

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Sinai, Brookings County

MBS-Lake-232-000

2019

Lake Information

Name: Sinai **Maximum Depth:** 33 Feet
County: Brookings **Mean Depth:** 17 Feet
Legal Description: T109N- R52W-Sec 3-4, 8-10
Surface Area: 1,778 Acres

Surveys and Investigations

Survey methods used by gear type, date, and effort.

Gear	Date	Effort
AFS std gill net	Jul 01, 2019	12 net-nights
frame net (std 3/4 in)	Jul 01, 2019	10 net-nights

Common Fish Species Present

Muskellunge

Walleye

Smallmouth Bass

White Bass

Yellow Perch

Black Bullhead

Yellow Bullhead

Black Crappie

Common Carp

Northern Pike

Terminology

Catch per unit effort (**CPUE**) refers to the relative abundance of a species. It is defined as the number of fish captured per unit of effort (i.e., number of fish captured per net-night or number of fish captured per hour electrofishing). In this report CPUE is typically given for only stock-length fish (see length categories table for stock lengths).

A statewide effort to help make netting efforts comparable to all waters sampled across the state, occurred in 2017, with a switch to American Fisheries Society gill nets. Past gill netting efforts were completed with different style/types of nets and are not comparable side by side.

- **AFS std gill net** – 80 ft experimental gill net containing eight panels (10 ft each) of varying monofilament meshes of 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25 and 2.50 inches.
- **std experimental gill net for non-Missouri River waters** - 150 ft experimental gill net containing six panels (25 ft each) of varying monofilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.
- **std experimental gill net for Missouri River reservoirs** – 300 ft experimental gill net containing six panels (50 ft each) of varying multifilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.

$$CPUE = \frac{\text{number of fish}}{\text{effort}}$$

Population size structure is quantified using the indices proportional size distribution of quality-length fish (**PSD**) and proportional size distribution of preferred-length fish (**PSD-P**). These indices indicate the proportion of stock-length fish that are equal to or greater than a given length. Minimum lengths for stock, quality and preferred length fish are given in the length categories table.

$$PSD = \left(\frac{\text{number of fish} \geq \text{quality length}}{\text{number of fish} \geq \text{stock length}} \right) \times 100$$

$$PSD - P = \left(\frac{\text{number of fish} \geq \text{preferred length}}{\text{number of fish} \geq \text{stock length}} \right) \times 100$$

Relative weight (**Wr**) is used to quantify fish plumpness. Relative weight is the ratio of what a fish weighs (**W**) compared to a length-specific standard weight (**Ws**) multiplied by 100. Relative weight values of 95-105 are commonly cited as optimum values, but values in the 80s are common during summer sampling in South Dakota.

$$Wr = \left(\frac{W}{W_s} \right) \times 100$$

Confidence intervals (CI) are provided for many of the estimates calculated in this report. The confidence interval provides a range in which the true mean is expected to fall. For example, with an 80% CI we are 80% confident that the interval contains the true value.

Length categories include stock (S), quality (Q), preferred (P), memorable (M) and trophy (T). Length categories for most species have been defined based on a percentage of the world record length for that species. Some species mentioned in this report do not have defined length categories. Length categories for species used in this report are provided in the following table. Measurements are the minimum total length for each category and are reported in inches (in) and centimeters (cm).

Species Name	Stock		Quality		Preferred		Memorable		Trophy	
	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)
Black Bullhead	6	15	9	23	12	30	15	38	18	46
Black Crappie	5	13	8	20	10	25	12	30	15	38
Bluegill	3	8	6	15	8	20	10	25	12	30
Brown Trout	8	20	12	30	16	40	20	50	18	46
Channel Catfish	11	28	16	41	24	61	28	71	36	91
Freshwater Drum	8	20	12	30	15	38	20	51	25	63
Lake Trout	12	30	20	50	26	65	31	80	39	100
Largemouth Bass	8	20	12	30	15	38	20	51	25	63
Muskellunge	20	51	30	76	38	97	42	107	50	127
Northern Pike	14	35	21	53	28	71	34	86	44	112
Pumpkinseed	3	8	6	15	8	20	10	25	12	30
Rainbow Trout	10	25	16	40	20	50	26	65	31	80
Rudd	6	15	10	25	12	30	15	38	19	48
Sauger	8	20	12	30	15	38	20	51	25	63
Smallmouth Bass	7	18	11	28	14	35	17	43	20	51
Walleye	10	25	15	38	20	51	25	63	30	76
White Bass	6	15	9	23	12	30	15	38	18	46
White Crappie	5	13	8	20	10	25	12	30	15	38
Yellow Bullhead	4	10	7	18	9	23	11	28	14	36
Yellow Perch	5	13	8	20	10	25	12	30	15	38

Catch Summary of Stock Length Fish

Catch per unit effort (CPUE), proportional size distribution (PSD), proportional size distribution of preferred length fish (PSD-P), and relative weight (Wr) for species sampled in survey with 80% confidence interval (CI-80).

* **Methods/Species that ignore stock length**

Gear	Species	Sample Size (n)	Abundance		Stock Density Indices			Condition		
			CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
AFS std gill net	Common Carp	2	0.2	0.2	100		50			
	Northern Pike	3	0.3	0.2	100		67	96	8	
	Smallmouth Bass	3	0.3	0.2	67		67	86	2	
	Walleye	34	2.8	1.2	52	13	30	12	78	1
	White Bass	14	1.2	0.8	100		93		89	1
	Yellow Bullhead	1	0.1	0.1	100		100			
	Yellow Perch	22	1.8	0.9	86		41	17	107	9
frame net (std 3/4 in)	Black Bullhead	14	1.4	0.8	100		86			
	Black Crappie	9	0.9	0.5	89		44		101	5
	Common Carp	8	0.8	0.4	100		100			
	Northern Pike	1	0.1	0.1	100		0		79	
	Smallmouth Bass	50	4.6	1.9	72	10	37	11	90	3
	Walleye	22	2.2	0.9	41	17	27	15	85	4
	White Bass	37	3.7	2.7	100		97		87	1
Yellow Bullhead	11	1.1	0.7	100		91				
Yellow Perch	1	0.1	0.1	100		0		99		

10-Year Catch Per Unit Effort by Gear and Species

Catch per unit effort (CPUE) and average (Avg) of species across 10 years using different gear types.

Gear	Species	CPUE										Avg
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AFS std frame net	Black Bullhead								1.7			1.70
	Black Crappie								1.9			1.90
	Common Carp								0.7			0.70
	Smallmouth Bass								1.9			1.90
	Walleye								0.9			0.90
	White Bass								2.0			2.00
	Yellow Bullhead								0.7			0.70
AFS std gill net	Black Bullhead								0.7	0.2	0.0	0.30
	Black Crappie								0.8	0.1	0.0	0.30
	Common Carp								0.3	0.6	0.2	0.37
	Northern Pike								0.2	0.0	0.3	0.17
	Smallmouth Bass								0.7	1.8	0.3	0.93
	Walleye								4.7	4.2	2.8	3.90
	White Bass								1.0	0.9	1.2	1.03
	White Sucker								0.1	0.0	0.0	0.03
	Yellow Bullhead								0.0	0.0	0.1	0.03
Yellow Perch								2.5	5.3	1.8	3.20	
fall night EF-WAE	Walleye	210.5	262.0	16.0	55.5	94.5	79.0					119.58
frame net (std 3/4 in)	Black Bullhead	0.0	0.0	0.4	2.5	10.0	44.4	6.6		2.5	1.4	7.53
	Black Crappie	0.4	0.0	11.1	2.5	4.5	11.5	6.7		3.9	0.9	4.61
	Bluegill	0.4	1.3	4.9	1.0	0.3	2.6	0.4		0.2	0.0	1.23
	Channel Catfish	0.0	0.0	0.1	0.0	0.0	0.0	0.0		0.0	0.0	0.01
	Common Carp	1.6	0.1	1.7	1.4	0.0	0.2	0.4		0.6	0.8	0.76
	Green Sunfish	0.1	0.0	0.1	0.1	0.0	0.0	0.0		0.0	0.0	0.03
	Northern Pike	0.0	0.0	0.6	0.2	0.0	0.3	0.8		0.7	0.1	0.30
	Smallmouth Bass	2.9	2.0	16.8	2.9	0.9	2.7	6.1		4.4	4.6	4.81
	Sunfish Hybrid	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.00
	Walleye	1.9	0.6	4.9	1.3	2.8	1.6	1.2		4.3	2.2	2.31
	White Bass	0.0	0.0	0.0	0.0	0.0	0.0	1.1		10.3	3.7	1.68
	Yellow Bullhead	0.0	0.0	0.0	0.0	0.2	1.1	1.4		1.4	1.1	0.58
	Yellow Perch	1.0	1.5	2.7	0.0	0.3	1.8	0.0		0.1	0.1	0.83
std exp gill net	Black Bullhead	0.0	0.0	0.3	0.3	1.5	40.0	12.4				7.79
	Black Crappie	0.0	0.0	0.3	0.0	0.0	2.0	3.6				0.84
	Bluegill	0.0	0.0	0.0	0.0	0.3	0.0	0.0				0.04

		CPUE										
Gear	Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Avg
std exp gill net	Common Carp	0.0	0.4	0.8	0.0	0.8	0.0	0.4				0.34
	Green Sunfish	0.0	0.0	0.3	0.0	0.0	0.0	0.0				0.04
	Northern Pike	0.2	0.0	0.5	0.8	0.0	1.0	0.6				0.44
	Smallmouth Bass	0.4	0.8	2.5	0.3	1.3	1.7	2.0				1.29
	Walleye	15.0	4.4	36.8	23.0	18.3	18.0	7.8				17.61
	White Sucker	0.0	0.0	0.0	0.3	0.0	0.0	0.0				0.04
	Yellow Perch	23.4	45.0	33.8	4.5	2.5	24.3	12.8				20.90

10-Year Size Structure and Condition Statistics by Gear and Species

Species proportional size distribution (PSD), proportional size distribution of preferred length fish (PSD-P), and relative weight (Wr) collected by different gear types across 10 years.

