Bitter Lake Survey Summary

Bitter Lake, located on the southern edge of the town of Waubay, is managed as a walleye and yellow perch fishery but other fish species (e.g., northern pike, white bass) also contribute to the fishery.

- **Walleye.** At 17.2 per gill net, the relative abundance of walleyes >10.0 inches remained high. A wide length range of walleyes (8.3 to 26.4 inches) was sampled, of those that were at least 10.0 inches 11% were ≥ 15.0 inches and 6% were ≥ 20.0 inches. Thirteen year classes contributed to the catch. Individuals from the 2021 year class (age-3), which coincided with a fry stocking, were the most abundant accounting for 80% of the fish in the sample. Meanwhile, fish from the naturally produced 2023 (age-1) year class made up an additional 8%. The strong 2021 cohort has experienced slower growth to age 3 than recent cohorts sampled from 2020 – 2023. In 2024, age-3 walleyes had a mean length at capture of 12.8 inches compared to mean length at captures of 15.6 inches in 2023, 16.5 inches in 2022, 17.4 inches in 2021, and 15.4 inches in 2020. Slowed growth is not uncommon when strong walleye cohorts are present in northeast South Dakota lakes.

- **Yellow perch.** Yellow perch numbers were similar to those observed in 2023. At 4.6 per gill net, relative abundance was considered low to moderate for Bitter Lake in 2024. Sampled yellow perch ranged in length from 5.1 to 13.0 inches, 27% were ≥ 8.0 inches and 12% were ≥ 10.0 inches. Five year classes contributed to the catch. Individuals from the 2023 (age-1) cohort were the most abundant accounting for 70% of yellow perch in the sample. Growth tends to be moderate to fast with mean length at captures of age-3 fish from 9.3 to 11.7 inches since 2015. In 2024, the mean length at capture for age-3 yellow perch was 9.9 inches.

For more detailed results see the computer-generated South Dakota Statewide Fisheries Survey for Bitter (Day; below).

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Bitter, Day County
UBS-Lake-409-800
2024

Lake Information

Name: Bitter

County: Day

Surface Area: 18,783 Acres

Maximum Depth: 32 Feet

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Aug 28, 2024	8 net-nights
AFS std gill net	Aug 29, 2024	8 net-nights
fall night EF-WAE	Oct 03, 2024	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.
- s**td 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.

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

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.

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

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

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.

$$Wr = \left(\frac{W}{Ws}\right) \text{x } 100$$

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).

	Stock		Quality		Preferred		Memorable		Trophy	
Species Name	(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**

			Abundance		Stock Density Indices				Condition	
Gear	Species	Sample Size (n)	CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
AFS std gill net	Common Carp	9	0.6	0.3	100		100		102	2
	Northern Pike	16	1.0	0.4	100		56	20	76	2
	Rock Bass	1	0.1	0.1	0		0		130	
	Walleye	290	17.2	2.9	11	3	6	2	90	1
	White Bass	26	1.3	0.6	100		100		107	2
	Yellow Perch	74	4.6	1.3	27	8	12	6	119	2

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.

***SDGFP standard gill net used in 2015 (Avg. excludes 2015); ** Methods/Species that ignore stock length**

		CPUE										
Gear	Species	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Avg
AFS std gill net*	Black Bullhead	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.6	0.0	0.0	0.13
	Black Crappie	0.0	0.1	0.0	0.1	0.0	0.7	0.3	0.1	0.0	0.0	0.14
	Common Carp	0.1	0.4	1.9	1.2	0.2	1.8	1.3	1.6	0.5	0.6	1.06
	Gizzard Shad	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.08
	Northern Pike	1.5	0.7	0.5	0.1	0.3	0.3	0.4	1.4	1.3	1.0	0.67
	Rock Bass	0.0	0.0	0.1	0.3	0.3	1.3	1.9	0.4	0.3	0.1	0.52
	Walleye	41.4	12.8	10.5	10.3	13.5	13.4	10.3	7.8	14.8	17.2	12.29
	White Bass	0.5	1.0	5.3	4.1	3.1	3.9	6.6	5.1	5.3	1.3	3.97
	White Sucker	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.04
	Yellow Perch	8.4	9.3	5.3	25.1	8.6	12.6	16.1	8.6	4.7	4.6	10.54
fall night EF-WAE**	Walleye	2.0	37.0	136.0	60.0	---	3.0	411.0	70.0	105.0	59.0	98.11

