Project Title: Bigheaded Carp Monitoring and Removal 2024

Geographic Location: Pools 14–19 of the Mississippi River

Lead Agency: Illinois Natural History Survey

Participating Agencies: Illinois Natural History Survey, Missouri Department of Conservation, Illinois Department of Natural Resources, United States Geological Survey-Upper Midwest Environmental Sciences Center, and United States Fish and Wildlife Services

Statement of Need:

Adult Silver carp (*Hypophthalmichthys molitrix*), Bighead carp (*H. nobilis*), Grass carp (*Ctenopharyngodon idella*), and Black carp (*Mylopharyngodon piceus*), hereafter referred to as invasive carp, are present in varying abundances in Pools 14 through 19; however Black Carp have not been collected above Lock and Dam (LD) 19. Bighead and Silver Carp, collectively referred to as bigheaded carp, have increased in range and abundance throughout the Mississippi River basin, thus increasing their potential for causing ecological and economic damage. Lock and Dam 19 has limited movements of invasive carp upstream as all upstream passage is restricted to the lock chamber, effectively slowing progression and establishment of invasive carp in the UMR. A combination of containment and control measures are thought to be the most effective tools for managing invasive carp in the UMR. The Upper Mississippi River Invasive Carp Team (UMRICT) is an interagency group across five states that is concerned with minimizing the impacts of bigheaded carp in the UMR. Commercial harvest effort programs, funded through the UMRICT, are aimed at capturing and removing bigheaded carp in the UMR to prevent establishment of incipient populations. We propose that targeted commercial harvest at the established and invasion front (Pool 16) will be effective in reducing populations and help alleviate the pressure invasive species elicit at dams.

Illinois Natural History Survey

Project Objectives:

1. Targeted removal of 100,000-200,000 lbs. of invasive carp species in UMR pools 14-19 using commercial fishers and intensive netting protocols.
2. Acoustically tag and monitor, collectively, 200 Bigmouth Buffalo, Paddlefish, Lake Sturgeon, Flathead Catfish, Blue Sucker, White Bass, Freshwater Drum, Walleye with acoustic tags in Pools 16, 15 in the fall of 2023 to assess frequency and timing of fish passage at Lock and Dam 14, 15.

Project Highlights:

- Commercial removal efforts resulted in 98,980 lbs. of invasive carp removed from 01/08/2024–12/18/2024
- Since the project started in 2015 a total of 1,246,858 lbs. of invasive carp have been removed, with 1,078,998 lbs. coming from 2018, 2019, 2020, 2021, 2022, 2023, and 2024.
- 156 Bighead Carp (BHCP), 2,772 Silver Carp (SVCP), 12 hybrid Silver Carp x Bighead Carp (SCBC), and 1,168 Grass Carp (GSCP) were harvested and removed in 2024.

- Continued increases in Silver Carp relative weight (Wr) suggest reduced abundances of carp through harvest or emigration out of the IMZ.

Methods:

Study site

Data were collected from September 2015 through December 2024 on Pools 14–20 of the UMR. The UMR is classified as the portion of the river above Cairo, Illinois to St. Anthony Falls near Minneapolis, Minnesota. The UMR consists of 29 locks and dams that vary in size and passage capability. The UMR has a drainage basin of 490,000 km^2 and at the mouth has a discharge of 5,796 m^3/s. Pools 14–19 of the Mississippi River are the border waters between Illinois and Iowa, while Pool 20 is the border water between Illinois and Missouri. Pool 14 is 47.0 km long and has an area of 41.6 km^2. It extends from Lock and Dam 13 near Clinton, IA to Lock and Dam 14 in Le Claire, IA. Pool 15 is 16.7 km long and covers an area of 14.7 km^2, extending from Lock and Dam 14 in Le Claire, IA to Lock and Dam 15 in Rock Island, IL. Pool 16 is 41.4 km long and occupies an area of 52.6 km^2. It extends from Lock and Dam 15 in Rock Island, IL to Lock and Dam 16 in Muscatine, IA. Pool 17 is 32.3 km long and covers 30.7 km^2 between Lock and Dam 16 in Muscatine, IA and Lock and Dam 17 near New Boston, IL. Pool 18 is 42.8 km long and covers 53.8 km^2. It is located between Lock and Dam 17 near New Boston, IL and Lock and Dam 18 in Gladstone, IL. Pool 19 extends 74.5 km and covers 123.3 km^2 from Lock and Dam 18 in Gladstone, IL to Lock and Dam 19 in Keokuk, IA. Pool 20 is approximately 34 km long and has an area of approximately 28.3 km^2 (Jahn and Anderson 1986). It extends from Lock and Dam 19 in Keokuk, IA to Lock and Dam 20 near Canton, MO. Pools 14–18 and 20 have similar aquatic habitats, while Pool 19 shows more similarities to pools further upriver (Pools 4–13), characterized by a higher average size of contiguous impounded and shallow aquatic areas than downstream pools (Koel 2001). Pools can be split into three distinct groups based on dominant aquatic habitat types: Pools 14, 18, and 20, Pools 15 and 17, and Pool 16. Pools 14, 18, and 20 have no contiguous impounded area, contiguous floodplain shallow aquatic area, or tertiary channel. Pools 15 and 17 have a small portion of the tertiary channel and contain a larger floodplain area than other pools. Pool 16 has more secondary channels than other pools (Koel 2001). Tributaries that contribute to Pools 14–19 of the Mississippi River include Wapsipinicon River (converges at Pool 14), Rock River (converges at Pool 16), Iowa River (converges at Pool 18), and Skunk River (converges at Pool 19).

Sample Collection

Fish were collected using nylon filament gillnets provided by Illinois Natural History Survey (INHS) biologists and contracted removal effort personnel. Net mesh sizes used were 3, 3.5, 4, 4.25, 4.5, 4.75, 5, 5.25, and 6-inch bar gillnets. Gillnets were set in a range of habitat areas (backwater, side channel, main channel border, and tributaries) to target bigheaded carp. Bigheaded carp were located using side-scan sonar, acoustic receivers (manual, stationary, and real-time), visual cues, and fishing areas that have had historically high catch rates. The time nets were set and removed was recorded, along with mesh size, net height, length, color, and twine size. Dissolved oxygen, specific conductivity, and water temperature were measured at net locations using a YSI Pro 2030 meter (Yellow Springs, Ohio, USA), and GPS coordinates were taken using a Vemco VR-100 receiver (Bedford, Nova Scotia, Canada). Once set, the nets were either left overnight to fish (“dead set”) or a method called “pounding” was employed which included driving fish towards the nets to scare them into the nets (Butler et al. 2019). Nets were

then removed from the water, and fish were removed from the net. Fish collected from nets were identified to species, the number of fish per species was recorded, and the bulk weight of invasive carp by species was measured and recorded. Additionally, drift nets were set in high flow areas such as the main channel and side channels to target invasive carp preparing to spawn. These nets were 3.5, 4, and 4.5-inch bar gillnets, and were left to float downriver for approximately 5-15 minutes, before being picked up. Similar to other net sets, fish were removed from the nets and invasive carp species collected to add to the bulk weight for the day. To collect additional bycatch data, on certain days all collected fish were weighed to the nearest 10 g and measured to the nearest mm. Invasive carp were removed from the system and bycatch were released back into the water at the capture location.

Statistical analyses

Relative weight was calculated based on the available standard weight equation for each species. Grass Carp could not be included in these analyses because standard weight equations do not exist for this species. Relative weight for a species was compared between years, and between pools per year. Box plots were constructed to display the Wr for each species between years, and between pools per year. Analysis of Variance (ANOVA) tests were performed to determine if Wr of species were statistically, significantly different (α=0.05) between years both in all pools combined, and in each pool separately. A Tukey's Post Hoc test (α=0.05) determined between what years in each pool any difference in Wr existed.

Results and Discussion:

Contracted Commercial Removal

Low river conditions, late-season flooding, and low personnel greatly impacted our fishing efforts in 2024. Our intensive harvest event occurred from April 2-May 1. During intensive harvest, we contracted 3-4 fishermen crews during the peak period when bigheaded carp occupy backwater areas, which past data indicate can account for 1/3 of our yearly catch. Fishing efforts for 2024 occurred between January 8-January 10 because of mild weather and lack of ice and began consistently for the year on February 13 with ice-off and continued until December 18.

In 2024, we removed 4,108 invasive carp, weighing 44,889 kg (98,980 lbs.), from Pools 14–19 of the Mississippi River (Table 1, Table 2, Table 3). An additional 145 invasive carp weighing 1,852 kg (4,084 lbs.) were tagged by partners and released back into the UMR (Table 9). Silver Carp were the most abundant invasive carp species removed from the UMR (2,772 fish; 28,038 kg; 61,824 lbs.), followed by Grass Carp (1,168 fish; 13,783 kg; 30,393 lbs.), Bighead Carp (156 fish; 2,942 kg; 6,488 lbs.), and hybrid carp (12 fish; 124 kg; 274 lbs.). A total of 13,498 bycatch fish were captured in gill nets and released (Table 4).

