

## Evaluation of new recreational and commercial regulations on catfish in the Ohio River

### Project Objectives:

1. Determine abundance (CPUE), size structure, and condition of blue, channel, and flathead catfish in the Ohio River, and evaluate the effects of new regulations on blue, channel, and flathead catfish in the Ohio River, particularly trophy-size catfish.
2. Quantify age, growth, and mortality of the three species in each reach, and compare to previous data to determine if any changes have occurred over time.
3. Model the catfish populations and estimate the impacts of harvest (predict how varying length limits may affect the population given the current amount of harvest).

## FINDINGS

### *Trotline Surveys*

During spring and summer 2015, trotlines baited with cut gizzard shad were used to sample blue catfish, channel catfish, and flathead catfish in Meldahl, Cannelton, JT Meyers, and Smithland pools of the Ohio River. One-hundred thirty total trotlines were fished throughout those pools: 36 in Meldahl Pool, 33 in Cannelton Pool, 46 in JT Meyers Pool, and 15 in Smithland Pool (Table 1). CPUE of all species of catfish increased from 2014 sampling ; however, blue catfish and channel catfish catch rates were still lower than their historical averages (3.0 fish/line and 1.4 fish/line, respectively; Table 2). Blue catfish lengths ranged from 11.8 – 52.0 in with a mean length of 25.7 in. Lengths of channel catfish ranged from 11.7 – 27.1 in with a mean length of 19.3 in. Flathead catfish lengths ranged from 14.2 – 29.2 in with a mean length of 21.6 in. Trophy catfish, defined as blue catfish and flathead catfish  $\geq 35.0$  in and channel catfish  $\geq 28.0$  in, accounted for 4.8% of the total catfish catch (up from 4.5% in 2014 and 1.2% in 2013). No trophy channel catfish or flathead catfish were collected (Table 3). Catch rates for different size groups of each species of catfish were also examined. Catch rates of all size groups for all species have remained fairly consistent and stable since 2012 (Table 4).

### *Hoop Net Surveys*

Ride-alongs with commercial hoop net anglers were conducted in the JT Meyers pool and Department hoop netting was conducted in the Meldahl and Cannelton pools to gather data from hoop net catch of blue catfish, channel catfish, and flathead catfish. Unbaited, single nets were set overnight for up to three consecutive net nights in the main stem of the river by both commercial anglers and KDFWR. Due to time constraints, only data on blue catfish and flathead catfish were collected during commercial ride-alongs. A total of 183 hoop nets were set for a total of 414 net-nights; 150 in Meldahl Pool, 120 in Cannelton Pool, and 144 in JT Meyers Pool (Table 5). Blue catfish mean CPUE was  $<0.1$  fish/net-night and was below historical average hoop net catch (0.3 fish/net-night) in all pools except JT Meyers (Table 6). Blue catfish lengths across sampled pools ranged from 17.3 – 42.5 in with a mean length of 28.7 in (up from 23.7 in in 2014 and from 28.0 in in 2013). Only one blue catfish was collected in the Meldahl Pool and the Cannelton Pool and both were trophy blue catfish. Seven trophy blue catfish were collected in the JT Meyers Pool and this represented 8.6% of the blue catfish catch (Table 7). Channel catfish lengths ranged from 10.3 – 25.9 in with a mean length of 18.1 in. Flathead catfish CPUE decreased from 2.6 fish/net-night in 2013 to 0.9 fish/net-night in 2014 and 0.5 fish/net-night in 2015, which was below historical average hoop net catch (1.3 fish/net-night; Table 6). Flathead catfish lengths ranged from 9.0 – 46.1 in with a mean length of 23.2 in, which is similar to the mean length in 2014 (23.4 in). No trophy flathead catfish were collected in the Meldahl Pool; however, 6.1% of the flathead catfish catch in the Cannelton Pool and 3.7% of flathead catfish catch in the JT Meyers Pool were trophy fish (Table 7).

Overall trophy catfish accounted for 5.6% of the total catfish catch in hoop nets (up from 4.3% in 2014). Catch rates for different size groups of each species of catfish were also examined. Catch rates for all size groups of blue catfish decreased from 2014 catch rates (Table 8). Channel catfish CPUE for each size group was nearly identical to those in 2007 (the last year channel catfish were surveyed in hoopnets). Total flathead catfish CPUE was down from 2014, resulting from lower catch rates of flathead catfish in the 12.0 – 14.9 in and 20.0 – 29.9 in size groups (Table 8).

