Federal Aid in Sport Fish Restoration
F16AF00354
F-57-R-35
Annual Performance Report

2016-17

Connecticut Fisheries Division

- Monitoring Warmwater Fish Populations in Lakes and Large Rivers
- Bass Research and Management

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State of Connecticut
Department of Energy and Environmental Protection
Bureau of Natural Resources
Fisheries Division

Grant Title: Inland Fisheries Research and Management
Study 2: Warmwater Fisheries Program
Project: Warmwater Fisheries Monitoring
Job 1: Monitoring Warmwater Fish Populations in Lakes and Large Rivers
Job 3: Bass Research and Management
Job 4: Bass Supplemental Stocking Study - Not Active

Period Covered: April 1, 2016 to March 31, 2017

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Cover photo: Lake Waramaug, Warren CT. DEEP file photo.

Summary

Boat electrofishing fish surveys were conducted at 46 sites during the spring and fall of 2016. Data were collected from six bass tournaments at Lake Zoar between May and August 2016. Tournament angler catch rate of bass was 0.35 bass/hr. Twelve Bass Management lakes were sampled during the spring and fall of 2016. The Bass Supplemental Stocking Study was completed in 2015. Seven unfished reservoirs were sampled in 2016 to improve our estimate of the numbers of fish available for a potential program of stocking bass from water supply reservoirs into public waters.

Background

The Connecticut Department of Energy and Environmental Protection Fisheries Division (FD) has regularly monitored fish populations among the state's important lakes and large rivers since 1988 via night boat electrofishing. Lakes are dynamic systems that are subject to both natural variations as well as anthropogenic influences (e.g. winter drawdowns, chemical herbicide applications, dredging, invasive species, changes in angler pressure, and climate change). Maintaining current fish population data is therefore vital for fishery biologists to make informed management decisions. Through this job, Connecticut's special management lakes (Bass, Walleye, Channel Catfish and Northern Pike) are sampled to assess potential changes in fish populations. Additionally, a variety of waterbodies are also sampled on a regular rotational basis to document overarching statewide trends among Connecticut's freshwater fish populations.

Largemouth and Smallmouth Bass combined are Connecticut's most popular gamefish (U.S. Fish and Wildlife Service 2011). In addition to their recreational importance, bass are the principal predatory fish in nearly all of the state's lakes and ponds and thus play a key role in maintaining predator-prey balance in complex fish communities. In recent decades, interest in bass fishing and the sophistication of bass angling techniques have increased as have the popularity of competitive bass tournaments. These tournaments offer biologists an opportunity to efficiently monitor angler catch rates of bass in Connecticut's Bass lakes.

Much of bass management in Connecticut over the last 30 years has focused on reducing harvest by restricting the sizes and numbers of bass that anglers may take. Recent evidence has indicated that vulnerability to angling is a genetically heritable trait (Phillips et al. 2009). It was hypothesized that decades of angling and harvest has reduced the genetic diversity of bass populations due to anglers removing bolder bass from fished populations. This phenomenon is referred to as fisheries induced evolution (FIE) (Law 2007).

Connecticut is unique in that most public water supply reservoirs are closed to angling and; therefore, their bass populations are free from the effects of FIE. A cooperative study between the University of Connecticut and the DEEP-FD "Bass Supplemental Stocking Study" was launched in 2011 to investigate the potential utility of stocking bass from unfished reservoir to improve bass fishing in Connecticut public lakes. This research revealed several key findings. Among them were that Largemouth Bass from unfished reservoirs had significantly higher resting metabolisms (a corollary of boldness in bass; Cooke et al. 2007, Hessenauer et al. 2015), that adult bass transferred from an unfished reservoir to a public lake increased angler catch rates during the spring angling season, and that transplanted bass successfully spawned and bred with resident bass in a public lake (Hessenauer 2015, Davis and O'Donnell 2016). This study concluded that supplemental stocking of reservoir bass into public lakes may have potential in mitigating the effects of FIE on heavily-fished bass populations.

The purpose of this report is to summarize the work performed during the period April 1, 2016 through March 31, 2017.

Note: The Connecticut DEEP Inland and Marine Fisheries Divisions were merged into a single Fisheries Division in January 2017. Although the majority of the work for this report was conducted while we were still Inland Fisheries, the new designation has been incorporated herein.

Approach

Warmwater fish are sampled in selected lakes by standard night boat electrofishing from late-April to the first week of June, and from the last week of September to the first week of November. All fish species sampled are identified and measured, and scales are taken from a subsample of important species for age-and-growth analyses (see Jacobs et al. 2011 for detailed methods).