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. ***SDGFP standard gill net used in 2015**

			Year									
Gear	Species	Index	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
AFS std gill net*	Walleye	PSD	14	50	49	59	32	57	89	74	38	11
		PSD-P	1	5	2	16	9	7	13	19	14	6
		Wr	89	89	92	88	94	96	96	88	87	90
	Yellow Perch	PSD	40	72	31	11	28	47	47	27	40	27
		PSD-P	21	31	15	4	7	11	33	11	9	12
		Wr	112	120	120	112	115	112	114	117	116	119

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+
2024	290	244 (23)	275 (8)	326 (231)		509 (4)	494 (9)	508 (3)	552 (1)	590 (1)	581 (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)

Species: Yellow Perch

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2024	73	160 (52)	222 (6)	252 (12)	249 (2)		303 (1)				
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)				

Fish Condition

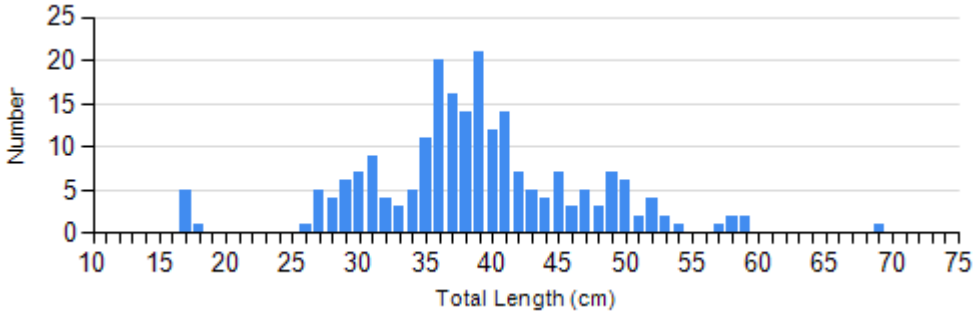
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Walleye Gill Net	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)
	2024	244	91 (0.4)	15	85 (1.3)	13	80 (1.5)	3	82 (3.1)
Yellow Perch Gill Net	2020	107	113 (0.7)	72	112 (1.1)	21	107 (2.1)	1	91
	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	
	2024	54	121 (1.3)	11	119 (2.4)	6	115 (3.1)	3	101 (6.3)

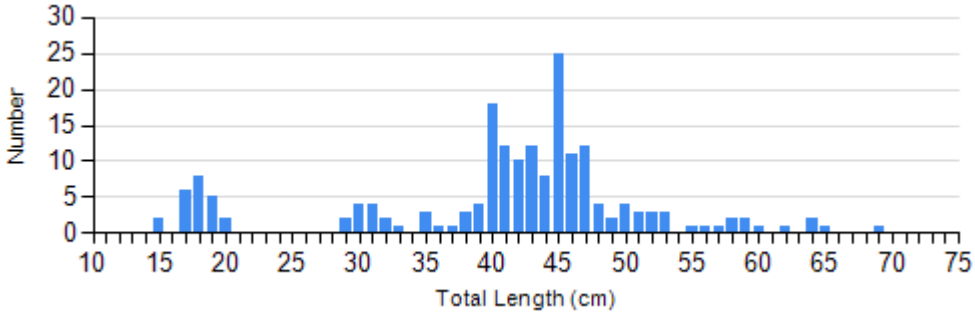
Length Frequency Distribution

Length frequency histogram of species sampled by year.

Species: Walleye
Gear: AFS std gill net



2020



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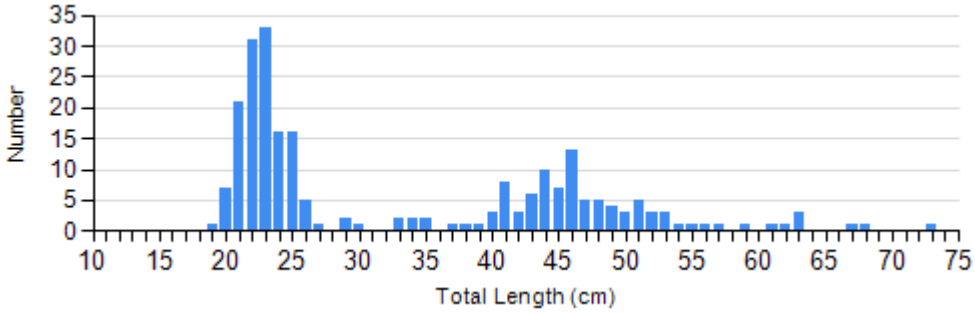

