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Northern Aquaculture Demonstration Facility – 2014 Walleye Project

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Introduction

From May through October, 2014, the UW Stevens Point Northern Aquaculture Demonstration Facility (UWSP-NADF) worked cooperatively with Hayward Bait and Tackle and Northside Enterprises on rearing walleyes for the Wisconsin Walleye Initiative. The UWSP-NADF provided approximately 10,000 extended growth (13/lb) walleyes to our cooperators. The information presented in this case study describes the methods used by the UWSP-NADF to incubate and raise the walleyes. The UWSP-NADF used 0.4 acre (0.16 ha) outdoor earthen ponds, several types of organic and inorganic fertilizers, various aeration systems and forage minnows. The intent of this report is to provide information to assist other aquaculture personnel and hatcheries that are raising walleyes and other cool water fish.

Methods

Eggs:

Eggs were collected by WIDNR from wild walleye and transported to the UWSP-NADF by Hayward Bait and Tackle (HBT) staff and Northside Enterprises (NE) staff. No information regarding egg collection methods or handling was provided. The water hardened eggs were transported to the UWSP-NADF for incubation in a bell jar incubation system located at the facility.

Due to fish health concerns water hardened eggs were treated with 100 ppm iodine in a 10 minute bath before being placed into bell jars.

Northside Enterprises Eggs:

Approximately 3.0 L of eggs were placed in McDonald style egg jars on May 11. Eggs were enumerated for a count of 138,200 eggs per liter or 138 eggs per mL for a total of 414,600 eggs. Fertilization rate was verified at 89.9% utilizing a dissection scope at 10x power. Water temperature was maintained at 7.8-10°C throughout incubation, and temperature was increased to 14°C during hatch-out to aid in hatching. Initial water flow through the jars was approximately 3.3 LPM and then increased to 4.0 LPM once eggs became eyed. Dead eggs were

removed every other day from the hatching jars through siphoning. A modified chicken waterer with a 15 minute (1,600 mg/l) formalin drip was used daily after egg eyeup to control fungus. Formalin treatments were discontinued near egg hatchout. Fry began hatching on May 23 and finished on May 24.

Premature hatching was observed and fry were dying in the bell jars. No eggs or fry survived for Northside Enterprises. Other facilities that received same group of eggs verified similar results.

Hayward Bait Eggs: Approximately 4.0 L of eggs were placed in McDonald style egg jars on May 5. Eggs were enumerated for a count of 150,300 eggs per liter or 150 eggs per mL for a total of 601,200 eggs. Fertilization rate was verified at 87.5% utilizing a dissection scope at 10x power. Water temperature was maintained at 7.8-10°C throughout incubation, and temperature was increased to 13°C during hatch-out to aid in hatching. Initial water flow through the jars was approximately 3.3 LPM and then increased to 4.0 LPM once eggs became eyed. Dead eggs were removed every other day from the hatching jars through siphoning. A modified chicken waterer with a 15 minute (1,600 mg/l) formalin drip was used daily after egg eyeup to control fungus. Formalin treatments were discontinued near egg hatchout. Fry began hatching on May 19 and finished on May 24. Average hatching percentage was 86%. The remaining information is for continued rearing of the HBT fry in ponds.