Gear	Species	Index	Year												
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019			
AFS std frame net	Black Bullhead	PSD									100				
		PSD-P									53				
		Wr									91				
	Black Crappie	PSD										100			
		PSD-P										95			
		Wr										91			
	Common Carp	PSD										100			
		PSD-P										86			
		Wr										84			
	Smallmouth Bass	PSD										95			
		PSD-P										37			
		Wr										89			
	Walleye	PSD										56			
		PSD-P										56			
		Wr										84			
	White Bass	PSD										100			
		PSD-P										85			
		Wr										92			
Yellow Bullhead	PSD										100				
	PSD-P										100				
AFS std gill net	Black Bullhead	PSD									100	100			
		PSD-P									71	100			
		Wr									95	110			
	Black Crappie	PSD										88	100		
		PSD-P										88	0		
		Wr										95	110		
	Common Carp	PSD										100	100	100	
		PSD-P										100	86	50	
		Wr										91	102	86	
	Northern Pike	PSD										100		100	
		PSD-P										100		67	
		Wr										91	102	86	
	Smallmouth Bass	PSD										71	57	67	
		PSD-P										71	48	67	
		Wr										91	102	86	
	Walleye	PSD										70	34	52	
		PSD-P										28	18	30	

Gear	Species	Index	Year											
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019		
AFS std gill net	Walleye	Wr									84	87	78	
	White Bass	PSD									90	100	100	
		PSD-P									50	82	93	
		Wr									95	95	89	
	Yellow Bullhead	PSD												100
		PSD-P												100
	Yellow Perch	PSD										64	51	86
		PSD-P										24	11	41
		Wr										98	111	107
fall night EF-WAE	Walleye	Wr	80	92	93	88	89	84						
frame net (std 3/4 in)	Black Bullhead	PSD			75	100	26	13	88			100	100	
		PSD-P			0	48	19	6	20			88	86	
Wr				93	99									
Black Crappie	PSD	25	0	98	92	91	20	92			97	89		
	PSD-P	0	0	5	84	84	14	47			85	44		
	Wr	115		103	102	99	104	94			97	101		
Common Carp	PSD	100	100	18	93			100	100		100	100		
	PSD-P	50	0	6	0			50	100		50	100		
	Wr	87	92	100	106									
Northern Pike	PSD			0	50			100	100		100	100		
	PSD-P			0	0			67	14		57	0		
	Wr			75	78			83	83		86	79		
Smallmouth Bass	PSD	21	50	24	52	78	15	38			68	72		
	PSD-P	7	25	17	14	78	11	24			52	37		
	Wr	103	100	88	98	106	94	90			93	90		
Walleye	PSD	32	100	14	54	61	100	73			65	41		
	PSD-P	5	17	8	46	11	31	27			40	27		
	Wr	88	82	78	91	89	84	74			86	85		
White Bass	PSD									80	100	100		
	PSD-P									80	93	97		
	Wr									91	98	87		
Yellow Bullhead	PSD					100	100	100			100	100		
	PSD-P					100	18	85			100	91		
	Wr					111								
Yellow Perch	PSD	70	60	100		67	39				100	100		
	PSD-P	10	7	33		33	0				0	0		

Gear	Species	Index	Year									
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
frame net (std 3/4 in)	Yellow Perch	Wr	100	100	99		91	92			80	99
std exp gill net	Black Bullhead	PSD			100	100	50	8	90			
		PSD-P			0	0	33	0	0			
		Wr			99							
	Black Crappie	PSD			100		0	17	78			
		PSD-P			0		0	0	0			
		Wr			99			113	96			
	Common Carp	PSD		100	67		100		100			
		PSD-P		50	67		67		100			
		Wr		92	88							
	Northern Pike	PSD	100		50	33		100	100			
		PSD-P	100		0	0		33	33			
		Wr	76		84	76		85	83			
	Smallmouth Bass	PSD	50	50	20	100	60	40	50			
		PSD-P	0	25	10	0	20	40	30			
		Wr	96	100	89	108	101	90	86			
	Walleye	PSD	28	59	7	5	92	83	46			
		PSD-P	4	0	1	0	1	13	26			
		Wr	84	83	77	87	91	85	81			
	Yellow Perch	PSD	81	56	99	94	40	11	77			
		PSD-P	26	9	39	72	20	0	8			
		Wr	102	103	96	110	106	99	98			

Length at Capture

Mean length at capture by age across years sampled, sample size (N).

Species: Walleye

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	32		282 (5)	335 (10)	374 (3)	435 (2)		446 (1)	478 (1)	617 (6)	676 (4)
2018	50	210 (2)	297 (22)	356 (11)	416 (4)			533 (4)	553 (6)		714 (1)
2017	52	231 (5)	346 (14)	420 (11)	444 (2)		491 (3)	518 (12)		689 (2)	623 (3)
2016	61	204 (22)	298 (18)	367 (4)		506 (6)	520 (10)			637 (1)	
2015	55	209 (1)	340 (10)		469 (10)	470 (29)			541 (4)		593 (1)
2014	73	260 (5)		408 (22)	429 (43)			471 (2)	547 (1)		
2013	92		294 (14)	343 (75)	455 (1)	416 (1)		424 (1)			
2012	150	195 (4)	307 (133)	419 (5)	404 (3)	450 (5)					602 (2)
2011	64	208 (45)	352 (5)	376 (1)	429 (12)	426 (1)					
2010	75	280 (1)	329 (10)	365 (45)	383 (15)		507 (2)			530 (1)	645 (1)

Species: Yellow Perch

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2015	75	103 (2)	179 (73)								
2014	29	119 (25)		248 (3)	265 (1)						
2013	18		231 (5)	260 (4)	274 (8)		322 (1)				
2012	135		221 (37)	247 (88)	278 (11)						
2011	227	134 (9)	199 (186)	248 (23)	268 (9)						
2010	159	107 (42)	206 (76)	259 (41)							

Fish Condition

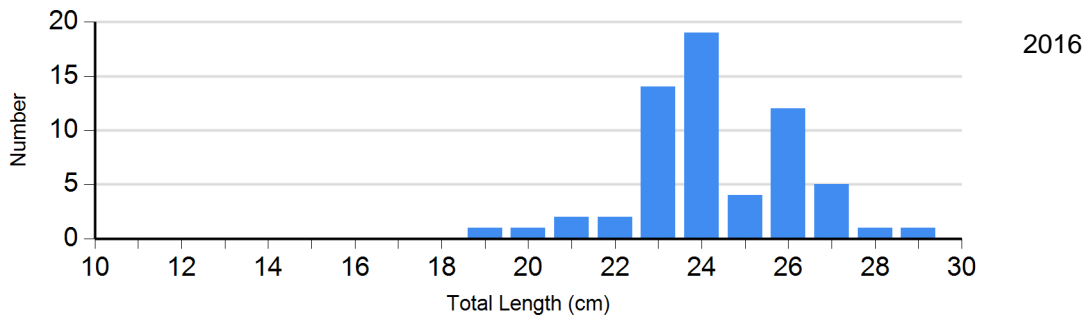
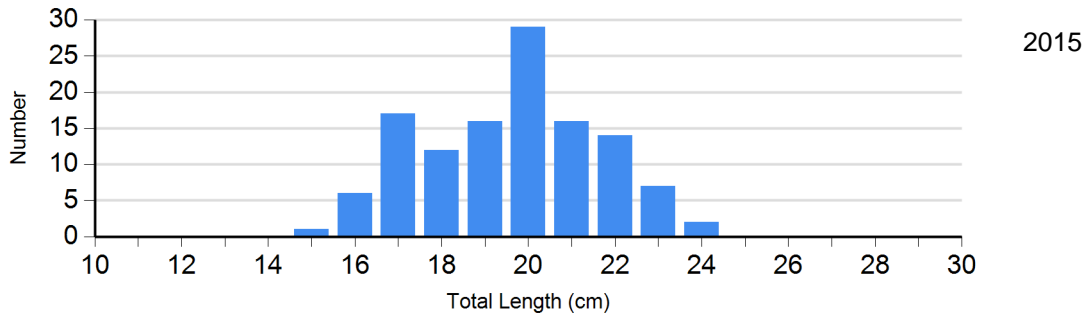
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Crappie Frame Net	2015	92	108 (0.9)	7	108 (0.8)	5	97	11	89 (1.4)
	2016	5	102 (2.2)	27	99 (1.6)	11	89 (2.9)	17	87 (1.1)
	2017	0		1	102	12	92 (1.2)	6	87 (1.1)
	2018	1	99	5	106 (2.9)	16	95 (1.5)	17	96 (1.7)
	2019	1	120	4	102 (4.0)	2	100 (2.7)	2	88 (7.7)
Northern Pike Gill Net	2015	0		2	82 (3.3)	1	91	0	
	2016	0		2	87 (0.1)	1	74	0	
	2017	0		0		2	91 (3.6)	0	
	2019	0		1	89	2	100 (9.4)	0	
Walleye Gill Net	2015	9	84 (1.8)	38	85 (1.6)	6	85 (3.1)	1	82
	2016	21	84 (1.9)	8	78 (1.1)	9	77 (1.2)	1	78
	2017	14	81 (1.2)	20	85 (1.3)	9	87 (2.2)	4	88 (3.1)
	2018	33	87 (1.4)	8	83 (2.1)	8	92 (2.5)	1	89
	2019	16	81 (1.7)	7	77 (1.3)	4	75 (2.2)	6	74 (2.6)
White Bass Gill Net	2017	1	96	4	95 (2.1)	4	93 (0.4)	1	96
	2018	0		2	94 (3.1)	9	95 (1.6)	0	
	2019	0		1	85	13	89 (1.0)	0	
Yellow Perch Gill Net	2015	65	99 (1.0)	8	99 (6.4)	0		0	
	2016	15	97 (1.9)	44	99 (3.2)	5	92 (3.1)	0	
	2017	9	104 (3.6)	10	94 (2.1)	6	94 (2.2)	0	
	2018	31	112 (1.9)	25	111 (1.6)	7	105 (2.9)	0	
	2019	3	155 (49.8)	10	102 (3.0)	9	97 (2.4)	0	

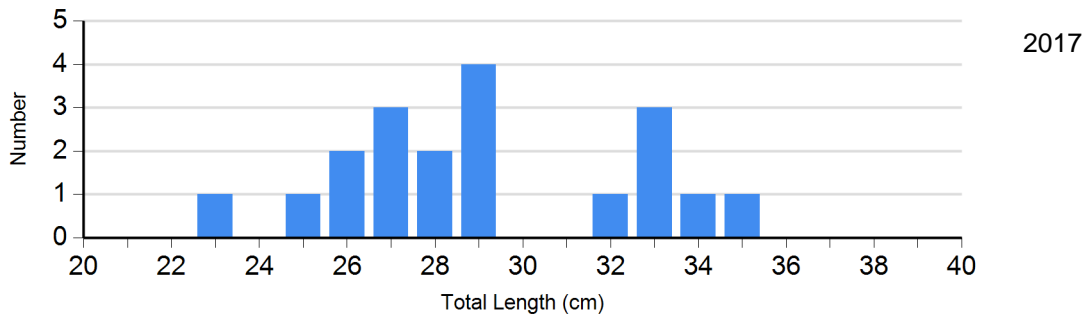
Length Frequency Distribution

Length frequency histogram of species sampled by year.

