

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Bitter, Day County

UBS-Lake-409-800

2023

Lake Information

Name: Bitter **Maximum Depth:** 32 Feet
County: Day
Surface Area: 18,783 Acres

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Aug 29, 2023	8 net-nights
AFS std gill net	Aug 30, 2023	8 net-nights
fall night EF-WAE	Sep 19, 2023	3600 seconds

Common Fish Species Present

Walleye

Northern Pike

Yellow Perch

White Bass

Common Carp

Rock Bass

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	8	0.5	0.3	100		100		109	7
	Northern Pike	20	1.3	0.4	100		40	18	79	2
	Rock Bass	5	0.3	0.2	80		40		115	5
	Walleye	265	14.8	1.8	38	4	14	3	87	1
	White Bass	90	5.3	1.3	100		98		103	3
	Yellow Perch	75	4.7	1.2	40	8	9	5	116	1

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.

* Methods/Species that ignore stock length

Gear	Species	CPUE										Avg
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
AFS std gill net	Black Bullhead			0.0	0.0	0.1	0.2	0.2	0.1	0.6	0.0	0.15
	Black Crappie			0.1	0.0	0.1	0.0	0.7	0.3	0.1	0.0	0.16
	Common Carp			0.4	1.9	1.2	0.2	1.8	1.3	1.6	0.5	1.11
	Gizzard Shad			0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.09
	Northern Pike			0.7	0.5	0.1	0.3	0.3	0.4	1.4	1.3	0.63
	Rock Bass			0.0	0.1	0.3	0.3	1.3	1.9	0.4	0.3	0.58
	Walleye			12.8	10.5	10.3	13.5	13.4	10.3	7.8	14.8	11.68
	White Bass			1.0	5.3	4.1	3.1	3.9	6.6	5.1	5.3	4.30
	White Sucker			0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.05
	Yellow Perch			9.3	5.3	25.1	8.6	12.6	16.1	8.6	4.7	11.29
boat shocker (night)	Walleye*	9.6	2.0	37.0	136.0							46.15
fall night EF- WAE*	Walleye					60.0		3.0	411.0	70.0	105.0	129.8 0
std exp gill net	Common Carp	1.4	0.1									0.75
	Northern Pike	1.5	1.5									1.50
	Rock Bass	0.0	0.0									0.00
	Walleye	38.8	41.4									40.10
	White Bass	1.9	0.5									1.20
	White Sucker	0.0	0.0									0.00
	Yellow Perch	5.8	8.4									7.10

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									
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
AFS std gill net	Common Carp	PSD			86	77	84	100	46	100	96	100
		PSD-P			57	58	58	67	25	45	76	100
		Wr			111	111	106	116	118	112	109	109
	Northern Pike	PSD			91	100	100	100	100	100	100	100
		PSD-P			36	38	100	40	0	29	17	40
		Wr			88	86	90	82	91	91	80	79
	Rock Bass	PSD				0	50	80	50	74	43	80
		PSD-P				0	0	20	5	16	14	40
		Wr				127	110	121	121	117	117	115
	Walleye	PSD			50	49	59	32	57	89	74	38
		PSD-P			5	2	16	9	7	13	19	14
		Wr			89	92	88	94	96	96	88	87
	White Bass	PSD			94	92	98	100	85	84	100	100
		PSD-P			94	32	97	82	85	73	88	98
		Wr			107	116	107	109	110	113	105	103
Yellow Perch	PSD			72	31	11	28	47	47	27	40	
	PSD-P			31	15	4	7	11	33	11	9	
	Wr			120	120	112	115	112	114	117	116	
boat shocker (night)	Walleye	PSD	0	0	0	0						
		PSD-P	0	0	0	0						
		Wr	95	95	93	98						
std exp gill net	Common Carp	PSD	91	100								
		PSD-P	91	100								
		Wr	113	120								
	Northern Pike	PSD	100	100								
		PSD-P	50	33								
		Wr	75	78								
	Walleye	PSD	8	14								
		PSD-P	3	1								
		Wr	91	89								
White Bass	PSD	100	100									
	PSD-P	100	100									

Gear	Species	Index	Year									
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
std exp gill net	White Bass	Wr	107	108								
	Yellow Perch	PSD	80	40								
		PSD-P	48	21								
		Wr	111	112								

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+
2023	265	209 (22)	285 (154)	396 (8)	450 (13)	472 (20)	482 (12)	523 (10)	503 (1)	586 (3)	619 (20)
2022	234	233 (133)	348 (9)	420 (11)	460 (18)	467 (36)	498 (10)		570 (5)		589 (12)
2021	165	315 (14)	398 (27)	443 (53)	455 (45)	527 (5)	475 (2)	525 (7)	563 (1)	596 (1)	615 (9)
2020	214	297 (31)	350 (24)	391 (105)	462 (28)	496 (2)	512 (5)	494 (3)	551 (3)	520 (10)	606 (2)
2019	226	260 (31)	313 (107)	385 (38)	478 (3)	464 (10)	519 (2)	451 (3)	494 (25)	661 (1)	620 (5)
2018	193	232 (36)	322 (52)	398 (8)	420 (23)	460 (5)	448 (6)	486 (56)		598 (6)	626 (2)
2017	202	254 (77)	333 (18)	370 (23)	401 (13)	411 (6)	421 (61)		558 (4)		
2016	207	264 (6)	319 (33)	346 (13)	377 (18)	395 (120)		531 (11)	623 (1)	653 (1)	607 (3)
2015	348	228 (18)	290 (15)	315 (10)	356 (297)		479 (6)			606 (1)	538 (1)
2014	329	202 (18)	255 (13)	321 (280)	416 (2)	486 (12)	575 (1)		543 (1)	551 (1)	675 (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+
2023	75	163 (43)	233 (25)	240 (6)	293 (1)						
2022	137	169 (94)	226 (36)	296 (1)	303 (6)						
2021	257	177 (153)	253 (49)	281 (50)	304 (4)	304 (1)					
2020	201	169 (88)	221 (95)	257 (17)							358 (1)
2019	138	167 (95)	225 (35)	261 (2)	316 (1)	275 (3)	325 (1)			325 (1)	
2018	401	164 (351)	222 (34)	269 (9)	256 (4)	323 (1)	317 (2)				
2017	84	169 (54)	205 (9)	255 (12)	259 (5)	297 (3)		301 (1)			
2016	148	169 (9)	206 (79)	237 (21)	277 (4)	298 (12)	312 (13)	314 (8)			
2015	70	141 (27)	194 (22)	243 (3)	248 (9)	303 (3)	312 (6)				
2014	48	135 (8)	194 (3)	239 (19)	264 (7)	303 (10)	313 (1)				

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).

