Davison Lake
Lapeer County, T06N, R09E, Section 34
Kearsley Creek watershed, last surveyed 2021

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Environment

Davison Lake is a 56-acre kettle lake in the Michigan Department of Natural Resources (MDNR) Ortonville Recreation Area. Kettle lakes are small potholes left in the landscape by receding glaciers. Over time, these areas fill in with water and small lakes are created. Davison Lake is in the headwater region of East Branch Kearsley Creek, a tributary to Kearsley Creek in the Flint River watershed (Figure 1). Davison Lake is classified as a small (<100 acre), deep (thermally stratified), mesotrophic lake with a warm- and coolwater fish community. The lake is semi-circular in shape with steep depth contours and a maximum depth of 67 ft. A small outlet is located on the south shore which connects to East Branch Kearsley Creek. Approximately 50% of the shoreline is developed with residential housing; the remainder is undeveloped and part of the Ortonville Recreation Area. There is a small gravel boat launch on the west side of the lake and no-wake rules apply to all watercraft year-round.

The landscape within the 598-acre catchment area of Davison Lake is primarily forested (47%) with some agriculture (26%) and urban development (8%) according to the 2011 National Land Cover Database (Multi-Resolution Land Characteristics Consortium 2018). The undeveloped forested land lies within the Ortonville Recreation Area. Based on Michigan Forest Inventory data (Michigan Department of Natural Resources Open Data Portal 2021), the primary tree species that surround Davison Lake are Black Cherry, Red Maple, and Northern Pin Oak on the west side while some Red Oak, Black Oak, and Shagbark Hickory are present at the north end. This area also has a non-forested wetland dominated by Cattail. The east shore of the lake is mostly residences, and there is some wetland on the south shore.

The substrate in Davison Lake is dominated by sand and organic muck. Aquatic vegetation provides the primary form of fish cover and is very abundant in the littoral zone. Invasive Eurasian Watermilfoil and native Coontail are abundant in some areas while Curlyleaf Pondweed and Water Lily are present in moderate densities. Muskgrass, a macro-algae, occurs along the lake bottom and also provides some habitat.

History

From 1949 to 1979, Davison Lake was managed for Rainbow and Brown Trout with semi-annual stocking of 1,500 fish of each species. Fisheries surveys conducted in 1977 and 1979 found poor survival of trout and stocking was discontinued. Management efforts concentrated on maintaining what was described as an "excellent" Bluegill fishery with an abundance of large fish >8 in. Davison Lake was sampled in 1992 and the fishery was still considered very good for large Bluegill. In addition to large Bluegill, the 1992 survey documented abundant Largemouth Bass, Pumpkinseed, and Northern Pike.

During 2008 Davison Lake was surveyed as part of the MDNR Fisheries Division's Status and Trends Program. This survey used various types of gear including trap nets, seines, and nighttime boat electrofishing. These gear types were used to capture a wide range of species and sizes to better understand the entire fish community as outlined by the Status and Trends Program protocol (Wehrly et al. 2015). Results from this survey suggested the Davison Lake Bluegill fishery had declined with poor juvenile growth and a decrease in abundance of larger fish. Furthermore, while the size structure of Largemouth Bass had improved with higher abundance of 12-13 in fish, slow growth was documented at early ages with mean lengths of age 2 and age 3 Largemouth Bass almost 2 in below state mean.

Current Status

The most recent fish community survey for Davison Lake was completed from 26 April to 5 May 2021 using Status and Trends protocols. This survey used three large-mesh fyke nets, two small-mesh fyke nets, one seine, two experimental gill nets, and nighttime boat electrofishing to capture a wide variety of the fish community (Wehrly et al. 2015; Table 1). Total effort for the survey was 9 net-nights for large-mesh fyke nets, 4 net-nights for small-mesh fyke nets, 4 net-nights for experimental gill nets, 2 seine hauls, and 30 min of electrofishing. Mean daily surface water temperature during the fish community survey was 55°F.

