Northern Aquaculture Demonstration Facility – 2008 Walleye Project

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Introduction

From May through October, 2008, the UW Stevens Point Northern Aquaculture Demonstration Facility (NADF) continued to work cooperatively with the Lac Courte Oreilles Tribal Fisheries Program (LCO). NADF provided approximately 17,080 extended growth (18/lb) walleyes for the tribe's lake stocking program. The information presented in this case study describes the methods used by NADF to incubate and raise the walleyes. NADF used two 0.4 acre (0.16 ha) outdoor earthen ponds, several types of organic and inorganic fertilizers, various aeration systems and forage minnows. The outcomes of this project suggest that you can successfully produce 1,000 lbs of extended growth walleye in a 1.0 acre outdoor earthen pond. Size and number of fish at harvest will be dependant on initial stocking numbers, good water quality and proper feeding protocol. 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 from adult male and female walleye were collected on May 2 by WiDNR staff using fyke nets set in Big LCO Lake near Hayward, WI. Eggs were stripped by hand from female walleye into plastic containers and milt was added from several males utilizing both wet and dry methods. More than one male was utilized for two reasons: 1) because milt from a single male may not be capable of fertilizing eggs, and 2) for maintaining genetic diversity. After eggs and milt were in the pan, clean water was added and the combination stirred with a soft brush or feather to water harden the eggs. Stirring continued for several minutes and a slurry (consistency of a thick milkshake) of bentonite clay was added to the mixture. Stirring the egg/clay mixture continued for several minutes and additional clean water was added. The egg/clay mixture was rinsed off with clean water and placed into a larger bucket or cooler of clean water. Water in the container was freshened periodically to maintain oxygen levels and to keep water temperature at 48ºF during transport. The water hardened eggs were

transported to NADF for incubation in a bell jar incubation system located at the facility.

Due to fish health concerns (such as VHS) ovarian fluid was collected for screening from female broodfish. All ovarian samples collected were negative for VHS. Water hardened eggs were treated with 100 ppm Iodine in a 10 minute bath before being placed into bell jars.

Approximately 329,000 eggs were placed in McDonald style egg jars on May 2. Water temperature was maintained between 48-50°F throughout incubation, and temperature was increased to 59°F during hatch-out to aid in hatching. Initial water flow through the jars was approximately 0.4 gpm and then increased to 0.7 gpm once eggs became eyed. Dead eggs were removed daily 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 16 and finished on May 20. Average hatching percentage was 36%.

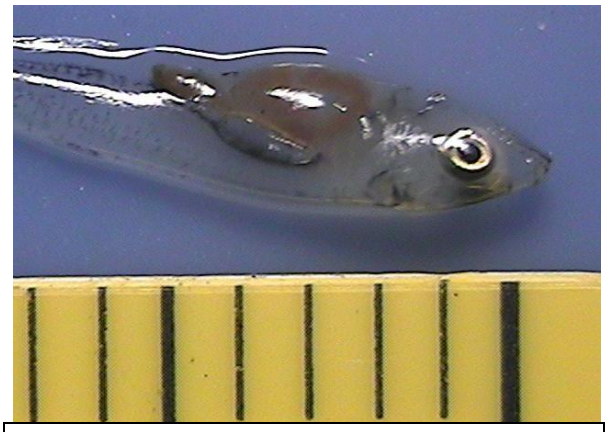

Figure 1. Newly hatched walleye fry

Two 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 both ponds via the facilities 5 h.p. main rotary air blower system.

Figure 2. Fingerling sampling to assess condition

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 lbs of soybean meal, 2.25 gallons of liquid 28% nitrogen-urea, and 1.0 lb. of granular 0-45-0 phosphorous fertilizer. Granular phosphate fertilizer was liquefied with warm water before application. A total of 400 lbs of soybean meal costing $90.00, 2.25 gallons of 28% nitrogen-urea costing $28.00, and 1.5 lbs of 0-45-0 phosphorous fertilizer costing $0.54 was added during May-June to stimulate plankton blooms.

Fry Stocking: Strong swimming fry were stocked into the prepared outdoor earthen ponds on May 21. Pond 1 was stocked with approximately 51,866 fry and pond 2 was stocked with approximately 66,223 fry. All fry numbers were determined volumetrically. Fry were also sent to the USFWS La Crosse Fish Health Center for VHS testing. All tests were negative for VHS.

Fingerling walleyes were sampled on a weekly basis to assess length, weight, and fish condition (Figure 2). Fish condition is an observation that takes into consideration a fishes overall appearance including fin condition and body proportions (i.e. fat or skinny).