### *Electrofishing Surveys*

Low-pulse DC electrofishing was conducted in June 2015 in all pools of the Ohio River bordering Kentucky. Each pool received 3.0 hr of electrofishing effort in 15-minute transects (1.0 hr each in the upper, middle, and lower thirds of the pool) with two exceptions. The Greenup Pool (1.0 hr of effort) and the Lower River (Pool 52, Pool 53, and the open river; 2.0 hr effort) received less effort due to their smaller areas. A total of 24.0 hr of electrofishing effort was conducted across all pools resulting in a total catch of 455 blue catfish, 225 channel catfish, and 902 flathead catfish (Table 9). CPUE of blue catfish was 19.0 fish/hr, similar to 2014 (19.3 fish/hr), but was well above the historical average of 10.3 fish/hr (Table 10). Blue catfish lengths ranged from 3.8 – 44.4 in with a mean length of 17.8 in (Table 11). CPUE of channel catfish was 9.4 fish/hr (up from 8.8 fish/hr in 2014) but was similar to the historical average catch rate (9.6 fish/hr; Table 10). Channel catfish lengths ranged from 3.5 – 25.8 in with a mean length of 11.1 in (Table 11). Flathead catfish CPUE was 37.6 fish/hr (up from 32.8 fish/hr in 2014) and was above the historical average (25.4 fish/hr; Table 10). Lengths of flathead catfish ranged from 2.9 – 45.5 in with a mean length of 14.4 in (Table 11). Electrofishing typically targets smaller catfish on the Ohio River, and only 2.8% of all catfish sampled were trophy size. Catch rates for different size groups of each species of catfish were also examined. Although total CPUE of blue catfish was nearly identical to 2014, CPUE of blue catfish <12.0 in decreased, while CPUE of blue catfish in the 12.0 – 19.9 in and 20.0 – 29.9 in size groups increased from 2014 rates. CPUE of channel catfish across size groups was similar to those in 2014. CPUE for all size groups of flathead catfish increased from 2014 rates with the exception of the 12.0 – 19.9 in size group (Table 12).

### *Catfish Tournament Surveys*

Recreational catfish tournaments were attended up and down the Ohio River to gather additional data. A total of 9 tournaments were attended with 694 boats weighing in catfish. Collectively, catfish tournament anglers weighed in 1,009 blue catfish, 378 channel catfish, and 162 flathead catfish, with a total catfish CPUE of 2.2 fish/boat (down slightly from 2.5 fish/boat in 2014). Of all catfish weighed in, 10.8% were considered trophy catfish as defined by recreational regulations discussed above (Table 13). Catch rates for blue catfish and flathead catfish were similar to those over the past 3 years, while CPUE of channel cats has decreased since 2013 (Table 14). Blue catfish lengths ranged from 12.0 – 60.3 in with a mean length of 28.0 in and mean CPUE of 1.5 fish/boat. Channel catfish lengths ranged from 10.2 – 31.8 in with a mean length of 22.6 in and mean CPUE of 0.5 fish/boat. Flathead catfish were not as commonly caught (CPUE=0.2 fish/boat). Lengths of flathead catfish ranged from 13.2 – 42.6 in with a mean length of 25.3 in (Table 15). Catch rates for different size groups of each species of catfish were also examined. Catch rates of all size groups of blue catfish and flathead catfish as well as channel catfish in all the <12.0 in, 12.0 – 19.9 in, and ≥28.0 in size groups have remained similar since 2013. Channel catfish CPUE of fish in the 20.0 – 27.9 in groups has steadily decreased since 2013 (Table 16).

### *Relative Weight*

Relative weight (Wr) for each species of catfish was also calculated. Fish collected from all sampling methods used were combined to provide a more representative estimate for the entire populations of each catfish species. Mean Wr of blue catfish was 109 (up from 105 in 2014), and ranged from 97 in the McAlpine Pool to 115 in the Smithland Pool. Mean Wr of channel catfish was 100 (up from 97 in 2014), and ranged from 92 in the Greenup and McAlpine pools to 117 in the Cannelton Pool. Wr of flatheads ranged from 91 in the McAlpine Pool to 106 in the JT Meyers Pool with a mean Wr of 98 (up from 92 in 2014; Table 17).

### *Mortality Estimates*

In 2012 otoliths were taken from blue and channel catfish to assess mean lengths at age of capture for each species. On average, it took blue catfish 15 years to reach trophy size ( $\geq 35.0$  in), channel catfish  $>17$  years to reach trophy size ( $\geq 28.0$  in), and 20 years for flathead catfish to reach trophy size ( $\geq 35.0$  in; Table 18). Total annual mortality estimates were made on all three species of catfish based off length-at-age of capture data from otoliths removed from Ohio River catfish in 2012 and paired with unaged catfish collected with multiple sampling techniques in 2015. Using Fishery Analysis and Modeling Simulator, an unweighted catch-curve regression was ran on each species of catfish for each sampling method to calculate a range of mortality estimates. River-wide total annual mortality rates ranged from 6.7 – 20.0% for blue catfish, 14.6 – 28.4% for channel catfish, and 13.6 – 15.9% for flathead catfish. Although ranges of mortality (dependent upon sampling technique) were historically wider for blue and channel catfish, they still fell in a range of levels that are likely acceptable for the Ohio River (Table 19).

### *Commercial Fishing Industry*

Commercial fishing for catfish has long been present in the Ohio River, but recent concerns of potential overharvest have warranted further investigations. Trends for total harvest were similar for all three species of catfish since 2004. Harvest totals tended to increase gradually until 2011 and 2012, before falling off through the 2014 season (Figure 1). Unfortunately, commercial fish harvest reports do not include detailed information about gear (number of net nights, baited vs. unbaited, length of gillnet, etc.); however, the number of hooks fished for trotlines is required to be reported. Although trotline harvest should not be considered indicative of the entire commercial catfish harvest, it is the best available method to analyze trends in commercial catfish harvest rates. Effort (number of hooks) and pounds harvested by trotlines were examined to determine if harvest rates (lbs/hook) varied over the years. Although harvest varied significantly from 2004 – 2014, harvest rates of channel catfish and flathead catfish have remained fairly stable over that same time period. Harvest rate of blue catfish had a sharp increase from 2004 to 2005, but has increased gradually from 2005 – 2014 (Figure 2). Recent decreases in pounds harvested (2013 and 2014) are likely not a result of decrease harvest rates, but rather a decrease in effort.