All fish captured were identified to species and measured for total length (TL; inch group). For game species, the ages of up to 10 fish per inch group were estimated from scale and spine samples. To estimate age from scales, four to six scales were pressed onto acetate film and the impressions were viewed under a microscope. For estimating age from dorsal spines, a thin cross-section of the dorsal spine was cut using a Dremel grinding and cutting tool. Mineral oil was added to the section for clarity when viewed under a microscope. Mean growth indices were calculated as described by Schneider et al. (2000) for age groups represented by five or more fish.

A total of 984 fish representing 18 different species were collected during this survey (Table 2). A variety of panfish were captured including Black Crappie, Bluegill, Hybrid Sunfish, Longear Sunfish, Pumpkinseed, and Rock Bass as well as Yellow Perch. Bluegill were the most frequently captured panfish species in the survey, with individuals ranging from 0-8 in (mean TL = 4.4 in; Table 2). Just over one-third (34%) of the 578 Bluegill captured were larger than 6 in (Figure 2), which is the assumed minimum length at which anglers typically consider them suitable for harvest. The mean growth index of -0.5 for Bluegill indicated slow growth, and the oldest individual captured was 8 years old. The Bluegill population in Davison Lake scored an "acceptable" rating using the Schneider Index for classifying Bluegill populations (Schneider 1990). Pumpkinseed, the next most frequently captured panfish species in the survey, ranged in size from 3-8 in (mean TL = 5.7 in; Table 2). One-third of the 73 Pumpkinseed captured were above the angler-preferred 6 in minimum length for harvest (Figure 2). The mean growth index for Pumpkinseed was 0, which suggests a typical growth rate when compared to statewide mean growth. Similar to Bluegill, Pumpkinseed longevity peaked at age 8.

Top predators captured in Davison Lake were Largemouth Bass and Northern Pike. A total of 52 Largemouth Bass up to 17 in long (mean TL = 14.2 in; Table 2) were collected; 46% of the fish captured exceed the 14 in minimum size limit (Figure 2). Ten year classes of Largemouth Bass were present in the system, with the oldest individual estimated to be 10 years old. Twenty-two Northern Pike ranging in size from 14-32 inches long (mean TL = 23.1 in; Table 2) were collected; 45% of the

fish captured exceeded the 24 in minimum size limit (Figure 2). There were seven year classes or Northern Pike present and longevity peaked at age 8. The negative mean growth index for both Largemouth Bass (-0.8) and Northern Pike (-1.2) indicated slower than mean growth for each species.

A variety of forage species were collected including Barred Fantail Darter, Iowa Darter, Blackchin Shiner, and Lake Chubsucker. However, less than ten individuals of each species were captured. Additionally, Lake Chubsucker were the only species captured with individuals longer than 2 in TL. Given the size range of Lake Chubsucker sampled in Davison Lake (7-8 in TL), they may provide the largest, energy rich, prey species available to top predators in Davison Lake like Largemouth Bass and Northern Pike.

Limnological parameters were measured in August 2021 and included temperature, dissolved oxygen (DO), and pH. Thermal stratification was present with water temperatures ranging from 78°F at the surface to 43°F at the bottom; DO concentrations were 8.04 ppm at the surface and 0.33 ppm at the bottom (Table 3). Insufficient DO concentrations for fish (<3 ppm) were observed at depths greater than 21 ft. Water clarity was high; a Secchi disk was observable to a depth of 15 ft. Surface water temperature was also continuously recorded at a 1 hr interval with a temperature logger that was deployed from 7 April to 14 October 2021. The logger was attached to a t-stake driven into the substrate and submerged approximately 1 ft below the water surface. The lowest mean monthly surface water temperature (54°F) was observed in April and the highest mean monthly surface water temperature (79°F) was observed in August (Figure 3).