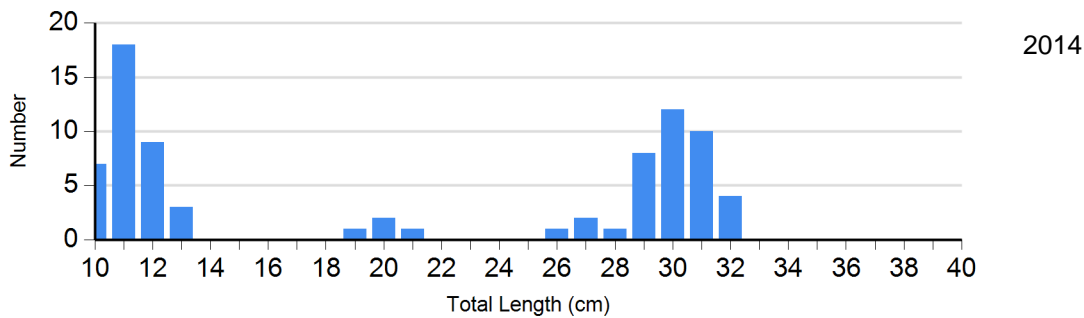
Species: Black Bullhead
Gear: std exp gill net

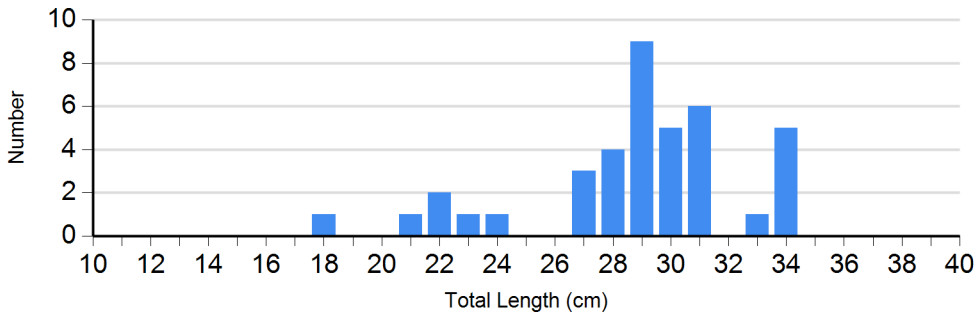
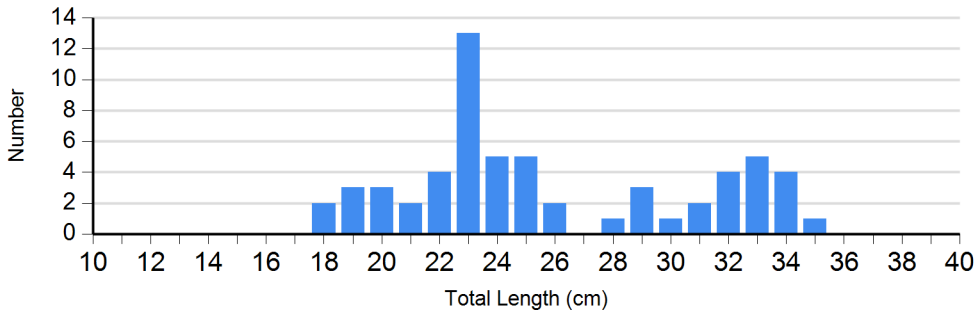
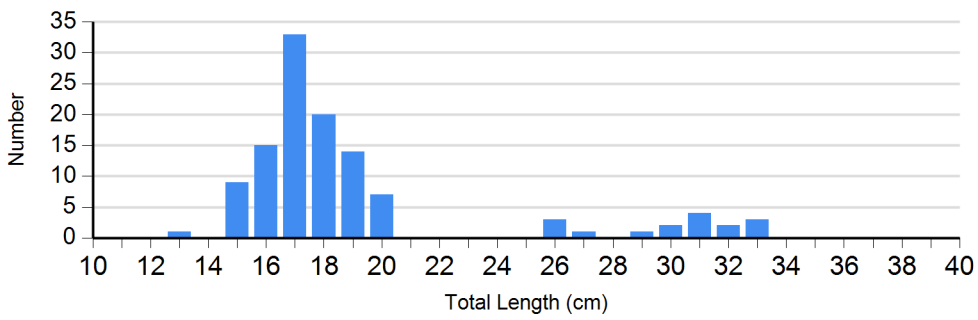


Species: Black Crappie
Gear: AFS std frame net

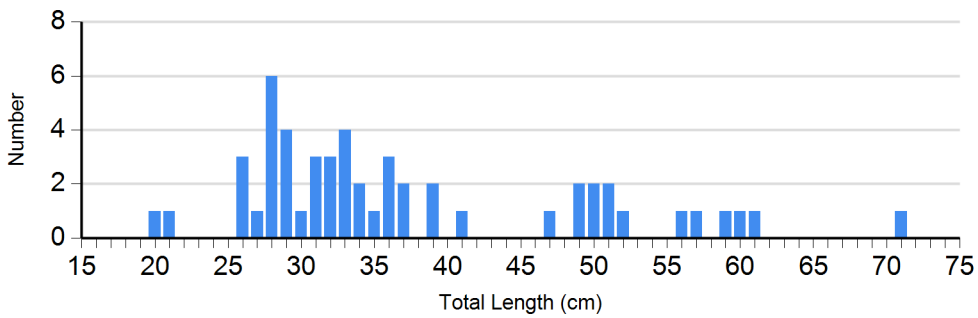
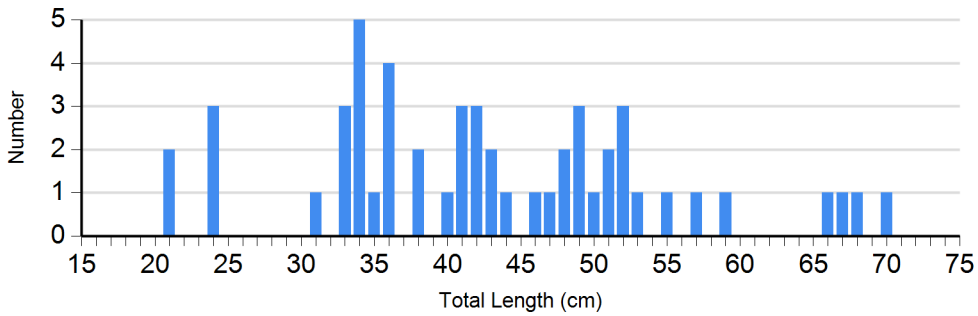


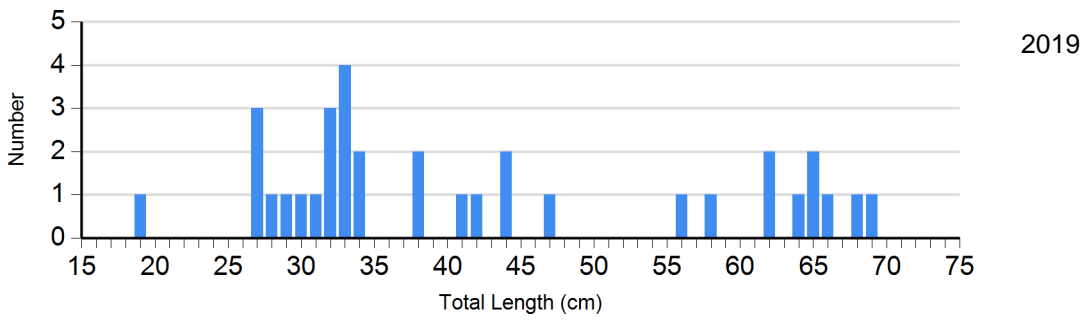
Species: Black Crappie
Gear: frame net (std 3/4 in)



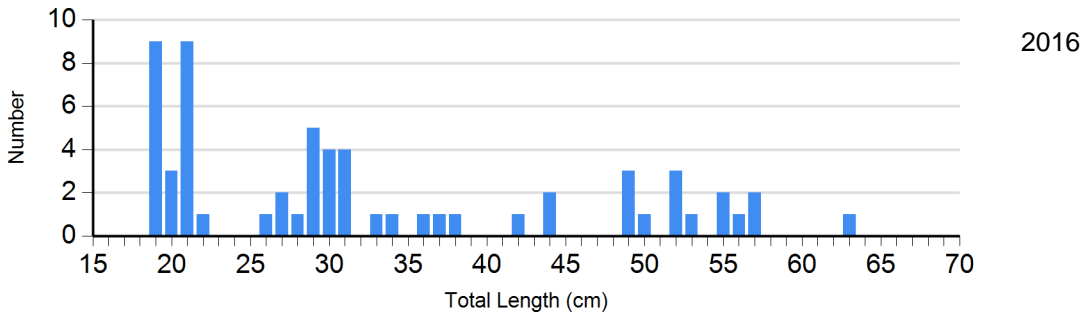
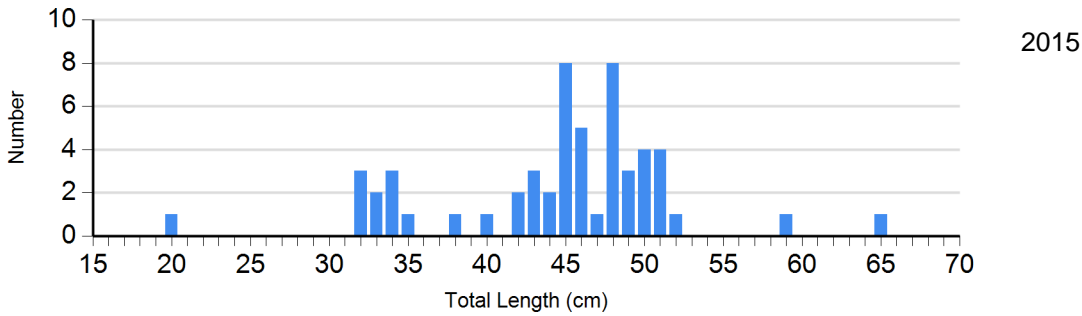
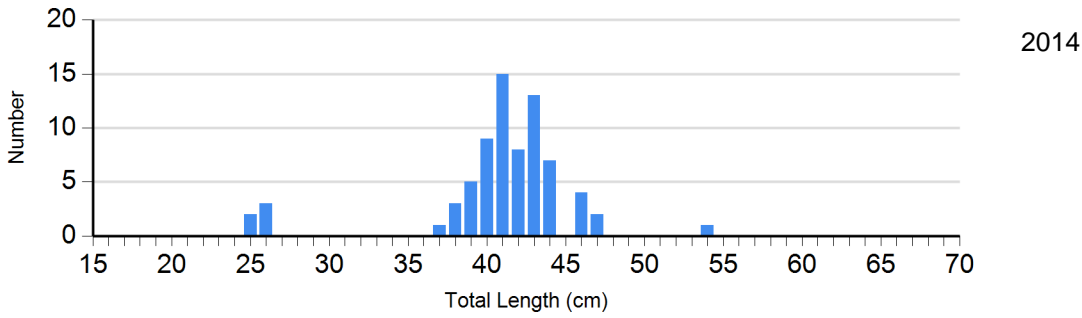