Table 1. CPUE (fish/line) of blue catfish, channel catfish, and flathead catfish collected during trotline surveys on the Ohio River in 2015. Standard errors are in parentheses.

Pool	No. of trotlines	Effort (hooks)	No. of Blue Catfish		No. of Channel Catfish		No. of Flathead Catfish	
			No. of Blue Catfish	CPUE	No. of Channel Catfish	CPUE	No. of Flathead Catfish	CPUE
Meldahl	36	1800	55	1.5 (0.3)	56	1.6 (0.2)	4	0.1 (0.1)
Cannelton	33	1650	77	2.3 (0.4)	55	1.7 (0.2)	9	0.3 (0.1)
JT Meyers	46	2300	63	1.4 (0.2)	29	0.6 (0.1)	20	0.4 (0.1)
Smithland	15	750	15	1.0 (0.3)	13	0.9 (0.2)	1	0.1 (0.1)
Total	130	6500	210		153		34	
Mean				1.6 (0.2)		1.2 (0.1)		0.3 (0.1)

Table 2. CPUE (fish/line) of blue catfish, channel catfish, and flathead catfish collected during trotline surveys on the Ohio River from 2004 - 2015. Standard errors are in parentheses.

Year	Species		
	Blue catfish	Channel catfish	Flathead catfish
2004	1.5 (0.4)	1.1 (0.3)	0.1 (0.1)
2005	1.5 (0.4)	0.8 (0.1)	0.2 (0.1)
2006	6.6 (1.2)	1.2 (0.3)	<0.1 (<0.1)
2007	2.4 (0.5)	1.2 (0.4)	<0.1 (<0.1)
2008	5.9 (0.7)	1.6 (0.3)	0.1 (<0.1)
2010	4.0 (0.4)	2.6 (0.3)	<0.1 (<0.1)
2011	3.9 (0.6)	2.0 (0.4)	0.1 (<0.1)
2012	3.0 (0.8)	1.6 (0.6)	<0.1 (<0.1)
2013	1.2 (0.2)	1.1 (0.1)	0.1 (<0.1)
2014	1.3 (0.1)	1.0 (0.1)	0.2 (0.1)
2015	1.6 (0.2)	1.2 (0.1)	0.3 (0.1)
Mean	3.0 (0.6)	1.4 (0.2)	0.1 (<0.1)

Table 3. Length frequency, and CPUE (fish/line) of blue catfish, channel catfish, and flathead catfish collected during trawline surveys on Ohio River in 2015. Standard errors are in parentheses.

Pool	Species	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	Total	CPUE			
Meldahl	Blue catfish	1		1	3	5	4	5	6	4	2	3							3	2	5	4	2	1	2	1																1	55	1.5 (0.3)				
	Channel catfish	1	1		1	1	4	4	7	5	11	5	10	2	1	2	1																													56	1.6 (0.2)	
	Flathead catfish				1	1									1		1																												4	0.1 (0.1)		
Cannelton	Blue catfish		1			1	2	3	2	5	2		2	4	4	4	5	6	5	4	3	4	1	5	3	3	2	1	2																1	77	2.3 (0.4)	
	Channel catfish				3	3	12	6	15	3	5	5	1	1		1																														55	1.7 (0.2)	
	Flathead catfish				1					1	1					2	3			1																										9	0.3 (0.1)	
JT Meyers	Blue catfish					2	3	1	5	4	2	1	2	4	2	3	2	4	7	2	3	3	5	2		3	1																		1	63	1.4 (0.2)	
	Channel catfish				4	1	3	2	2	3	4	2	1	2	2	2		1																												29	0.6 (0.1)	
	Flathead catfish				1		1	1	3	3	2	1	1	2	2		2		1																											20	0.4 (0.1)	
Smithland	Blue catfish							3	2				1	1	2	3	2	1																													15	1.0 (0.3)
	Channel catfish			1		1	1	1	1	1	2	1	3		1																																13	0.9 (0.2)
	Flathead catfish																																														1	0.1 (0.1)
Total	Blue catfish	1	1	1	3	8	9	12	15	13	6	4	5	9	8	10	9	11	15	8	11	11	8	8	5	7	3	1	2																	1	210	1.6 (0.2)
	Channel catfish	1	1	1	8	6	20	13	25	12	22	13	15	5	4	5	1	1																													153	1.2 (0.1)
	Flathead catfish				3	1	1	1	4	4	3	1	1	3	2	3	5		1	1																											34	0.3 (0.1)

Table 4. CPUE by size group of blue catfish, channel catfish, and flathead catfish collected during trotline surveys on the Ohio River from 2004 - 2015. Standard errors are in parentheses.