Residential shoreline development was also quantified in August 2021. Data were collected along 1,000 ft segments until the entire shoreline was surveyed. The number of dwellings, large (>2 boat slips) and small (1-2 boat slips) docks, submerged and partially submerged logs and large diameter tree limbs (≥3 in diameter, hereafter referred to as coarse woody material), and percent shoreline armoring were determined following the methods described by Wehrly et al. 2015. The west shore of Davison Lake within the Ortonville Recreation Area remained relatively undeveloped aside from the small boat launch that is present. The number of dwellings and docks along the shoreline remained similar to observations in 2007 (Figure 4). However, habitat conditions appeared to improve as the total count of coarse woody material along the shoreline increased from 32 in 2007 to 53 in 2021 (Figure 4) and the total linear feet of armored shoreline decreased from 160 ft to 100 ft from 2007-2021, which constitutes less than 2% of the total shoreline perimeter.

Analysis and Discussion

While recent data suggests the Bluegill population in Davison Lake does not represent the excellent fishery described several decades ago, it did score as "acceptable" based on the Schneider Index and provides a better Bluegill fishery than many small inland lakes in southeast Michigan. Bluegill are one of the most abundant fish species present in this region and they play a key role in fish community structure and overall sportfishing quality (Schneider 1981).

The mean growth index for Bluegill in Davison Lake during this survey was -0.5, which is similar to the -0.4 value from the 2007 survey. This suggests the population is not considered stunted, as evidenced by a growth index <-1.0, but fish growth has not improved since 2007. While mean length and overall size-structure were similar to the 2007 survey, both surveys showed a decline in Bluegill quality compared to the historic status. Poor Bluegill growth and size structure is often associated with

lakes that have high adult mortality and high densities of age-0 and age-1 fish competing for limited zooplankton resources. Slow growth typically begins early in life when age-0 Bluegill over-forage zooplankton populations (Breck 1998). Faster Bluegill growth is often associated with large-sized zooplankton (e.g., Daphnia species) that are present during summer when water temperatures are favorable for fish growth (Schneider 1993). Other factors which may contribute to poor Bluegill size structure include insufficient macroinvertebrate food supply for adult fish and low juvenile predation, which keeps their density, and competition among individuals, high. Davison Lake may lack the large zooplankton forage necessary to facilitate good Bluegill growth at young ages; however, zooplankton abundance and size data are not available. Macroinvertebrates, a preferred forage item for adult Bluegill, may also be limited. Typically, macroinvertebrate abundance is correlated with coarse woody material. While this survey documented more wood habitat along the shoreline than was observed in 2007, macroinvertebrate abundance was not estimated in either survey.

Angler harvest could be responsible for high adult mortality and the lack of large, old Bluegills. Currently, Davison Lake is managed under the statewide regulation for panfish which allows anglers to harvest 25 panfish (Black Crappie, White Crappie, Bluegill, Green Sunfish, Hybrid Sunfish, Longear, Pumpkinseed, Redear, Rock Bass, and Warmouth) in any combination with no minimum size limit. Since creel survey data are unavailable angler effort and harvest is unknown, but a general assumption can be made. Geographically, Davison Lake is located approximately an hour from metropolitan Detroit and is likely popular to many anglers living in that area, thereby attracting high angler effort and harvest. The 2007 survey report also suggested the lake's popularity and that angler harvest may be resulting in lower abundance of large fish.

The two top predators in Davison Lake, Largemouth Bass and Northern Pike, are also experiencing slower growth based on length-at-age estimates. In the 2021 survey, Largemouth Bass had a mean growth index of -0.8 and Northern Pike had a mean growth index of -1.2, suggesting both species are growing slower than the state mean. However, Largemouth Bass growth has improved since the 2007 survey when the mean growth index was -1.7 and signs of stunting were present. The mean TL for Largemouth Bass captured via electrofishing increased from 9.8 in in 2007 to 11.9 in in 2021, indicating the population may be improving.