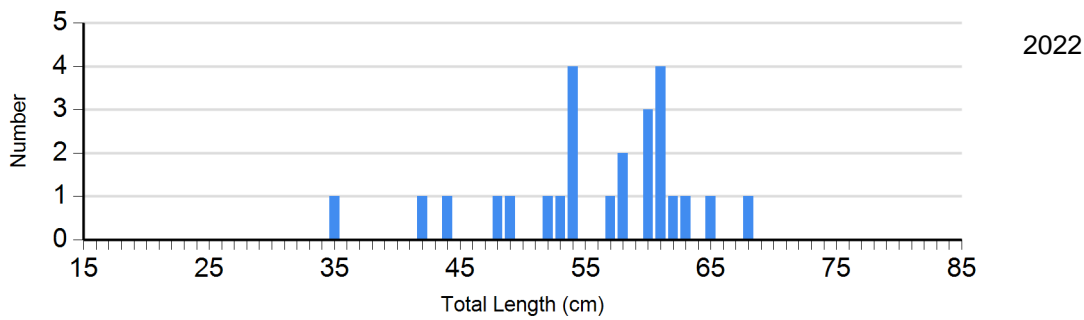
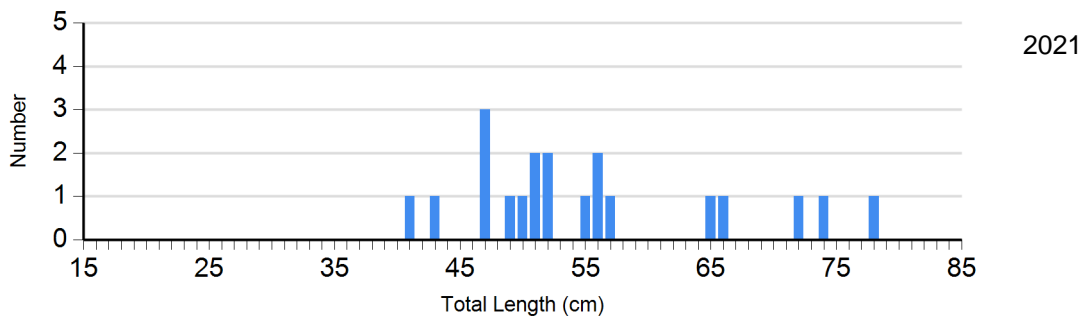
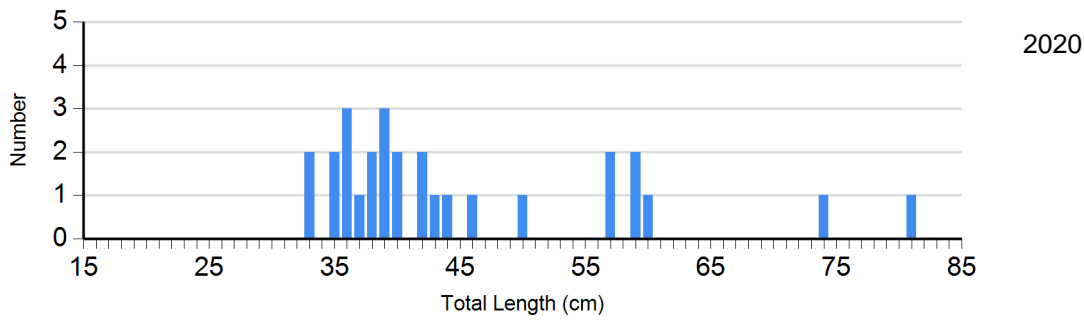
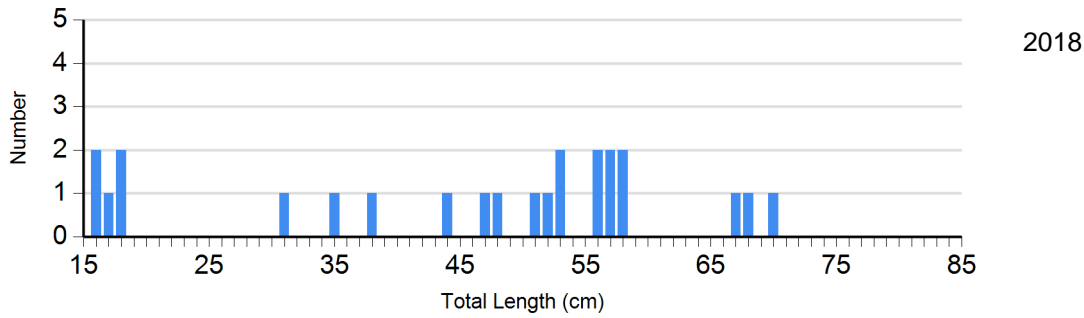
Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Common Carp Gill Net	2019	0		1	141	0		2	104 (10.4)
	2020	15	122 (2.8)	6	117 (3.7)	5	110 (1.7)	2	111 (4.2)
	2021	0		11	114 (2.6)	5	111 (3.2)	4	111 (5.9)
	2022	1	119	5	115 (4.3)	18	107 (1.8)	1	116
	2023	0		0		3	106 (2.1)	5	110 (9.2)
Northern Pike Gill Net	2019	0		3	83 (6.1)	1	87	1	76
	2020	0		4	91 (2.6)	0		0	
	2021	0		5	92 (1.3)	2	87 (1.6)	0	
	2022	0		19	80 (1.5)	3	81 (0.4)	1	
	2023	0		12	80 (1.7)	8	78 (1.3)	0	
Walleye Gill Net	2019	147	94 (0.5)	49	95 (0.8)	16	93 (1.8)	4	92 (1.8)
	2020	91	96 (0.7)	108	95 (0.5)	14	96 (1.2)	1	103
	2021	18	89 (1.4)	125	97 (0.6)	18	97 (1.7)	4	92 (2.5)
	2022	32	88 (1.5)	69	87 (0.7)	18	90 (1.5)	6	96 (2.0)
	2023	148	89 (0.4)	55	84 (0.7)	21	83 (1.7)	13	87 (2.1)
White Bass Gill Net	2019	0		9	112 (1.3)	22	109 (0.9)	18	108 (0.9)
	2020	9	116 (2.1)	0		12	109 (1.7)	41	109 (0.9)
	2021	17	118 (1.4)	12	109 (1.5)	24	113 (2.2)	53	113 (1.1)
	2022	0		10	108 (2.1)	19	105 (1.6)	52	105 (1.4)
	2023	0		2	185 (77.8)	30	104 (0.8)	53	99 (1.1)
Yellow Perch Gill Net	2019	99	115 (1.1)	29	117 (1.8)	7	116 (3.2)	3	111 (3.1)
	2020	107	113 (0.7)	72	112 (1.1)	21	107 (2.1)	1	91

Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Yellow Perch Gill Net	2021	137	116 (0.8)	34	116 (1.8)	80	111 (0.7)	6	107 (2.8)
	2022	100	118 (1.0)	22	119 (2.2)	11	103 (2.8)	4	108 (4.6)
	2023	45	116 (1.4)	23	117 (1.4)	7	110 (2.1)	0	

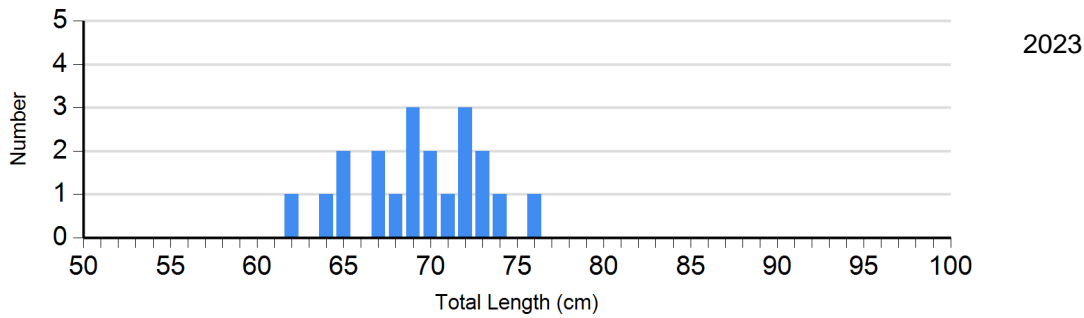
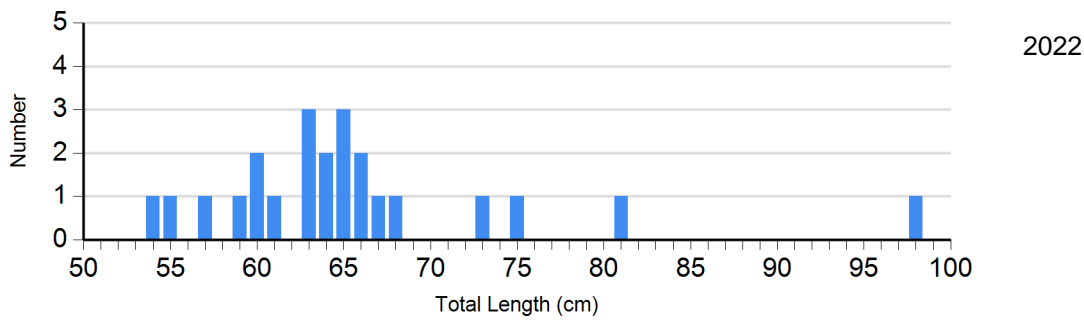
Length Frequency Distribution

Length frequency histogram of species sampled by year.