Species: Walleye
Gear: AFS std gill net

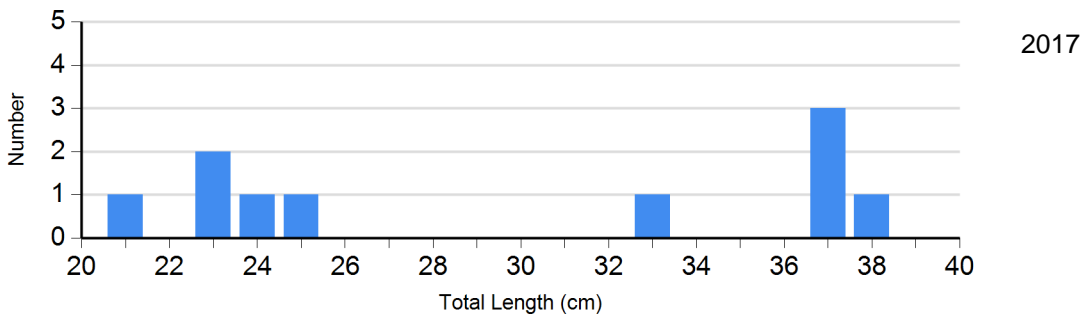


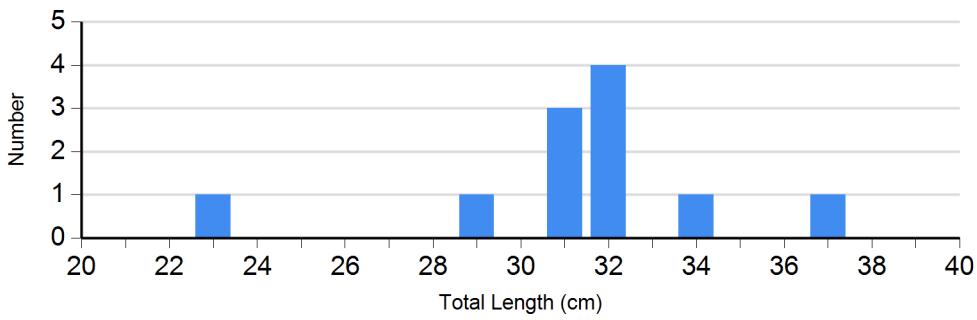


Species: Walleye
Gear: std exp gill net

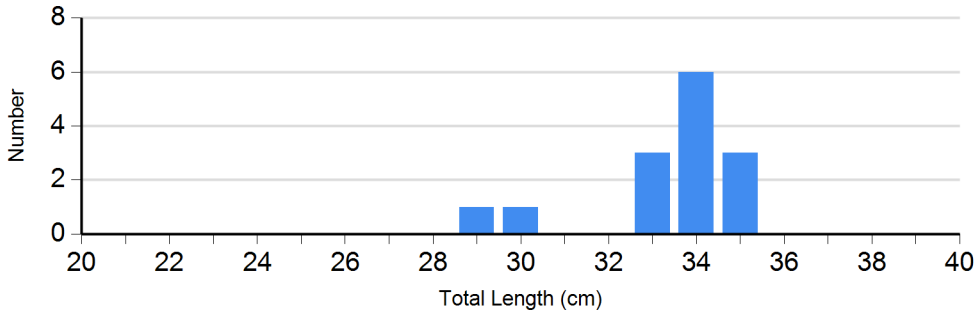


Species: White Bass
Gear: AFS std gill net



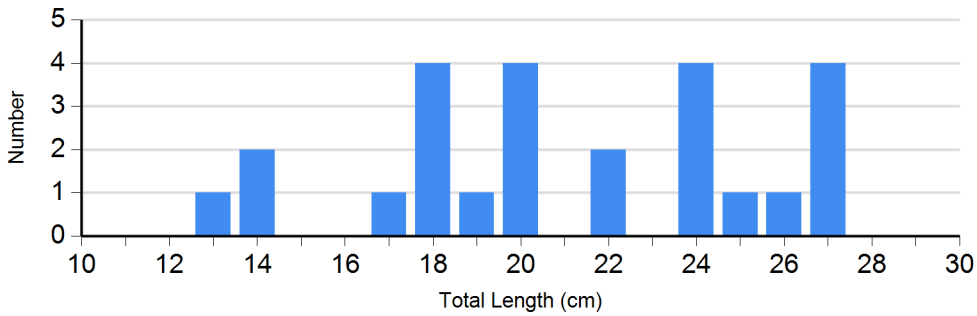


2018

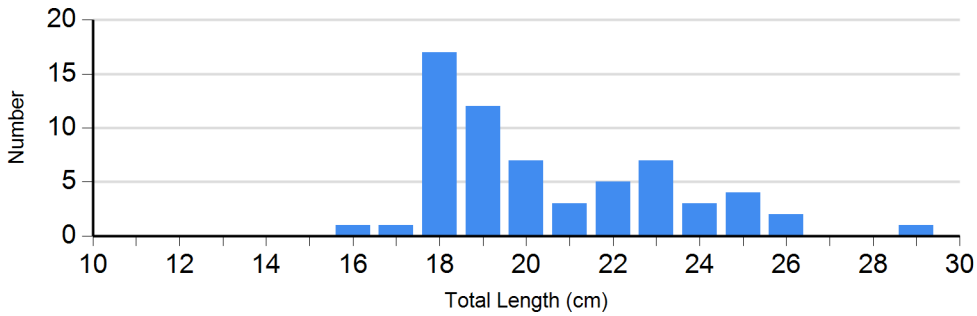


2019

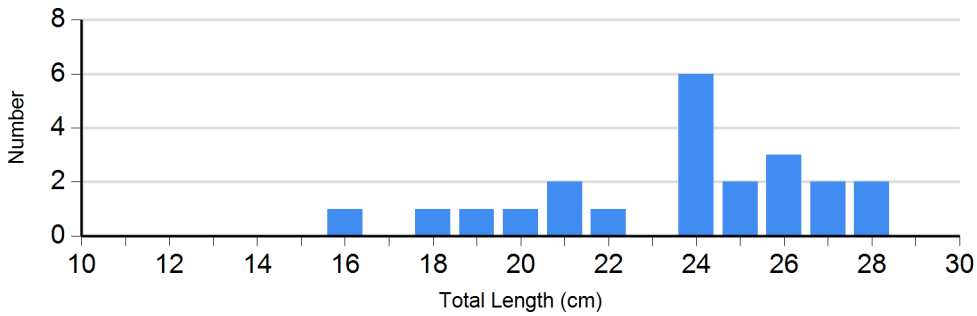
Species: Yellow Perch
Gear: AFS std gill net



2017

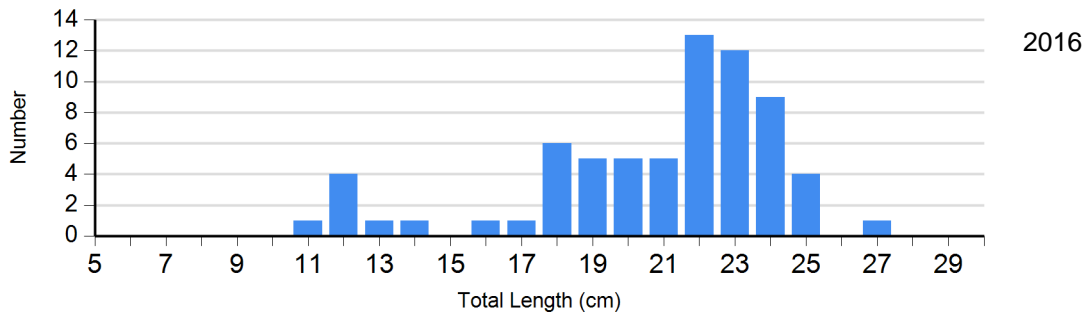
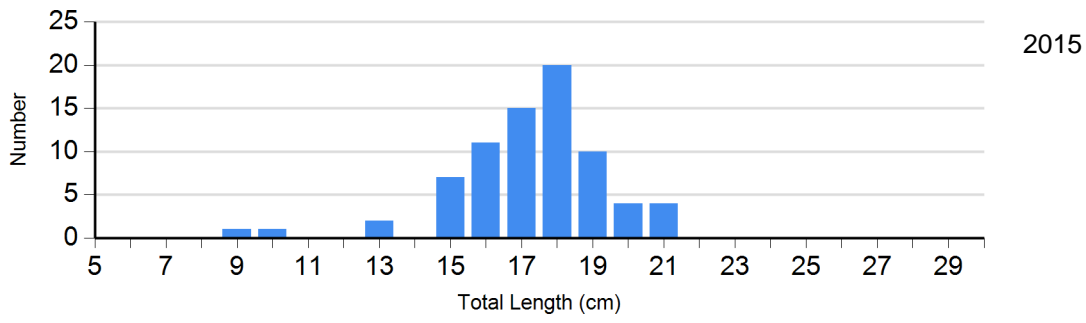
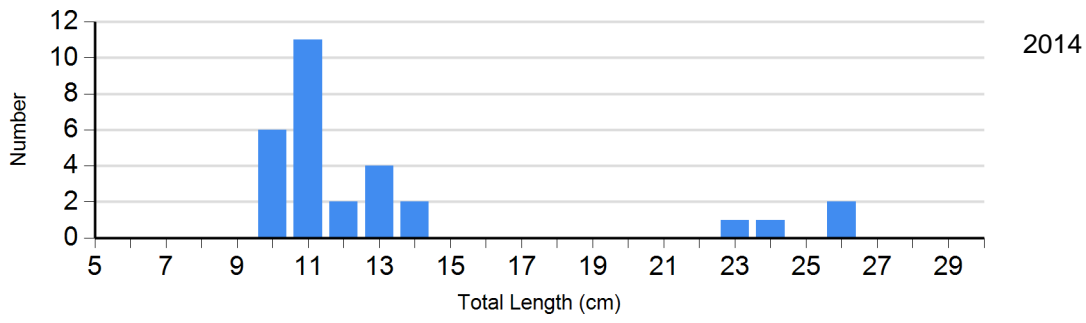