Few Northern Pike (seven) were captured during the 2007 survey, so it is difficult to make comparisons with data from 2021. Age estimates from the 2021 survey suggested Northern Pike in Davison Lake were growing well below the statewide mean. The lack of large (>30 in TL) Northern Pike may be due to limited food or habitat availability. Northern Pike prefer fusiform, soft-rayed prey items like sucker and minnow species rather than deep-bodied, spiny-rayed fish such as Bluegill and Pumpkinseed. Four different forage species were collected during 2007 and 2021 but species composition and size structure were different. All the forage species present in 2021 exhibited the morphometric traits that Northern Pike prefer but forage abundance appeared low. Lake Chubsucker abundance and size structure were limited to a few large individuals (7-8 in TL) compared to the range of sizes captured for this species in 2007 (2-7 in TL). Lake Chubsuckers are possibly an important prey item for Northern Pike, but their abundance is trending downwards according to this survey. Additionally, Northern Pike optimal thermal habitat may be limiting in Davison Lake given the thermocline that establishes in summer. Jacobson (1992) suggests 72°F is the optimum temperature for Northern Pike growth and that growth does not occur at temperatures >82°F. The lake profile data

from 2021 and bathymetry within Davison Lake indicated a limited volume of water with optimal growth temperatures, adequate DO requirements, and habitat features for Northern Pike.

Management Direction

While Largemouth Bass growth in Davison Lake may be improving, the abundance of large Bluegill remains low compared to 1992. Davison Lake may present a system that would benefit from a reduction in the daily possession limit for panfish if high effort and harvest is driving the lack of larger fish, given the lake's proximity to the metropolitan Detroit area. While a reduced daily possession limit is not currently a part of the regulation toolbox for managers, discussions are occurring to determine if candidate lakes can be identified to implement a such a regulation to increase mean length and abundance of larger panfish including Bluegill. If the opportunity arises to lower the possession limit for panfish, Davison Lake should be proposed for that regulation change.

Northern Pike in Davison Lake are also experiencing slow growth. Thermal characteristics, forage abundance, and physical habitat are offered as possible explanations for the current growth rate. Overabundance of Northern Pike could also result in slow growth. While the current density of Northern Pike is unknown, it could be estimated by a mark-recapture study. This should be completed in Davison Lake in the next five years to estimate the population size of Northern Pike and determine if they are overabundant. If the Northern Pike population in Davison Lake was deemed overabundant, a more liberal harvest regulation allowing five Northern Pike to be harvested, of which only one fish could be over 24 in TL, should be proposed.

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Table 1. Gear specifications for the 2021 fish community survey in Davison Lake, Lapeer and Oakland counties, Michigan.

Gear Type	**Stretch Mesh Size (in)**	**Pot Dimensions (length x width, ft)**	**Lead Dimensions (length x width, ft)**	
Large-mesh fyke net	1.5	6 x 4	100 x 4	
Small-mesh fyke net	0.18	6 x 3.5	50 x 4	
	Stretch Mesh Size (in)	**Stretch Mesh Increment (in)**	**Panel Dimensions (length x width, ft)**	**No. of Panels**
Experimental gill net	1.5-4.0	0.5	25 x 6	5
	Stretch Mesh Size (in)	**Total Length (ft)**	**Height (ft)**	
Seine	0.18	25	5	
	Current	**Duty Cycle**	**Amps**	
Electrofishing boat	DC	40	4	

Table 2. Species, number, length range (in group), mean length (in), and percent harvestable size for all fish captured during the 2021 survey in Davison Lake, Lapeer and Oakland counties, Michigan.

