

STUDY PERFORMANCE REPORT

State: Michigan

Project No.: F-81-R-1

Study No.: 486

Title: Assessment of lake trout populations in Michigan's waters of Lake Michigan.

Period Covered: October 1, 1999 to September 30, 2000

Study Objectives: To determine the population structure, health, and reproductive success of lake trout in Michigan's waters of eastern Lake Michigan. To determine if spawning adults are present at the three stocked spawning reefs within the northern refuge (NGS Crew), and at traditional spawning reefs that lie within (Big Reef) and outside (Fisherman's Island and Dahlia Shoals) the boundaries of the northern refuge.

Summary: During the 1999 field season, lake trout sampling efforts focused on assessments of populations in eastern and northern Lake Michigan from April-August, and spawning-reef assessments in northern Lake Michigan in October and November. Data collection for 2000 is ongoing and we are in the process of entering information into standardized database formats. As in the past, we did not detect any notable indications of feral lake trout in Lake Michigan. A total of 345 lake trout were captured throughout Lake Michigan during the 1999 field season, 19 of which were collected during fall spawning-reef assessments in northern Lake Michigan. The age composition of lake trout in May-July assessments ranged from 2 to 9 years. The majority of these fish fell into the 5 to 7 year old age groups. We collected stomach samples from 245 lake trout in 1999. Incidence of bacterial kidney disease (BKD) in lake trout populations remained low in 1999 when compared to that observed in 1997.

Job 2. Title: Search for feral lake trout.

Findings: All lake trout stocked in Lake Michigan are marked, and the number of unmarked fish collected from each statistical district was within the range expected for clipping or tagging error for all years sampled (1996-1999). Data collection for the year 2000 is ongoing. Few of the lake trout evaluated in 1996 (51 of 1,427 (4%)) were missing fin clips, the majority of these fish were from MM-6. Only five of the 850 (<1%) lake trout captured in 1997 had no fin clips. In 1998, 38 of the 754 (5%) lake trout captured did not have fin clips and 20 of the 38 fish were from MM-3. In 1999, nine of 345 (3%) lake trout did not have clips. We will continue to watch for evidence of natural reproduction, however, currently there is no evidence to show that there has been a significant increase in the number of feral lake trout in Lake Michigan.

Job 3. Title: Coordinate with other studies, process and analyze data; write reports.

Findings: We initiated a new lake-wide spring/early summer monitoring program in 1998. All agencies on Lake Michigan have agreed to standardized protocols that will enable us to better compare data, and will help provide a lake-wide perspective to fishery population assessments. Data collected in 1999 and 2000 followed the standardized protocols. Since 1998, agencies on

Lake Michigan have adopted standardized fall spawning assessments. In 1999, the Great Lakes Fisheries Trust Fund provided funding for a multiple-agency effort to assess lake trout spawning habitat in northern Lake Michigan. We are playing an active role in the implementation of both the spring/summer, and fall spawning assessment programs. We have coordinated closely with other agencies to develop lake trout population models for northern Lake Michigan, and have compiled past and present assessment data to contribute to this effort. We are working with the U.S. Fish and Wildlife Service to coordinate the final (third) year of lake trout egg plantings on Big Reef, this being a site that was historically important for lake trout spawning in northern Lake Michigan. For the last two years, we have played a major role in compiling and authoring a report to the Great Lakes Fishery Commission on behalf of the Lake Michigan Technical Committee. This report represents a recorded summary of all collaborative Lake Michigan sampling efforts directed at lake trout.

We produced this annual progress report as scheduled.

Job 4. Title: Evaluate relevant literature on lake trout.

Findings: Literature on lake trout physiology, behavior, and habitats are being collected and catalogued in an “Endnote” bibliographic software library. Twice monthly, we evaluate Current Contents search results from relevant fisheries journals to identify current journal articles and publications that we will obtain and integrate into the database.