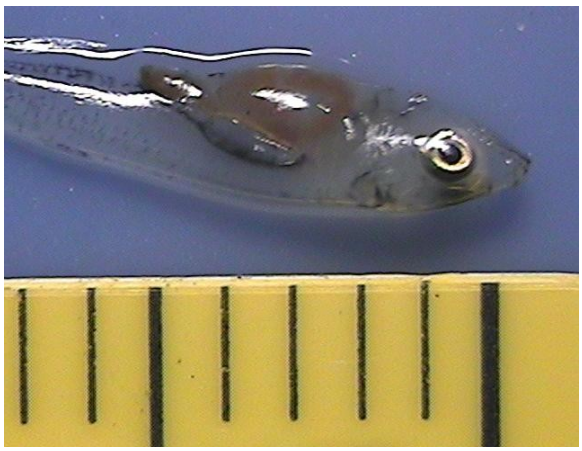

Figure 1. Newly hatched walleye fry

Figure 2. Fingerling sampling to assess condition

Three ponds were prepared for fry stocking by adding fertilizers. Both organic and inorganic fertilizers were used; soybean meal and alfalfa meal were the organics, and liquid nitrogen-urea and granular phosphorus were the inorganic fertilizers. Aeration was provided to ponds via the facilities 5 h.p. main rotary air blower system and in pond Kasco surface aerators (turned on after fish were

larger in the ponds).

The fertilizer type, cost, and application rates are as follows:

Pond 1: Pond 1 was filled partway and prepared approximately one week in advance of filling with 300 pounds of alfalfa meal, 2.25 gallons liquid 28% nitrogen-urea, and 1.0 lb. granular 0-45-0 phosphorous fertilizer. Granular phosphate was liquefied with warm water before application. A total of 500 lbs of alfalfa meal costing $115.00, 2.25 gallons of 28% nitrogen-urea costing $28.00, and 2.0 lbs. of 0-45-0 phosphorous fertilizer costing $0.72 was added during May-June to stimulate plankton blooms.

Pond 2: Pond number 2 was filled partway and prepared approximately one week in advance of filling with 300 pounds of alfalfa meal, 2.25 gallons liquid 28% nitrogen-urea, and 1.0 lb. granular 0-45-0 phosphorous fertilizer. Granular phosphate was liquefied with warm water before application. A total of 500 lbs of alfalfa meal costing $115.00, 2.25 gallons of 28% nitrogen-urea costing $28.00, and 2.0 lbs. of 0-45-0 phosphorous fertilizer costing $0.72 was added during May-June to stimulate plankton blooms.

Pond 4: Pond number 4 was filled partway and prepared approximately one week in advance of filling with 300 pounds of alfalfa meal, 2.25 gallons liquid 28% nitrogen-urea, and 1.0 lb. granular 0-45-0 phosphorous fertilizer. Granular phosphate was liquefied with warm water before application. A total of 500 lbs of alfalfa meal costing $115.00, 2.25 gallons of 28% nitrogen-urea costing $28.00, and 2.0 lbs. of 0-45-0 phosphorous fertilizer costing $0.72 was added during May-June to stimulate plankton blooms.

Fry Stocking: Strong swimming fry were stocked into the prepared outdoor earthen ponds on May 24. Pond 1 was stocked with approximately 80,000 fry and pond 2 was stocked with approximately 80,000 fry. Pond 4 was stocked with 43,000 fry. Remaining fry were destroyed. All fry numbers were determined by using a Jensorter fry counter (Figure 3).

Figure 3. Jensorter fry counter for walleye.

Fingerling walleyes were sampled on a weekly basis to assess length, weight, and fish condition. Fish condition is an observation that takes into consideration a fishes overall appearance including fin condition and body proportions (i.e. fat or skinny) (Figure 4).

Ponds were monitored daily for temperature (ºC), oxygen (ppm), pH and secchi disk readings (m) throughout fingerling production.

Results

Walleye fry were observed around edges of the ponds in daylight and with lights at night during the month of May. Plankton populations were sampled weekly with a plankton net during the month of May.

