fish species accounting for this high catch in weight were bigmouth buffalo, common carp, smallmouth buffalo, and channel catfish. Only two species catches were highest in terms of relative biomass in 2006. Channel catfish catch in weight was the highest ever observed for Peoria Reach, while bluegill catch in weight was the highest ever observed for Starved Rock Reach. Non-native fish species continued to have a major role in relative biomass catches. Common carp, silver carp, and grass carp combined to produce 794.3 pounds of the 1,752.3 total pounds collected (45.3%). Silver carp relative biomass collections continue to increase rapidly in La Grange Reach. The catch in weight of silver carp in La Grange Reach was the highest for this species since first collected in 2001 and the second highest catch in weight of any species in F-101-R sampling. Since their first collection in Alton Reach in 2001, silver carp biomass has increased to become the dominant species by weight for the Illinois Waterway (although only collected in the lower and middle waterway) with a total of 437.2 pounds collected in 2006. Of the 1,752.3 pounds of fish collected during our 2006 survey, 1,377.9 pounds (78.6%) were collected from the middle river. The upper waterway produced 187.5 pounds (10.7%) while the lower waterway produced 187.0 pounds (10.7%). Although these catches may be reflective of higher productivity of the middle Illinois Waterway floodplain ecosystem, a greater number of collections in this section likely play a role.

Sport fishes were collected throughout the waterway in 2006, although catch rate in number and weight varied among reaches. For channel catfish, we usually collected more individuals per hour in Alton Reach (lower waterway) than in the middle or upper waterway reaches. However, Starved Rock Reach produced the greatest catch of

channel catfish in number over all reaches. In terms of catch in weight for channel catfish, the lower and middle waterway reaches usually produced the highest pounds per hour. In 2006, Dresden Reach exhibited the highest CPUE_W of channel catfish at 10.53 pound per hour. White bass were most abundant and provided the highest CPUE_W in the lower waterway. Black crappie were most abundant and provided the highest catches by weight in Marseilles Reach of the upper waterway. Bluegill CPUE_N was greatest in Peoria Reach of the middle waterway, but CPUE_W was highest for bluegill in Dresden Reach. Largemouth bass CPUE_N was highest in Dresden Reach in 2006. Catch in number throughout the upper waterway was again higher than both the lower and middle waterway. Catch by weight for largemouth bass was higher in the middle waterway, with Peoria Reach CPUE_W highest over all, which indicated collections of larger fish in that reach when compared to Dresden Reach. As in previous years of project F-101-R sampling, we collected low numbers of sauger. Smallmouth bass, which were usually found in low numbers, were again collected in every reach of the upper waterway and in the Peoria Reach of the middle waterway.

A total of 12 fishes had externally visible abnormalities. Eleven (91.7%) were sediment-contact fishes. The highest incidence occurred in the upper waterway where 0.3% of all fishes exhibited visual abnormalities. In the middle waterway, only 0.1% of fishes exhibited abnormalities and none were recorded in the lower waterway.

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APPENDIX A. Fish species collected during Long-term Monitoring of the Illinois Waterway, 1957-2006. Common names marked by an asterisk indicate species that were collected from 1989 through 2005 during federal aid project F-101-R. Common and scientific names are from Robins et al. (1991) and Cross et al. (1995). Habitat associations are based on behavioral descriptions from Pflieger (1975), Cross et al. (1995) and communications with INHS fisheries biologists.