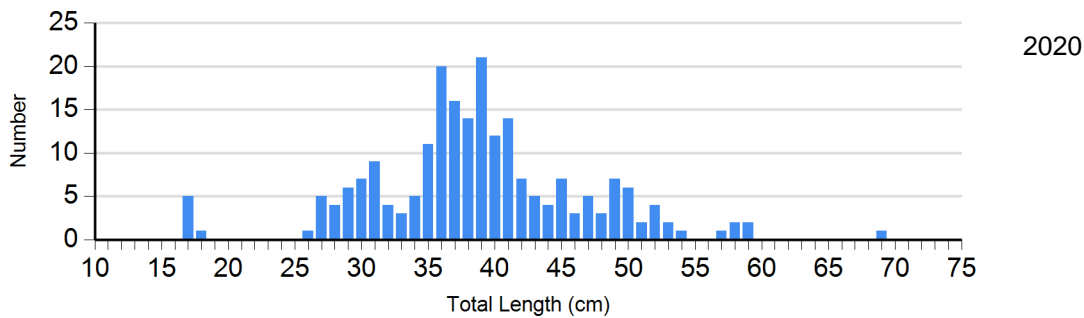
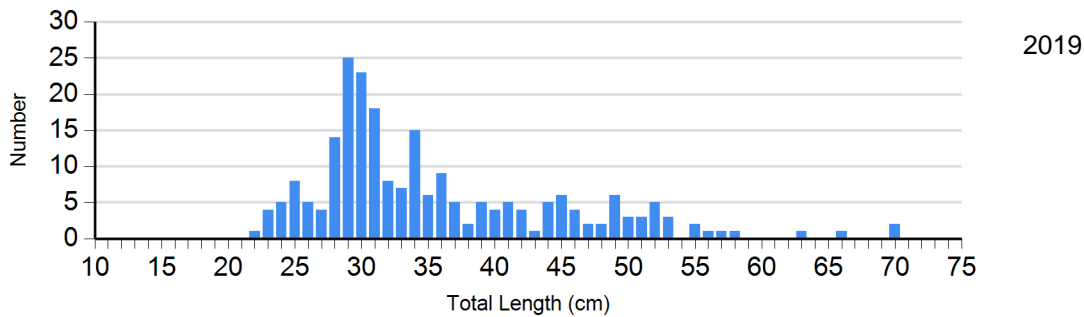
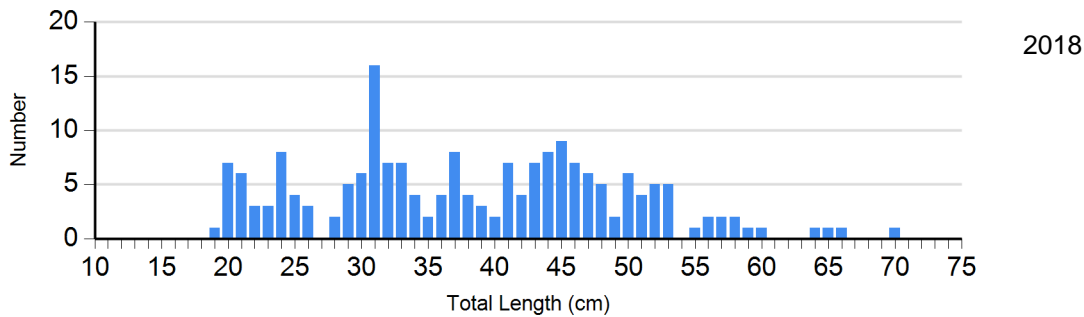
Species: Common Carp
Gear: AFS std gill net

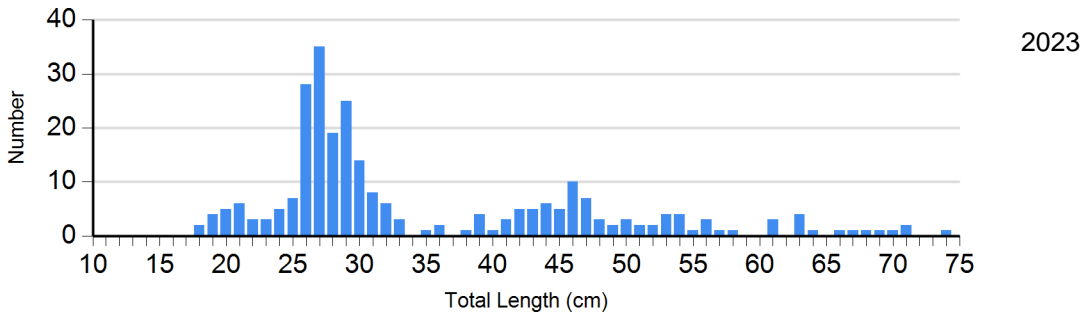
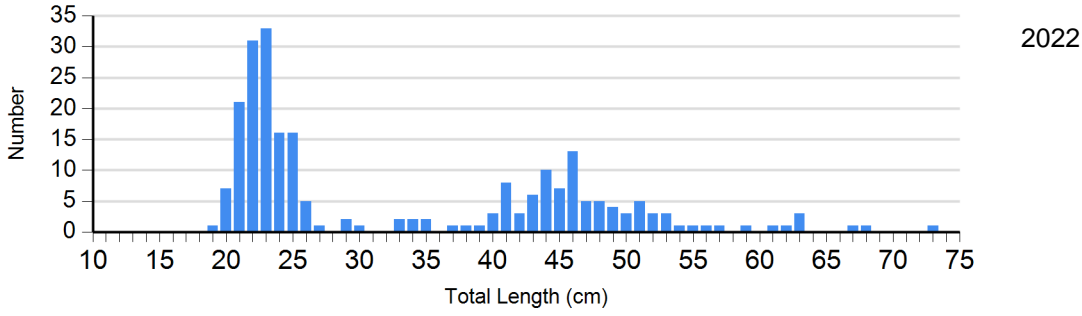
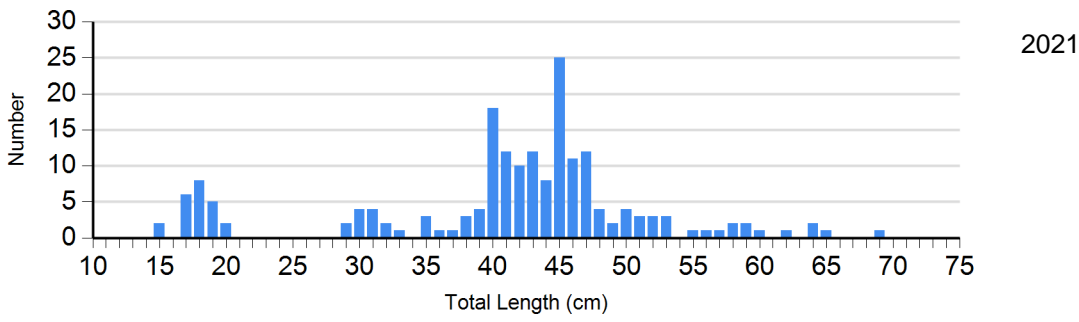


Species: Northern Pike
Gear: AFS std gill net

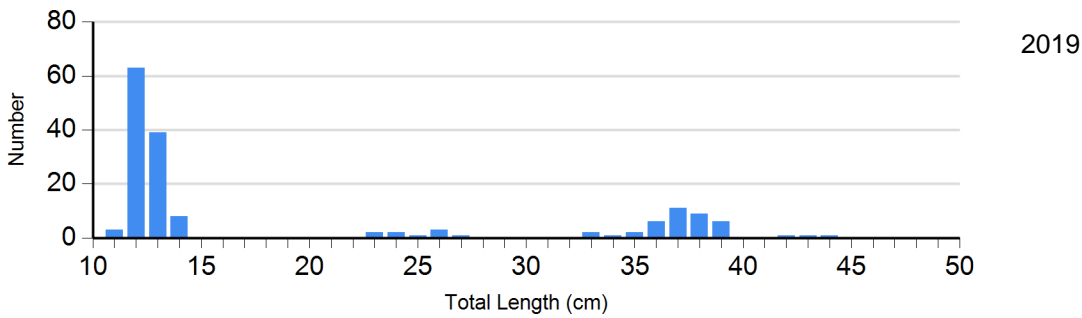
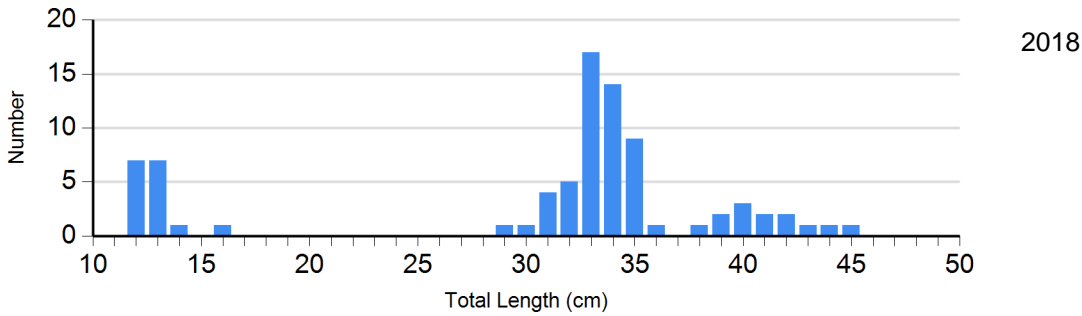