Species	Number	Length Range (in group)	Mean Length (in)	% Harvestable Size*
Black Bullhead	26	7-14	11.3	-
Black Crappie	14	4-12	6.7	29
Blackchin Shiner	2	1-2	2.0	-
Bluegill	578	0-8	4.4	34
Brown Bullhead	41	4-14	10.5	-
Fantail Darter	9	1-1	1.5	-
Grass Pickerel	4	9-11	10.5	-
Hybrid Sunfish	4	2-3	3.3	0
Iowa Darter	2	1-2	2.0	-
Lake Chubsucker	5	7-8	8.3	-
Largemouth Bass	52	3-17	14.2	46
Longear Sunfish	6	2-3	2.8	0
Northern Pike	22	14-32	23.1	45
Pumpkinseed	73	3-8	5.5	33
Rock Bass	1	10-10	10.5	100
Warmouth	21	2-6	4.4	10
Yellow Bullhead	122	7-12	10.4	-
Yellow Perch	2	4-4	4.5	0
Total	984			

* Harvestable size is assumed to be 6 in for Bluegill, Hybrid Sunfish, Longear Sunfish, Pumpkinseed, and Rock Bass, and 7 in for Black Crappie and Yellow Perch. Legal size for harvest is 14 in for Largemouth Bass and 24 in for Northern Pike.

Table 3. Temperature, dissolved oxygen (DO), and pH profile from the water surface to the bottom in Davison Lake, Lapeer and Oakland counties, Michigan, August 2021.

Depth (ft)	Temperature (°F)	DO (ppm)	pH
Surface	77.8	8.04	9.33
3	77.7	8.12	9.31
6	77.7	8.02	9.3
9	77.6	8.05	9.32
12	77.5	7.81	9.31
15	75.2	6.88	9.21
18	66.9	9.06	9.13
21	58.7	6.5	9.03
24	54.8	0.59	8.74
27	51.5	0.3	8.61
30	47.6	0.42	8.56
33	46.3	0.26	8.43
36	45.7	0.27	8.36
39	44.8	0.28	8.31
42	44.5	0.29	8.23
45	43.8	0.29	8.15
48	43.3	0.29	8.12
51	43.1	0.29	8.05
54	43	0.32	7.99
57	43	0.3	7.96
60	43	0.32	7.92
63	42.9	0.33	7.88