Family Name	Common Name	Scientific Name	Habitat Association (B=benthic)
Lepisosteidae	longnose gar*	<i>Lepisosteus osseus</i>	
	shortnose gar*	<i>Lepisosteus platostomus</i>	
	spotted gar*	<i>Lepisosteus oculatus</i>	
Amiidae	bowfin*	<i>Amia calva</i>	
Hiodontidae	goldeye*	<i>Hiodon alosoides</i>	
	mooneye*	<i>Hiodon tergisus</i>	
Anguillidae	American eel	<i>Anguilla rostrata</i>	
Clupeidae	gizzard shad*	<i>Dorosoma cepedianum</i>	
	skipjack herring*	<i>Alosa chrysochloris</i>	
	threadfin shad*	<i>Dorosoma petenense</i>	
Cyprinidae	bighead carp*	<i>Hypophthalmichthys nobilis</i>	
	bigmouth shiner*	<i>Notropis dorsalis</i>	B
	blacknose dace*	<i>Rhinichthys atratulus</i>	B
	bluntnose minnow*	<i>Pimephales notatus</i>	
	bullhead minnow*	<i>Pimephales vigilax</i>	
	central stoneroller*	<i>Campostoma anomalum</i>	B
	common carp*	<i>Cyprinus carpio</i>	B
	common carp x goldfish*	<i>Cyprinus carpio x Carassius auratus</i>	B
	common shiner*	<i>Luxilus cornutus</i>	
	creek chub*	<i>Semotilus atromaculatus</i>	
	emerald shiner*	<i>Notropis atherinoides</i>	
	fathead minnow*	<i>Pimephales promelas</i>	
	ghost shiner	<i>Notropis buchmanii</i>	
	golden shiner*	<i>Notemigonus crysolucas</i>	
	goldfish*	<i>Carassius auratus</i>	B
	grass carp*	<i>Ctenopharyngodon idella</i>	
	hornyhead chub	<i>Nocomis biguttatus</i>	
	Mississippi silvery minnow	<i>Hybognathus nuchalis</i>	B
	pugnose minnow	<i>Opsopoeodus emiliae</i>	
	redfin shiner	<i>Lythrurus umbratilis</i>	
	red shiner*	<i>Cyprinella lutrensis</i>	
	ribbon shiner*	<i>Lythrurus fumeus</i>	
	river shiner*	<i>Notropis blennioides</i>	
	sand shiner*	<i>Notropis stramineus</i>	
	silverband shiner*	<i>Notropis shumardi</i>	
	silver carp*	<i>Hypophthalmichthys molitrix</i>	
	silver chub*	<i>Hybopsis storeriana</i>	B
	silverjaw minnow	<i>Notropis buccatus</i>	B
spotfin shiner*	<i>Cyprinella spiloptera</i>		
spottail shiner*	<i>Notropis hudsonius</i>		
steelcolor shiner	<i>Cyprinella whipplei</i>		
striped shiner*	<i>Luxilus chrysocephalus</i>		
suckermouth minnow*	<i>Phenacobius mirabilis</i>	B	
Catastomidae	bigmouth buffalo*	<i>Ictiobus cyprinellus</i>	B
	black buffalo*	<i>Ictiobus niger</i>	B
	black redbhorse	<i>Moxostoma duzuesnei</i>	B
	golden redbhorse*	<i>Moxostoma erythrurum</i>	B
	highfin carpsucker*	<i>Carpoides velifer</i>	B
	northern hogsucker*	<i>Hypentelium nigricans</i>	B
	quillback*	<i>Carpoides cyprinus</i>	B
	river carpsucker*	<i>Carpoides carpio</i>	B
	river redbhorse	<i>Moxostoma carinatum</i>	B
	shorthead redbhorse*	<i>Moxostoma macrolepidotum</i>	B
	silver redbhorse*	<i>Moxostoma anisurum</i>	B
	smallmouth buffalo*	<i>Ictiobus bubalus</i>	B
	white sucker*	<i>Catostomus commersoni</i>	B

Appendix A Continued.