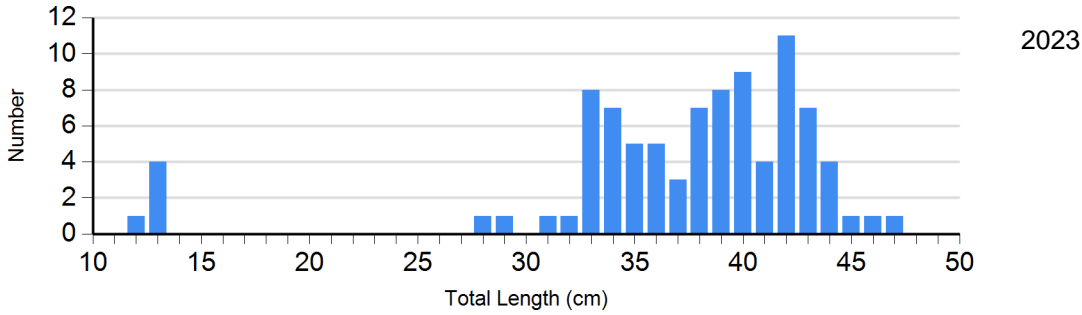
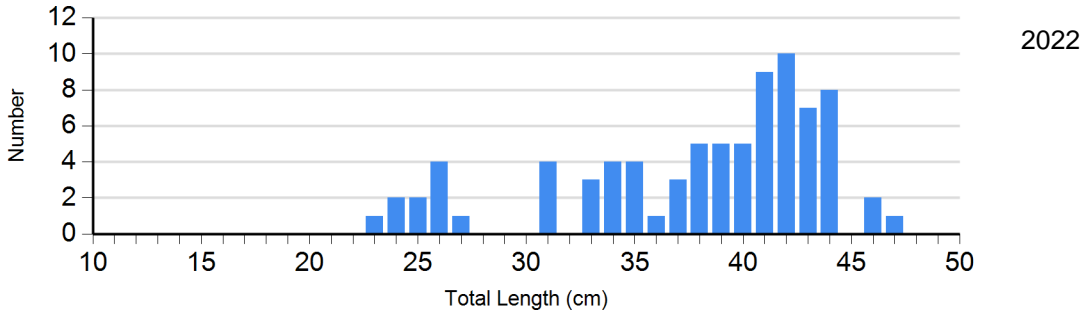
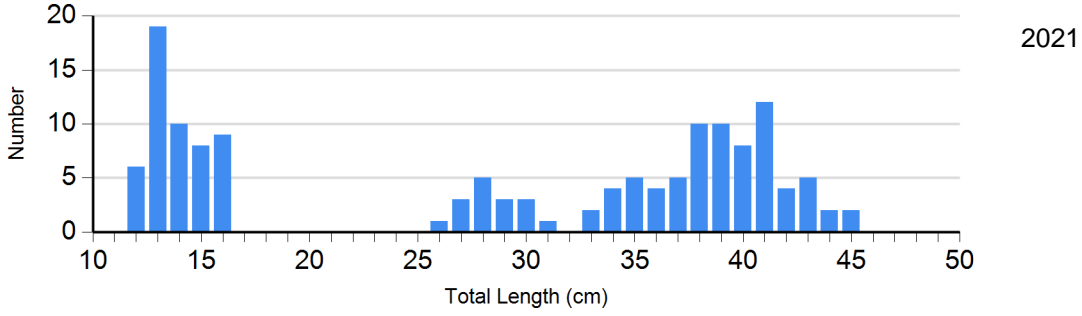
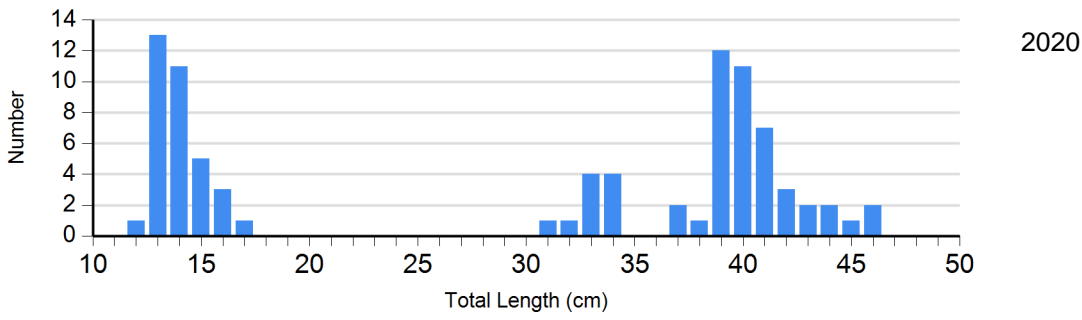
Species: Walleye
Gear: AFS std gill net



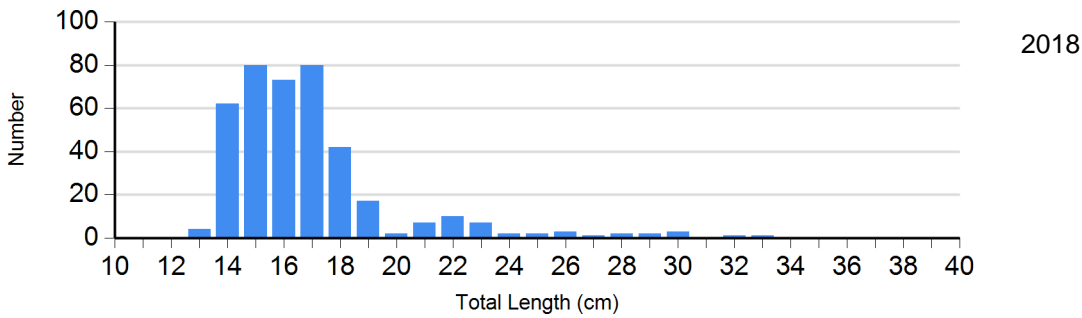


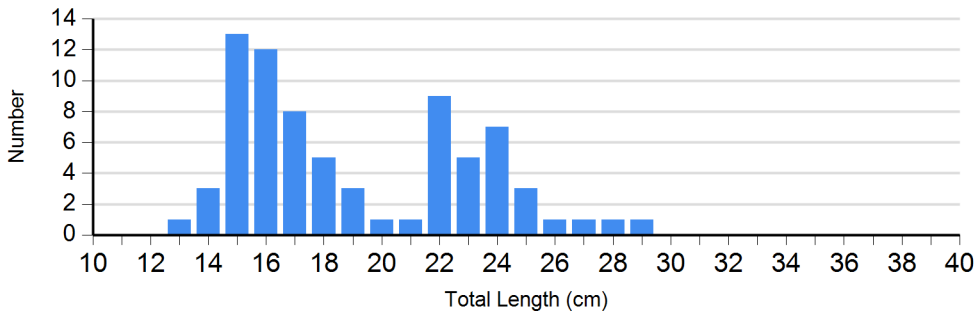
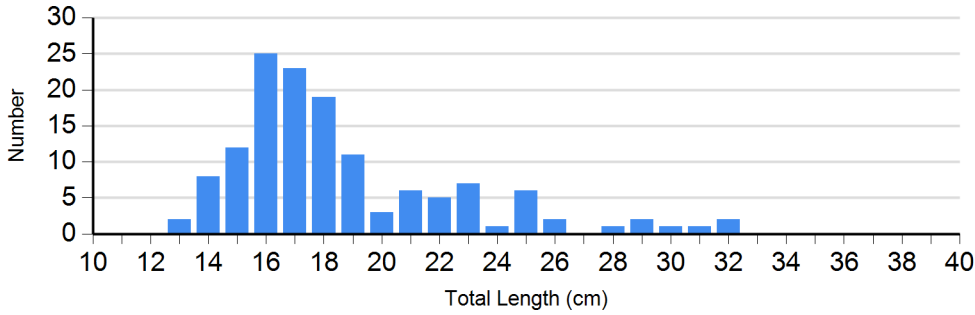
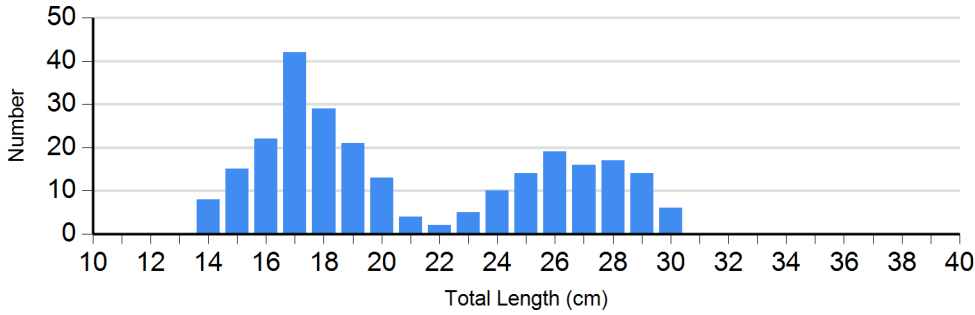
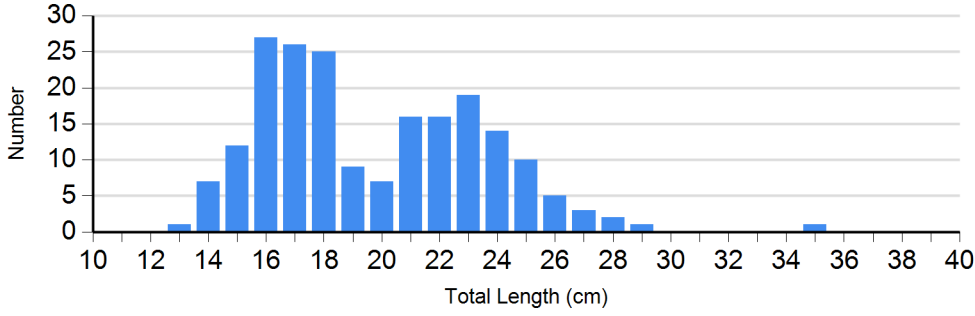
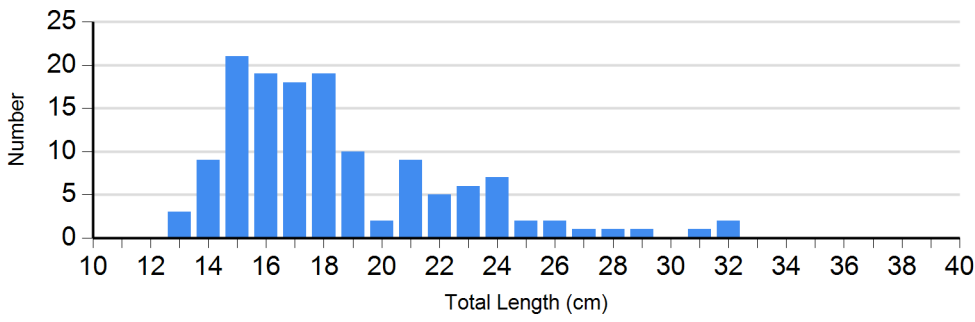
Species: White Bass
Gear: AFS std gill net