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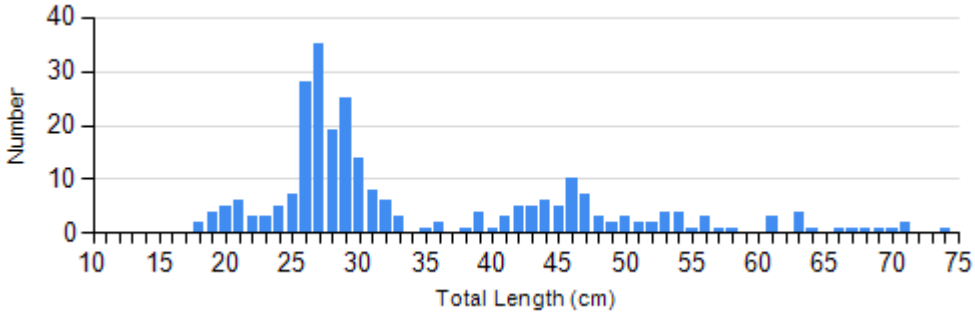

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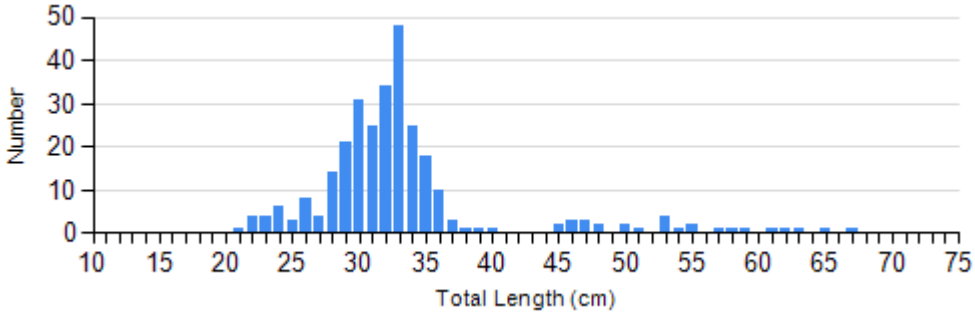
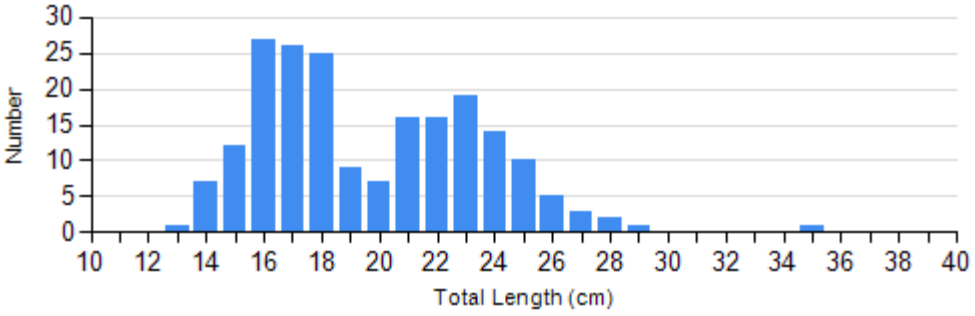