Job 5. Title: Establish the distribution pattern, relative abundance, and origin of lake trout collected throughout eastern Lake Michigan from May through August.

Findings: We implemented a revised salmonid sampling protocol in 1997 to better define spatial and temporal variation in fish distributions, and have followed the protocol in subsequent years. Our lake-wide netting efforts covered the entire lake in two south to north sweeps during the spring and summer. In 2000, because of time constraints, we altered the protocol by completing only the first sweep of the lake. A set consisted of two 30-ft. deep suspended gill nets. One gang (3-7" mesh, 1,600-ft length) was set at the surface fishing in 0-30 ft of water. The other gang (3-7" mesh, 1,600-ft length) was suspended at a minimum of 30-60 ft or at a depth where the bottom of the net rests in 55°F (13°C) water. It was common to catch lake trout in surface and suspended gill nets. A second mode of sampling lake trout in the spring/summer period was through targeted bottom gill nets set as part of the newly adopted lake-wide lake trout assessment plan. Due to low catch rates in 1998 (3-5.5" mesh, 800 foot gang), we doubled the net length in 1999 and 2000 (3-5.5" mesh, 1600 foot gang). In 1999, six bottom gill nets were set at each of three Lake Michigan sites (Manistique, Arcadia and Northern Refuge) in April and May. The 2000 data collected from six nets set at two Lake Michigan sites (Saugatuck and Arcadia) is currently being entered into standardized databases.

Based on current (1999) and previous data (1994-1998), we were equally likely to capture lake trout in surface or bottom gill nets (Table 1). In the future, we intend to evaluate if lake trout diets varied for fish captured in nets at different depth strata.

Four of the more common species captured in fall assessment sampling efforts included lake trout, burbot, whitefish, and herring. In bottom gill nets set in 1999, overall lake trout catch rates were lowest in Manistique (avg CPUE=1/1600 ft of gill net), while the Northern Refuge (avg CPUE=15/1600 ft of gill net) area showed the highest catch rates (Table 2). We also captured

the greatest numbers of burbot in the northern refuge area, while whitefish were more prevalent at Arcadia. We did not observe lake herring in 1999 spring gill net collections.

The age composition of lake trout in May-July, 1999 assessments ranged from 2 to 9 years. The majority of fish fell into the 5 to 7 year old age groups (Table 3).

Job 6. Title: Determine the timing of spawning, distribution patterns, relative abundance, and origin of lake trout collected on traditional spawning reefs from October through November.

Findings: In 1999, the Great Lakes Fishery Trust (Trust) approved a proposal to sample multiple reefs in northern Lake Michigan. Six tribal agencies, two federal agencies, and the state are collaborating in this project. This Trust-funded project has provided the opportunity to collaborate and combine data from each of the collaborating agencies involved and has greatly increased the number of sites evaluated in northern Lake Michigan (Table 4). In the fall of 2000, we will conduct fall spawning assessments similar to the 1999 protocol with two minor changes in sites. Because there are over four years of data from Big Reef indicating extremely low spawner biomass, the Michigan Department of Natural Resources will sample Middle Ground instead of focussing further efforts at this site. Collaborating agencies will select additional nearshore sites in northeastern Lake Michigan and make Dahlia Shoal a secondary site because multiple years of data indicate low spawner biomass.

Evaluation of catch rates at both nearshore and offshore stocked and non-stocked sites was used to determine whether stocked lake trout were using historically important spawning sites or staying near the locations where planted. In 1999, catch rates at stocked sites were substantially higher than on non-stocked reefs (Table 5). In northern Lake Michigan, stocked nearshore sites produced slightly higher catch rates than stocked offshore sites.

All offshore Northern Refuge-planted lake trout have an adipose fin clip indicating they have a coded-wire-tag (CWT) inserted in their snout. Nearshore planted lake trout are given finclips other than the adipose and do not contain CWTs. At all sites (nearshore and offshore; stocked and non-stocked), adipose-clipped fish made up 31-100% of fish that were captured and levels remained consistent at a given site across years 1997-1999 (Table 6). The above information (CPUE, CWT data) provided evidence that lake trout are straying from the Northern Refuge area, and seem to be orienting towards the shoreline.