Species: Yellow Perch
 Gear: AFS std gill net

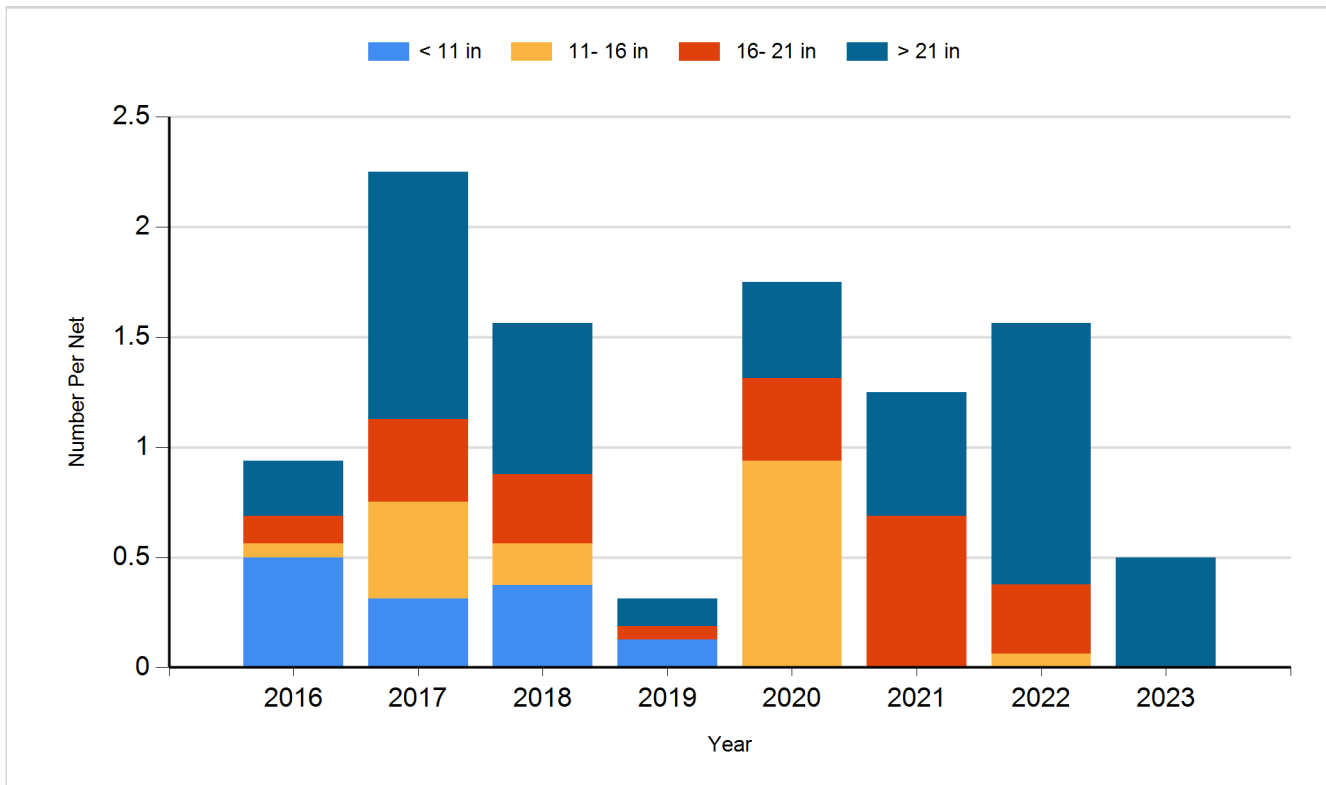




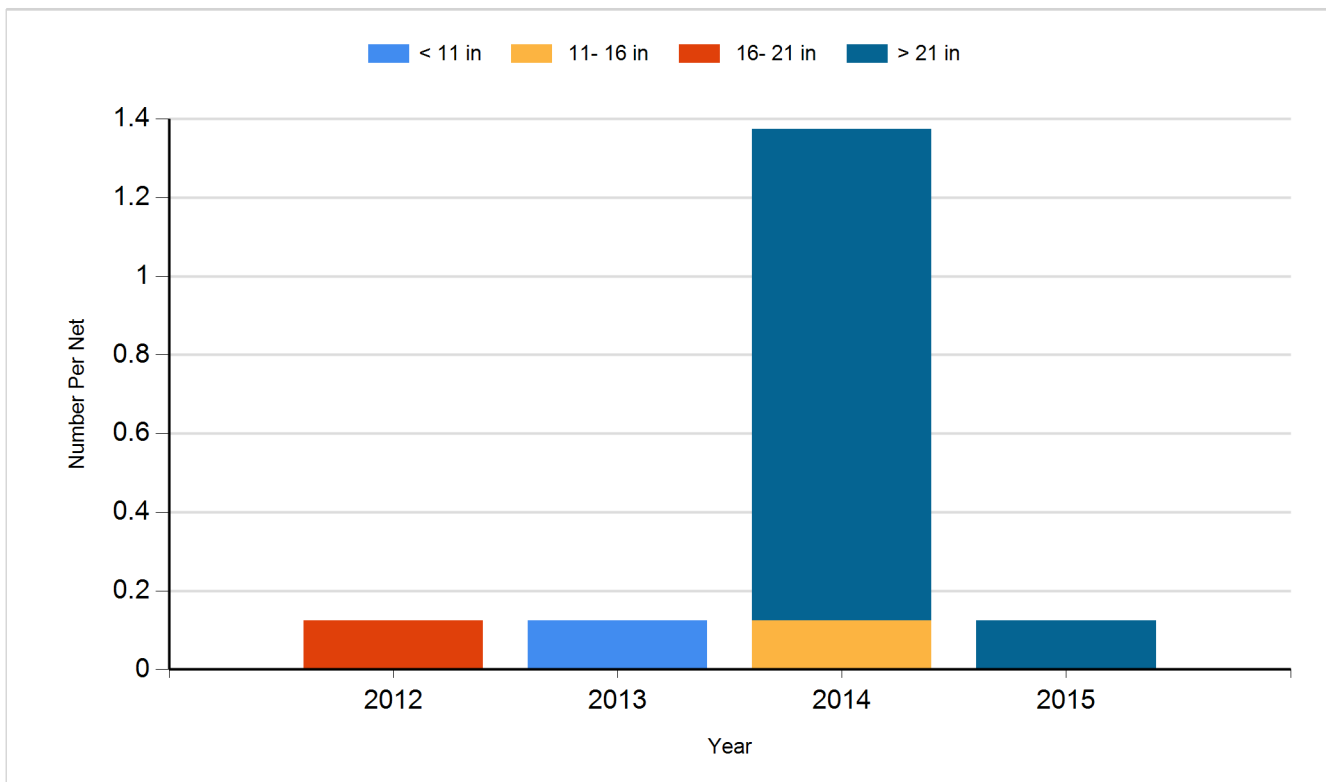
Historic Fish Sizes and Relative Abundance