Contracted commercial efforts have been successful in removing large quantities of biomass annually from the UMR. Catch per unit effort (CPUE) has steadily risen from 2018 to 2020, but dropped in 2021, 2022, 2023, and 2024 potentially due to low water, which leads to a decrease in accessibility to backwaters where high abundances of fish are historically caught (Fig. 1). As contracted fishing moved upstream, the total CPUE generally decreased. The exception for this was Pools 16 and 17 in 2019, Pool 17 and 18 in 2021, and Pools 17 and 16 in 2022 and 2023. Pools 18 and 19 had the highest overall CPUE, and Pool 14 had the lowest CPUE, with only four invasive carp removed from Pool 14 from 2018 through

2024 (Fig. 2). These results suggest that Pools 18 and 19 are the key focal points for removing pressure from upstream movement and contain the highest densities. The decrease in CPUE in Pool 19 in 2024 may be partially attributed to the start of incentivized fishing in Pools 18-19, and a large overlap in areas fished by commercial fishers and our fishing crews.

The effectiveness of using one versus 2+ fishing crews was analyzed using data from 2018 through 2024, which showed that CPUE generally increased with additional fishing crews (Fig. 3). Results from 2020, 2023, and 2024 may be slightly biased because crews of 3 fishermen were generally used when the harvest was the lowest for the year. Comparison of CPUE between crews of 1-4 fishermen across years showed that in 2018, 2019, 2020, 2021, 2022, and 2023 a positive trend generally exists between the number of fishing crews and CPUE, except for 2024 where CPUE was similar among crew numbers throughout the season (Fig. 3).

Total removed weight was the lowest it has been since 2013 at 98,980 lbs (Table 2). We also had the lowest number of invasive carp removed (4,108) in 2024 since 2023 (Table 3). This year was likely affected by both flooding and low water events. Flooding in the summer limited our access to the river, and the low water on the Mississippi River throughout most of the year made it difficult to target areas where invasive carp tend to congregate. It was also difficult to pinpoint areas to target due to waning acoustic tags in the system. More fish will be tagged in 2025, which should help guide us to places to target more effectively. Additionally, the plan to use additional net designs in 2025 may increase the efficiency of catching targeted invasive carp.

Acoustic Monitoring

We monitored acoustically tagged fish through two methods in Pools 14–19: recaptures of acoustically tagged individuals in nets during harvest (Table 10), and Vemco VR100 detections during harvest (Table 11). These data were used to monitor movements of invasive carp to assist in contracted commercial harvest efforts.

Acoustic tag recaptures

We recaptured 17 unique telemetered individuals during our commercial removal efforts in 2024. These recaptured individuals included two Grass Carp, seven Silver Carp, two Bighead Carp, one Silver x Bighead hybrid carp, and three unknown species fish (Table 10). Recaptures occurred in Pools 16-19.

Commercial fishing VR 100 detections

Our Vemco VR100 receiver was equipped with a portable omni-directional hydrophone (Vemco Model VH165) to detect the presence of acoustically tagged fish in areas where commercial removal efforts occurred. In 2024, we had 54 detections among five different species: Bighead Carp, Silver Carp, Grass Carp, Paddlefish, and Bigmouth Buffalo. There were 10 Bighead Carp individuals, 21 Silver Carp individuals, 10 Grass Carp individuals, 4 Paddlefish individuals, 1 Bigmouth Buffalo individual, and 1 unknown species individual detected by the VR100 receiver (Table 11) in Pools 15-19.

SEIcarP/Fishery-Dependent Demographic Data

From 10/15/2024 to 12/18/2024 we captured fish and removed structures for both the SEIcarP model and as part of the Fishery-Dependent Demographic Data project led by the U.S. Fish and Wildlife Service.

A total of 174 Silver Carp, Bighead Carp, and hybrids were captured in Pools 16-19 with the use of gillnets. In Pool 16, 2 Bighead Carp and 21 Silver Carp were captured. In Pool 17, 2 Bighead Carp, 1 hybrid, and 52 Silver Carp were captured. In Pool 18, 16 Silver Carp were captured. In Pool 19, 2 Bighead Carp and 78 Silver Carp were captured. Fish were brought to Lee County Conservation Area or the Illinois River Biological Station to be processed. Processing involved taking lengths and weights of fish, checking sex, weighing gonads, taking a fin clip, and removing otoliths. Otoliths are currently being processed.

Relative Weight of 4 Common Species Caught During Commercial Efforts

Bighead Carp

Bighead Carp relative weight (Wr) slightly increased from 2016 to 2018, held steady from 2018 to 2019, slightly increased from 2019 through 2023, and slightly decreased from 2023 to 2024 (Fig. 4). There was a statistical difference among years shown using an ANOVA ($p \leq 0.001$, $\alpha = 0.05$). A Tukey's test showed a difference between several years (Table 12).

There were low amounts of data associated with bighead carp due to low capture success using gill nets or abundance in these pools. More data are needed to analyze the effects of bighead carp in the UMR.

Silver Carp

Silver carp Wr (Fig. 5) remained stable from 2016 to 2019. From 2019 to 2024 there has been a steady upward trend in relative weight – a likely indicator of reduced Silver Carp populations through harvest of emigration out of the IMZ. An ANOVA ($p \leq 0.001$, $\alpha = 0.05$) revealed there were significant differences in the data and a t-test showed where those differences were (Table 13). The years that were compared that did not have a significant difference from each other were 2016 and 2017, 2016 and 2019, 2017 and 2019, 2018 and 2020, 2021 and 2022, and 2023 and 2024.

Evaluation of harvest activities are important, and we primarily rely on the density dependent effects that regulate Wr. Continued collections are needed to continue to monitor Silver Carp Wr and the effects they have on other species.

Bigmouth Buffalo

Bigmouth Buffalo show relatively stable Wr throughout all years of sampling (Fig. 6). There was a significant difference found in the data with an ANOVA ($p \leq 0.001$, $\alpha = 0.05$), a Tukey's test showed a significant difference between 2016 and 2021, 2016 and 2022, 2017 and 2021, 2017 and 2022, 2017 and 2024, and 2018 and 2021 (Table 14). Additional data from various times throughout future years would aid in monitoring this species' health in the UMR.

Paddlefish

Paddlefish showed a slightly decreasing trend in Wr from 2016 to 2017, an increasing trend from 2017 to 2019, were stable from 2019 to 2021, then increased slightly in 2022 and 2023, while decreasing from 2023 to 2024 when all the Pools were combined (Fig. 7). The ANOVA showed significant differences ($p < 0.001$, $\alpha = 0.05$) between the years and a tukeys test revealed where those differences were (Table 15). Additional data from various times throughout future years would aid in monitoring this species' health in the UMR.

Recommendation:

It is recommended that commercial removal efforts continue to reduce the number of bigheaded carp in Pools 16–19 of the Upper Mississippi River (low-density management zone). It is also recommended that efforts continue to determine the relationship between bigheaded carp and commonly encountered bycatch. This information is important to collect to target bigheaded carp more effectively and efficiently while trying to avoid harming other ecologically and commercially important species.

It is recommended to continue contracting commercial fishermen and increase the number of fishermen per sampling event to increase the total likelihood of bigheaded carp captured. Trying new methods of net deployment such as drift nets and mass capture methods (purse seine/beach seine) is also recommended to increase efficiency during different seasons and water conditions. Having additional acoustically tagged bigheaded carp and real-time receivers can offer greater capture success by identifying where schools of bigheaded carp are daily and providing better population estimates. Use of GPS-enabled tags in 2025 and progress on the predictive harvest model should increase harvest efficiency.

References:

Butler, S. E., A. P. Porreca, S. F. Collins, J. A. Freedman, J. J. Parkos, M. J. Diana, and D. H. Wahl. 2019. Does fish herding enhance catch rates and detection of invasive bigheaded carp? Biological Invasions 21(3):775–785.

Jahn, L. A., and R. V. Anderson. 1986. The Ecology of Pools 19 and 20, Upper Mississippi River: A Community Profile. Biological Report 85(7.6):142.

Koel, T. M. 2001. Classification of Upper Mississippi River Pools Based on Contiguous Aquatic/Geomorphic Habitats. Journal of Freshwater Ecology 16(2):159–170.