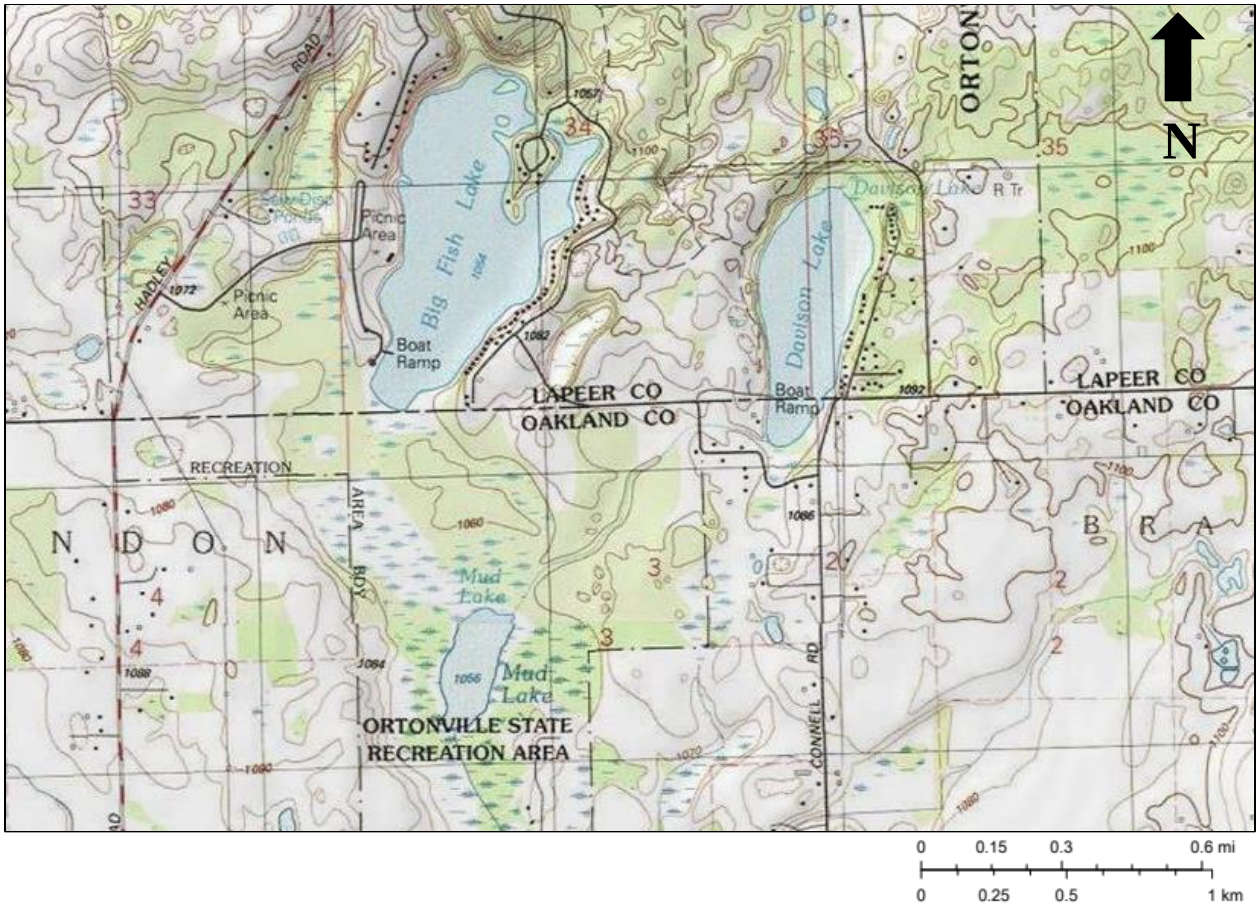

Figure 1. Davison Lake in the Ortonville Recreation Area, Lapeer and Oakland counties, MI.