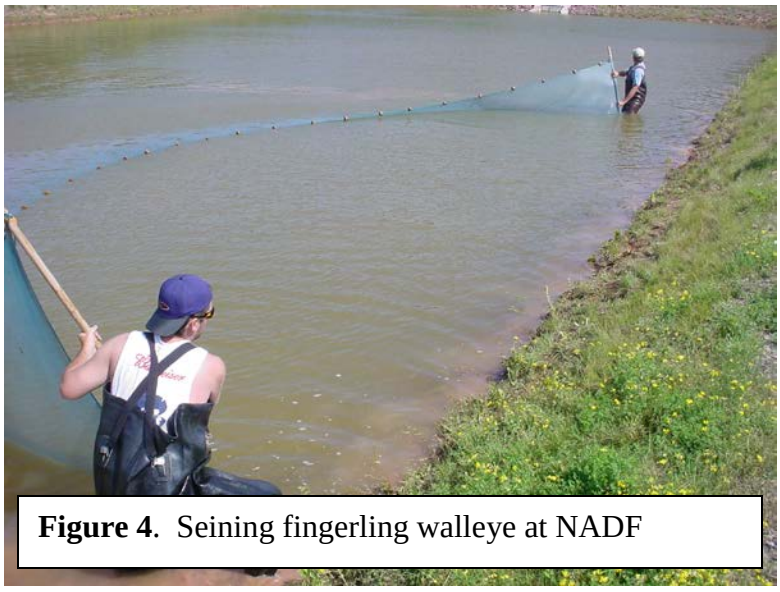

Figure 4. Seining fingerling walleye at NADF

Pond temperatures were low for the ponds and fingerling growth was limited by phytoplankton production.

On July 2, approximately 12,407 fingerlings were harvested from Pond 2 by fully draining the pond down into the collection basin.

Pond 1 was fully drained on June 3. Approximately 13,889 fingerlings were harvested from the drained pond. No fingerlings were removed from Pond 4 due to low seining numbers of fingerlings and ostracods in the pond. Average fry to fingerling production return in ponds 1 and 2 was 16.5%. Average length and weight was 33.6 mm (1.3 in) and 0.31 g, respectively.

Ponds 2 and 3 were restocked with 13,889 and 12,407 fingerlings, respectively, to rear extended growth walleye. Ponds depth averaged 4 ft (1.2 m) during extended growth rearing. Final pond volume was approximately 520,740 gal. (1,971,000 L).

Ponds were stocked periodically with a total of 440 gallons (3,520 lbs or 1,600 kg) of forage minnows of various sizes ranging <1- 2" from June through September. Final poundage ratio of forage minnow to walleye was approximately 4:1.

Figure 5. Extended growth walleye sampled for fish condition.

Walleye from both ponds were sampled on a weekly basis to assess length, weight, and fish condition (Figure 5). Forage was provided weekly to maintain fish condition.

Ponds were monitored daily for temperature, oxygen, pH and secchi disk readings throughout advanced fingerling production(Figure 5). Aeration systems were run at night during days of excessive heat (>85ºF) to prevent pond temperatures from increasing. No observed water quality parameter issues were apparent during this time period.