Tables and Figures:

Table 1. *Total weight (lbs) of invasive carp removed from Pools 14–19 on the Upper Mississippi River from 2015 through 2024. Invasive carp are broken down by bighead carp (BHCP), silver carp (SVCP), grass carp (GSCP), and bighead x silver carp (Hybrid). Unsorted weight is an accumulated weight of all species weight when there was no ability to sort by species.*

Year	BHCP	SVCP	GSCP	Hybrid	Unsorted	Total
2015	205.9	1,168.1	192.4	0	0	1,566.4
2016	18,800.3	38,274.4	12,488.9	1509.5	0	7,1073.1
2017	15,361.5	32,726.2	19,621.1	405.0	28472.1	95,220.7
2018	26,029.1	98,798.9	49,887.6	482.0	13071.1	188,271.7
2019	24,308.0	90,280.1	53,739.3	613.8	1786.1	170,727.2
2020	13,092.6	120,461.3	35,223.8	421.8	0	169,199.4
2021	15,655.5	116,516.0	75,537.2	915.05	0	208,623.7
2022	9,716.7	67,231.3	60,525.2	1,585.5	0	138,963.5
2023	7,627.6	44,654.9	51,173.3	819.9	0	104,232.6
2024	6,488.1	61,824.3	30,393.3	274.5	0	98,980.1
Totals	137,285.3	671,935.5	388,782.1	43,329.3	43,329.3	**1,246,858.4**

Table 2. *Total weight (kgs) of invasive carp removed from Pools 14–19 on the Upper Mississippi River from 2015 through 2024. Invasive carp are broken down by bighead carp (BHCP), silver carp (SVCP), grass carp (GSCP), and bighead x silver carp (Hybrid). Unsorted weight is an accumulated weight of all species weight when there was no ability to sort by species.*

Year	BHCP	SVCP	GSCP	Hybrid	Unsorted	Total
2015	93.4	529.8	87.3	0.0	0.0	710.4
2016	8,526.2	17,358.0	5,663.9	684.6	0.0	32,232.7
2017	6,966.7	14,841.8	8,898.5	183.7	12,912.5	43,184.0
2018	11,804.6	44,806.8	22,624.8	218.6	5,927.9	85,384.0
2019	11,024.0	40,943.4	24,371.6	278.4	810.0	77,427.3
2020	5,937.7	54,631.0	15,974.5	191.3	0.0	76,734.4
2021	7,100.0	52,841.7	34,257.2	415.0	0.0	94,613.9
2022	4,406.7	30,490.4	27,449.1	719.0	0.0	63,022.0
2023	3,459.3	20,251.7	23,207.9	371.8	0.0	47,271.0
2024	2,942.4	28,038.2	13,783.8	124.5	0.0	44,888.9
Total	65,289.8	346,305.4	183,504.0	3,089.6	19,650.4	**617,177.7**

Table 3. *Total number of invasive carp captured and removed using gill nets in Pools 14–20 of the Upper Mississippi River from 2015 through 2024.*

Year	Pool	Bighead Carp	Silver Carp	Hybrid Carp	Grass Carp	Total
2015	14	0	0	0	0	0
	15	0	0	0	0	0
	16	0	0	0	0	0
	17	1	3	0	0	4
	18	0	6	0	0	6
	19	6	56	0	9	71
	20	3	4	0	0	7
	Total	**10**	**69**	**0**	**9**	**88**
2016	14	0	0	0	0	0
	15	0	0	0	0	0
	16	0	0	0	8	8
	17	22	66	1	54	143
	18	95	136	3	119	353
	19	180	1,781	18	450	2,429
	20	57	255	1	44	357
	Total	**354**	**2,238**	**23**	**675**	**3,290**
2017	14	0	0	0	0	0
	15	0	0	0	0	0
	16	13	33	1	51	98
	17	106	342	3	37	488
	18	19	64	0	14	97
	19	70	395	0	347	812
	20	0	0	0	0	0
	Total	**208**	**834**	**4**	**449**	**1,495**
2018	14	2	0	0	0	2
	15	0	0	0	0	0
	16	64	330	2	127	523
	17	119	531	4	157	811
	18	266	1,061	2	690	2,019
	19	305	3,078	22	1,275	4,680
	20	0	0	0	0	0
	Total	**756**	**5,000**	**30**	**2,249**	**8,035**
2019	14	0	0	0	0	0
	15	2	36	0	4	46
	16	116	364	2	115	597
	17	44	240	1	27	306

	18	372	1,556	5	379	2,313
	19	302	3,637	19	2,113	6,056
	20	0	0	0	0	0
Total		**836**	**5,843**	**27**	**2,638**	**9,318**
	14	0	1	0	0	1
	15	2	8	0	2	12
	16	77	626	2	92	797
2020	17	83	819	2	75	979
	18	65	1,139	4	161	1,369
	19	246	4,582	19	1,546	6,393
	20	0	0	0	0	0
Total		**473**	**7,175**	**27**	**1,876**	**9,551**
	14	0	0	0	0	0
	15	0	4	0	6	10
	16	26	628	3	268	925
2021	17	91	660	7	97	855
	18	60	356	5	147	568
	19	350	4,342	28	3,037	7,757
	20	0	0	0	0	0
Total		**527**	**5,990**	**43**	**3,555**	**10,115**
	14	0	0	0	1	1
	15	5	25	0	2	32
	16	29	306	4	245	584
2022	17	11	341	0	38	390
	18	49	793	12	99	953
	19	188	1,734	35	2,150	4,107
	20	0	0	0	0	0
Total		**282**	**3,199**	**51**	**2,535**	**6,067**
	14	0	0	0	0	0
	15	0	0	0	0	0
	16	9	198	1	86	294
2023	17	2	76	3	36	117
	18	55	479	6	207	747
	19	152	1113	28	1813	3126
	20	0	0	0	0	0
Total		**218**	**1,866**	**38**	**2,142**	**4,264**
	14	1	2	0	0	3
	15	0	4	0	0	4
	16	19	450	0	139	608
2024	17	25	376	0	76	477
	18	35	1238	3	170	1446
	19	76	702	9	783	1570
	20	0	0	0	0	0

Total	**156**	**2772**	**12**	**1168**	**4108**
Total	**3820**	**34986**	**255**	**17296**	**56357**

Table 4. *Total number of bycatch species captured using gill nets during contracted commercial removal of invasive carp in Pools 14–20 of the Upper Mississippi River from 2015 through 2024.*

Family/Species	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Acipenseridae											
Lake Sturgeon			1	1		3	4	3	1	2	15
Shovelnose Sturgeon				1	2		2				5
Amiidae											
Bowfin		7	3	16	6	15	5	9	10	15	86
Catostomidae											
Bigmouth Buffalo	79	868	2,151	2,443	1,986	2,473	4,274	4,195	2,892	1,708	23,069
Black Buffalo		262	1,023	959	859	1,310	1,380	822	935	726	8,276
Golden Redhorse				1							1
Quillback		23	2		7	3		1			36
River Carpsucker	16	95	67	144	82	50	125	179	99	64	921
River Redhorse				1							1
Shorthead Redhorse		2			2				1		5
Smallmouth Buffalo	19	312	3,249	1,186	974	2,512	2,959	3,425	1,844	1,225	17,705
White Sucker									1		1
Centrarchidae											
Black Crappie				1	4	2		2			9
Bluegill					2		1		1		4
Largemouth Bass	1	5	1	7	11	7	2	8	2	18	62
Smallmouth Bass					1	2	1	1			5
White Crappie		1	6	3	2		2	1	1		16
Clupeidae											
Gizzard Shad	4	8	11	12	8	6	9	17		8	83
Cyprinidae											
Common Carp	83	1,602	2,279	3,822	3,965	3,460	3,012	4,600	3,730	1,765	28,318
Goldfish			1		2	2	1	7	1	1	15
Hiodontidae											
Mooneye			3	13	13	1	9	4	1		44
Goldeye									1		1

Ictaluridae											
Brown Bullhead						1					1
Channel Catfish	1	61	34	102	92	72	149	175	219	73	978
Flathead Catfish		4	48	145	90	89	58	57	58	63	612
Lepisosteidae											
Longnose Gar	21	32	29	124	111	138	135	102	108	93	893
Shortnose Gar	37	35	29	109	179	267	151	305	189	196	1,497
Spotted Gar										1	1
Moronidae											
Striped x White Bass	1		2	24	52	26	1		18	2	126
White Bass	1	5	3	7	3	1			1	6	27
Sciaenidae											
Freshwater Drum	68	328	814	1,847	3,108	2,613	2,396	2,950	2,274	1,473	17,871
Esocidae											
Northern Pike		18	28	65	67	29	67	24	26	28	352
Muskellunge										1	1
Polyodontidae											
Paddlefish	5	1,064	2,078	2,993	2,088	1313	2,671	1,769	1,188	1,699	16,868
Percidae											
Sauger			1	3	7		6	1	4	1	23
Walleye	3	1	1	21	14	14	80	7	11	5	157
Total	339	4,718	11,864	14,050	13,737	14,414	17,505	18,664	13,616	13,498	122,405

Table 5. *Total gill netting effort for removed invasive carp (IC) in Pools 14–19 of the Upper Mississippi River in 2021. Invasive carp are broken down by bighead carp (BHCP), silver carp (SVCP), grass carp (GSCP), and bighead x silver carp (*SCBC*). Unsorted weight is an accumulated weight of all species weight when there was not an ability to sort by species.*