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Blue catfish	2004	0.0	0.3 (0.1)	0.9 (0.2)	0.3 (0.1)	0.1 (0.1)	1.5 (0.4)
	2005	0.0	<0.1 (0.1)	1.0 (0.2)	0.2 (0.1)	0.2 (0.1)	1.5 (0.4)
	2006	<0.1 (<0.1)	0.8 (0.2)	5.0 (1.0)	0.6 (0.2)	0.2 (0.1)	6.6 (1.2)
	2007	0.0	0.3 (0.1)	1.5 (0.4)	0.5 (0.2)	0.1 (<0.1)	2.4 (0.5)
	2008	0.0	0.6 (0.2)	4.1 (0.8)	1.0 (0.1)	0.1 (0.1)	5.9 (0.7)
	2010	0.0	0.2 (<0.1)	1.9 (0.3)	1.1 (0.3)	0.7 (0.2)	4.0 (0.4)
	2011	0.0	0.2 (0.1)	2.7 (0.5)	0.9 (0.3)	0.3 (0.1)	3.9 (0.6)
	2012	0.1 (<0.1)	0.7 (0.3)	1.7 (0.3)	0.3 (0.2)	0.2 (0.1)	3.0 (0.8)
	2013	0.1 (<0.1)	0.3 (0.1)	0.6 (0.1)	0.1 (<0.1)	<0.1 (<0.1)	1.2 (0.2)
	2014	<0.1 (<0.1)	0.5 (0.1)	0.5 (0.1)	0.2 (<0.1)	0.1 (0.1)	1.3 (0.1)
	2015	<0.1 (<0.1)	0.5 (0.2)	0.7 (0.2)	0.3 (0.1)	0.1 (<0.1)	1.6 (0.2)
	Total		<0.1 (<0.1)	0.4 (0.1)	1.9 (0.4)	0.5 (0.1)	0.2 (0.1)

Species	Year	Size group				Total
		<12.0	12.0 - 19.9	20.0 - 27.9	≥28.0	
Channel catfish	2004	0.0	0.7 (0.3)	0.4 (0.2)	0.0	1.1 (0.3)
	2005	0.0	0.4 (0.1)	0.4 (0.1)	0.0	0.8 (0.1)
	2006	0.0	0.7 (0.2)	0.6 (0.2)	0.0	1.2 (0.3)
	2007	0.0	0.6 (0.2)	0.6 (0.2)	0.0	1.2 (0.4)
	2008	0.0	0.9 (0.2)	0.6 (0.2)	0.1 (<0.1)	1.6 (0.3)
	2010	0.0	0.7 (0.2)	1.9 (0.4)	<0.1 (<0.1)	2.6 (0.3)
	2011	0.0	1.2 (0.3)	0.8 (0.3)	0.0	2.0 (0.4)
	2012	0.0	0.8 (0.2)	0.7 (0.2)	<0.1 (<0.1)	1.6 (0.6)
	2013	<0.1 (<0.1)	0.7 (0.1)	0.4 (0.1)	0.0	1.1 (0.1)
	2014	<0.1 (<0.1)	0.6 (0.2)	0.4 (0.1)	0.0	1.0 (0.1)
	2015	<0.1 (<0.1)	0.7 (0.2)	0.5 (0.1)	0.0	1.2 (0.1)
	Total		<0.1 (<0.1)	0.7 (0.1)	0.7 (0.1)	<0.1 (0.1)

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Flathead catfish	2004	0.0	0.1 (0.1)	0	0	0	0.1 (0.1)
	2005	0.0	0	0.1 (<0.1)	0.1 (<0.1)	0.1 (<0.1)	0.2 (0.1)
	2006	0.0	<0.1 (<0.1)	0	0	0	<0.1 (<0.1)
	2007	0.0	<0.1 (<0.1)	0	0	0	<0.1 (<0.1)
	2008	0.0	0	0.1 (<0.1)	0	0	0.1 (<0.1)
	2010	0.0	0	<0.1 (<0.1)	0	<0.1 (<0.1)	<0.1 (<0.1)
	2011	0.0	0	0	<0.1 (<0.1)	<0.1 (<0.1)	0.1 (<0.1)
	2012	0.0	<0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	0	<0.1 (<0.1)
	2013	0.0	<0.1 (<0.1)	<0.1 (<0.1)	0	0	0.1 (<0.1)
	2014	0.0	0.1 (<0.1)	0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	0.2 (0.1)
	2015	0.0	0.1 (<0.1)	0.2 (0.1)	0	0	0.3 (0.1)
	Total		0.0	<0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)

Table 5. CPUE (fish/net-night) of blue catfish, channel catfish, and flathead catfish during hoopnet surveys in Meldahl, Cannelton, and JT Meyers pools of the Ohio River in 2015. Standard errors are in parentheses.

Pool	No. of hoopnets	Effort (net nights)	No. of Blue Catfish		No. of Channel Catfish		No. of Flathead Catfish	
			No. of Catfish	CPUE	No. of Catfish	CPUE	No. of Catfish	CPUE
Meldahl	75	150	1	<0.1 (<0.1)	30	0.2 (0.1)	40	0.3 (0.1)
Cannelton	60	120	1	<0.1 (<0.1)	21	0.2 (0.1)	66	0.6 (0.2)
JT Meyers*	48	144	81	0.6 (0.4)			95	0.7 (0.3)
Total	183	414	83		51		201	
Mean				<0.1 (<0.1)		0.2 (0.1)		0.5 (0.1)

\*Numbers calculated from ride-alongs with commercial fishermen.

Table 6. CPUE (fish/net-night) of blue catfish, channel catfish, and flathead catfish collected during hoopnet surveys on the Ohio River from 2006 - 2015. Standard errors are in parentheses.

Year	Species		
	Blue catfish	Channel catfish	Flathead catfish
2006	0.0	2.4 (0.2)	1.0 (0.4)
2007	<0.1 (<0.1)	0.3 (<0.1)	0.2 (0.1)
2013*	0.7 (0.2)		2.6 (0.3)
2014*	0.8 (0.6)		0.9 (0.1)
2015**	<0.1 (<0.1)	0.2 (0.1)	0.5 (0.1)
Mean	0.3 (0.1)	1.0 (0.2)	1.0 (0.2)

\*Numbers calculated from ride-alongs with commercial fishermen.