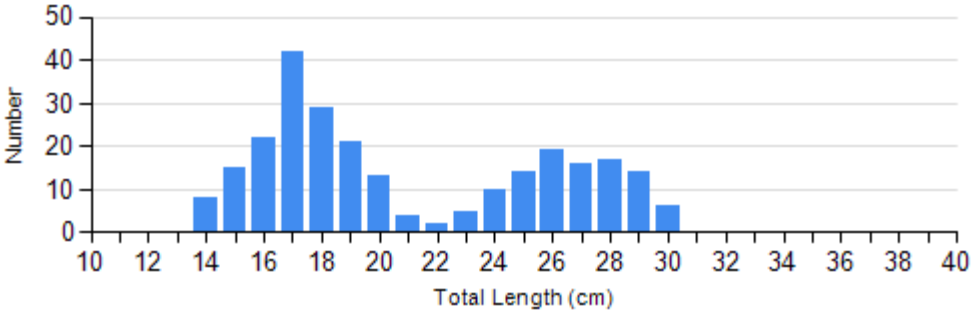
2024

Species: Yellow Perch
Gear: AFS std gill net

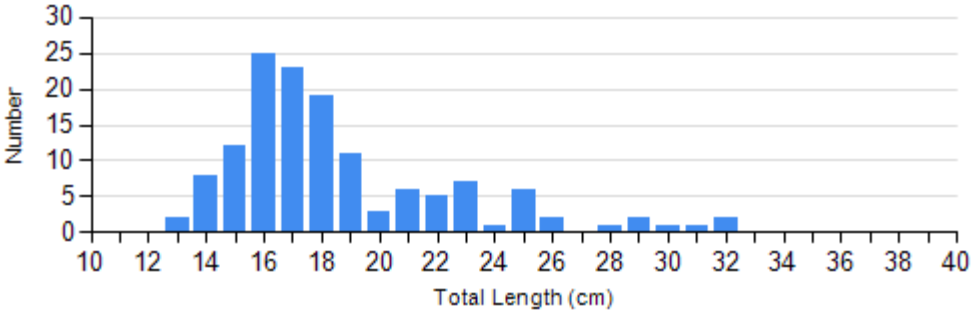
2020



2021



2022



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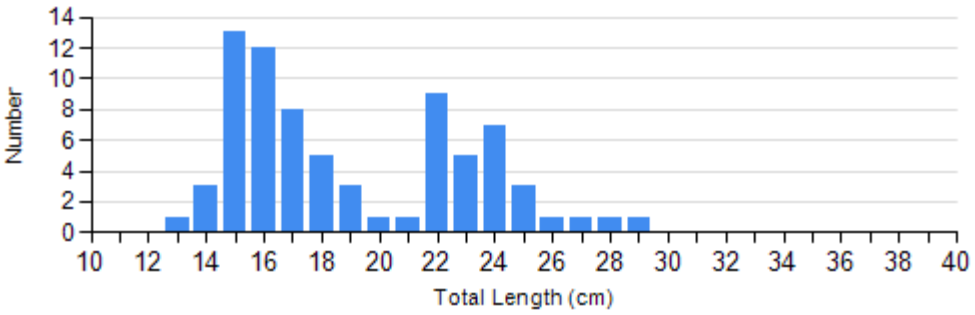
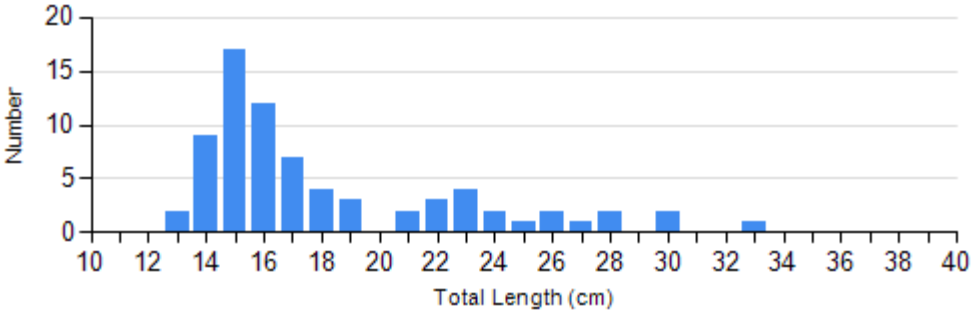