2021	Pool 19	Pool 18	Pool 17	Pool 16	Pool 15	Pool 14	Total
Netting Effort							
Total Yards of Net	242,290	49,610	52,970	68,500	7,240	10,830	431,440
Catch Effort (Removed)							
Total IC (N)	7,757	568	855	925	10	0	10,115
Total IC Weight (kg)	74,490	3,714	8,261	8,057	90	0	94,613
Average IC Weight (kg)	9.6	6.5	9.7	8.7	9	0	9.3
Total Unsorted IC Weight (kg)	0	0	0	0	0	0	0
Total BHCP (N)	350	60	91	26	0	0	527
Total BHCP Weight (kg)	4,510	735	1,512	343	0	0	8,000
Average BHCP Weight (kg)	12.9	12.3	16.6	13.2	0	0	15.2
Total SVCP (N)	4,342	356	660	628	4	0	5,990
Total SVCP Weight (kg)	39,523	2,182	5,804	5,305	28	0	52,842
Average SVCP Weight (kg)	9.1	6.1	8.8	8.4	7	0	8.8
Total SCBC (N)	28	5	7	3	0	0	27
Total SCBC Weight (kg)	322	51	72	17	0	0	415
Average SCBC Weight (kg)	11.5	10.2	10.3	5.6	0	0	10.5
Total GSCP (N)	3,037	147	97	268	6	0	3,555
Total GSCP Weight (kg)	30,135	747	909	2,404	62	0	34,257
Average GSCP Weight (kg)	9.9	5.1	9.4	9.0	10.3	0	9.6
Catch per unit of effort							
CPUE (BHCP/100 yds of net)	0.14	.12	0.17	0.04	0	0	0.12
CPUE (SVCP/100 yds of net)	1.8	.71	1.26	.92	0.05	0	1.4
CPUE (SCBC/100 yds of net)	0.01	0.01	0.01	0.013	.004	0	.01
CPUE (GSCP/100 yds of net)	1.25	.3	.2	.4	.08	0	.82
CPUE (Total/100 yds of net)	3.2	1.1	1.6	1.3	0.14	0	2.34

Table 6. *Total gill netting effort for removed invasive carp (IC) in Pools 13–19 of the Upper Mississippi River in 2022. Invasive carp are broken down by bighead carp (BHCP), silver carp (SVCP), grass carp (GSCP), and bighead x silver carp (*SCBC*). Unsorted weight is an accumulated weight of all species weight when there was not an ability to sort by species.*

2022	Pool 19	Pool 18	Pool 17	Pool 16	Pool 15	Pool 14	Pool 13	Total
Netting Effort								
Total Yards of Net	167,250	44,300	43,200	49,400	5,900	10,350	3,650	324,050
Catch Effort (Removed)								
Total IC (N)	4,107	953	390	584	32	1	0	6,067
Total IC Weight (kg)	43,260	9,923	4,150	5,409	313	8.2	0	63,063
Average IC Weight (kg)	10.5	10.4	10.6	9.3	9.8	0	0	10.4
Total Unsorted IC Weight (kg)	0	0	0	0	0	0	0	0
Total BHCP (N)	188	49	11	29	5	0	0	282
Total BHCP Weight (kg)	2,887	847	182	408	82	0	0	4,407
Average BHCP Weight (kg)	16.6	15.4	17.3	16.5	16.4	0	0	15.6
Total SVCP (N)	1,734	793	341	306	25	0	0	3,199
Total SVCP Weight (kg)	15,935	7,989	3,557	2,788	212	0	0	30,482
Average SVCP Weight (kg)	9.2	10.1	10.4	9.1	8.5	0	0	9.5
Total SCBC (N)	35	12	2	4	0	0	0	53
Total SCBC Weight (kg)	506	130	37	47	0	0	0	719
Average SCBC Weight (kg)	35	12	18.5	14.4	0	0	0	14.1
Total GSCP (N)	2,150	99	38	245	1	1	0	2,535
Total GSCP Weight (kg)	23,931	957	374	2,166	18	8.2	0	27,455
Average GSCP Weight (kg)	11.1	9.6	9.8	8.8	9	8.2	0	10.8
Catch per unit of effort								
CPUE (BHCP/100 yds of net)	0.11	0.11	0.03	0.06	0.08	0.00	0.00	0.09
CPUE (SVCP/100 yds of net)	1.04	1.79	0.79	0.62	0.42	0.00	0.00	0.99
CPUE (SCBC/100 yds of net)	0.02	0.03	0.00	0.01	0.00	0.00	0.00	0.02
CPUE (GSCP/100 yds of net)	1.29	0.22	0.09	0.50	0.02	0.01	0.00	0.78
CPUE (Total/100 yds of net)	2.46	2.15	0.90	1.18	0.54	0.01	0.00	1.87

Table 7. *Total gill netting effort for removed invasive carp (IC) in Pools 13–19 of the Upper Mississippi River in 2023. Invasive carp are broken down by bighead carp (BHCP), silver carp (SVCP), grass carp (GSCP), and bighead x silver carp (*SCBC*). Unsorted weight is an accumulated weight of all species weight when there was not an ability to sort by species.*

2023	Pool 19	Pool 18	Pool 17	Pool 16	Pool 15	Pool 14	Pool 13	Total
Netting Effort								
Total Yards of Net	165,100	56,250	30,950	46,650	4,450	12,450	2,650	318,500
Catch Effort (Removed)								
Total IC (N)	3,106	747	117	294	0	0	0	4,264
Total IC Weight (kg)	35,104	8,175	1,271	2,740	0	0	0	47,290
Average IC Weight (kg)	11.3	10.9	10.9	9.3	0.0	0.0	0.0	11.1
Total Unsorted IC Weight (kg)	0	0	0	0	0	0	0	0
Total BHCP (N)	152	55	2	9	0	0	0	218
Total BHCP Weight (kg)	2,393	864	10	191	0	0	0	3458
Average BHCP Weight (kg)	15.7	15.7	5.0	21.2	0.0	0.0	0.0	15.9
Total SVCP (N)	1,113	479	76	198	0	0	0	1,866
Total SVCP Weight (kg)	12,343	5,145	933	1,831	0	0	0	20,252
Average SVCP Weight (kg)	11.1	10.7	12.3	9.2	0.0	0.0	0.0	10.9
Total SCBC (N)	28	6	3	1	0	0	0	38
Total SCBC Weight (kg)	247	85	16	24	0	0		372
Average SCBC Weight (kg)	8.8	14.2	5.3	24.0	0.0	0.0	0.0	9.8
Total GSCP (N)	1,813	207	36	86	0	0	0	2,142
Total GSCP Weight (kg)	20,121	2,080	312	694	0	0	0	23,207
Average GSCP Weight (kg)	11.1	10.0	8.7	8.1	0.0	0.0	0.0	10.8
Catch per unit of effort								
CPUE (BHCP/100 yds of net)	0.09	0.10	0.01	0.02	0.00	0.00	0.00	0.07
CPUE (SVCP/100 yds of net)	0.67	0.85	0.25	0.42	0.00	0.00	0.00	0.59
CPUE (SCBC /100 yds of net)	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.01
CPUE (GSCP/100 yds of net)	1.10	0.37	0.12	0.18	0.00	0.00	0.00	0.67
CPUE (Total/100 yds of net)	1.88	1.33	0.38	0.63	0.00	0.00	0.00	1.34

Table 8. *Total gill netting effort for removed invasive carp (IC) in Pools 14–19 of the Upper Mississippi River in 2024. Invasive carp are broken down by bighead carp (BHCP), silver carp (SVCP), grass carp (GSCP), and bighead x silver carp (*SCBC*). Unsorted weight is an accumulated weight of all species weight when there was not an ability to sort by species.*

2024	Pool 19	Pool 18	Pool 17	Pool 16	Pool 15	Pool 14	Total
Netting Effort							
Total Yards of Net	123,940	57,610	69,180	77,410	5,090	4,080	337,310
Catch Effort (Removed)							
Total IC (N)	1,570	1,446	477	608	4	3	4,108
Total IC Weight (kg)	18,652	14,701	5,355	6,095	46	40	44,889
Average IC Weight (kg)	11.9	10.2	11.2	10.0	11.4	13.4	10.9
Total Unsorted IC Weight (kg)	0	0	0	0	0	0	0
Total BHCP (N)	76	35	25	19	0	1	156
Total BHCP Weight (kg)	1,562	581	479	307	0	13	2,942
Average BHCP Weight (kg)	20.6	16.6	19.2	16.2	0	13.0	18.9
Total SVCP (N)	702	1,238	376	450	4	2	2,772
Total SVCP Weight (kg)	7,698	12,223	3,776	4,269	46	27	28,038
Average SVCP Weight (kg)	11.0	9.9	10.0	9.5	11.5	13.5	10.1
Total SCBC (N)	9	3	0	0	0	0	12
Total SCBC Weight (kg)	63	39	0	0	0	0	102
Average SCBC Weight (kg)	7.0	13.0	0	0	0	0	8.5
Total GSCP (N)	783	170	76	139	0	0	1,168
Total GSCP Weight (kg)	9,329	1,858	1,089	1,508	0	0	13,784
Average GSCP Weight (kg)	11.9	10.9	14.3	10.8	0	0	11.8
Catch per unit of effort							
CPUE (BHCP/100 yds of net)	1.26	1.01	0.69	0.40	0.00	0.32	0.87
CPUE (SVCP/100 yds of net)	0.57	2.15	0.54	0.58	0.08	0.05	0.82
CPUE (SCBC /100 yds of net)	0.01	0.01	0.00	0.00	0.00	0.00	0.00
CPUE (GSCP/100 yds of net)	0.63	0.30	0.11	0.18	0.00	0.00	0.35
CPUE (Total/100 yds of net)	1.27	2.51	0.69	0.79	0.08	0.07	1.22