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

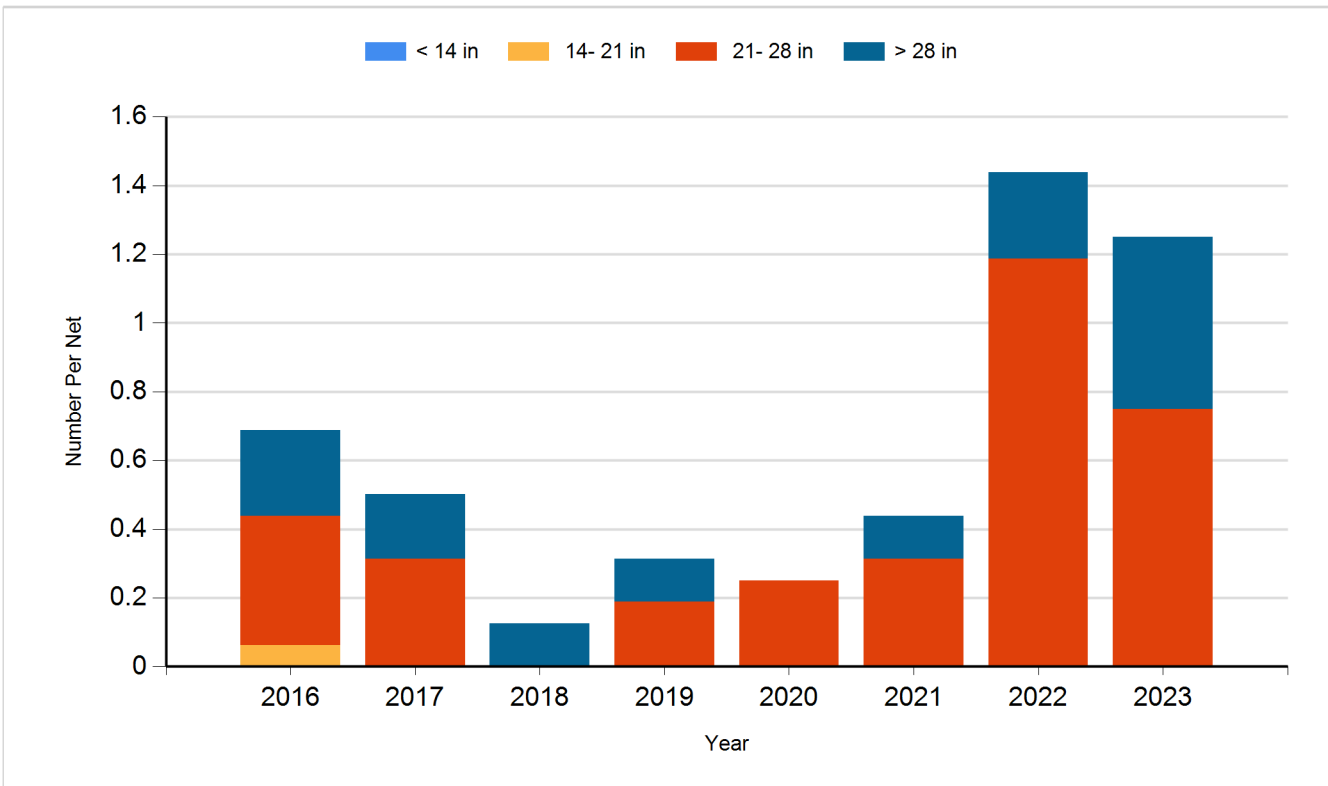
Species: Common Carp
Gear: AFS std gill net



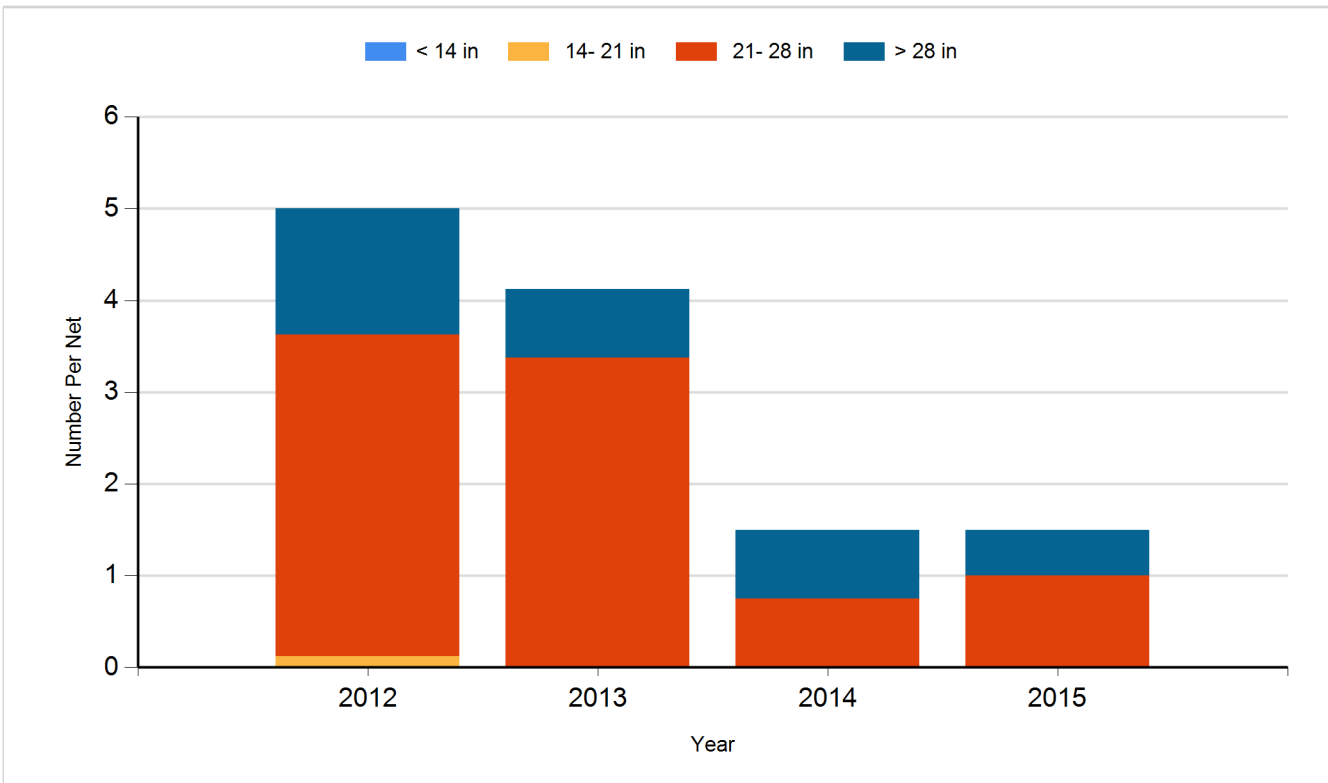
Species: Common Carp
Gear: std exp gill net



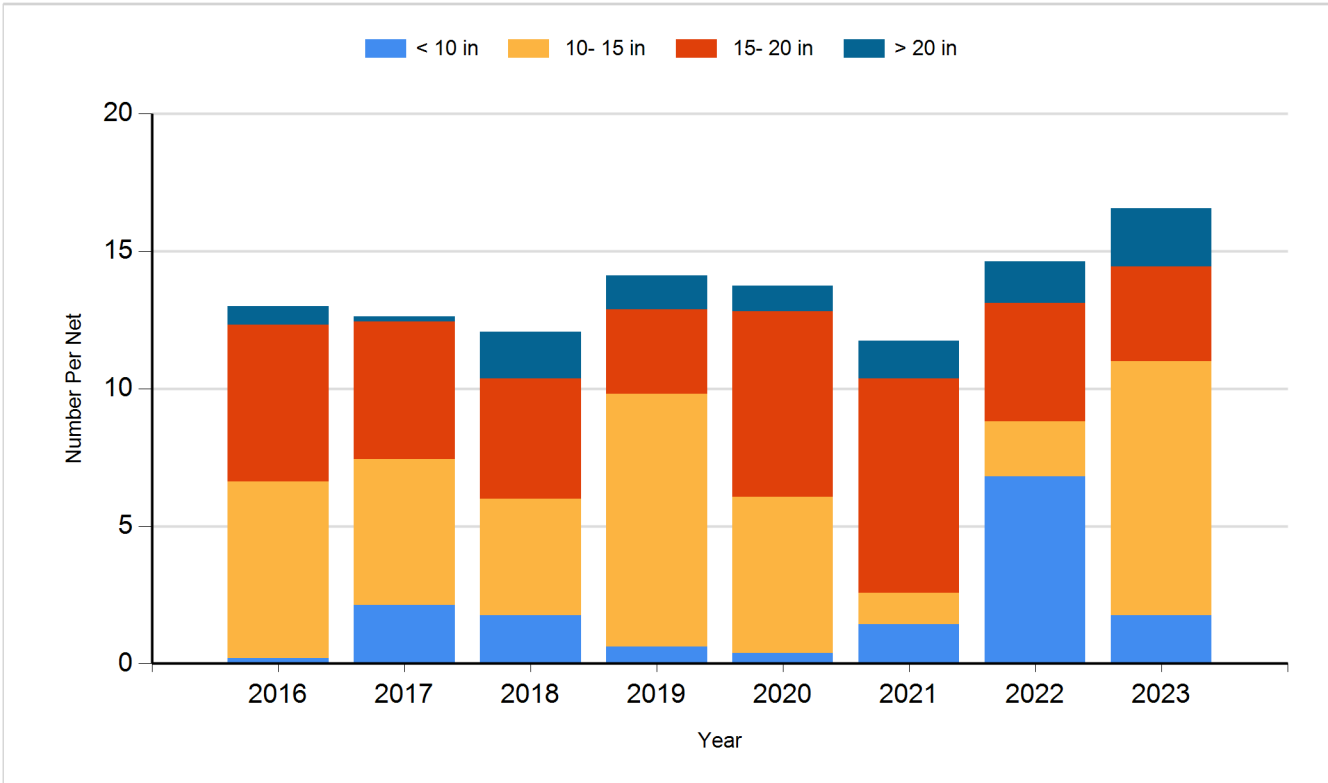
Species: Northern Pike
Gear: AFS std gill net