Family Name	Common Name	Scientific Name	Habitat Association (B=benthic)
Ictaluridae	black bullhead*	<i>Ameiurus melas</i>	B
	blue catfish	<i>Ictalurus furcatus</i>	B
	brown bullhead*	<i>Ameiurus nebulosus</i>	B
	channel catfish*	<i>Ictalurus punctatus</i>	B
	flathead catfish*	<i>Pylodictis olivaris</i>	B
	freckled madtom*	<i>Noturus nocturnus</i>	B
	tadpole madtom*	<i>Noturus gyrinus</i>	B
	white catfish	<i>Ameiurus catus</i>	B
yellow bullhead*	<i>Ameiurus natalis</i>	B	
Esocidae	grass pickerel*	<i>Esox americanus vermiculatus</i>	
	nothern pike	<i>Esox lucius</i>	
Salmonidae	rainbow trout	<i>Oncorhynchus mykiss</i>	
Percopsidae	trout-perch	<i>Percopsis omiscomaycus</i>	B
Fundulidae	banded killifish*	<i>Fundulus diaphanus</i>	
	blackstripe topminnow*	<i>Fundulus notatus</i>	
Poeciliidae	western mosquitofish*	<i>Gambusia affinis</i>	
Atherinidae	brook silverside*	<i>Labidesthes sicculus</i>	
Moronidae	striped bass	<i>Morone saxatilis</i>	
	striped bass x white bass*	<i>Morone saxatilis</i> x <i>M. chrysops</i>	
	white bass*	<i>Morone chrysops</i>	
	white perch*	<i>Morone americana</i>	
	yellow bass*	<i>Morone mississippiensis</i>	
	yellow bass x white perch*	<i>Morone mississippiensis</i> x <i>M. americana</i>	
Centrarchidae	black crappie*	<i>Pomoxis nigromaculatus</i>	
	bluegill*	<i>Lepomis macrochirus</i>	
	bluegill x green sunfish*	<i>Lepomis macrochirus</i> x <i>L. cyanellus</i>	
	green sunfish*	<i>Lepomis cyanellus</i>	
	largemouth bass*	<i>Micropterus salmoides</i>	
	longear sunfish*	<i>Lepomis megalotis</i>	
	orangespotted sunfish*	<i>Lepomis humilis</i>	
	orangespotted sunfish x bluegill*	<i>Lepomis humilis</i> x <i>L. macrochirus</i>	
	orangespotted sunfish x green sunfish*	<i>Lepomis humilis</i> x <i>L. cyanellus</i>	
	pumpkinseed*	<i>Lepomis gibbosus</i>	
	pumpkinseed x green sunfish*	<i>Lepomis gibbosus</i> x <i>L. cyanellus</i>	
	reardear sunfish*	<i>Lepomis microlophus</i>	
	rock bass*	<i>Ambloplites rupestris</i>	
	smallmouth bass*	<i>Micropterus dolomieu</i>	
	spotted sunfish*	<i>Lepomis punctatus</i>	
warmouth*	<i>Lepomis gulosus</i>		
white crappie*	<i>Pomoxis annularis</i>		
Percidae	bluntnose darter	<i>Etheostoma chlorosomum</i>	B
	johnny darter*	<i>Etheostoma nigrum</i>	B
	logperch*	<i>Percina caprodes</i>	B
	mud darter*	<i>Etheostoma asprigene</i>	B
	sauger*	<i>Stizostedion canadense</i>	
	slenderhead darter*	<i>Percina phoxocephala</i>	B
	walleye*	<i>Stizostedion vitreum</i>	
	yellow perch*	<i>Perca flavescens</i>	
Sciaenidae	freshwater drum*	<i>Aplodinotus grunniens</i>	B
Gobiidae	round goby*	<i>Neogobius melanostomus</i>	B

APPENDIX B. Species richness (S) at Long-term Illinois River Fish Population Monitoring (F-101-R) sites.

Description	Site #	Reach	Low S (year)	High S (year)
Treats Island	279.8	3	10 (2003)	19 (1995)
Du Page River	277.4	3	11 (1999, 2000)	20 (2006)
Waupecan Island	260.6	4	11 (1996)	21 (2005)
Johnson Island	249.6	4	6 (1993)	16 (1995)
Ballards Island	248.0	4	10 (1991)	21 (2005)
Bulls Island Bend	241.5	5	8 (1990)	23 (2005)
Bulls Island	240.8	5	8 (1990, 96, 99)	20 (2006)
Clark Island	215.3	6	11 (1990)	21 (1995)
Hennepin	207.6	6	2 (1990)	26 (2005)
Upper Twin Sister	203.3	6	8 (1990)	22 (2001)
Lower Twin Sister	202.8	6	7 (1992)	20 (2005)
Henry Island	193.8	6	12 (1991)	24 (2005)
Chillicothe	180.6	6	14 (1989,91,92,96)	26 (2006)
Lambie's Boat Harbor	170.3	6	9 (1989)	22 (2006)
Lower Peoria Lake	163.3	6	10 (1989)	20 (2005)
Pekin	155.1	7	6 (1992)	19 (2005)
Turkey Island	148.0	7	8 (2004)	17 (1999)
Upper Bath Chute	113.0	7	12 (1994)	22 (2001)
Lower Bath Chute	107.1	7	9 (1992)	19 (2001)
Sugar Creek Island	95.1	7	10 (1989, 1999, 2003)	20 (2005)
Grape-Bar Islands	86.5	7	7 (1989)	23 (1994)
Moore's Towhead	75.3	8	6 (2002)	17 (2004, 2005)
Big Blue Island	58.3	8	9 (1990)	20 (2005, 2006)
Crater-Willow Islands	30.0	8	11 (2003)	18 (1999)
Hurricane Island	26.8	8	11 (1990, 1999, 2004)	20 (1997)
Dark Chute	24.7	8	11 (1994, 2004)	18 (2006)
Mortland Island	19.0	8	10 (2003)	19 (2006)
Brickhouse Slough	0.0	26	10 (1990)	20 (2005)

¹Sites 0.0-215.3 were not sampled during 1993 (n=17 years) (sites 240.8-279.8 n=18 years).