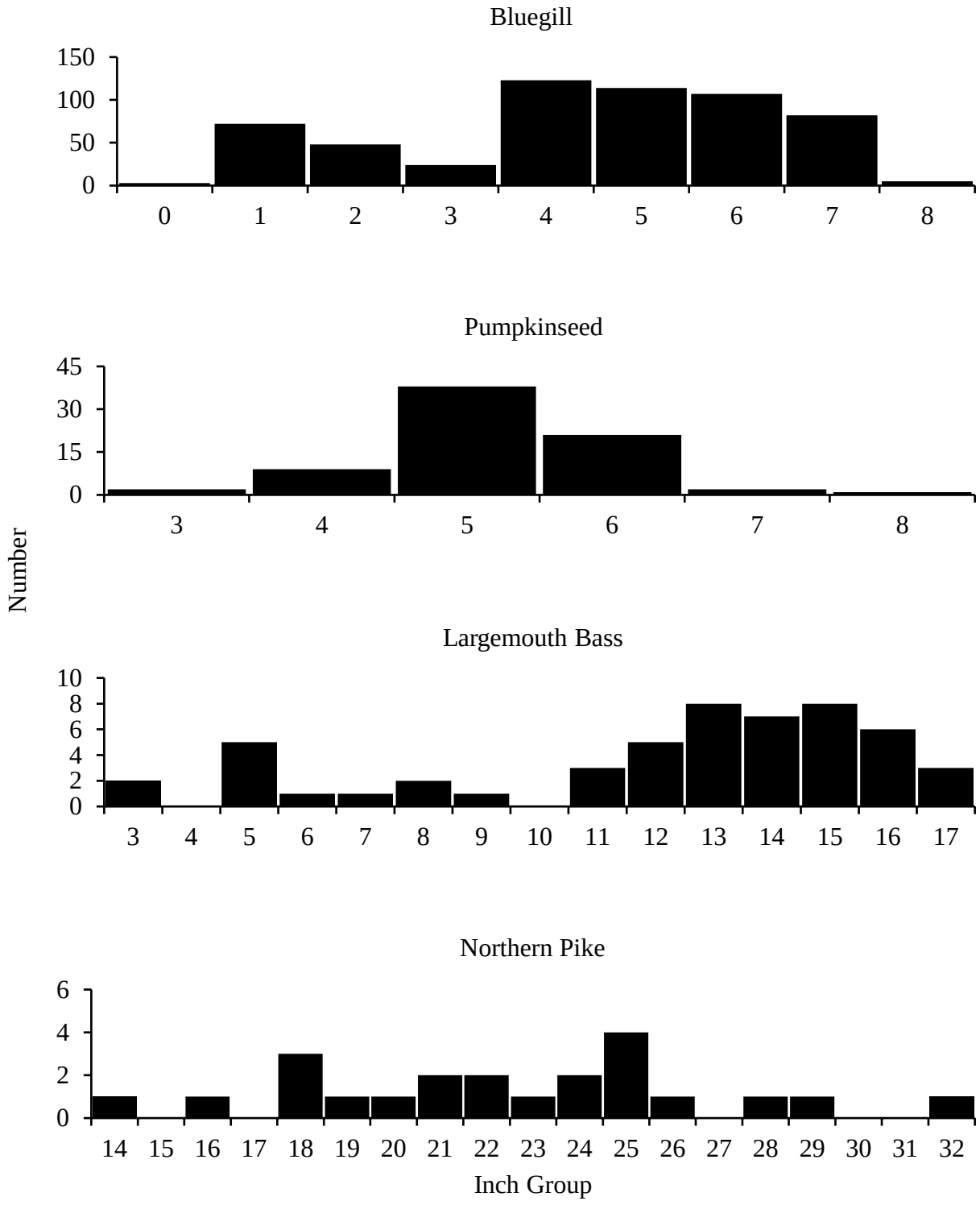

Figure 2. Length-frequency for select species collected in Davison Lake, Lapeer and Oakland counties, Michigan during the 2021 fisheries survey.