\*\*Numbers calculated from ride-alongs with commercial fishermen and KDFWR sampling.



Table 8. CPUE by size group of blue catfish, channel catfish, and flathead catfish collected during hoopnet surveys on the Ohio River from 2004 - 2015. Standard errors are in parentheses.

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Blue catfish	2006	0.0	0.0	0.0	0.0	0.0	0.0
	2007	<0.1 (<0.1)	0.0	<0.1 (<0.1)	0.0	0.0	<0.1 (<0.1)
	2013	<0.1 (<0.1)	<0.1 (<0.1)	0.4 (0.3)	0.2 (<0.1)	0.1 (<0.1)	0.7 (0.2)
	2014	<0.1 (<0.1)	0.3 (0.2)	0.4 (0.2)	0.1 (0.1)	<0.1 (0.1)	0.8 (0.6)
	2015	0.0	<0.1 (<0.1)	0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)
	Total	<0.1 (<0.1)	0.1 (0.1)	0.2 (0.1)	0.1 (<0.1)	<0.1 (<0.1)	0.3 (0.1)

Species	Year	Size group				Total
		<12.0	12.0 - 19.9	20.0 - 27.9	≥28.0	
Channel catfish	2006	0.3 (0.1)	1.0 (0.2)	1.2 (0.2)	0.0	2.4 (0.2)
	2007	0.1 (<0.1)	0.1 (<0.1)	0.1 (<0.1)	0.0	0.3 (<0.1)
	2015	<0.1 (<0.1)	0.1 (0.1)	0.1 (<0.1)	0.0	0.2 (0.1)
	Total	0.1 (0.1)	0.4 (0.1)	0.5 (0.2)	0.0	1.0 (0.2)

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Flathead catfish	2006	<0.1 (<0.1)	0.4 (0.3)	0.4 (0.1)	0.1 (<0.1)	0.0	1.0 (0.4)
	2007	0.0	<0.1 (<0.1)	0.2 (0.1)	<0.1 (<0.1)	<0.1 (<0.1)	0.2 (0.1)
	2013	0.0	0.5 (0.3)	1.5 (0.6)	0.4 (0.3)	0.3 (0.1)	2.6 (0.3)
	2014	0.0	0.2 (0.1)	0.4 (0.1)	0.1 (0.1)	<0.1 (<0.1)	0.9 (0.1)
	2015	<0.1 (<0.1)	0.1 (<0.1)	0.3 (0.1)	0.1 (0.1)	<0.1 (<0.1)	0.5 (0.1)
	Total	<0.1 (<0.1)	0.2 (0.1)	0.6 (0.2)	0.1 (0.1)	0.1 (0.1)	1.0 (0.2)

Table 9. Effort and CPUE (fish/hr) of blue catfish, channel catfish, and flathead catfish collected during electrofishing surveys on the Ohio River in June 2015. Standard errors are in parentheses.

Pool	No. of transects	Effort (hr)	No. of Blue		No. of Channel		No. of Flathead	
			Catfish	CPUE	Catfish	CPUE	Flathead	CPUE
Greenup	4	1.0	0	0.0	4	4.0 (1.6)	60	60.0 (1.6)
Meldahl	12	3.0	47	15.7 (9.3)	48	16.0 (4.6)	195	65.0 (22.2)
Markland	12	3.0	8	2.7 (1.0)	21	7.0 (3.2)	88	29.3 (4.9)
McAlpine	12	3.0	5	1.7 (1.3)	24	8.0 (2.4)	67	22.3 (4.3)
Cannelton	12	3.0	81	27.0 (8.9)	30	10.0 (2.0)	122	40.7 (4.2)
Newburgh	12	3.0	111	37.0 (16.9)	17	5.7 (1.7)	69	23.0 (4.3)
JT Meyers	12	3.0	22	7.3 (4.1)	33	11.0 (5.9)	101	33.7 (6.4)
Smithland	12	3.0	103	34.3 (15.6)	42	14.0 (3.6)	161	53.7 (10.1)
Lower River	8	2.0	78	39.0 (17.2)	6	3.0 (1.5)	39	19.5 (3.4)
Total	96	24.0	455		225		902	
Mean				19.0 (3.8)		9.4 (1.2)		37.6 (3.6)

Table 10. CPUE (fish/hr) of blue catfish, channel catfish, and flathead catfish collected during electrofishing surveys on the Ohio River from 2004 - 2015. Standard errors are in parentheses.

Year	Species		
	Blue catfish	Channel catfish	Flathead catfish
2004	0.0	4.5 (1.6)	14.5 (4.1)
2009	1.6 (0.8)	1.9 (0.9)	15.5 (4.1)
2010	11.9 (4.0)	8.8 (2.7)	17.1 (3.3)
2013	11.4 (4.8)	27.2 (3.9)	38.9 (5.1)
2014	19.3 (3.2)	8.8 (0.8)	32.8 (2.6)
2015	19.0 (3.8)	9.4 (1.2)	37.6 (3.6)
Mean	10.3 (3.4)	9.6 (3.2)	25.4 (4.4)



Table 12. CPUE by size group of blue catfish, channel catfish, and flathead catfish collected during electrofishing surveys on the Ohio River from 2004 - 2015. Standard errors are in parentheses.