Bass tournament weigh-ins are monitored on selected waterbodies between April and October. All bass brought to the weigh-in are identified to species, measured to the nearest cm and released. Anglers are also asked how many bass greater than 12 inches they released during their day's fishing (referred to as "culled" fish). The number of anglers and duration of fishing are recorded to determine angler effort (the total number of hours expended by all anglers, expressed as "angler-hrs"). Catch rates (# fish caught/angling hrs) are calculated using weighed-in bass only as well as weighed in plus reportedly released bass.

Key Findings

Monitoring Warmwater Fish Populations in Lakes and Large Rivers

Statewide Electrofishing

The FD sampled 46 sites via boat electrofishing during the spring and fall of 2016 (Figure 1 and Appendices 1a and 1b). Among the sites sampled were seven unfished water supply reservoirs, three of which had not been sampled previously; two private lakes; 19 special management lakes (for Bass, Walleye, Northern Pike or Channel Catfish); and the remaining sites were important Connecticut lakes and the Connecticut River that had not been recently sampled. All data were entered into the Statewide Lake and Pond Survey Database. Species and catch rates (electrofishing catch/hr) for all lakes, ponds and large rivers sampled by the FD between the 1980s and 2016 can be found here on our website:

http://www.ct.gov/deep/lib/deep/fishing/fisheries_management/Statewide_Lake_and_Large_River_Electrofishing_Survey.pdf

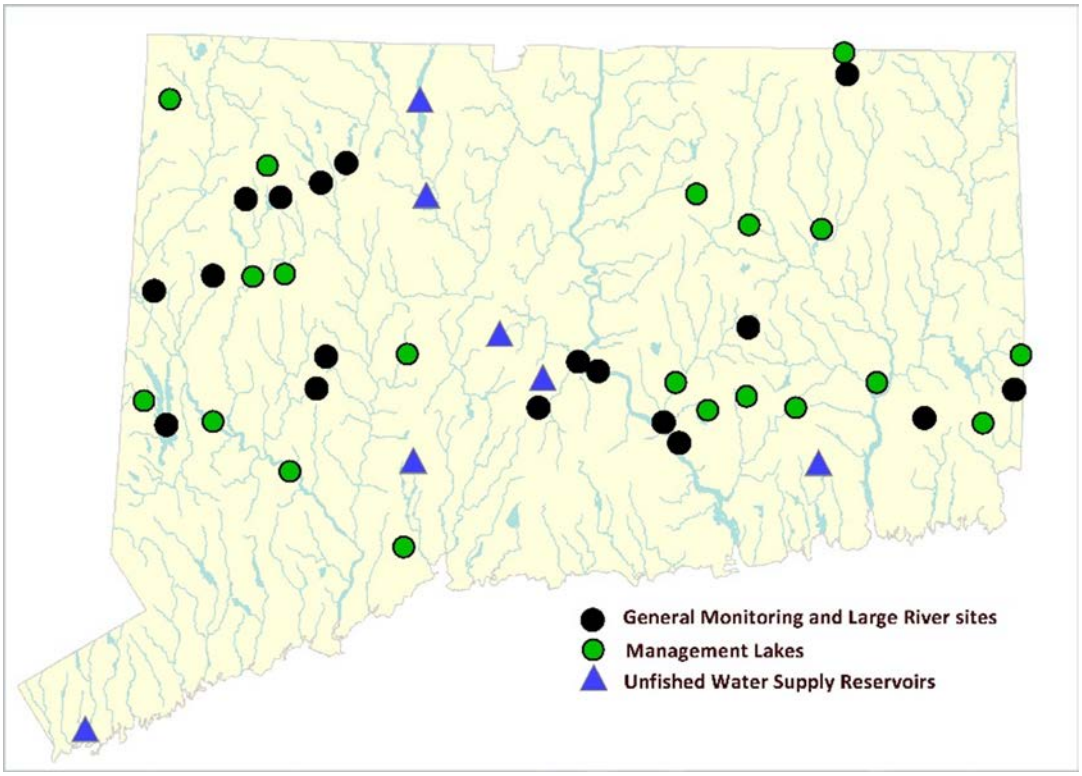

Figure 1. *Electrofishing sites sampled in the spring or fall of 2016.*

Some notable observations are:

1. Severe drought conditions extended well into the fall of 2016 limiting access to several small lakes which were due to be sampled.
2. The Tench population at Bantam Lake appears to be abundant but has stabilized. Over the last three electrofishing samples (2013, 2014 and 2016), catch rates of Tench were 65, 45 and 53 fish/hr, respectively. They appear to be much less common in Lake Winnemaug, the source of Bantam Lake's Tench population, where only one fish was sampled in 2016.
3. The Bowfin population in the Connecticut River continues to increase and expand.
4. As a result of the drought and continued low water levels in the Connecticut River during 2016, aquatic macrophytes were able to colonize shallow areas of the river that previously had been barren. As a result more warmwater fish species were sampled in the mainstem of the river than in previous years.