Job 7. Title: Obtain information on diets of lake trout in surface vs. bottom nets, throughout the spring and summer and during spawning, and from different spatial locations in eastern Lake Michigan.

Findings: We collected stomach samples during 2000 assessment netting efforts. The 2000 catch and collection information is being entered into standard database formats, and diet analysis is incomplete. We collected stomach samples from 245 lake trout for diet analysis in 1999 analysis is incomplete. The laboratory evaluation of 1996 and 1997 stomach contents is now complete. We are participating in a collaborative lake-wide effort to consolidate information and publish a paper describing the diets and foraging relationships of lake trout collected throughout Lake Michigan in 1994 and 1995. In 2000-2001, we will compare the 1996 and 1997 diet data from burbot and lake trout collected in the same nets and publish this information.

Job 8. Title: Monitor prevalence of bacterial kidney disease in populations of lake trout in eastern Lake Michigan.

Findings: We tested Lake trout for the presence of BKD with the enzyme-linked immunosorbant assay technique (Kwik Dtect¹) for laboratory and field use. BKD levels increased substantially in 1997 (31%, N=723), decreased in 1998 (1%, N=499) and remained low in 1999 (0%, N=306; Table 7). We have collected samples during 2000 assessment efforts, but have not evaluated or analyzed samples at this time.

¹Diagnostics, Inc., Wilton, CT

Prepared by: Jory Jonas
Date: September 30, 2000

Table 1.—Catch of lake trout in bottom, suspended, and surface gill nets in Lake Michigan in 1994-1997, 1998 and in 1999.

Net Type	1994-1997 (mean)	1998	1999
Bottom gill net	427	145	214
Suspended gill net	52	51	72
Surface gill net	439	211	59

Table 2.—Average catch of the four most commonly captured species per overnight set of 1,600 foot graded-mesh bottom gill nets (CPUE) at sites near Manistique, in the Northern Refuge, and Arcadia during April-July, 1999. Six nets were set per site.

Statistical District	Lake Trout	Burbot	Lake Herring	Lake Whitefish
Manistique	1.0	2.7	0.0	0.8
Refuge	15.0	10.0	0.0	0.3
Arcadia	12.3	3.7	0.0	2.2

Table 3.—Age composition of lake trout collected in April-July 1999. Percent values given in parentheses.

Statistical District	Age							
	2	3	4	5	6	7	8	9
Manistique	2(3)	7(9)	7(9)	8(11)	38(51)	11(15)	1(1)	0
Refuge	4(4)	6(7)	7(8)	18(20)	33(37)	14(16)	4(4)	3(3)
Manistique	0	0	0	2(33)	2(33)	2(33)	0	0
TOTAL	6(4)	13(8)	14(8)	28(17)	73(43)	27(16)	5(3)	3(2)

Table 4.–Sites for lake trout spawning assessments in 1999.

Site	Statistical District	Grid	Agency
Whaleback Shoal	MM-1	505	USFWS ¹
Claybanks	WM-3	905	USFWS
Fishermans Island	MM-3	616	LTBB ²
Menonaqua	MM-3	519	LTBB
9 Mile Point	MM-3	518	LTBB
Arcadia	MM-5	1010	MDNR ³
Pt. Aux Barques	MM-2	310	COTFMA ⁴
Dahlia Shoal	MM-3	417	COTFMA
Big Stone Bay	MM-3	319	COTFMA
Lansing Shoal	MM-3	215	COTFMA
GTB-Cherry Home	MM-4	615	GTB ⁵
GTB-Lee Point	MM-4	815	GTB
GTB-Old Mission	MM-4	716	GTB
South Fox	MM-3	513	MDNR
North Fox	MM-3	514	MDNR
Irishmen's	MM-3	517	MDNR
Big Reef	MM-3	516	MDNR
Waukegan-Shore	IL	2302	ILDNR ⁶
Waukegan-Reef	IL	2303	ILDNR
Julian's Reef	IL	2504	ILDNR
Portage Point	MM-6	1111	LRB ⁷
Point Betsie	MM-5	911	LRB
Trout Island Shoal	MM-3	314	USGS ⁸
Beaver Island	MM-3	315	USGS
Boulder Island	MM-3	413	USGS
Gull Island	MM-3	414	USGS
Richard's	MM-3	414	USGS