APPENDIX C. Total catch (C) at Long-term Illinois River Fish Population Monitoring (F-101-R) sites.

Description	Site #	Reach	Low C (year)	High C (year)
Treats Island	279.8	3	55 (1996)	586 (1995)
Du Page River	277.4	3	88 (1991)	614 (1995)
Waupecan Island	260.6	4	35 (1996)	266 (2006)
Johnson Island	249.6	4	15 (2003)	203 (1995)
Ballards Island	248.0	4	34 (1991)	492 (2005)
Bulls Island Bend	241.5	5	36 (1990)	897 (1995)
Bulls Island	240.8	5	32 (1990)	919 (2006)
Clark Island	215.3	6	45 (1991)	396 (1997)
Hennepin	207.6	6	2 (1990)	523 (2005)
Upper Twin Sister	203.3	6	33 (1990)	193 (1999)
Lower Twin Sister	202.8	6	33 (1990)	218 (2001)
Henry Island	193.8	6	54 (1990)	474 (1996)
Chillicothe	180.6	6	80 (1992)	297 (1999)
Lambie's Boat Harbor	170.3	6	47 (2003)	1142 (2002)
Lower Peoria Lake	163.3	6	83 (1991)	507 (2005)
Pekin	155.1	7	22 (1992)	524 (1996)
Turkey Island	148.0	7	30 (1992)	165 (1995)
Upper Bath Chute	113.0	7	80 (2002, '03)	352 (1996)
Lower Bath Chute	107.1	7	57 (1992)	273 (1996)
Sugar Creek Island	95.1	7	37 (2003)	238 (1996)
Grape-Bar Islands	86.5	7	42 (1990)	524 (1994)
Moore's Towhead	75.3	8	31 (2003)	263 (2005)
Big Blue Island	58.3	8	25 (1990)	240 (2005)
Crater-Willow Islands	30.0	8	57 (2003)	207 (1994)
Hurricane Island	26.8	8	50 (1999)	304 (2005)
Dark Chute	24.7	8	47 (2004)	237 (1991)
Mortland Island	19.0	8	28 (2004)	195 (1991)
Brickhouse Slough	0.0	26	53 (1996)	267 (2006)

¹Sites 0.0-215.3 were not sampled during 1993 (n=17 years) (sites 240.8-279.8 n=18 years).

Appendix D (Job 5).

Publications, reports, and presentations that resulted from research conducted during segments 6-15 of project F-101-R, the Long-term Illinois River Fish Population Monitoring Program (funded under Federal Aid in Sportfish Restoration Act, P.L. 81-681, Dingell-Johnson, Wallup-Breaux).

I. Publications

Koel, T.M. and Richard E. Sparks. 2000. Ecohydrology of the Illinois River and development of ecological criteria for operation of dams. Regulated Rivers: Research and Management.

Koel, T.M. 2000. Ecohydrology and development of ecological criteria for operation of dams. Project Status Report 2000-02. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, Onalaska, Wisconsin.

Koel, T.M. 2000. Abundance of age-0 fishes correlated with hydrologic indicators. Project Status Report 2000-03. U.S. Geological Survey, Upper Midwest Environmental Sciences Center, Onalaska, Wisconsin.

Koel, T.M. 1998. Channel catfish (*Ictalurus punctatus*) in the Upper Mississippi River System. Project Status Report 98-11. U.S. Geological Survey, Environmental Management Technical Center, Onalaska, Wisconsin.

Koel, T.M., R. Sparks, and R.E. Sparks. 1998. Channel catfish in the Upper Mississippi River System. Survey Report No. 353. Illinois Natural History Survey, Champaign.