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Blue catfish	2004	0.0	0.0	0.0	0.0	0.0	0.0
	2009	0.1 (<0.1)	1.0 (0.1)	0.4 (<0.1)	0.1 (<0.1)	0.0	1.6 (0.8)
	2010	8.8 (2.3)	1.0 (0.1)	1.4 (0.1)	0.7 (<0.1)	0.0	11.9 (4.0)
	2013	9.2 (2.5)	1.8 (0.9)	0.3 (0.1)	0.0	0.0	11.4 (4.8)
	2014	6.8 (0.6)	10.1 (1.2)	2.1 (0.2)	0.2 (0.1)	0.1 (0.1)	19.3 (3.2)
	2015	0.8 (0.4)	14.3 (3.0)	3.5 (0.5)	0.2 (<0.1)	0.2 (0.1)	19.0 (3.8)
	Total	4.3 (1.8)	4.7 (2.4)	1.3 (0.5)	0.2 (0.1)	0.1 (<0.1)	10.3 (3.4)

Species	Year	Size group				Total
		<12.0	12.0 - 19.9	20.0 - 27.9	≥28.0	
Channel catfish	2004	0.8 (0.6)	3.8 (2.4)	0.0	0.0	4.5 (1.6)
	2009	0.6 (<0.1)	1.2 (0.2)	0.1 (<0.1)	0.0	1.9 (0.9)
	2010	8.8 (0.4)	0.0	0.0	0.0	8.8 (2.7)
	2013	25.4 (7.2)	1.7 (0.3)	0.2 (0.2)	0.0	27.2 (3.9)
	2014	5.5 (0.5)	2.8 (0.4)	0.5 (0.2)	0.0	8.8 (0.8)
	2015	5.1 (2.4)	3.9 (0.3)	0.4(0.1)	0.0	9.4 (1.2)
	Total	7.7 (3.8)	2.2 (0.6)	0.2 (0.1)	0.0	9.6 (3.2)

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Flathead catfish	2004	9.3 (4.2)	5.0 (1.1)	0.3 (0.3)	0.0	0.0	14.5 (4.1)
	2009	8.4 (1.7)	4.3 (0.2)	2.6 (0.2)	0.0	0.3 (<0.1)	15.5 (4.1)
	2010	8.8 (1.9)	6.0 (2.1)	2.1 (0.5)	0.2 (<0.1)	0.0	17.1 (3.3)
	2013	14.9 (4.5)	17.2 (1.1)	6.3 (1.8)	0.3 (0.1)	0.2 (0.2)	38.9 (5.1)
	2014	12.3 (2.6)	15.9 (3.7)	4.3 (0.2)	0.3 (0.1)	0.1 (<0.1)	32.8 (2.6)
	2015	15.8 (2.1)	14.6 (4.2)	5.6 (0.9)	0.9 (0.4)	0.7 (0.3)	37.6 (3.6)
	Total	11.6 (3.3)	10.5 (2.4)	3.5 (0.9)	0.3 (0.1)	0.2 (0.1)	25.4 (4.4)

Table 13. Tournament effort and CPUE (fish/boat; standard errors are in parentheses) of blue catfish, channel catfish, and flathead catfish collected from the Ohio

Pool	No. of tournaments	No. of boats	Blue			Channel			Flathead			Total		
			Ctfish	% Trophy	CPUE	Catfish	% Trophy	CPUE	Catfish	% trophy	CPUE	Catfish	% trophy	CPUE
Meldahl	2	39	41	19.5	1.1 (0.2)	30 (6.7)	6.7	0.8 (0.2)	21	4.8	0.5 (0.1)	92	12	2.4 (<0.1)
Markland	3	327	498	5.6	1.5 (0.1)	233 (9.4)	9.4	0.7 (0.1)	57	14.3	0.2 (<0.1)	788	9.5	2.4 (<0.1)
McAlpine	1	40	35	14.3	0.9 (0.1)	25 (8.0)	8.0	0.6 (0.1)	17	11.8	0.4 (0.1)	77	11.7	1.9 (<0.1)
Newburgh	2	263	389	14.1	1.5 (0.2)	88 (1.1)	1.1	0.3 (0.1)	64	15.6	0.2 (0.1)	541	12.2	2.1 (<0.1)
Lower River	1	25	46	21.7	1.8 (0.4)	2 (0.0)	0.0	0.1 (0.1)	3	0.0	0.1 (0.1)	51	19.6	2.0 (<0.1)
Total	9	694	1009	12.5	1.5 (0.1)	378 (7.1)	7.1	0.5 (0.1)	162	9.3	0.2 (0.1)	1549	10.7	2.2 (<0.1)

Table 14. CPUE (fish/hr) of blue catfish, channel catfish, and flathead catfish collected during catfish tournament surveys on the Ohio River from 2013 - 2015. Standard errors are in parentheses.

Year	Species		
	Blue catfish	Channel catfish	Flathead catfish
2013	1.4 (0.4)	1.1 (0.3)	0.2 (0.1)
2014	1.4 (0.5)	0.7 (0.2)	0.3 (0.1)
2015	1.5 (0.1)	0.5 (0.1)	0.2 (0.1)
Mean	1.4 (0.1)	0.8 (0.2)	0.2 (<0.1)



Table 16. CPUE by size group of blue catfish, channel catfish, and flathead catfish collected during catfish tournament surveys on the Ohio River from 20013 - 2015. Standard errors are in parentheses.