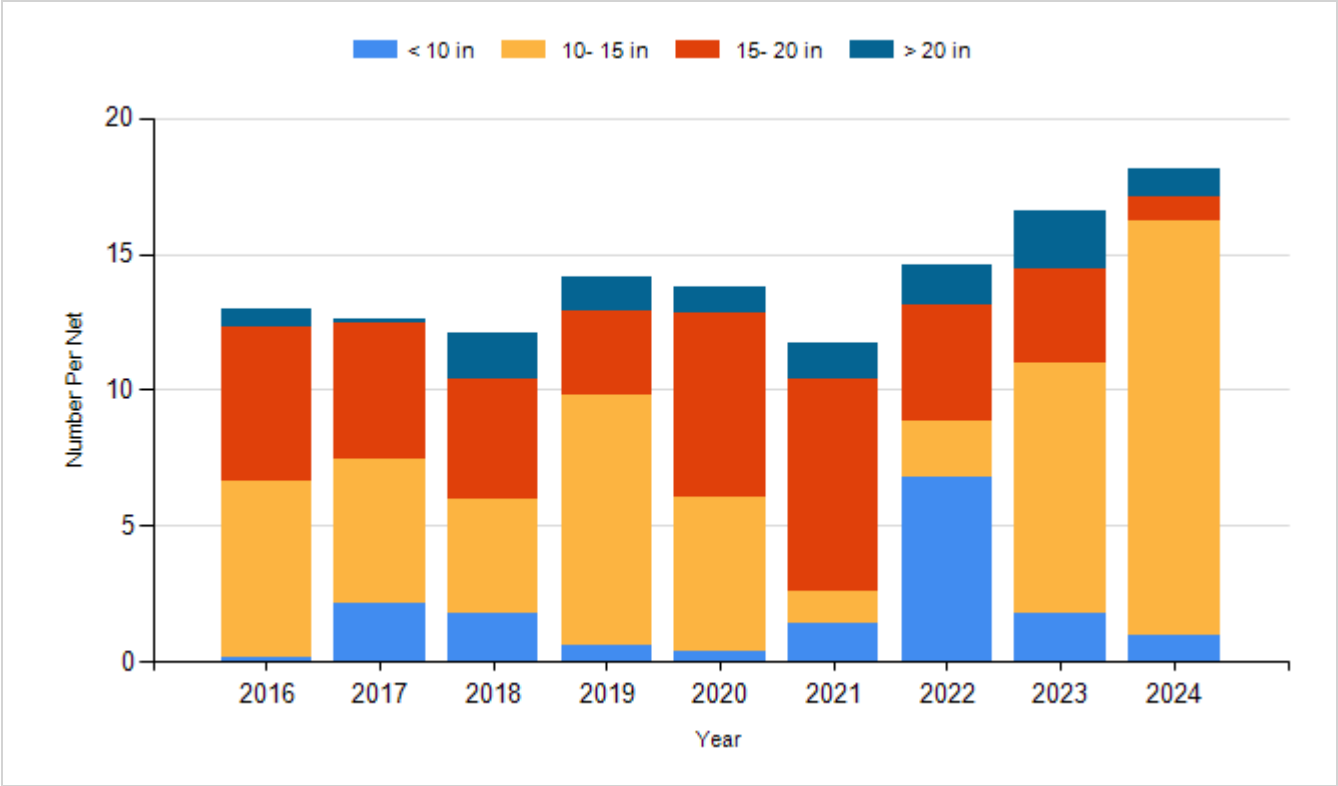
2024



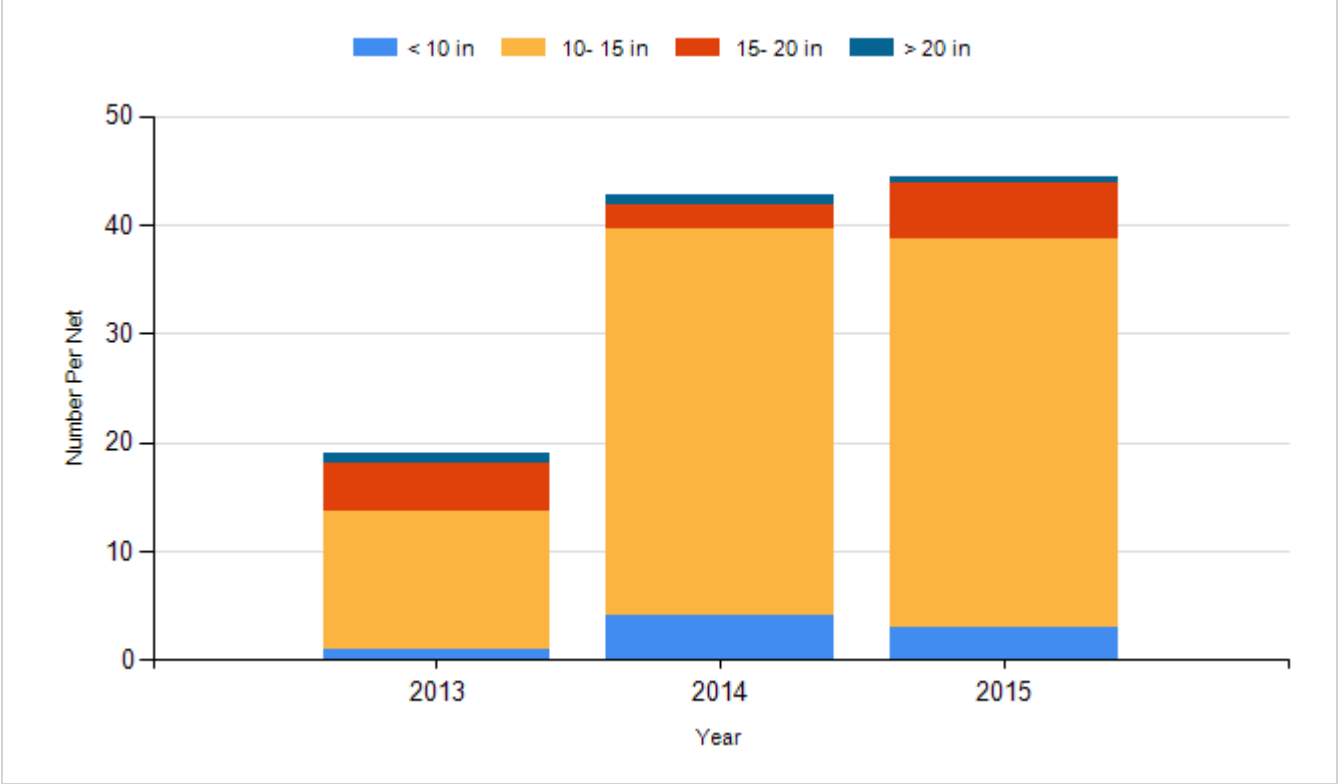
Historic Fish Sizes and Relative Abundance