Lerczak, T.V., R.E. Sparks, and K.D. Blodgett. 1994. Some upstream-to-downstream differences in Illinois River fish communities. Transactions of the Illinois State Academy of Science 87(Supplement):53. (Abstract)

Lerczak, T.V. 1995. Fish community changes in the Illinois River, 1962-1994. American Currents (Summer Issue).

Lerczak, T.V. 1995. The gizzard shad in nature's economy. Illinois Audubon. (Summer Issue). Reprinted in Big River 2(12):1-3.

Lerczak, T.V., and R.E. Sparks. 1995. Fish populations in the Illinois River. Pages 7-9 in G.S. Farris, editor. Our living resources 1994. National Biological Survey, Washington, D.C.

Lerczak, T.V., R.E. Sparks, and K.D. Blodgett. 1995. Long-term trends (1959-1994) in fish populations of the Illinois River. Transactions of the Illinois State Academy of Science 88(Supplement):74. (Abstract)

Lerczak, T.V., R.E. Sparks, and K.D. Blodgett. 1995. Long-term trends (1959-1994) in fish populations of the Illinois River with emphasis on upstream-to-downstream trends. *Proceedings of the Mississippi River Research Consortium* 27:62-63.

Lerczak, T.V. 1996. Illinois River fish communities: 1960's versus 1990's. *Illinois Natural History Survey Report No. 339*.

McClelland, Michael A., Mark A. Pegg, and Timothy W. Spier. 2006. Longitudinal Patterns of the Illinois Waterway Fish Community. *Journal of Freshwater Ecology*. 21/1:91-99.

Pegg, M.A. and M.A. McClelland. 2004. Assessment of spatial and temporal fish community patterns in the Illinois River. *Ecology of Freshwater Fish* 13:125-135.

Pegg, M. A. 2002. Invasion and transport of non-native aquatic species in the Illinois River. Pages 203-209 in A.M. Strawn, editor. *Proceedings of the 2001 Governor's conference on the management of the Illinois River System, Special Report Number 27*, Illinois Water Resources Center, Champaign, Illinois.

Raibley, P.T., K.D. Blodgett, and R.E. Sparks. 1995. Evidence of grass carp (*Ctenopharyngodon idella*) reproduction in the Illinois and upper Mississippi Rivers. *Journal of Freshwater Ecology* 10:65-74.

Sparks, R.E. 1995. Value and need for ecosystem management of large rivers and their floodplains. *Bioscience* 45:168-182.

Sparks, R.E. 1995. Environmental effects. Pages 132-162 in S.A. Changnon, editor. *The great flood of 1993*. University Corporation for Atmospheric Research (UCAR) and Westview Press.

II. Essays

Pegg, M.A. 2002. Aquatic resource monitoring in the Upper Mississippi River Basin. *INHS Reports*. Number 371:8-9.

III. Technical Papers

McClelland, Michael A. and Thad R. Cook. A Comparison of Fixed and Random Site Sampling on the Illinois River. Presented at the 38th Annual Meeting of the Mississippi River Research Consortium, La Crosse WI, April 27-28, 2006.

McClelland, Michael A., Mark A. Pegg, Kevin S. Irons, and T. Matt O'Hara. Fish Abundances of Backwater Lakes with Connectivity Gradients in the La Grange Reach, Illinois River. Presented at the 37th Annual Meeting of the Mississippi River Research Consortium, La Crosse, WI, April 28-29, 2005.

McClelland, Michael A., Kevin S. Irons, T. Matt O'Hara, Mark A. Pegg, and Thad R. Cook. A Comparison of Two Electrofishing Gears Used for Fish Monitoring on the Illinois River. Presented at the 36th Annual Meeting of the Mississippi River Research Consortium, LaCrosse, WI, April 1-2, 2004.

McClelland, Michael A. and Mark A. Pegg. Longitudinal Patterns of the Illinois Waterway Fish Community. Presented at the 64th Annual Midwest Fish and Wildlife Conference, Kansas City, MO, December 7-10, 2003.

Pegg, M.A. and M.A. McClelland. Assessment of spatial and temporal fish community patterns in the Illinois River. Presented at the American Fisheries Society meeting, Quebec City, Quebec Canada, August, 2003.

O'Hara, T.M., K.S. Irons, M.A. McClelland, and M.A. Pegg. Status of bighead carp and silver carp in the La Grange Reach, Illinois River and possible impacts to the commercial fishery. 41st Annual Meeting of the Illinois Chapter of the American Fisheries Society, Mt. Vernon, Illinois, 4-6 March, 2003.