Table 9. *Invasive carp tagged, translocated, and released from Pools 16-19 of the Mississippi River in 2021 -2024. Invasive carp are broken down by bighead carp (BHCP), silver carp (SVCP), grass carp (GSCP), and bighead x silver carp (*SCBC*).*

Year	Species	Number Tagged	Number Translocated	Weight (kg)
2021	SVCP	274	274	2,629
	BHCP	63	63	882
	GSCP	55	55	533
	Total	392	392	4,044
2022	SVCP	304	84	3,160
	BHCP	41	5	682
	GSCP	96	96	1,102
	SCBC	11	0	110
	Total	452	185	5,054
2023	SVCP	264	264	3,031
	BHCP	39	19	632
	GSCP	119	99	1,369
	Total	422	382	5,032
2024	SVCP	45	45	523
	BHCP	9	8	156
	GSCP	91	42	1,173
	Total	145	95	1,852
Total		1,411	976	15,982

Table 10. *Number of tagged fish captured from commercial removal efforts in Pools 16–19 in the Upper Mississippi River from 2021 through 2024.*

USFWS/USGS Acoustically Tagged Fish Recaptures												
Year	**2021**			**2022**		**2023**			**2024**			
Pool	**16**	**17**	**19**	**16**	**17**	**16**	**17**	**18**	**16**	**17**	**18**	**19**
BHCP	2	1	2	1	0	0	1	1	1	2	0	0
BMBF	3	0	0	0	0	1	0	0	1	0	0	0
GSCP	0	0	0	0	0	0	0	0	0	0	0	2
SCBC	1	0	0	0	0	0	0	0	0	0	1	0
SVCP	1	0	0	1	7	1	1	4	2	0	4	1
Unknown	0	0	0	0	0	0	0	0	0	1	1	1
Total Captures	7	1	2	2	7	2	2	5	4	3	6	4

Table 11. *Number of fish detections from the VR100 receiver during commercial removal efforts in Pools 15–19 in the Upper Mississippi River from 2021 through 2024.*

VR100 Detections																			
Year	**2021**					**2022**					**2023**				**2024**				
Pool	**15**	**16**	**17**	**18**	**19**	**15**	**16**	**17**	**18**	**19**	**16**	**17**	**18**	**19**	**15**	**16**	**17**	**18**	**19**
BHCP	0	1	1	2	5	0	1	2	2	1	0	1	1	0	0	2	6	0	2
BMBF	3	36	2	0	3	3	19	1	0	3	1	0	0	1	1	0	0	0	0
GSCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
PDFH	0	7	0	0	0	0	4	1	0	1	0	0	0	0	0	2	1	0	1
SCBC	0	2	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
SVCP	1	13	4	8	9	4	14	4	19	5	0	6	2	1	0	6	16	2	3
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Total Detections	4	59	7	11	17	7	38	8	22	10	1	7	4	2	1	10	25	2	16

Table 12. *Bighead Carp relative weight (Wr) comparison by year in pools 16-19 of the Mississippi River from 2016-2024*

Year	diff	lwr	upr	p. adj
2017-2016	1.3332113	-2.9116596	5.578082	0.987902
2018-2016	3.0028274	-1.5266875	7.532342	0.50061
2019-2016	2.1329556	-2.9069827	7.172894	0.926597
2020-2016	5.2248662	-11.760261	22.20999	0.989444
2021-2016	8.3145296	3.5718726	13.05719	2.3E-06
2022-2016	11.81982	6.68918	16.95046	0
2023-2016	21.141483	12.877304	29.40566	0
2024-2016	19.560549	8.9145567	30.20654	5E-07
2018-2017	1.6696161	-3.0261299	6.365362	0.973408
2019-2017	0.7997443	-4.3901019	5.98959	0.999928
2020-2017	3.8916549	-13.138556	20.92187	0.99865
2021-2017	6.9813183	2.0796532	11.88298	0.000364
2022-2017	10.486609	5.2086363	15.76458	0
2023-2017	19.808272	11.451826	28.16472	0
2024-2017	18.227337	7.5095638	28.94511	5.6E-06
2019-2018	-0.869872	-6.2950059	4.555262	0.999903
2020-2018	2.2220388	-14.881342	19.32542	0.999981
2021-2018	5.3117022	0.1615665	10.46184	0.037275
2022-2018	8.8169925	3.3074945	14.32649	2.75E-05
2023-2018	18.138656	9.6340825	26.64323	0
2024-2018	16.557721	5.7240586	27.39138	8.19E-05
2020-2019	3.0919106	-14.153672	20.33749	0.999774
2021-2019	6.181574	0.5772569	11.78589	0.01822
2022-2019	9.6868643	3.7506163	15.62311	1.68E-05
2023-2019	19.008528	10.221478	27.79558	0
2024-2019	17.427593	6.3707979	28.48439	3.99E-05
2021-2020	3.0896634	-14.071395	20.25072	0.999766
2022-2020	6.5949537	-10.677354	23.86726	0.95914
2023-2020	15.916617	-2.5307623	34.364	0.155344
2024-2020	14.335682	-5.2945567	33.96592	0.361054
2022-2021	3.5052903	-2.1807327	9.191313	0.602059
2023-2021	12.826954	4.2069735	21.44693	0.000148
2024-2021	11.246019	0.3215266	22.17051	0.037971
2023-2022	9.3216635	0.4822783	18.16105	0.029766
2024-2022	7.7407287	-3.3577039	18.83916	0.42713
2024-2023	-1.580935	-14.431943	11.27007	0.999987

Table 13. *Silver Carp relative weight (Wr) comparison by year in pools 16-19 of the Mississippi River from 2016-2024*

Year	diff	lwr	upr	p. adj
2017-2016	0.94856795	-0.8190055	2.716141	0.7678831
2018-2016	4.18302277	2.3345264	6.031519	0
2019-2016	0.8590702	-1.3267043	3.044845	0.9524323
2020-2016	5.65467861	1.567932	9.741425	0.0006047
2021-2016	13.68866909	11.7155191	15.661819	0
2022-2016	13.23890112	10.2970346	16.180768	0
2023-2016	19.7078182	15.0173813	24.398255	0
2024-2016	24.2079653	20.0483035	28.367627	0
2018-2017	3.23445482	1.3151561	5.153753	0.0000063
2019-2017	-0.08949775	-2.3354672	2.156472	1
2020-2017	4.70611066	0.5868551	8.825366	0.0118397
2021-2017	12.74010114	10.7004714	14.779731	0
2022-2017	12.29033317	9.3034708	15.277196	0
2023-2017	18.75925025	14.0404616	23.478039	0
2024-2017	23.25939735	19.0677921	27.451003	0
2019-2018	-3.32395257	-5.6341478	-1.013757	0.0002806
2020-2018	1.47165584	-2.6829668	5.626278	0.9745037
2021-2018	9.50564632	7.3955012	11.615791	0
2022-2018	9.05587835	6.0204261	12.091331	0
2023-2018	15.52479543	10.7751018	20.274489	0
2024-2018	20.02494253	15.7985756	24.25131	0
2020-2019	4.79560841	0.4803378	9.110879	0.0165713
2021-2019	12.82959889	10.4185029	15.240695	0
2022-2019	12.37983092	9.1279635	15.631698	0
2023-2019	18.848748	13.9579136	23.739582	0
2024-2019	23.3488951	18.9645081	27.733282	0
2021-2020	8.03399048	3.8224265	12.245554	0.0000001
2022-2020	7.58422251	2.8409611	12.327484	0.0000254
2023-2020	14.0531396	8.0661413	20.040138	0
2024-2020	18.5532867	12.9723605	24.134213	0
2022-2021	-0.44976797	-3.562701	2.663165	0.9999572
2023-2021	6.01914911	1.2195688	10.818729	0.0032364
2024-2021	10.51929621	6.2369418	14.801651	0
2023-2022	6.46891708	1.1966093	11.741225	0.004494
2024-2022	10.96906418	6.1628372	15.775291	0
2024-2023	4.5001471	-1.5368585	10.537153	0.3342051

Table 14. *Bigmouth buffalo relative weight (Wr) comparison by year in pools 16-19 of the Mississippi River from 2016-2024*