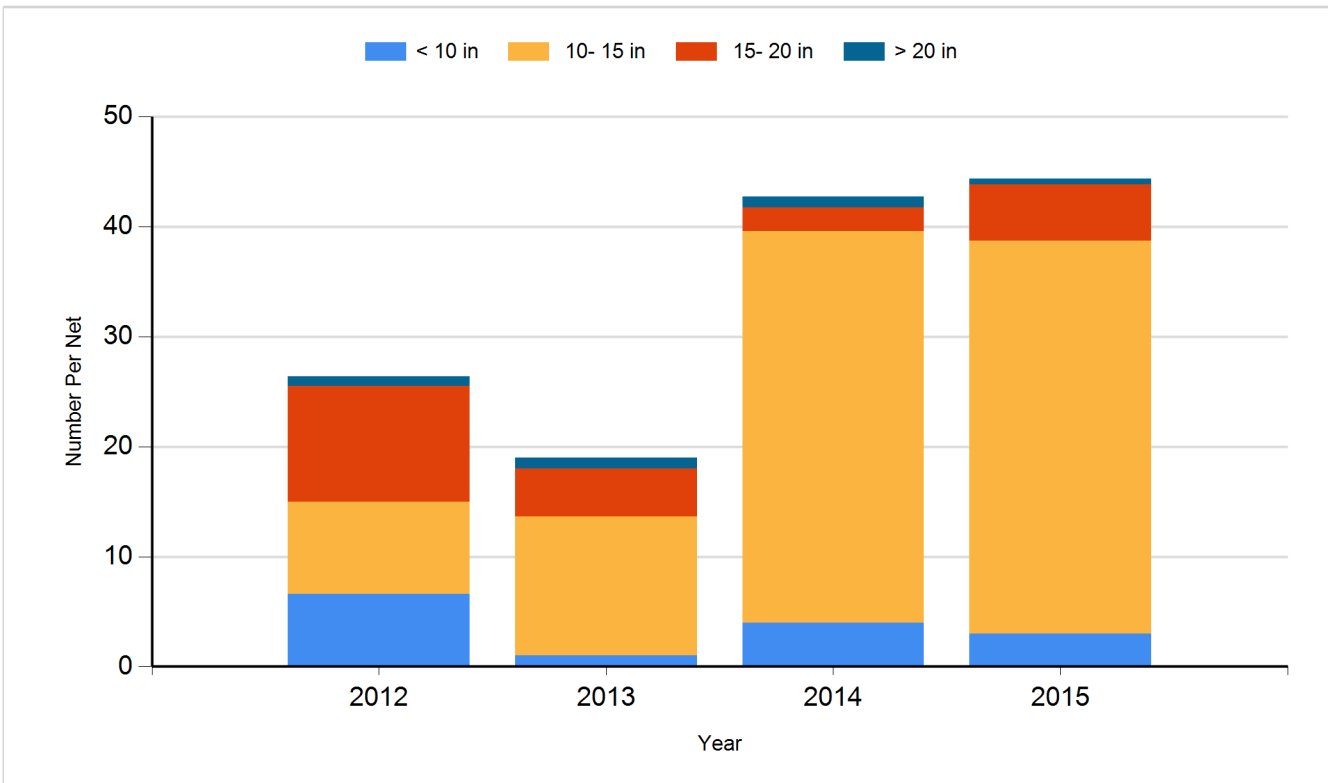
Species: Northern Pike
Gear: std exp gill net