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

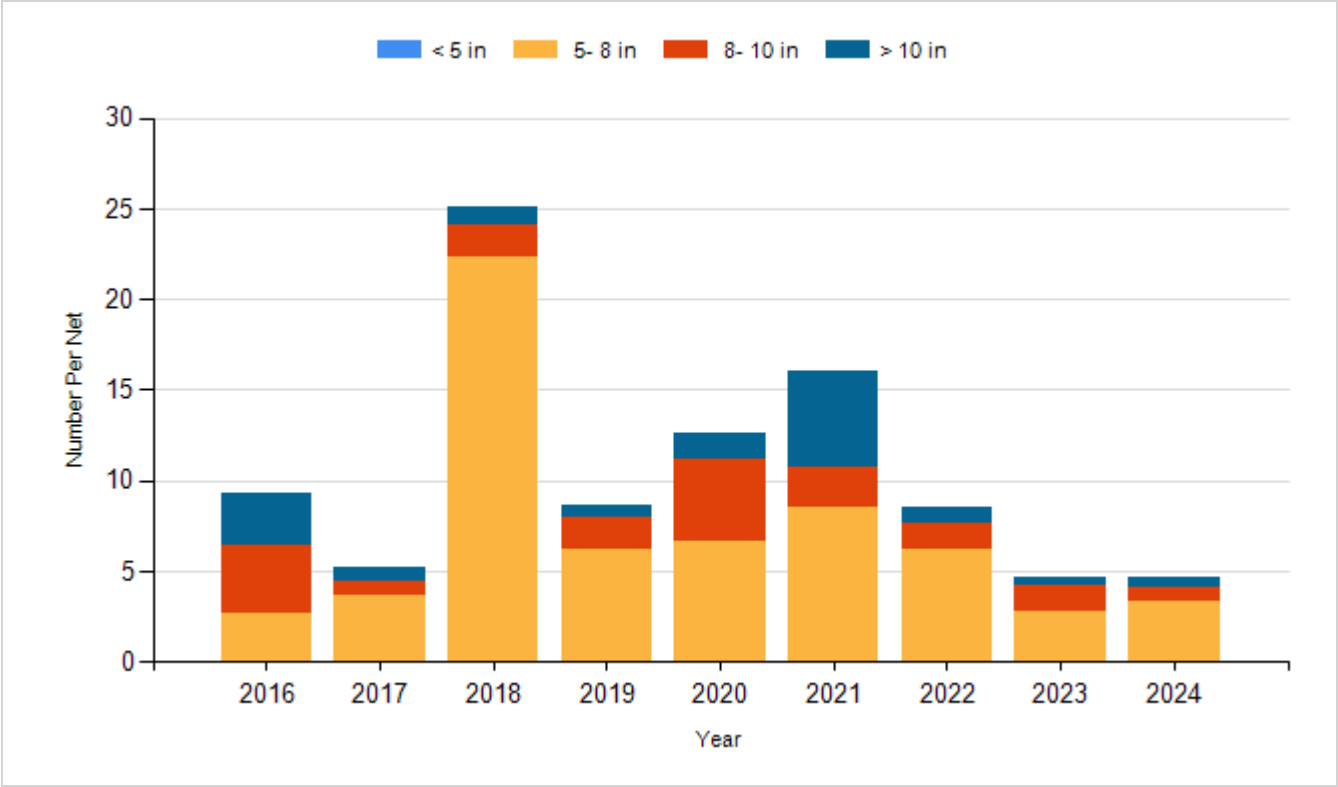
Species: Walleye
Gear: AFS std gill net