Irons, K.S., T.M. O'Hara, M.A. McClelland, and M.A. Pegg. Status of non-native fish species in the Illinois River. 41st Annual Meeting of the Illinois Chapter of the American Fisheries Society, Mt. Vernon, Illinois, 4-6 March, 2003.

O'Hara, T.M., K.S. Irons, M.A. McClelland, and M.A. Pegg. Status of bighead carp and silver carp in the La Grange Reach, Illinois River and possible impacts to the commercial fishery. Presented at the 34th Annual Meeting of the Mississippi River Research Consortium, LaCrosse, Wisconsin, April, 2002.

Irons, K.S., T.M. O'Hara, M.A. McClelland, and M.A. Pegg. White perch distributions in the Illinois River: detecting an invasive species with the Long Term Resource Monitoring Program. Presented at the 34th Annual Meeting of the Mississippi River Research Consortium, LaCrosse, Wisconsin, April, 2002.

O'Hara, T.M., K.S. Irons, M.A. McClelland, and M.A. Pegg. Status of bighead carp and silver carp in the La Grange Reach, Illinois River and possible impacts to the commercial fishery. Presented at the 2002 North Central Division American Fisheries Society River and Streams Technical Committee Meeting, Moline, Illinois, March 2002.

McClelland, M.A., Irons, K.S., and T.M. O'Hara, and M.A. Pegg. White perch (*morone americana*) occurrence in the Illinois River, Upper Mississippi River System. Presentation at the Illinois-Iowa American Fisheries Society Annual Meeting, Moline, Illinois, February, 2002.

Pegg, M.A. Invasion and transport of non-native aquatic species in the Illinois River. 2001 Governor's conference on the management of the Illinois River System, Peoria, Illinois, October, 2001.

Koel, T.M. and Richard E. Sparks. Ecohydrology of the Illinois River: development of criteria for operation of the La Grange and Peoria locks and dams. 32nd Annual Meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, April 13-14, 2000.

Koel, T.M., T.R. Cook, and K.S. Irons. Criteria for biota-friendly operations of the Peoria and La Grange locks and dams, Illinois River Waterway. 61st Midwest Fish and Wildlife Conference, Chicago, Illinois December 5-8, 1999.

Koel, T.M. and R.E. Sparks. Interannual variation in catches of young-of-year fish correlated with hydrology of the Upper Mississippi River System. 47th Annual Meeting of the North American Benthological Society, Duluth, Minnesota, May 23-24, 1999.

Koel, T.M. Changes in fish community structure: effects of hydrological variability in the Upper Mississippi River System. Presented to the Illinois Natural History Survey, Center for Aquatic Ecology, Havana Field Station Director Search Committee and Senior Staff, March 24, 1999.

Koel, T.M. Spatial and temporal variability of channel catfish populations in the Upper Mississippi River System. Illinois Department of Natural Resources LTRMP field station biannual retreat, Dickson Mounds, Illinois, December 15, 1998.

Koel, T.M. Long Term Resource Monitoring Program Showcase: analysis of catfish catch. Environmental Management Program Coordinating Committee, Fall Quarterly Meeting, Rock Island, Illinois, November 19-20, 1998.

Koel, T.M. and K.D. Blodgett. Fish-environment associations: effects of inter-annual hydrological variability on fish populations of the Illinois River waterway, 1957-1997. Upper Mississippi River Conservation Committee, Fish Technical Section Annual Fall Meeting, Dubuque, Iowa, September 15-17, 1998.

Koel, T.M., K.S. Irons, T.M. O'Hara, K.D. Blodgett, and R.E. Sparks. Changes in fish community structure: effects of hydrological variability in the Upper Mississippi River System. 128th Annual Meeting of the American Fisheries Society, Hartford, Connecticut, August 23-27, 1998.

Koel, T.M., T.M. Mihuc, R.E. Sparks, and K.D. Blodgett. Upper Mississippi River System status and trends report. Fish species-environment relationships: LTRMP data analysis and preliminary results. 54th Annual Meeting of the Upper Mississippi River Conservation Committee, Moline, Illinois, 17-19 March 1998.

Blodgett, K.D. and T.M. Mihuc. Decision support using Long Term Resource Monitoring Program component data and supplementary data on the Illinois River. 54th Annual Meeting of the Upper Mississippi River Conservation Committee, Moline, Illinois, 17-19 March 1998.