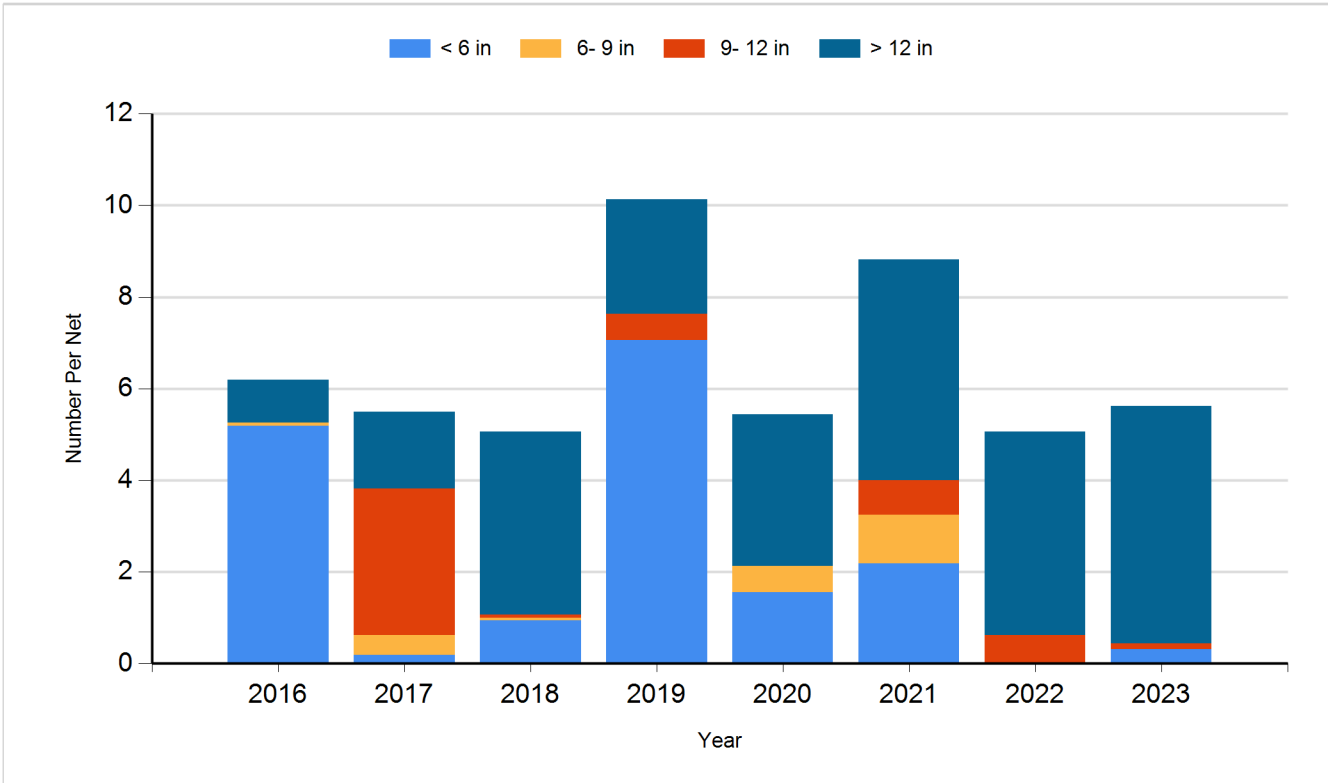
Species: Walleye
Gear: AFS std gill net



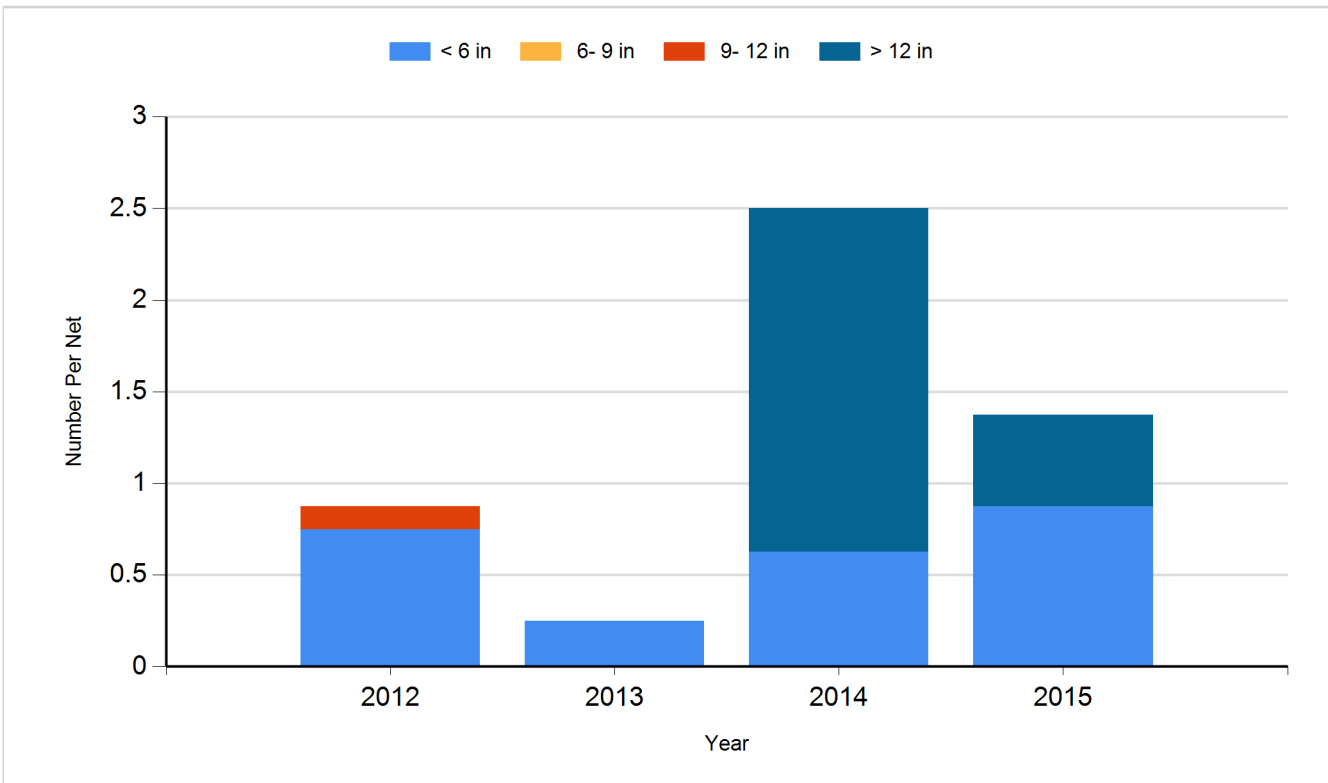
Species: Walleye
Gear: std exp gill net



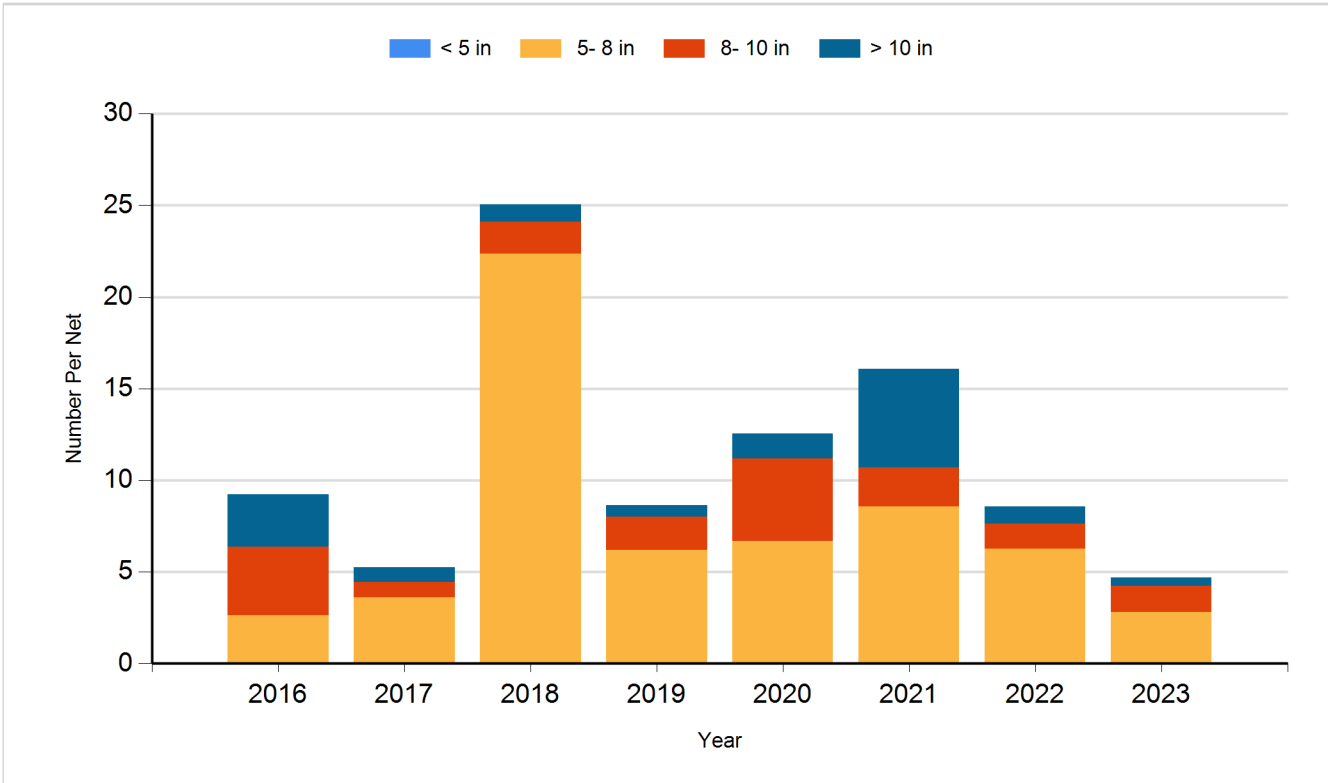
Species: White Bass
Gear: AFS std gill net



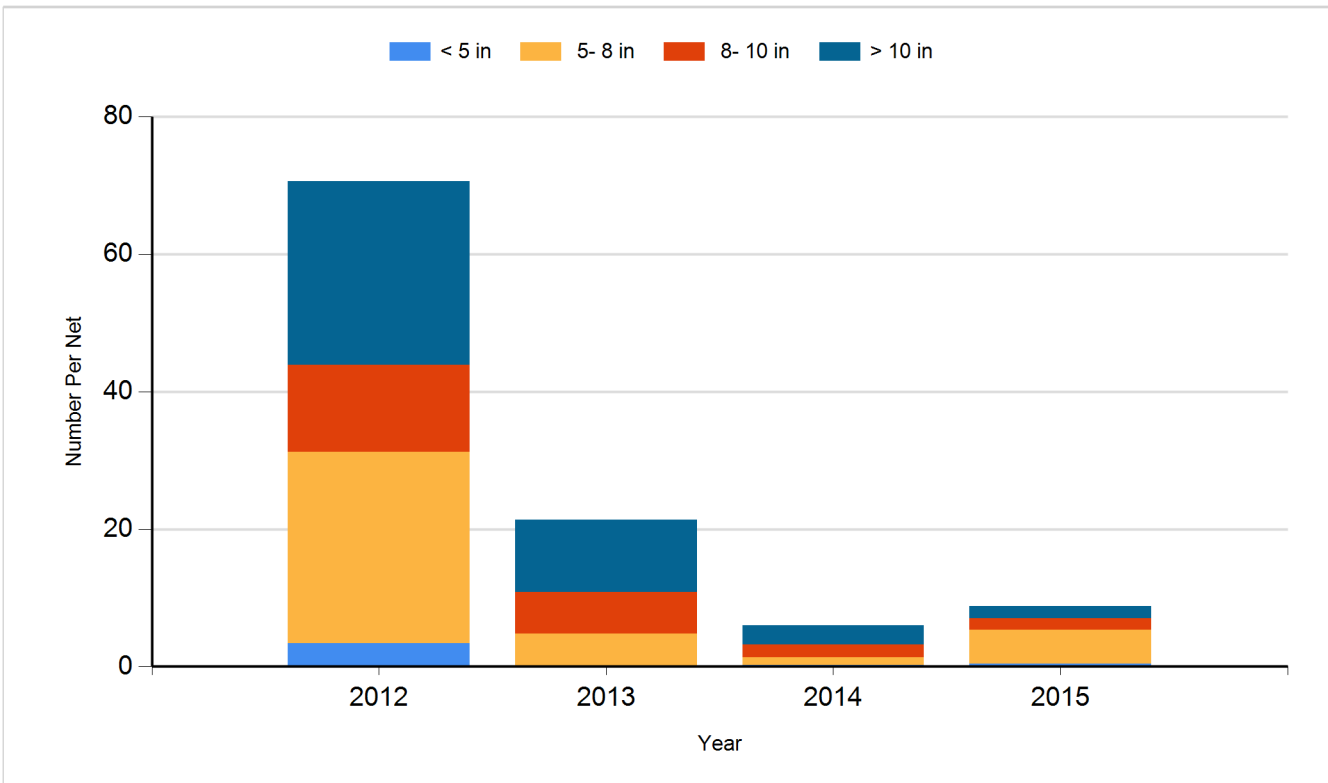
Species: White Bass
Gear: std exp gill net



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
2013	Walleye	Fry	7,500,000
2015	Walleye	Fry	4,000,000
2016	Gizzard Shad	Adult	600
2016	Walleye	Fry	6,500,000
2021	Walleye	Fry	8,000,000