¹ USFWS=United States Fish and Wildlife Service² LTBB=Little Traverse Bay Band³ MDNR=Michigan Department of Natural Resources⁴ COTFMA=Chippewa-Ottawa Treaty Fisheries Management Authority (becomes CORA-Chippewa Ottawa Resource Authority, in fall of 2000)⁵ GTB=Grand Traverse Bands⁶ ILDNR=Illinois Department of Natural Resources⁷ LRB=Little River Band⁸ USGS=United States Geological Service, Biological Resources Division

Table 5.—Lake trout catch per net night per 800 ft. of bottom gill net (CPUE) on spawning reefs in northern Lake Michigan during 1999.

Location	Stocked	Number of Nets	Onshore vs. Offshore	CPUE
Whaleback Shoal	? ¹	4	Off	0
Claybanks	Yes	4	On	66
Fishermans Island	Yes	3	On	77
Menonaqua	Yes	2	On	66
9 Mile Point	Yes	3	On	68
Arcadia	No	1	On	10
Pt. Aux Barques	No	6	On	1
Dahlia Shoal	No	6	Off	1
Big Stone Bay	No	6	On	0
Lansing Shoal	No	6	Off	0
GTB-Cherry Home	No	3	On	5
GTB-Lee Point	Yes	3	On	30
GTB-Old Mission	Yes	3	On	40
South Fox	No	4	Off	3
North Fox	No	4	Off	2
Irishmen's	No	4	Off	1
Big Reef	No	4	Off	1
Waukegan-Shore	No	3	On	18
Waukegan-Reef	Yes	2	Off	103
Julian's Reef	Yes	4	Off	66
Portage Point	? ¹	2	On	13
Point Betsie	? ¹	4	On	27
Trout Island Shoal	No	4	Off	2
Beaver Island	No	4	Off	3
Boulder Island	Yes	2	Off	59
Gull Island	Yes	2	Off	35
Richard's	Yes	1	Off	1

¹ ?=Unknown at this time.

Table 6.—Percent of lake trout captured with adipose fin clips (indicating origination from offshore plants) at each site for the years 1997-1999. An "X" indicates that data were not collected for the given year and location.

Classification	Location	1997	1998	1999
Offshore/Non-stocked	Big Reef ¹	47		100
	Irishman's Reef ¹	X	X	100
	Il Aux Galets (Dahlia)	40	50	X
	North Fox Is. ¹	X	X	100
	South Fox Is. ¹	X	X	78
	Good Hart	X	58	X
	Sturgeon Bay	X	100	X
Onshore/Stocked	Fisherman's Island	55	59	55
	Big Stone Bay	X	X	50
	9-Mile Point	X	33	43
	Menonaqua Bay	X	31	32
	Boulder Reef ¹	X	76	78
	Gull Island Reef ¹	X	82	61
	Richard's Reef ¹	X	81	100

¹Indicates sites located within the Northern Refuge Area.

Table 7.—Prevalence (percent and 95% confidence limits) of BKD in lake trout from Michigan waters of Lake Michigan, 1995-1999.

Year	Percent Positive	95% Confidence Limits
1995	11.9	2.4
1996	1.4	1.6
1997	31.4	3.4
1998	0.6	0.7
1999	0.0	0.0