Year	diff	lwr	upr	p. adj
2017-2016	-1.19138427	-4.59505914	2.212291	0.9761453
2018-2016	0.90225194	-2.31060434	4.115108	0.9943457
2019-2016	1.92147268	-1.31983727	5.162783	0.6546322
2020-2016	0.24823569	-7.82912046	8.325592	1
2021-2016	3.82865497	0.87644317	6.780867	0.0019198
2022-2016	3.92168885	0.40566278	7.437715	0.0159205
2023-2016	1.43554919	-4.08924585	6.960344	0.9966918
2024-2016	4.43012742	-1.01665046	9.876905	0.2201096
2018-2017	2.0936362	-1.27727088	5.464543	0.5936846
2019-2017	3.11285694	-0.28518061	6.510894	0.1033112
2020-2017	1.43961996	-6.70189412	9.581134	0.9997992
2021-2017	5.02003923	1.89655983	8.143519	0.0000232
2022-2017	5.11307311	1.45206118	8.774085	0.0005158
2023-2017	2.62693346	-2.99124501	8.245112	0.877188
2024-2017	5.62151168	0.08003549	11.162988	0.0437214
2019-2018	1.01922074	-2.1876628	4.226104	0.9870949
2020-2018	-0.65401624	-8.71761931	7.409587	0.9999995
2021-2018	2.92640303	0.01203064	5.840775	0.0481318
2022-2018	3.01943691	-0.46487812	6.503752	0.1515494
2023-2018	0.53329726	-4.97137096	6.037965	0.9999981
2024-2018	3.52787548	-1.89848621	8.954237	0.5301329
2020-2019	-1.67323698	-9.74821928	6.401745	0.9993475
2021-2019	1.90718229	-1.03852834	4.852893	0.5360216
2022-2019	2.00021617	-1.510353	5.510785	0.7025332
2023-2019	-0.48592348	-6.00724731	5.0354	0.9999991
2024-2019	2.50865474	-2.93460218	7.951912	0.8858315
2021-2020	3.58041927	-4.38292195	11.54376	0.8994893
2022-2020	3.67345315	-4.51566696	11.862573	0.9006908
2023-2020	1.1873135	-8.04429574	10.418923	0.9999824
2024-2020	4.18189172	-5.00323964	13.367023	0.8927398
2022-2021	0.09303388	-3.1525108	3.338579	1
2023-2021	-2.39310577	-7.74982876	2.963617	0.9027911
2024-2021	0.60147245	-4.67474876	5.877694	0.9999931
2023-2022	-2.48613965	-8.17308664	3.200807	0.913329
2024-2022	0.50843857	-5.10274625	6.119623	0.9999989
2024-2023	2.99457822	-4.05143597	10.040592	0.9255924

Table 15. *Paddlefish relative weight (Wr) comparison by year in pools 14-19 of the Mississippi River from 2016-2024*

Year	diff	lwr	upr	p. adj
2017-2016	-6.38627994	-11.5380788	-1.234481	0.0038841
2018-2016	6.94690572	2.7708512	11.1229602	0.0000093
2019-2016	9.54055683	5.718653	13.3624606	0
2020-2016	7.56118245	-14.8059595	29.9283244	0.9808625
2021-2016	6.943406803	2.7031844	11.1836292	0.0000142
2022-2016	18.48025803	14.8386855	22.1218306	0
2023-2016	13.751553	9.4676476	18.0354584	0
2024-2016	4.670660128	-2.8042449	12.1455652	0.5857552
2018-2017	13.33318566	8.1574345	18.5089368	0
2019-2017	15.92683677	11.0323585	20.821315	0
2020-2017	13.94746239	-8.6277011	36.5226259	0.6010679
2021-2017	13.32968674	8.1020243	18.5573492	0
2022-2017	24.86653797	20.1115386	29.6215374	0
2023-2017	20.13783294	14.8746767	25.4009892	0
2024-2017	11.05694007	2.9808535	19.1330266	0.0007458
2019-2018	2.593651111	-1.2604787	6.4477809	0.4808235
2020-2018	0.614276731	-21.7583942	22.9869477	1
2021-2018	-0.003498916	-4.2727909	4.265793	1
2022-2018	11.53335231	7.8579723	15.2087323	0
2023-2018	6.804647285	2.4919668	11.1173278	0.0000363
2024-2018	-2.276245592	-9.7676789	5.2151877	0.9904155
2020-2019	-1.97937438	-24.2886532	20.3299045	0.999999
2021-2019	-2.597150027	-6.5207162	1.3264161	0.5046642
2022-2019	8.939701199	5.6722961	12.2071063	0
2023-2019	4.210996174	0.2402619	8.1817304	0.0279917
2024-2019	-4.869896703	-12.1698344	2.430041	0.4934308
2021-2020	-0.617775647	-23.0025129	21.7669616	1
2022-2020	10.91907558	-11.3600183	33.1981695	0.8455579
2023-2020	6.190370554	-16.2026824	28.5834235	0.9949334
2024-2020	-2.890522322	-26.1062752	20.3252305	0.9999863
2022-2021	11.53685123	7.7887219	15.2849805	0
2023-2021	6.808146201	2.4333013	11.1829911	0.0000507
2024-2021	-2.272746675	-9.8001385	5.2546452	0.9908096
2023-2022	-4.728705025	-8.5261822	-0.9312279	0.00363
2024-2022	-13.8095979	-21.0167605	-6.6024353	0.0000001
2024-2023	-9.080892876	-16.6329778	-1.5288079	0.0060331

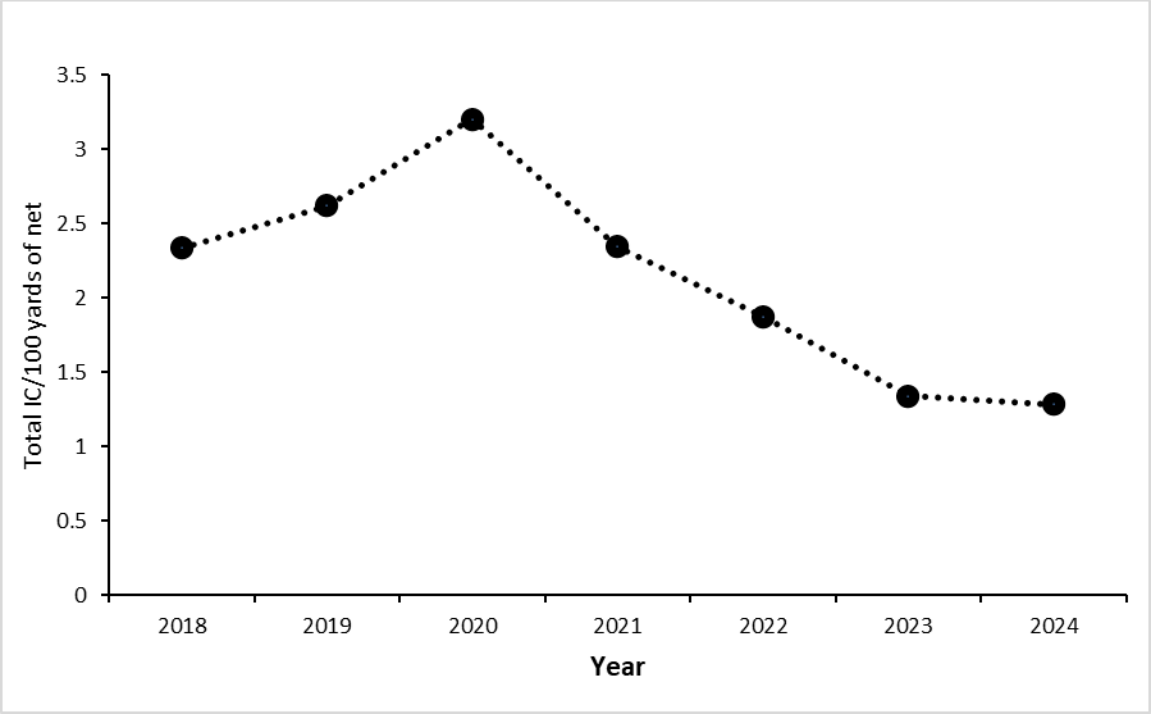

Figure 1. *Total catch per unit effort by year for invasive carp removed by contracted removal from the Upper Mississippi River Pools 14–19 using gill nets from 2018 through 2024.*

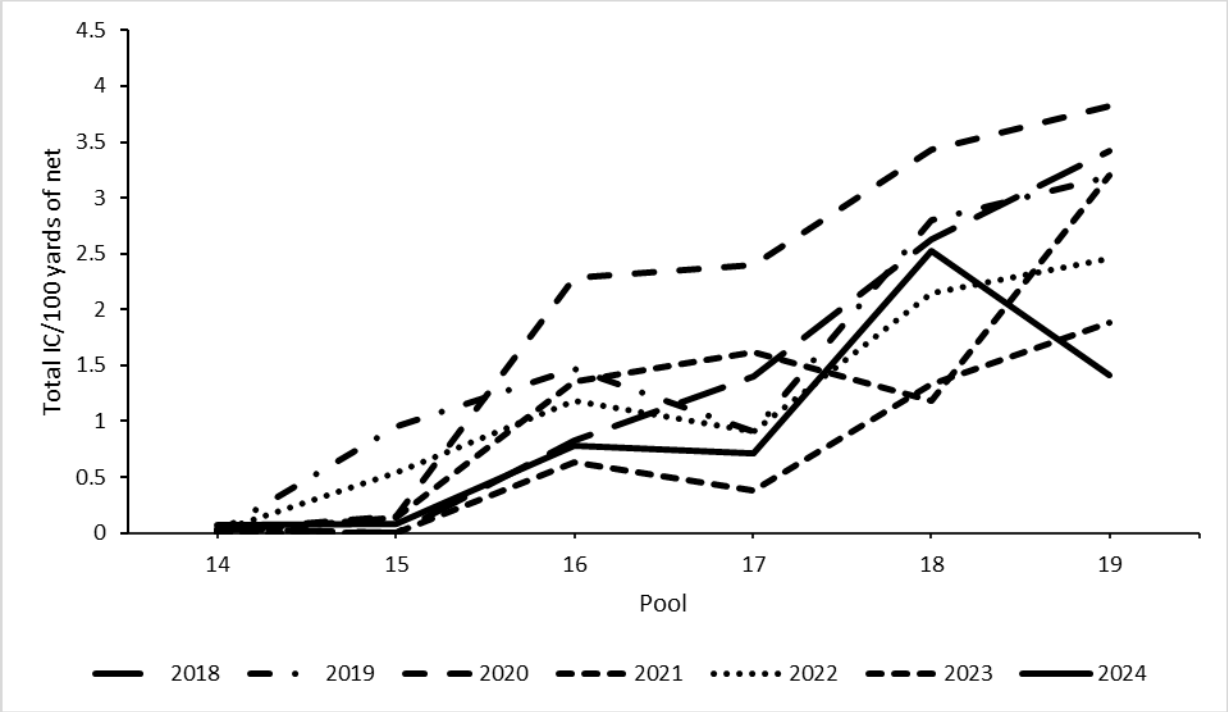

Figure 2. *Catch per unit effort by year and pool in the Upper Mississippi River in pools 14-19 for invasive carp removed during contracted commercial removal using gill nets from 2018 through 2024.*