2018



2019

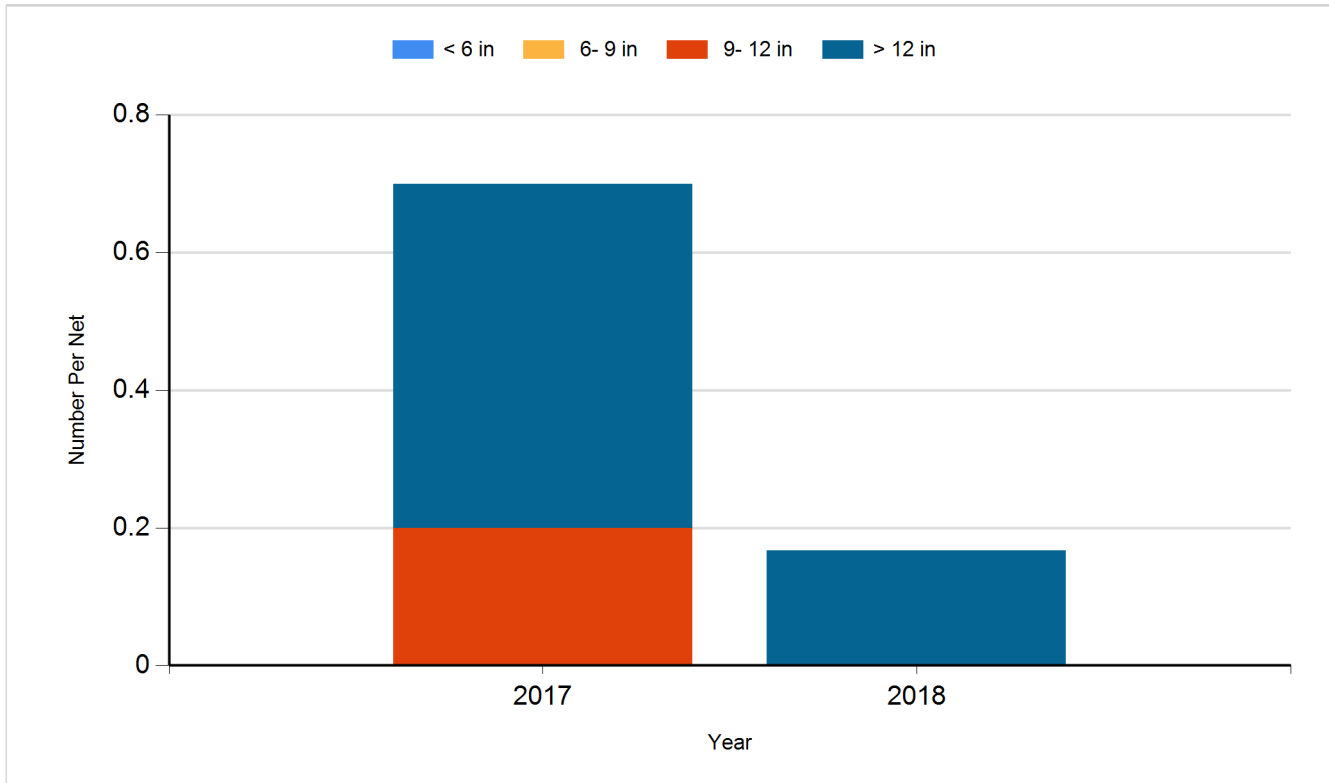
Species: Yellow Perch
Gear: std exp gill net



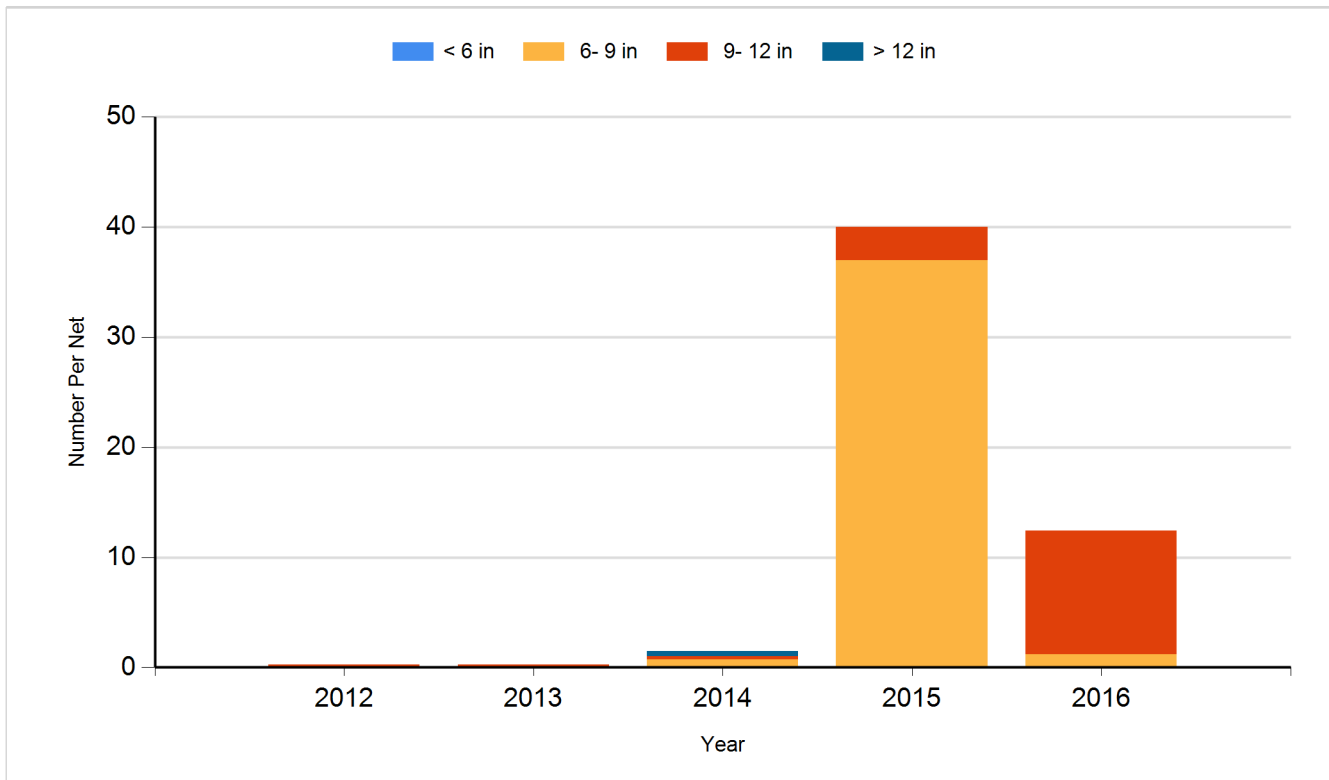
Historic Fish Sizes and Relative Abundance

Size distribution per net by color for species sampled by year.

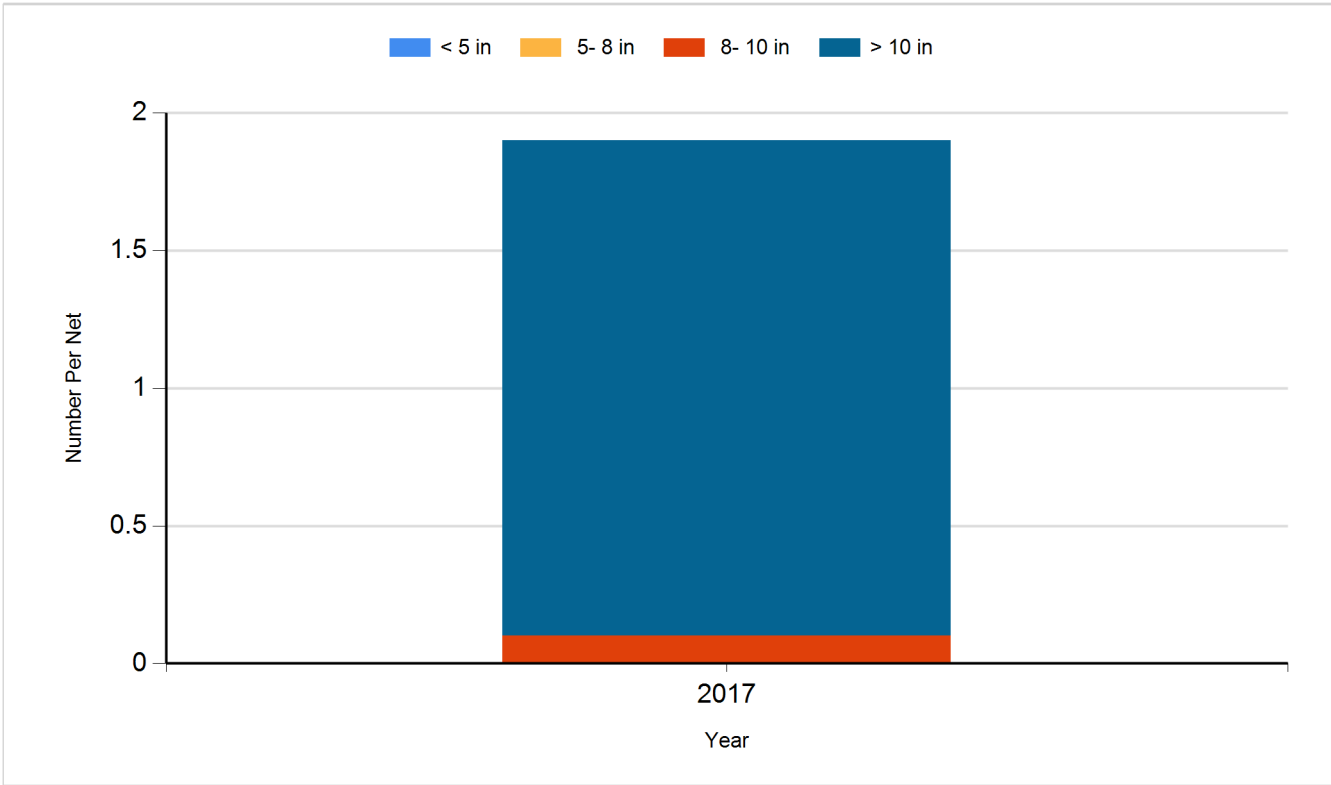
Species: Black Bullhead
Gear: AFS std gill net



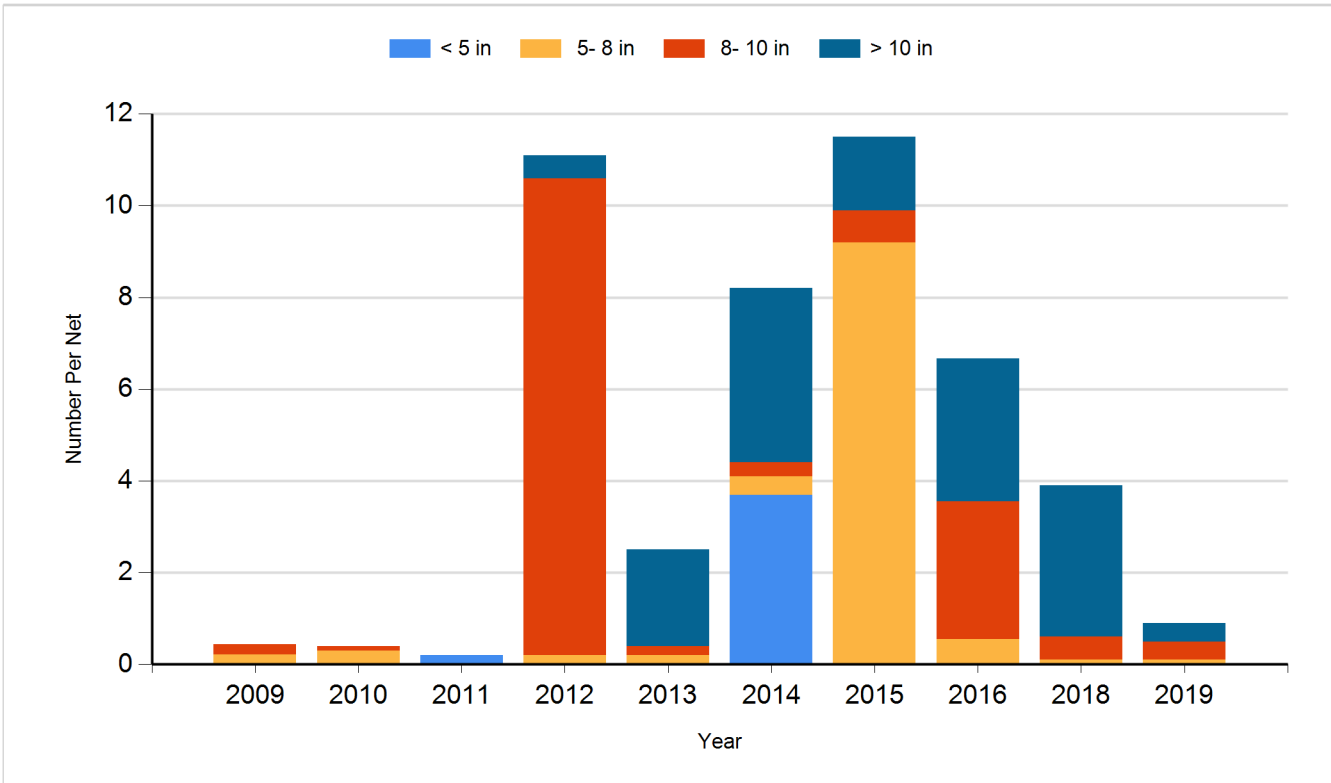
Species: Black Bullhead
Gear: std exp gill net