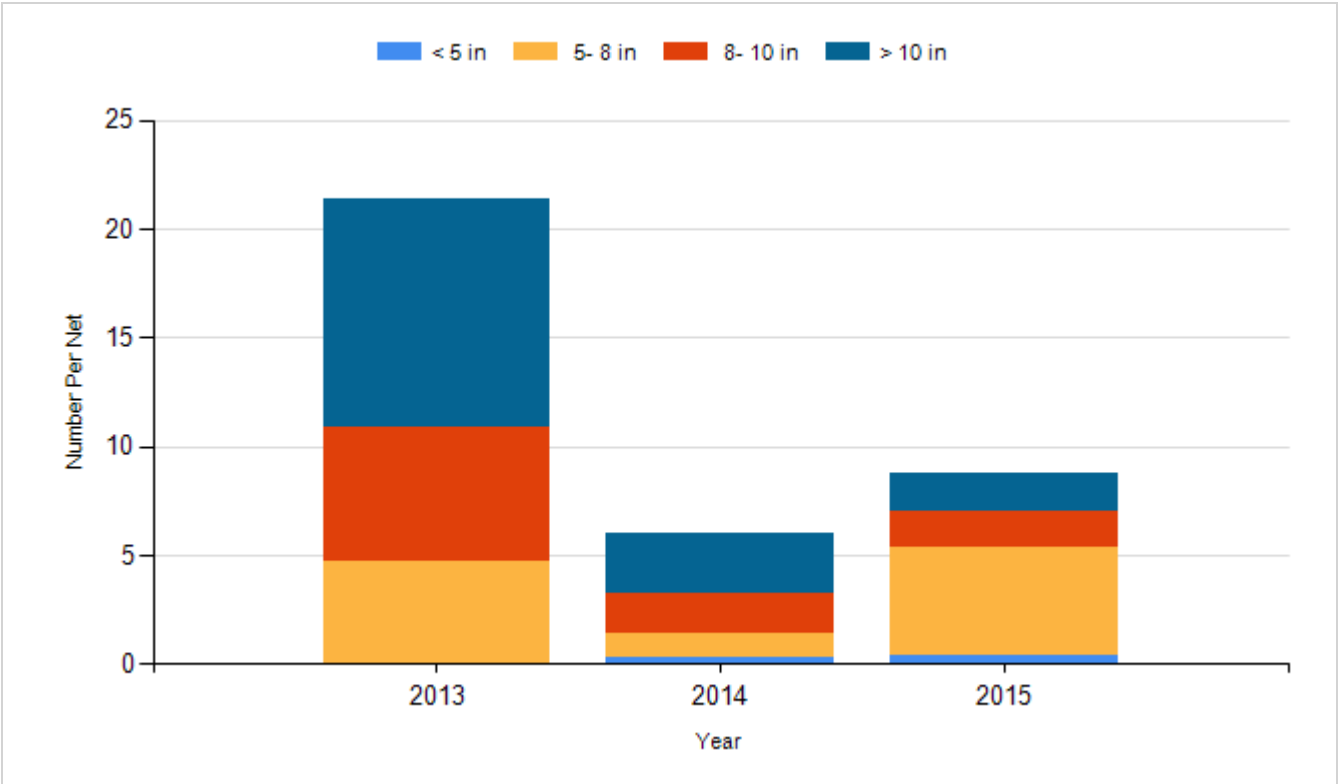
Species: Walleye
Gear: std exp gill net



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