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Blue catfish	2013	<0.1 (<0.1)	0.3 (0.1)	0.6 (0.1)	0.4 (0.1)	0.2 (<0.1)	
	2014	<0.1 (<0.1)	0.3 (0.1)	0.6 (0.1)	0.4 (0.1)	0.2 (<0.1)	
	2015	0.0	0.3 (<0.1)	0.6 (0.2)	0.4 (0.1)	0.2 (0.1)	1.5 (0.1)
	Total	<0.1 (0.1)	0.3 (0.1)	0.6 (0.1)	0.4 (0.1)	0.2 (<0.1)	

Species	Year	Size group				Total
		<12.0	12.0 - 19.9	20.0 - 27.9	≥28.0	
Channel catfish	2013	<0.1 (<0.1)	0.2 (<0.1)	0.8 (0.2)	0.1 (<0.1)	
	2014	<0.1 (<0.1)	0.2 (0.1)	0.5 (0.1)	<0.1 (<0.1)	
	2015	<0.1 (<0.1)	0.1 (<0.1)	0.4 (0.1)	<0.1 (<0.1)	0.5 (0.1)
	Total	<0.1 (<0.1)	0.2 (<0.1)	0.5 (0.1)	<0.1 (<0.1)	

Species	Year	Size group					Total
		<12.0	12.0 - 19.9	20.0 - 29.9	30.0 - 34.9	≥35.0	
Flathead catfish	2013	<0.1 (<0.1)	<0.1 (<0.1)	0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	
	2014	0.0	0.1 (<0.1)	0.2 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	
	2015	0.0	<0.1 (<0.1)	0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	0.2 (0.1)
	Total	<0.1 (<0.1)	<0.1 (<0.1)	0.1 (<0.1)	<0.1 (<0.1)	<0.1 (<0.1)	

Table 17. Relative weight (Wr) of blue catfish, channel catfish, and flathead catfish collected from the Ohio River using multiple sampling techniques from 2013 - 2015.

Pool	2013			2014			2015		
	Blue catfish	Channel catfish	Flathead catfish	Blue catfish	Channel catfish	Flathead catfish	Blue catfish	Channel catfish	Flathead catfish
Greenup	100	103	97	115	95	86		92	93
Meldahl	105	90	96	102	90	86	109	95	103
Markland	121	112	99	111	102	90	114	101	97
McAlpine	106	98	97	98	92	109	97	92	91
Cannelton	156	96		96	90	85	107	117	93
Newburgh	112	103	11	103	101	88	104	99	92
JT Meyers	105	95	94	109	105	88	112	99	106
Smithland	103	95	99	100	91	100	115	100	103
Lower River	113	102		113	113	107	110	108	102
Total	112	101	99	105	97	92	109	100	98

Table 18. Mean length (in) at age collected from otoliths of blue catfish, channel catfish, and flathead catfish from the Ohio River in summer of 2012.

Species	Sex	Age																															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Blue catfish	Male				17.8		23.3		25.3	27.0	26.3			28.6	32.2	34.1	36.3	38.5			43.1												
	Female						21.3	24.3	26.0			30.1	29.6		32.4		36.1																
	All		11.3	15.2	18.3		22.3	24.1	25.7	26.6	26.3	30.1	29.6	29.4	32.8	34.1	36.2	38.5				43.1											
Channel catfish	Male						19.6	19.4	21.5	20.3	20.2	21.0	23.4	23.2																			
	Female					17.0	16.9	19.6	19.6	22.3	21.1	20.6	22.4		22.8			19.5															
	All					16.7	18.2	19.5	20.4	21.1	20.7	20.8	22.9	23.2	23.1		25.7	19.5															
Flathead catfish	Male	10.8	12.6	13.8	18.1	18.1	22.3	20.8	26.8	24.5	27.3	29.6	31.3	28.4	28.8	30.7	38.3	34.4	34.4	34.5	25.5	35.8			37.3	35.9	37.5	42.2			28.7	36.4	41.0
	Female	8.8	10.3	13.0	15.2	18.8	19.3	21.7	19.5	26.6	25.2	27.0	23.8	26.1	26.9	33.8	28.8	28.5	28.8	31.8	27.5	31.5	37.8				31.4	30.5		24.8			
	All	7.7	11.8	13.1	15.4	18.2	19.9	20.6	23.4	25.3	26.5	27.7	29.1	26.3	28.1	32.8	31.2	33.8	32.2	32.1	28.2	34.0	32.7	35.3	33.6	35.9	38.2	24.8		29.2	36.4	41.0	

Table 19. Ranges of total annual mortality rates of blue catfish, channel catfish, and flathead catfish collected from the Ohio River based off of length-at-age of capture from otoliths collected in 2012 and paired non aged fish using multiple sampling techniques from 2013 - 2015 .

Year	Blue catfish		Channel catfish		Flathead	
	Low	High	Low	High	Low	High
2013	13.8	18.7	18.3	20.5	10.9	20.9
2014	11.3	18.2	21.7	26.8	11.5	18.7
2015	6.7	20.0	14.6	28.4	13.6	15.9
Mean	10.6	19.0	18.2	25.2	12.0	18.5