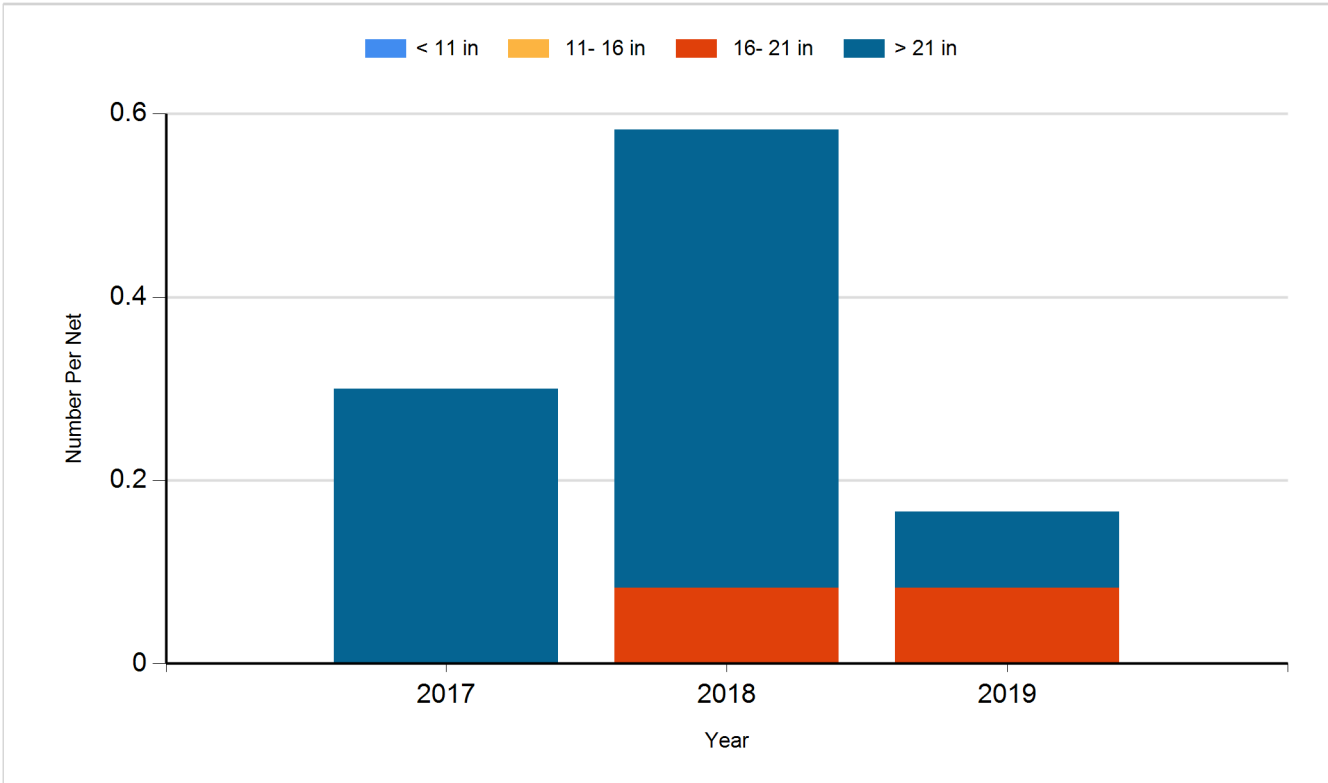
Species: Black Crappie
Gear: AFS std frame net



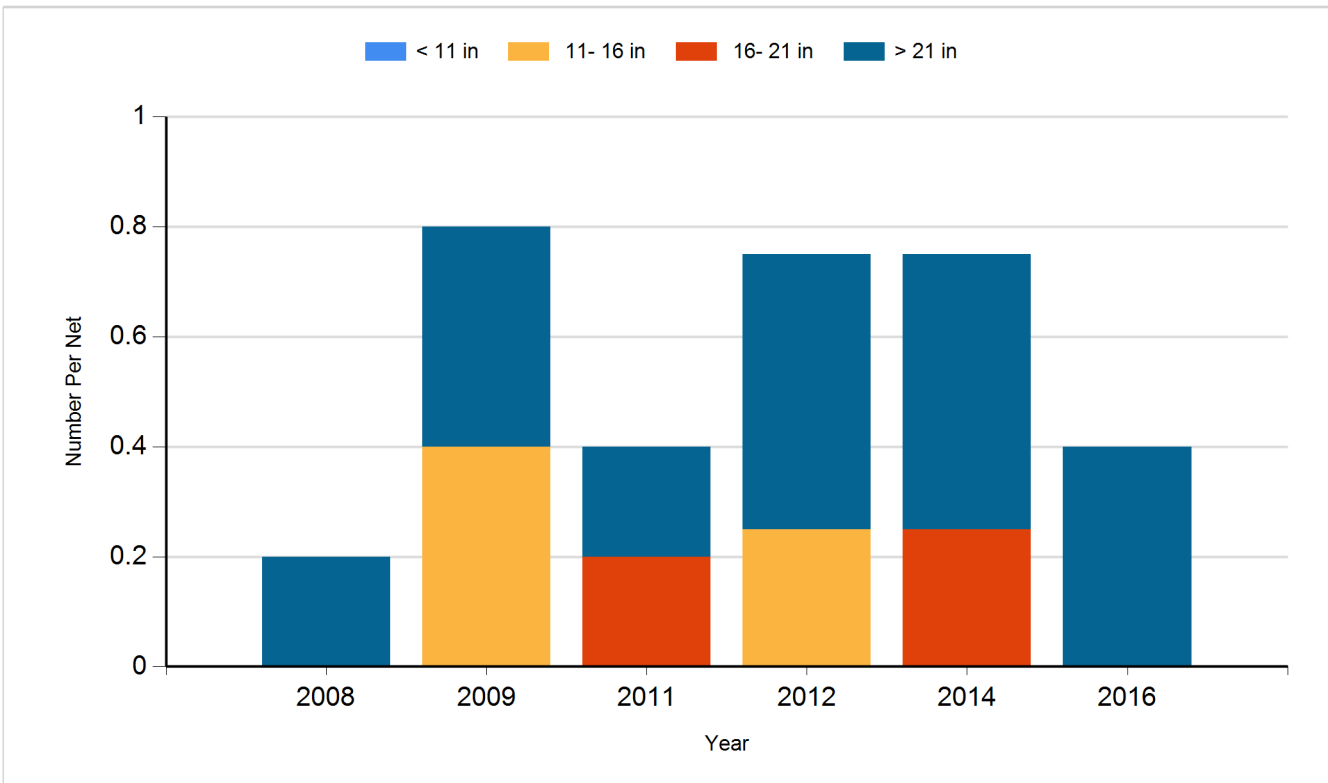
Species: Black Crappie
Gear: frame net (std 3/4 in)



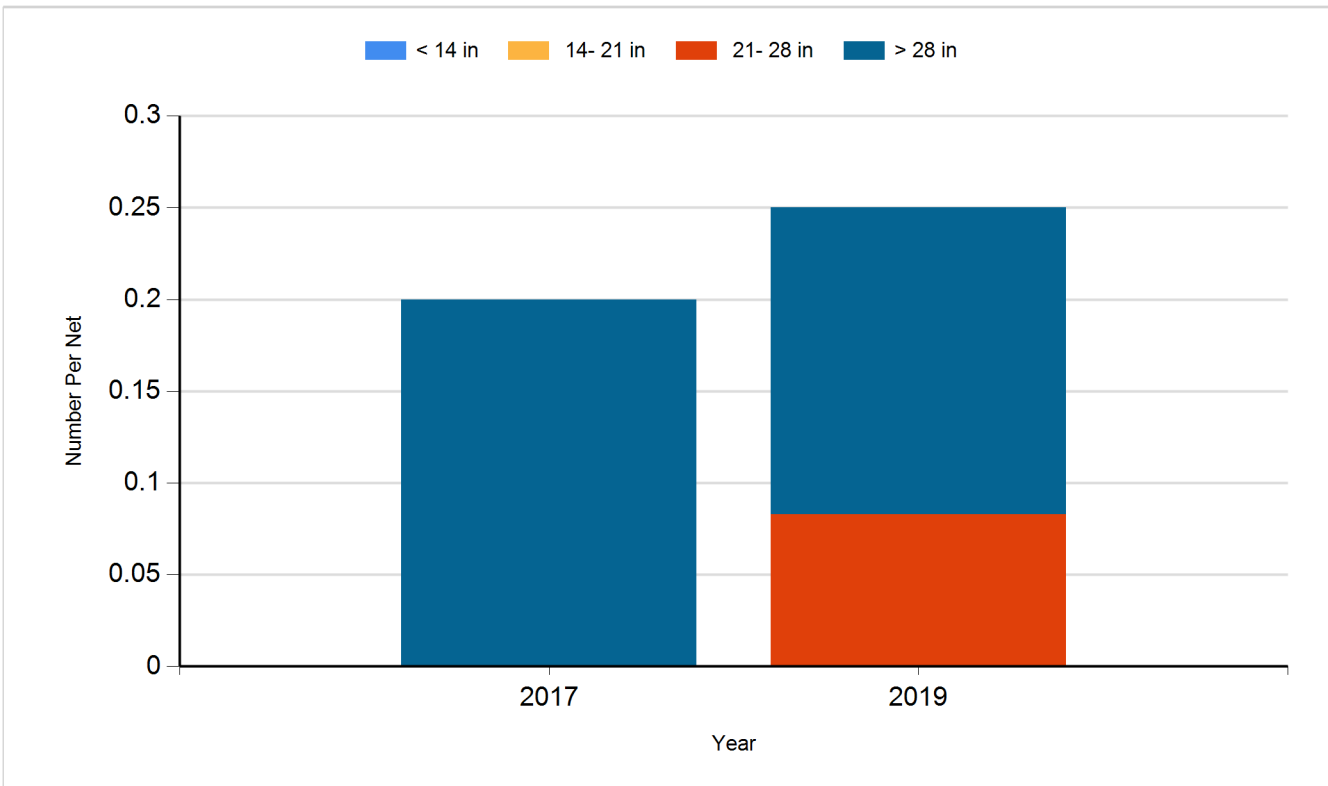
Species: Common Carp
Gear: AFS std gill net