The seven unfished water supply reservoirs were sampled for two reasons:

1. They serve as "controls" for monitoring statewide trends in fish populations. For example, if similar trends are observed among public waterbodies and waters closed to fishing, we know that fishing is not the cause.
2. To determine the efficacy of a program of stocking bass from unfished reservoirs into public lakes, we must first have a reasonable estimate of the potential numbers of fish available for such a program among the larger water supply reservoirs.

Bass Tournaments

Six bass tournaments were monitored at Lake Zoar between May and August, 2016. Tournaments ranged from 11 to 46 anglers (average 24). Four tournaments operated under a 5-bass per boat rule (5/boat) and two under a 5-bass per angler rule (5/angler) (Table 1). Fishing under the 5/boat rule limits the number of bass that can be weighed-in by a team and results in both lower catch rates of weighed-in bass and higher culling rates (O'Donnell and Leonard 2016). Not surprisingly, the catch rate of weighed-in bass was 13% lower for the 5/boat tournaments and the percent of bass culled at the 5/boat tournaments was 27% vs. 13% at the 5/angler tournaments. When culling was accounted for (+Released row in Table 1), the catch rates between the two tournament types were similar (0.34 vs. 0.35/hr).

Tournaments were last sampled at Lake Zoar in 2004 when the catch rate of weighed-in bass was 0.28/hr (Appendix 2). This was before FD adopted a new protocol discriminating between tournament types (5 bass/boat or 5 bass/angler) as well as recording culled bass. When both types of tournaments in 2016 are combined, the catch rate for weighed-in fish is equal to that measured in 2004 (0.28/hr).

Table 1. Tournament summary data for Largemouth (LM) and Smallmouth (SM) Bass from Lake Zoar in 2016. In the column labeled "Method", "Weighed-in" indicates catch rates of only those bass brought to weigh-ins, "+Released" indicates catch rates of weighed-in bass plus those of bass ≥30 cm reportedly released by the anglers. "Combined" is the catch rate of Largemouth and Smallmouth Bass combined.

Lake Zoar Tournament Type	No. of Tourns.	Angler -hrs	Method	Bass Catch Rate LM Bass/Hr	SM Bass/Hr	Combined
5-bass per angler	2	368	**Weighed-in**	0.19	0.11	0.30
			+Released	**0.23**	**0.11**	**0.34**
5-bass per boat	4	734	**Weighed-in**	0.14	0.12	0.26
			+Released	**0.19**	**0.16**	**0.35**

Bass Research and Management

A total of 12 Bass Management Lakes were sampled via night boat electrofishing during 2016 (Appendix 1b). Catch rates fluctuated among lakes generally within normal expectations. Catch rates for Bass Management Lakes as well as all sites sampled in 2016 are on the DEEP Fisheries website:

http://www.ct.gov/deep/lib/deep/fishing/fisheries_management/Statewide_Lake_and_Large_River_Electrofishing_Survey.pdf

Bass Supplemental Stocking Study

The Bass Supplemental Stocking Study concluded in 2015 (Hessenauer et al. 2015; Davis and O'Donnell 2016). The study produced a number of findings that will assist in guiding future bass management in Connecticut; among these were the findings that transplantation of adult bass from unfished reservoirs to public lakes a) produced a substantial short-term enhancement of bass fisheries, and b) had the potential to enhance the genetic makeup of bass populations. Accordingly, the study recommended assessing the potential of regularly transplanting reservoir bass to selected public lakes. A necessary pre-requisite for such a program is determination of the number of unfished reservoirs in the State that support substantial bass populations. Sampling the seven water supply reservoirs in 2016 was in part conducted to facilitate this inventory (see website link above for results of these samples). In addition to guiding development of a possible reservoir bass stocking initiative, these samples provided

data that are valuable to the FD statewide lake monitoring program (fish communities in unfished lakes provide an important comparative benchmark for those in public lakes). FD should continue to sample unfished reservoirs in the coming years as resources permit.

Expenditures

Job 1. Monitoring Warmwater Fish Populations in Lakes and Large Rivers

Total Cost:	111,887
Federal Share:	83,916
State Share:	27,972

Job 3. Bass Research and Management

Total Cost:	90,937
Federal Share:	68,203
State Share:	22,734

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Acknowledgements

We would like to thank all of the DEEP Fisheries staff who helped out in the collection of electrofishing data. We would like to thank all the Seasonal Research Staff who participated in the collection of these data: Frank Beres, William Henley, Jason Jaffee, Ryan Johnson, Nick McMahon, Erin McGrath, Max Nyquist, Jodi Pinder, Andrew Ransom, Steve Rogers, and Mike Steeves. Special thanks to Pete Aarrestad and Bill Hyatt for reviewing the document and to the U.S. Fish and Wildlife Service, Federal Aid in Sport Fish Restoration for providing most of the funding.