Koel, T.M. and T.M. Mihuc. Fish abundance in the La Grange Reach of the Illinois River correlated with environmental factors: problems of cross-component analysis. Presented at the Long Term Resource Monitoring Program Annual Winter Meeting, Davenport, Iowa, 13 January 1998.

Lerczak, T.V., R.E. Sparks, and K.D. Blodgett. Some upstream-to-downstream differences in Illinois River fish communities. Contributed paper presented at the Illinois State Academy of Science Annual Meeting, Galesburg, Illinois, 7 October 1994.

Sparks, R.E. Large river-floodplain ecosystems of the Midwest: status, trends, and management needs. Presented at the U.S. Environmental Protection Agency's "Ecological Seminar Series" held in Chicago, Illinois, 14 March.

IV. Poster Presentations

Koel, T.M. and R.E. Sparks. The Long-term Illinois River Fish Population Monitoring Program. National Meeting of the Ecological Society of America, Spokane, Washington, August 10-14, 1998.

Lerczak, T.V., R.E. Sparks, and K.D. Blodgett. Long-term trends (1959-1994) in fish populations of the Illinois River. Poster presented at the 56th Midwest Fish and Wildlife Conference, Indianapolis, Indiana, 4-7 December 1994.

Lerczak, T.V., R.E. Sparks, and K.D. Blodgett. Long-term trends (1959-1994) in fish populations of the Illinois River. Poster presented at the Illinois State Academy of Science Annual Meeting, Charleston, Illinois, 6 October 1995.

Lerczak, T.V., R.E. Sparks, and K.D. Blodgett. Long-term trends (1959-1994) in fish populations of the Illinois River with emphasis on upstream-to-downstream differences. Poster presented at the annual meeting of the Mississippi River Research Consortium, La Crosse, Wisconsin, 26-28 April 1995.

McClelland, Michael A., Mark A. Pegg, Kevin S. Irons, and T. Matt O'Hara. Fish Abundances of Backwater Lakes with Connectivity Gradients in the La Grange Reach, Illinois River. Presented at the 135th Annual Meeting of the American Fisheries Society, Anchorage, AK, September 11-15, 2005.

Pegg, M.A. and M.A. McClelland. Long-term fish population trends along the Illinois River. Poster presented at the 63rd Midwest Fish and Wildlife Conference, Des Moines, Iowa, December, 2001.

Pegg, M.A. and M.A. McClelland. Long-term fish population trends along the Illinois River. Poster presented at the 131st Annual Meeting of the American Fisheries Society, Phoenix, Arizona, August, 2001.

V. Popular Presentations

Lerczak, T.V. Wintering bald eagles along the Illinois River and factors affecting their environment. Invited presentation to the Peoria Audubon Society, Peoria, Illinois, 8 March 1995.

Lerczak, T.V. Seminar on Illinois River environmental issues. Conducted for Biology 140 (Human Ecology) at Spoon River College, 27 June 1994.

Lerczak, T.V. A photo trip up the Illinois River. After dinner talk presented to Havana Rotary Club, Havana, Illinois, 17 April 1995.

Blodgett, K.D. Ecosystem management for the Illinois River: can biological integrity be restored? Invited lecture for Earth Day celebration at Spoon River College, Canton, Illinois, 19 April 1995.

McClelland, M.A. The Long Term Illinois River Fish Population Monitoring Program. After dinner talk presented to Central Christian Men's 10th Annual Fish Fry, August 2003.

VI. Data Requests

1. Sam Cull, City of Peru, Electrical Department, Peru, Illinois
2. Stanley and Associates, Muscatine, Iowa
3. U.S. Army Corps of Engineers, Rock Island, Illinois
4. Shelly Miller, Aquatic Ecologist, The Nature Conservancy, Peoria, Illinois
5. K. Douglas Blodgett, Project Manager, The Nature Conservancy, Havana, Illinois
6. Kevin Irons, Fishery Biologist, LTRMP, Havana, Illinois
7. Matt O'Hara, Fishery Biologist, LTRMP, Havana, Illinois
8. Scott Langloss, Writer for Adventure Sports Outdoors
9. Richard Sparks, Director of Research National Great Rivers Research & Education Center
10. Jim Mick, Illinois Department of Natural Resources
11. James B. McLaren, ASA Analysis & Communication, Inc.