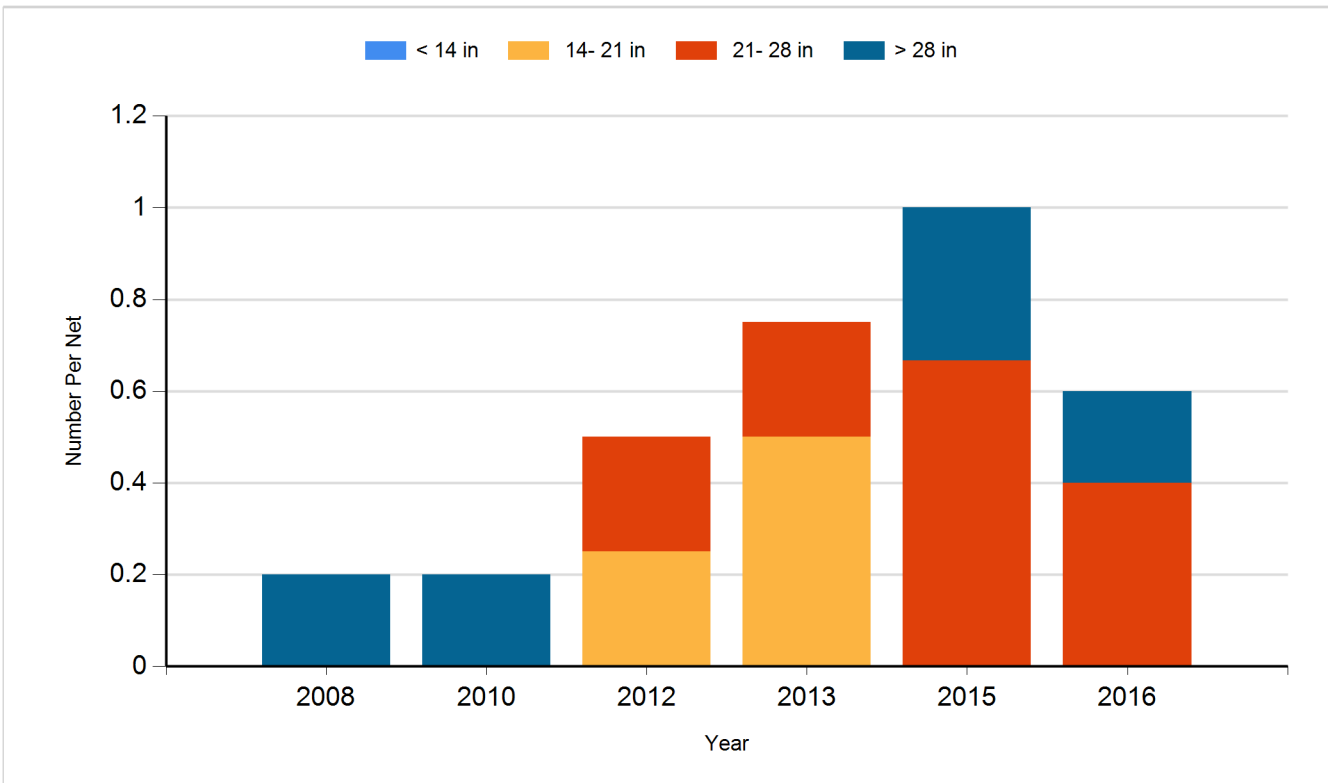
Species: Common Carp
Gear: std exp gill net



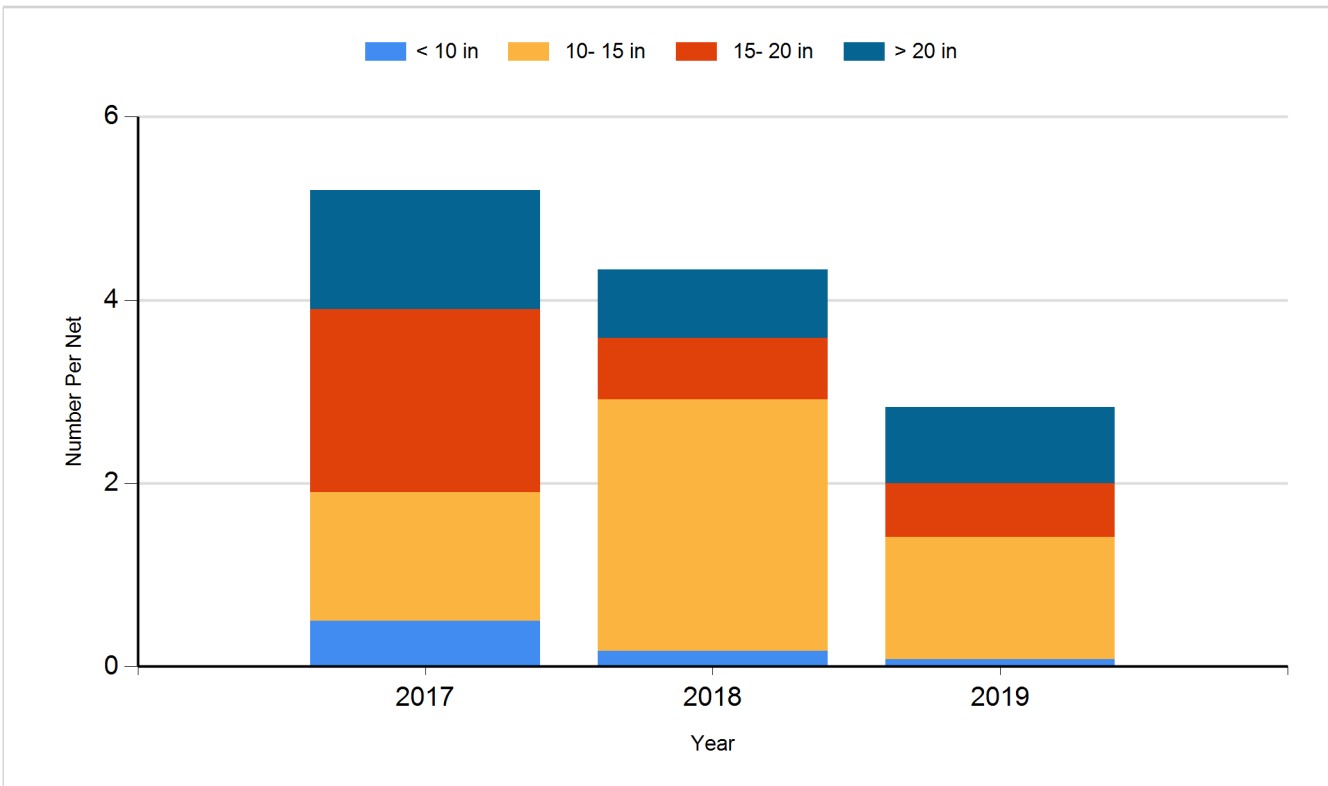
Species: Northern Pike
Gear: AFS std gill net



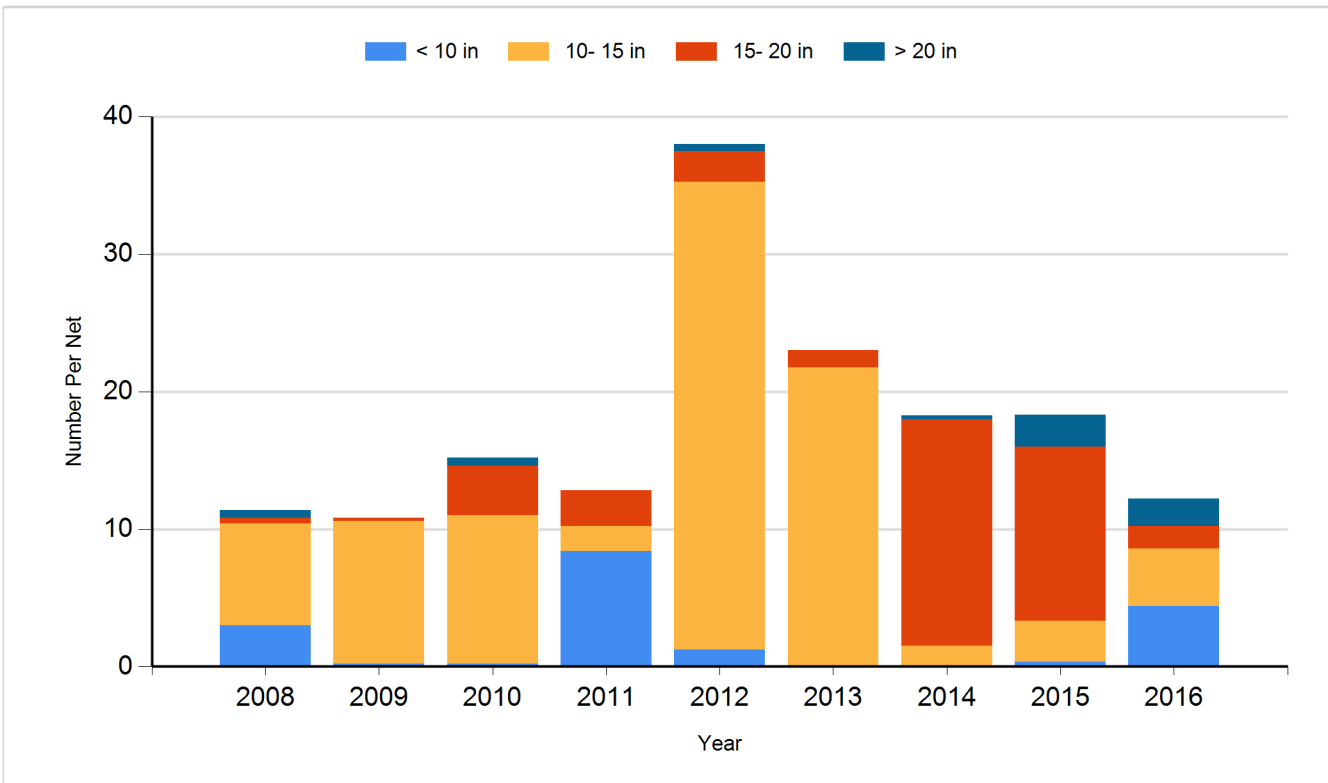
Species: Northern Pike
Gear: std exp gill net