Appendix 1a. **General monitoring sites** sampled by the FD using boat electrofishing gear during 2016.[1]

Lake	Town	Date(s) Sampled (month/day)	Comments
General Monitoring			
Amston L.	Hebron/Lebanon	10/5/16	Stocked in 2015 by Lake Association with Channel Catfish and Largemouth Bass
Avery P.	Preston	11/2/16	
Barkhamsted Res.	Barkhamsted	5/17/16	Unfished water supply reservoir
Bethany L.	Bethany	5/24/16	Unfished water supply reservoir
Beseck L.	Middlefield	10/12/16	Post deep lake drawdown
Bigelow P.	Union	11/3	
Burr P.	Torrington	10/12	
Candlewood L.	Brookfield/Danbury/New Fairfield/New Milford/Sherman	5/31	Grass carp stocking
Dog P.	Goshen	11/1	
Green Falls Res.	Voluntown	10/26	Banded sunfish site
Hatch P.	Kent	10/18	
Konomuc Res.	Waterford	10/17	Unfished water supply reservoir
Mianus Res.	Greenwich	5/2	Unfished water supply reservoir
Mohawk P.	Cornwall/Goshen	10/20	
Mt. Higby Res.	Middletown	4/25	Unfished water supply reservoir
Nepaug Res.	Burlington/Canton/New Hartford	5/23	Unfished water supply reservoir
Quassapaug L.	Middlebury	5/5	
Shuttle Meadow Res.	Southington	5/18	Unfished water supply reservoir
Stillwater Res.	Torrington	10/3	
Waramaug L.	Warren/Washington	4/27	
Winnemaug L.	Watertown	10/17	Tench site
Connecticut River Sites			
Mainstem Central	Middletown/Portland	10/18	
Mainstem South	East Haddam	10/4	
Mattabassett River	Middletown	10/18	
Salmon River Cove	East Haddam	10/4	
Connecticut Yankee Channel	East Haddam	10/4	

[1] Species and catch rates (electrofishing catch/hr) for all lakes, ponds and large rivers sampled by the FD between the 1980s and 2014 can be found here on our website:

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Appendix

Appendix 2b. Special Management Lakes sampled by the FD using boat electrofishing gear during 2016.[1]

Lake	Town	Date(s) Sampled (month/day)	Comments
Bantam L.	Litchfield/Morris	4/25	Northern Pike, Tench site
Beach P.	Voluntown	5/26	Walleye
Bolton L. (Middle)	Bolton/Vernon	10/11	Bass
Coventry L.	Coventry	4/12 & 5/10	Bass/Walleye
Gardner L.	Bozrah/Montville/Salem	4/13, 5/4, 5/18, 5/31	Bass/Walleye
Hayward L.	East Haddam	10/19	Bass
Lillinonah L.	Bridgewater, Brookfield, New Milford, Newtown, Roxbury, Southbury	5/26	Northern Pike
Maltby L. #2	West Haven	5/2	Bass/Catfish
Mansfield Hollow Res.	Mansfield/Windham	4/27	Bass
Mashapaug L.	Union	5/25	Bass/Walleye
Mohegan P.	Norwich	4/26, 5/11, 5/16	Bass/Catfish
Moodus Res.	East Haddam	10/25	Bass
Mt. Tom P.	Litchfield/Morris/Washington	4/13	Walleye
Pickerel L.	Colchester/East Haddam	10/24	Bass
Scoville Res.	Wolcott	10/31	Catfish
Squantz P.	New Fairfield/Sherman	5/9	Walleye/Pre-Grass Carp Introduction
West Side P.	Goshen	10/24	Bass
Wononscopomuc L.	Salisbury	5/11	Bass
Wyassup L.	North Stonington	6/1	Bass
Zoar L.	Monroe/Newtown/Oxford/ Southbury	5/16	Walleye

[1] Species and catch rates (electrofishing catch/hr) for all lakes, ponds and large rivers sampled by the FD between the 1980s and 2014 can be found here on our website:

http://www.ct.gov/deep/lib/deep/fishing/fisheries_management/Statewide_Lake_and_Large_River_Electrofishing_Survey.pdf

Appendix 2. Bass tournament summary data from Lake Zoar from 1985 to 2004.

Lake	Year	No. Tourns.	No. Angs.	Angler -hrs	Bass/Hour LM	Bass/Hour SM	Bass/Hr Comb.
Zoar	1985	2	100	703	0.12	0.01	0.13
	1986	3	157	1,096	0.12	0.04	0.16
	1987	3	123	858	0.20	0.04	0.24
	1991	4	200	1,401	0.10	0.04	0.14
	2004	4	115	800	0.19	0.09	0.28