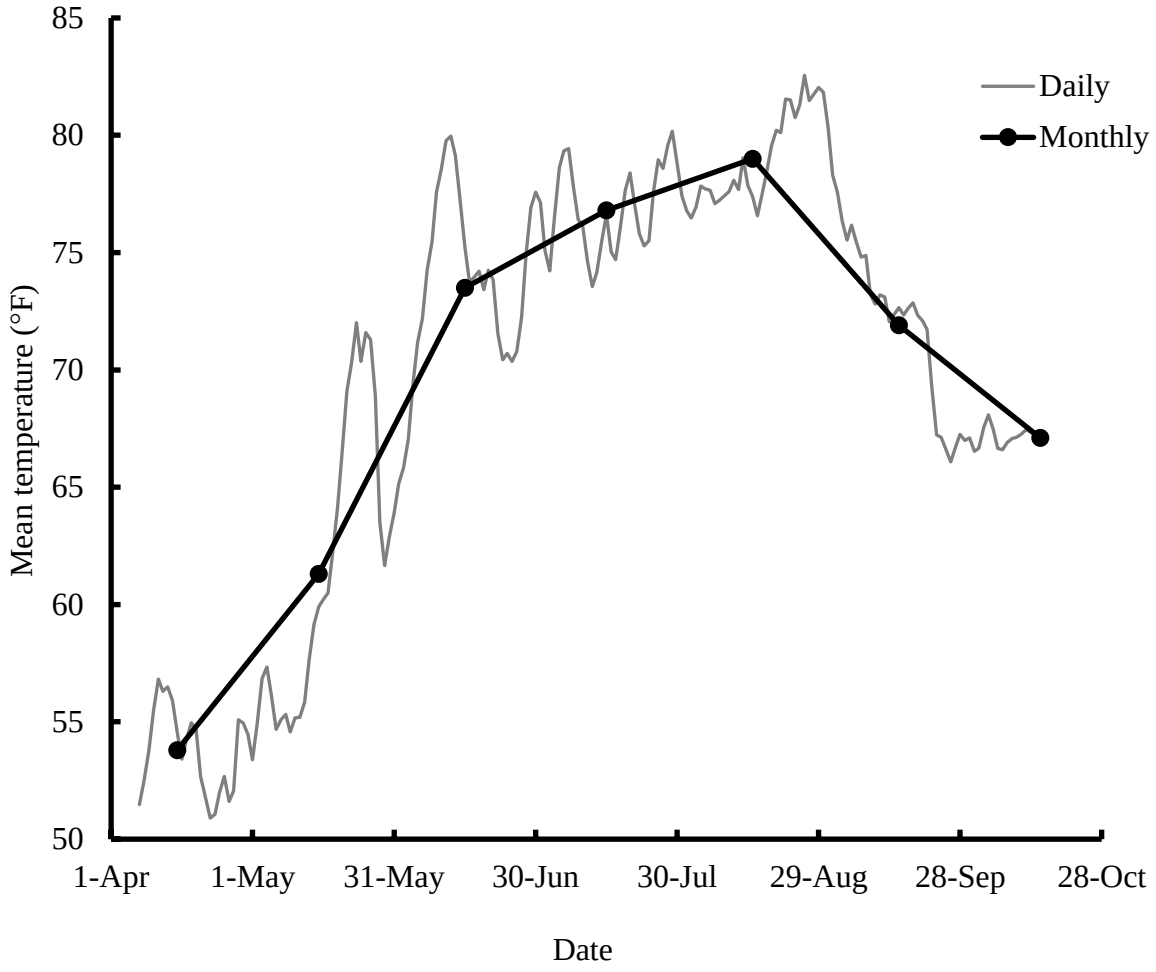

Figure 3. Surface water temperature from April to October 2021 in Davison Lake, Lapeer and Oakland counties, Michigan.

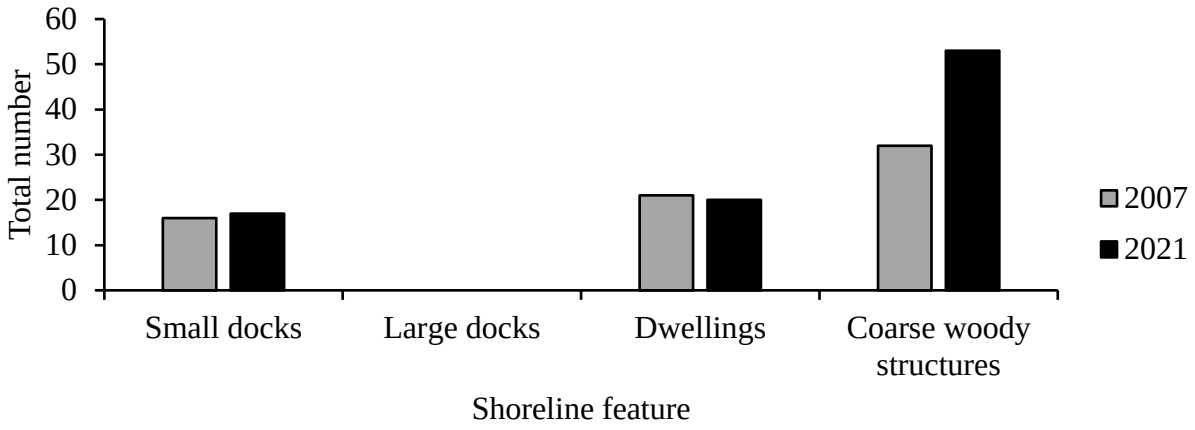

Figure 4. Total number of features around the entire shoreline of Davison Lake, Lapeer and Oakland counties, Michigan.

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