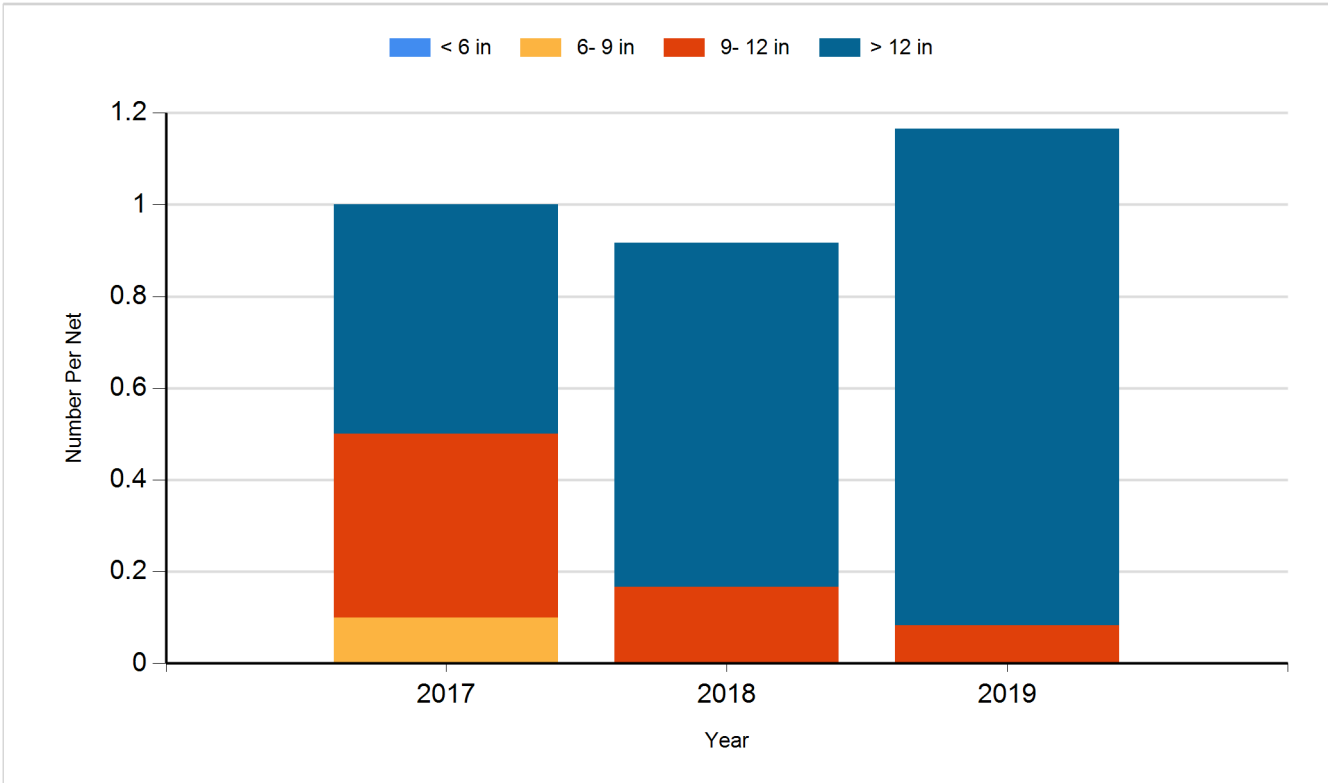
Species: Walleye
Gear: AFS std gill net



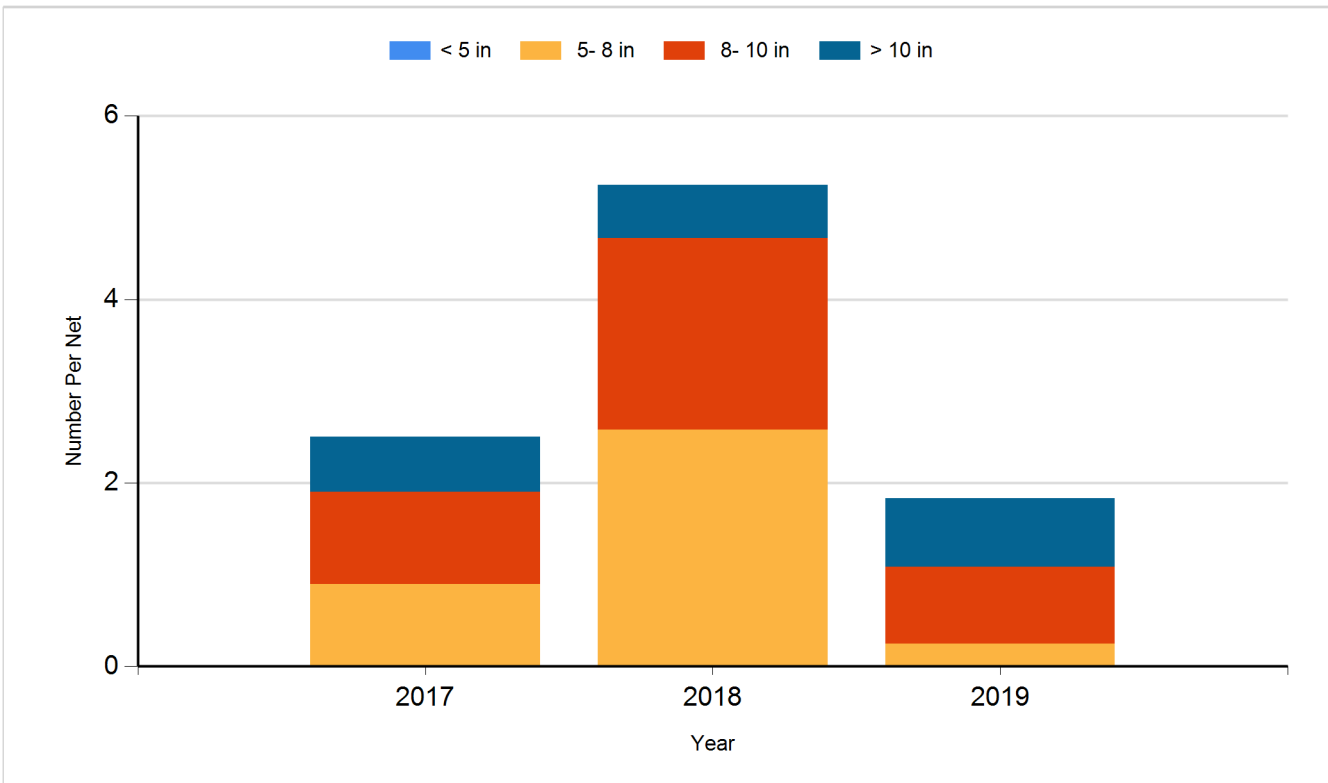
Species: Walleye
Gear: std exp gill net



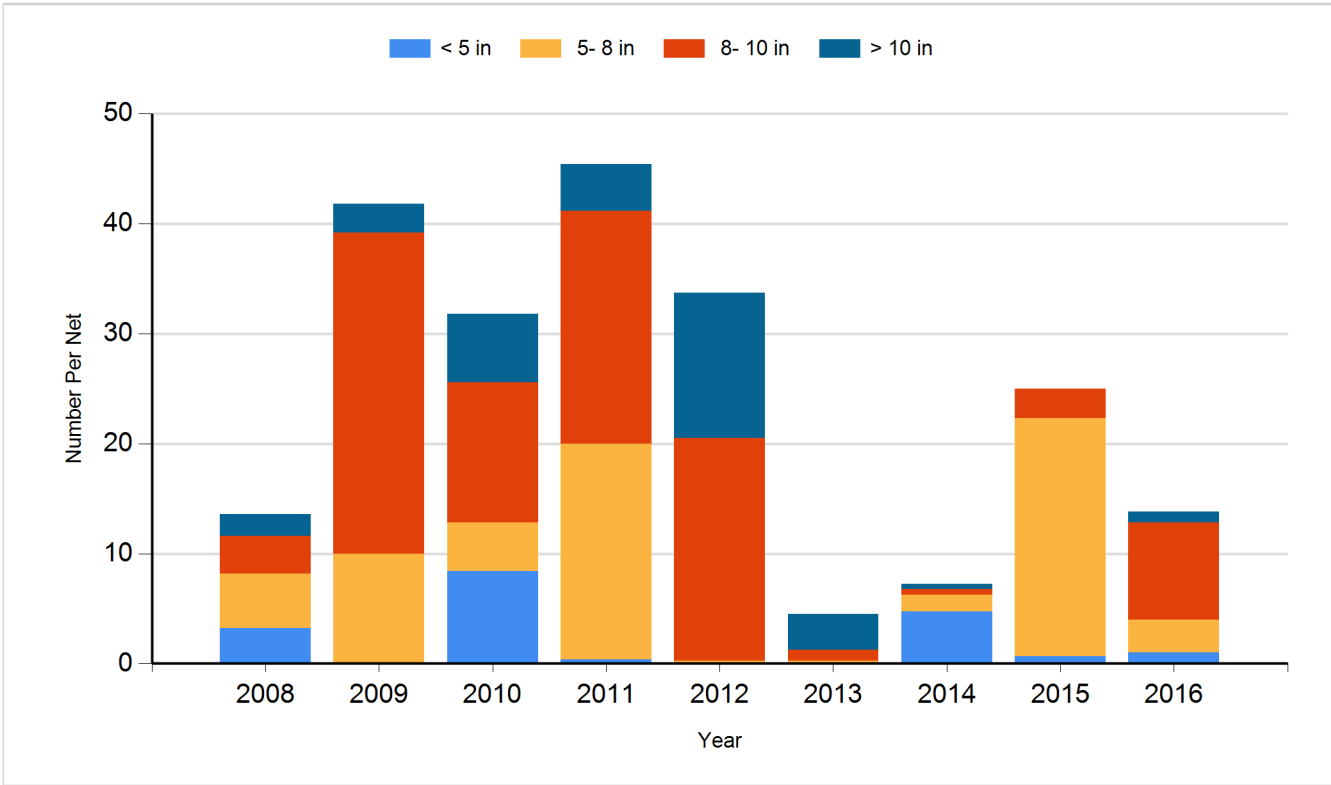
Species: White Bass
Gear: AFS std gill net



Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net



Fish Stocking

Number of fish stocked by year, species, and size.

Year	Species	Size	Number
2010	Walleye	Small Fingerling	172,480
2011	Muskellunge	Large Fingerling	1,223
2012	Muskellunge	Adult	2
2013	Muskellunge	Fingerling	780
2014	Muskellunge	Large Fingerling	1,719
2015	Muskellunge	Large Fingerling	1,720
2015	Walleye	Small Fingerling	118,400
2017	Muskellunge	Large Fingerling	3,206
2017	Walleye	Small Fingerling	121,030
2019	Walleye	Small Fingerling	117,220