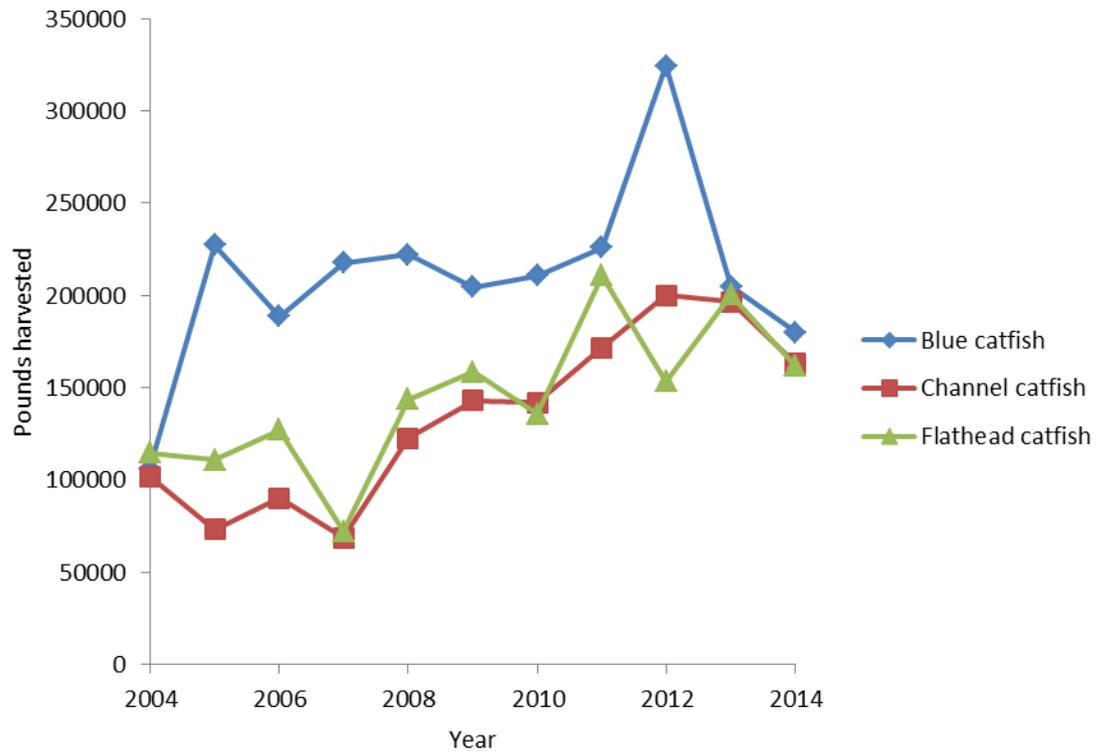


Figure 1. Total pounds of blue catfish, channel catfish, and flathead catfish harvested by commercial fishermen from the Ohio River from 2004 – 2014.

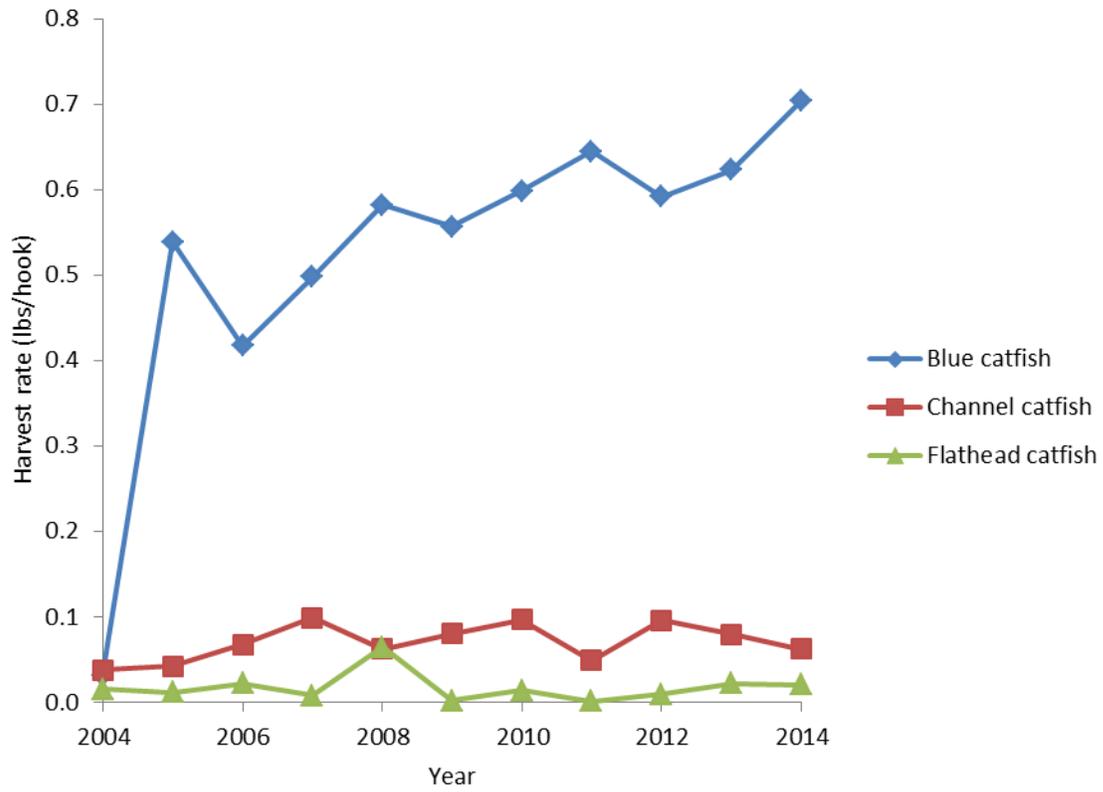


Figure 2. Harvest rate (lbs/hook) of blue catfish, channel catfish, and flathead catfish harvested by commercial fishermen from the Ohio River from 2004 – 2014.