Ponds were monitored daily for temperature (ºC), oxygen (ppm), pH and seechi 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 daily with a plankton net during the month of May.

Early fish sampling yielded good numbers of fish per seining attempt only in pond 1, but seining attempts were unsuccessful in pond 2 (Figure 3).

Figure 3. Seining fingerling walleye at NADF

Pond temperatures, as well as the plankton populations, increased in June. The lowest oxygen levels observed during fingerling production were in pond 2 at 1.4 ppm during the month of May.
Low oxygen levels could have been detrimental to the fish in the pond, and

therefore fresh water was added with aeration to alleviate the problem.

On June 2, approximately 9,127 fingerlings averaging 948.8fish/kg were moved from pond 1 into pond 3 for further rearing. An additional 8,293 fingerlings were moved from pond 1 to pond 4 for further rearing.

Pond 1 was fully drained on June 3. Approximately 8,018 fingerlings were moved into pond 3 and 6,795 fingerlings were moved to pond 4 for extended growth. Total fingerling production in pond 1 was 32,233. Fry to fingerling production return in pond 1 was 62%. Pond 1 was left to dry after draining.

Pond 2 was fully drained on June 20 and no walleye fingerlings were collected. Fry to fingerling production return in pond 2 was 0%, and pond 2 was refilled with pond water and well water. Low oxygen levels in Pond 2 during May probably led to fry mortality. It is not known for sure what caused the low oxygen levels in Pond 2.

A fish health assessment was performed on the walleye fingerlings on June 12 and a certified “clean bill of health” was provided.

Ponds 3 and 4 were initially stocked with 17,145 and 15,088 fingerlings, respectively, to investigate the capacity of 0.4 acre ponds 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 4. Extended growth walleye sampled for fish condition.

Walleyes from both ponds were sampled on a weekly basis to assess length, weight, and fish condition (Figure 4, 5, and 6). Forage was provided weekly to maintain fish condition. Average daily growth rate was 2.0 mm/day (Figure 5). Average daily weight gain

was 0.35 g/day.

Ponds were monitored daily for temperature, oxygen, pH and seechi disk readings throughout advanced fingerling production. Aeration systems were run at night during days of excessive heat (>85ºF) to prevent pond temperatures from increasing. Fresh groundwater was also added periodically during excessive heat periods to help control temperature in ponds. No observed water quality parameter issues were apparent during this time period.