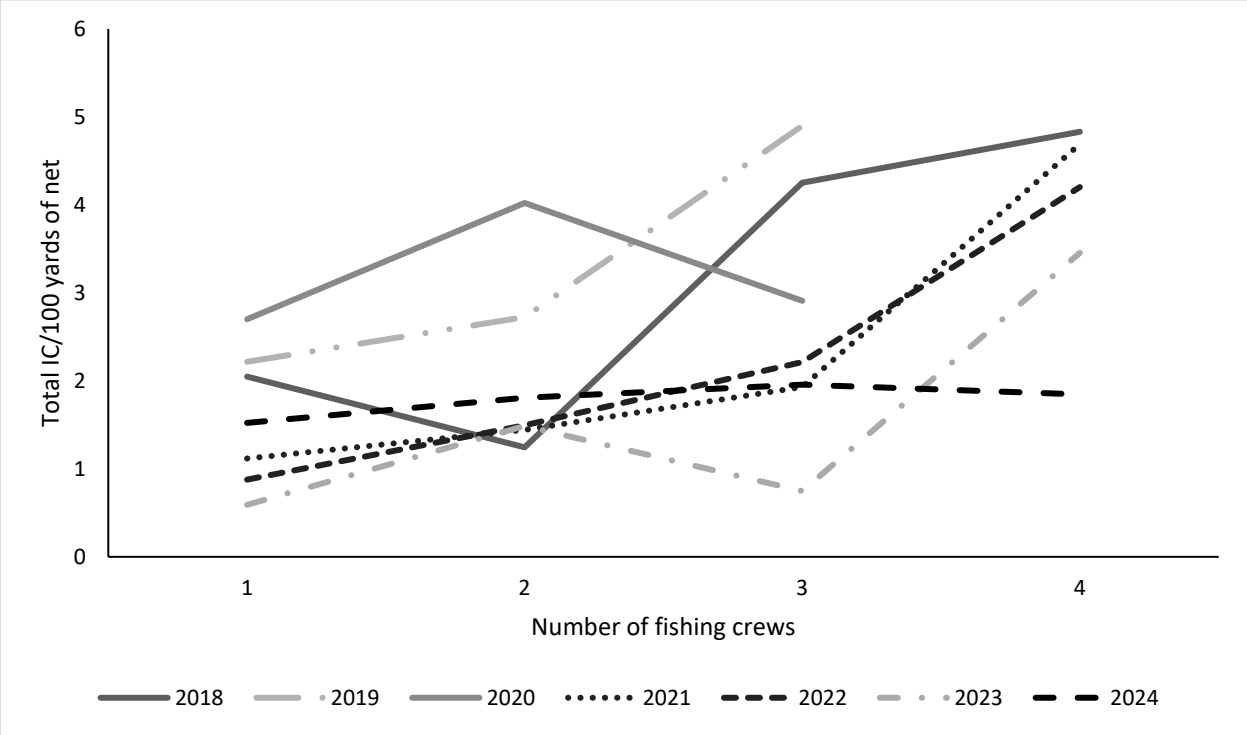

Figure 3. *Catch per unit effort by year and pool in the Upper Mississippi River in pools 14-19 for invasive carp removed during contracted commercial removal using gill nets from 2018 through 2024.*

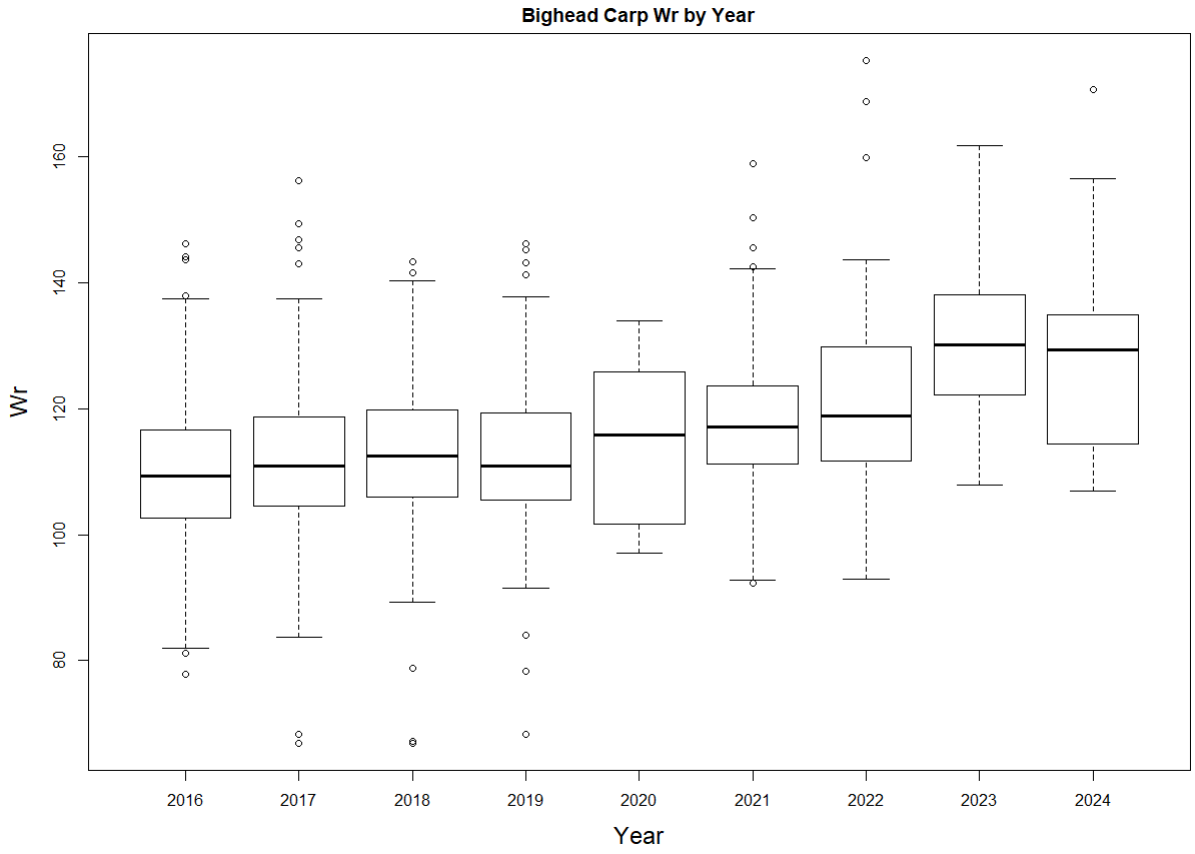

Figure 4. *Bighead Carp relative weight (Wr) by year in Pools 16–20 of the Upper Mississippi River from 2016 through 2024*