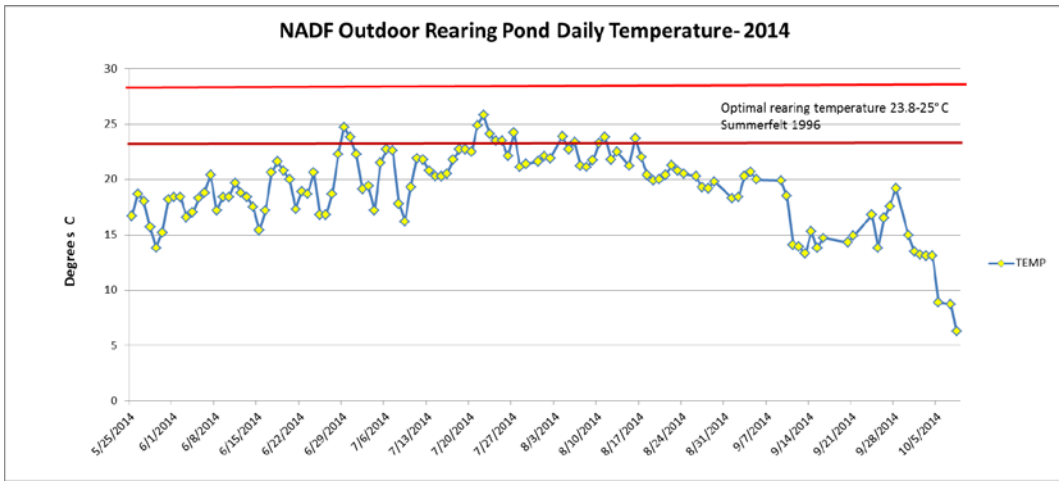

Figure 6. Daily Pond Temperature-2014

Extended growth walleyes were harvested from ponds 2, and 3 on October 8 and 9, respectively. Pond 4 was drained earlier when no walleye were found for sampling. Ponds were drawn down slowly through the use of gate valves and dam boards located in the concrete funnel structure at the rear of the ponds. Fish were collected and held in the external concrete collecting kettle with fresh water and aeration. Approximately, 10,211 extended growth walleyes weighing 794lbs (361 kg) were harvested from ponds 2 and 3. No walleyes were harvested from pond 4. Average fingerling to extended growth walleye survival was 38.7% for ponds 2 and 3. The harvested walleyes averaged 154.1mm (6.1 inch) in length and weighed 35.4g (12.8/pd). No significant losses were recorded during harvest. A portion of fish had to be removed from the weeds and mud in pond 3.

Fish were picked up by Hayward Bait and Tackle hauling truck and taken to various lakes in the Hayward area in cooperation with the WIDNR.

Discussion

Egg take

This year's walleye rearing season was filled with various issues from the beginning with a late ice out and cold spring. There are many variables that affect walleye egg hatching and survival such as environment, genetics, broodstock condition, weather, and husbandry. Walleye eggs were in various state of development when harvested and this may have led to the premature hatching that we encountered at NADF. This was the lowest egg survival we have experienced at NADF with over 12 years of rearing walleye. It would be our recommendation for 2015 to gather eggs from several different broodstocks and possibly hold some excess eggs to prevent an issue such as complete loss of entire egg collections which leaves hatcheries with no fish for the year.

Fry/fingerling rearing

Due to the cold spring and summer (Figure 6) it was difficult to maintain high plankton blooms in our ponds during May which ultimately affected the survival of early fingerlings. As the fish transitioned to a minnow diet, we had issues with obtaining small pinhead or Tuffy fatheads at the appropriate time to feed the small walleye. This is a critical time for providing adequate and appropriately sized forage for small fingerlings (1.3-2.0 inch). Due to the large numbers of walleye being reared in state and the high demand for the pinhead fatheads there was a shortage of this forage at the most important time for the walleye. We would recommend that you make arrangements way ahead of time to get the appropriate forage at the correct time with your baitfish provider.

Extended Growth Rearing

Pond temperatures for this year were not optimal for growing walleyes in northern Wisconsin. Looking over the graph of pond temperature (Figure 6), we did not see very many days in the optimal temperature range of 23-28° C for growing walleye as published in the Walleye Culture Manual (Summerfelt, 1996). Looking at this in more depth, our outdoor rearing ponds only saw approximately 13 days in the months of June, July and August above 23°C (Table 1).

Table 1. Walleye rearing pond temperature showing days above 23°C.

Walleye Rearing Pond Temperature -2014					
Month	June	July	August	Sept	Oct
Mean temp/mnth	19.02	21.52	21.47	16.63	10.97
High/mnth	24.7	25.8	23.9	20.7	13.5
Low/mnth	15.4	16.2	19.2	13.3	6.3
Days @ 23 C or above	2	6	5	0	0

The months of September and beginning of October had no days where the ponds were over 23°C. Growth rates of walleye at temperature <15.5°C (60°F) are nearly zero (Summerfelt 1996). By early September, our ponds were already under 15° C and nowhere near the optimum temperature for growing walleye, hence we harvested in early October.

Hopefully 2015 will be a better year for rearing walleyes in Wisconsin and fish rearing facilities can make advanced plans to deal with some of the trials and tribulations that came along with the first year of the WI Walleye Initiative.

Acknowledgements

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Questions or comments regarding this project can be directed to Gregory Fischer, NADF Facility Operations Manager, at 715-779-3461 or email gfischer@uwsp.edu