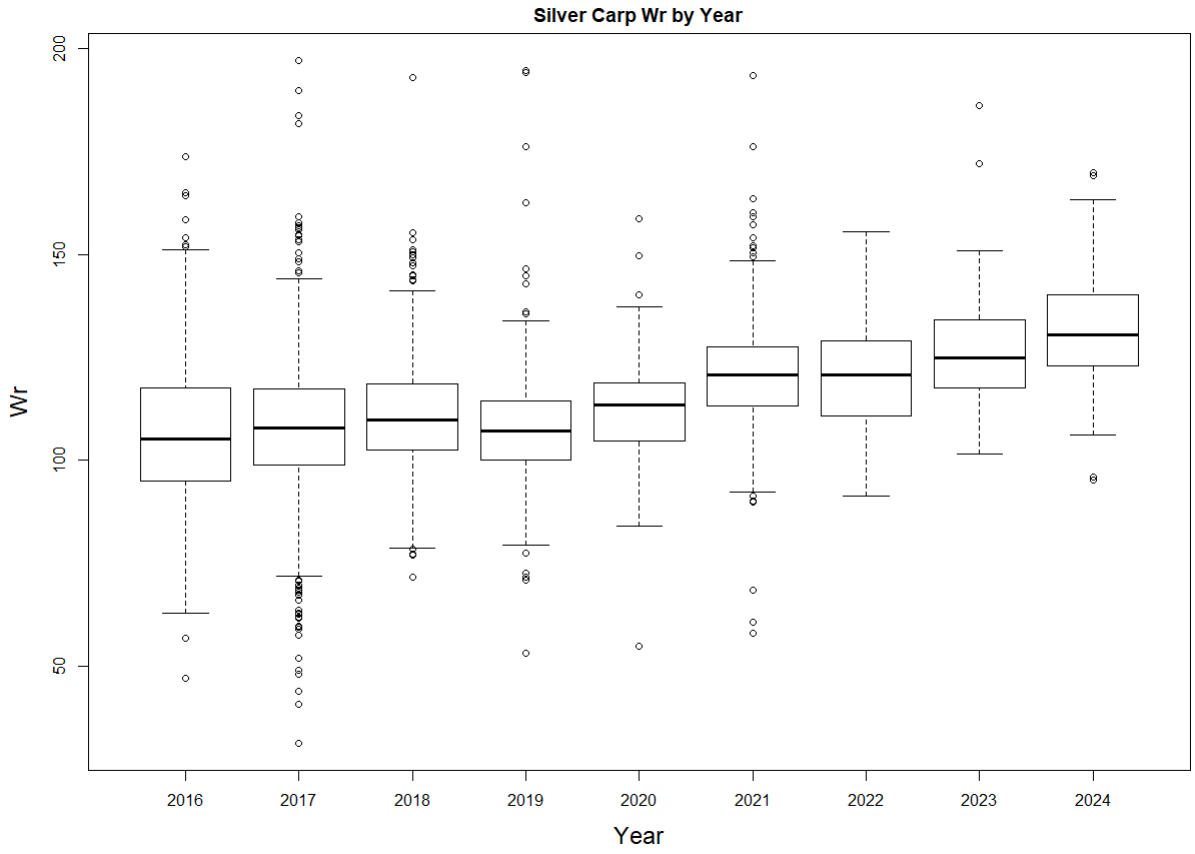

Figure 5. *Silver Carp relative weight (Wr) by year in Pools 16–19 of the Upper Mississippi River from 2016 through 2024*

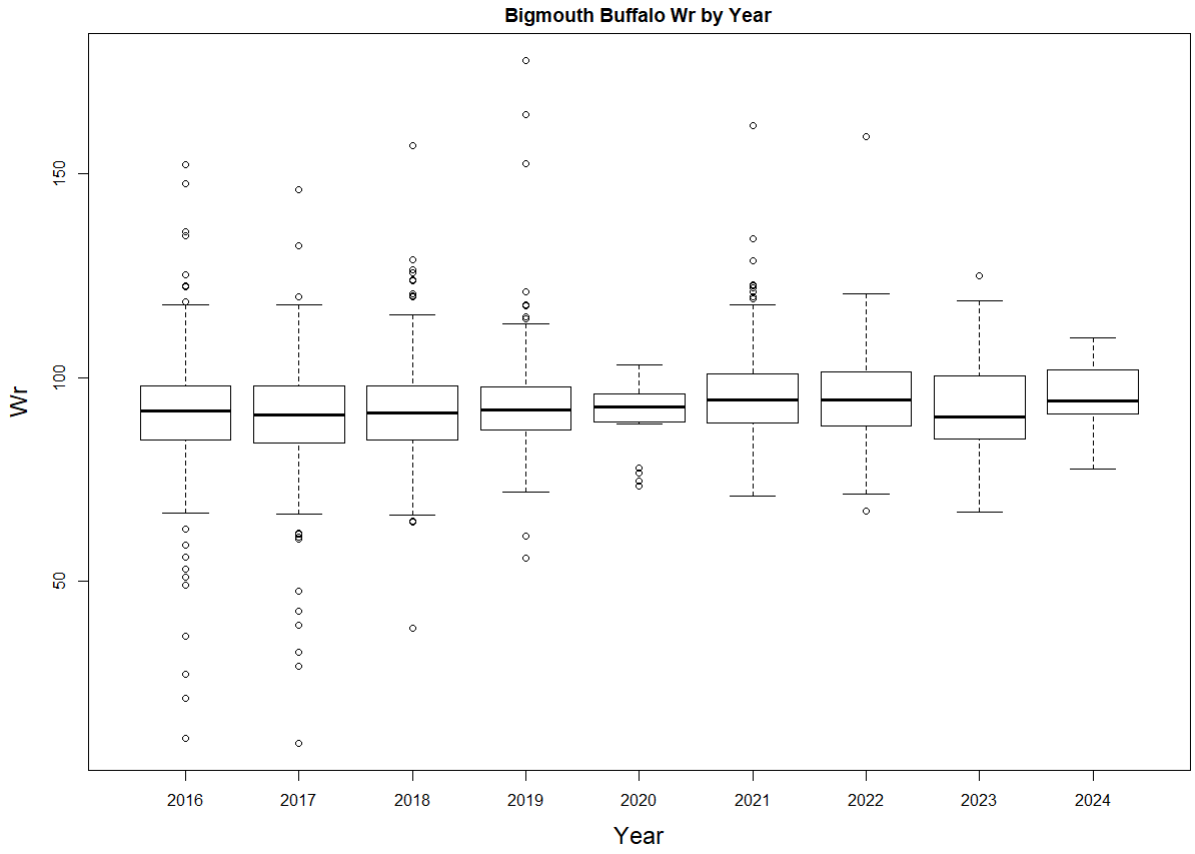

Figure 6. *Bigmouth buffalo relative weight (Wr) by year in Pools 16–19 of the Upper Mississippi River from 2016 through 2024*

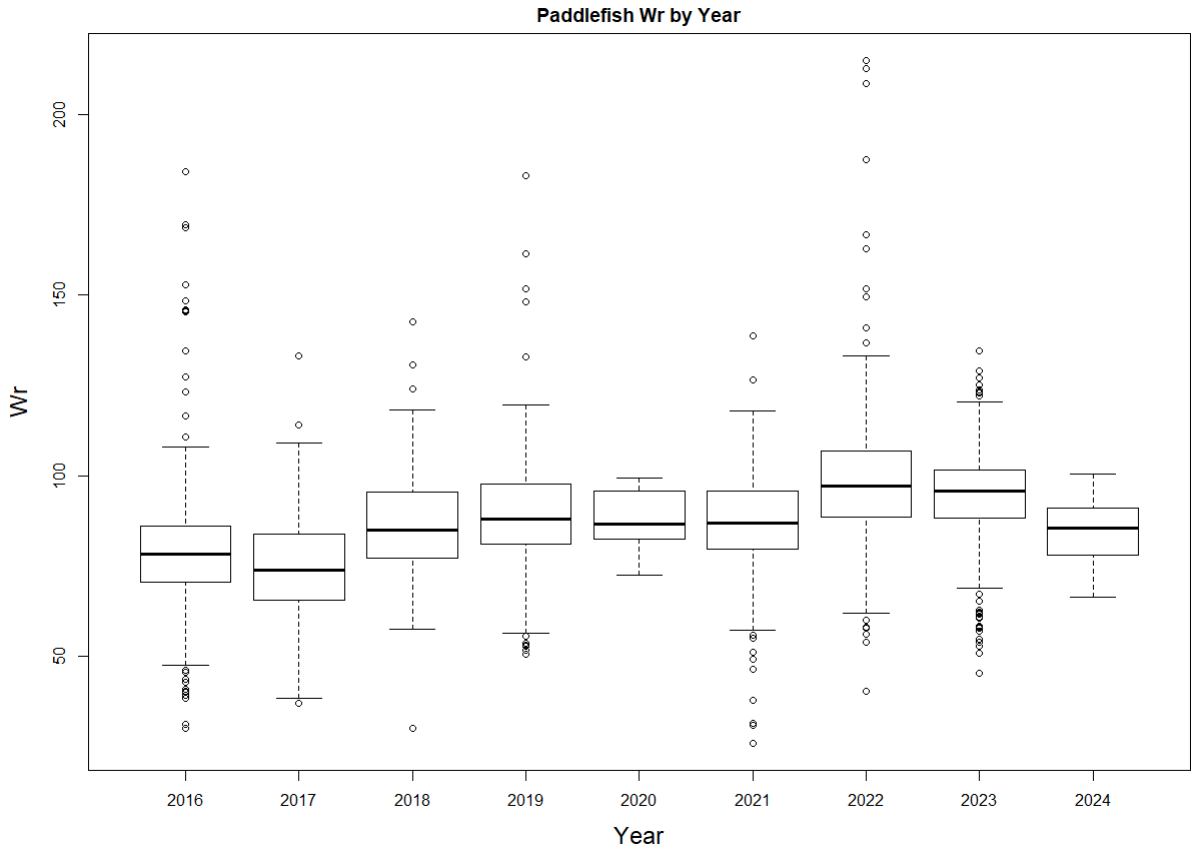

Figure 7. *Paddlefish relative weight (Wr) by year in Pools 14–19 of the Upper Mississippi River from 2016 through 2024*