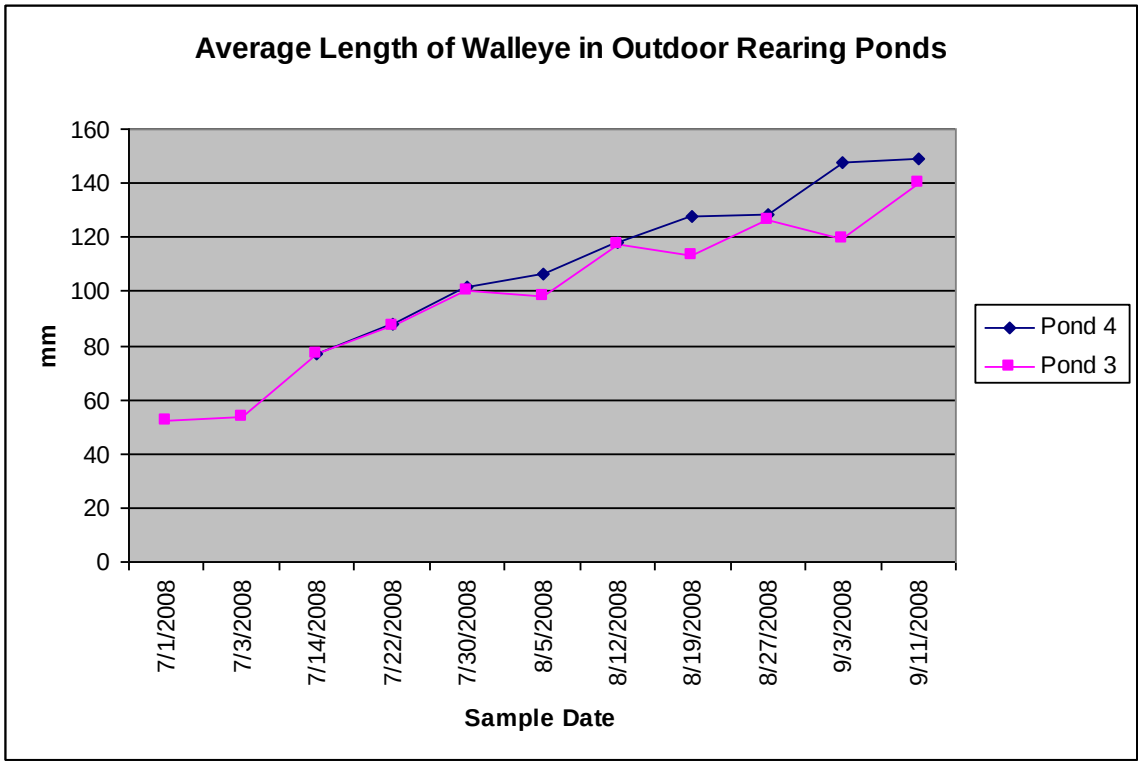

Figure 5. Average length of walleye fingerlings in outdoor rearing ponds at NADF during 2008 rearing season.

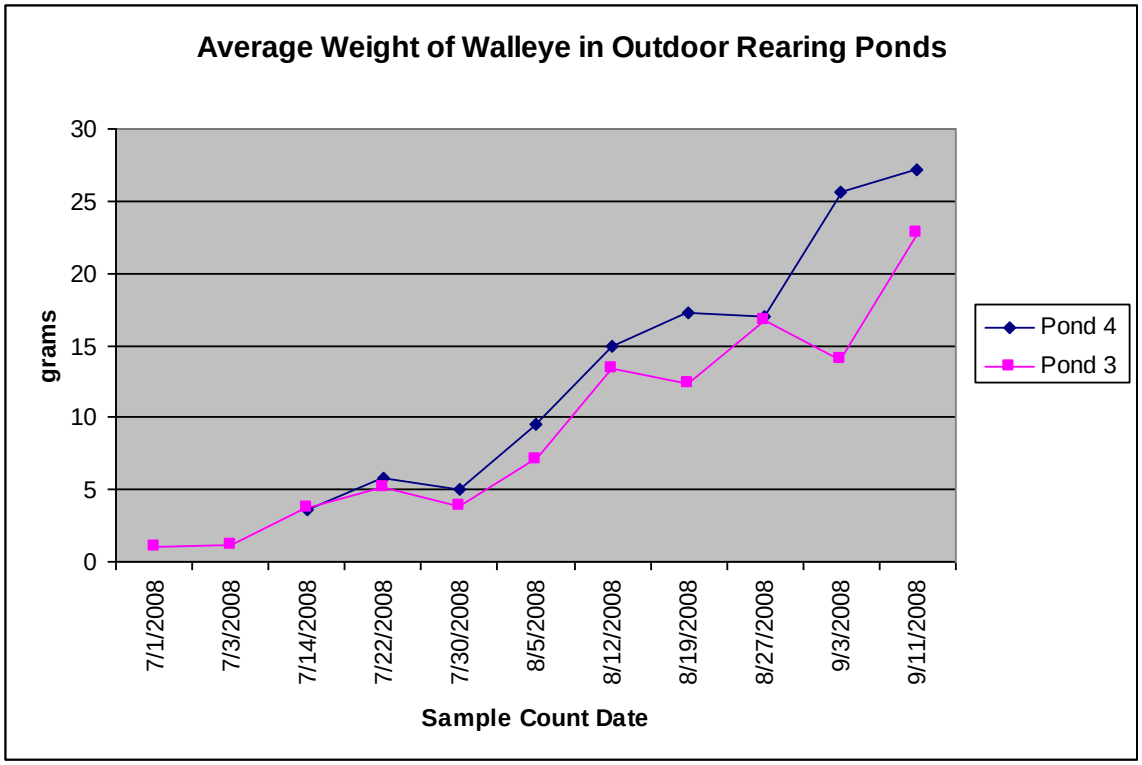

Figure 6. Average weight of walleye fingerlings in outdoor rearing ponds at NADF during 2008 rearing season.

Extended growth walleyes were harvested from ponds 3 and 4 on September 11 and 10, respectively. 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, 17,080 extended growth walleyes weighing 940 lbs (427 kg) were harvested from the two ponds. Average fingerling to extended growth walleye survival was 53%. The harvested walleyes averaged 5.7" (145mm) in length(Figure 5) with the average fish weight being 25g (18/pd)(Figure 6). No significant losses were recorded during harvest. A small portion of fish had to be removed from the weeds and mud.

Fish were stocked by LCO Fisheries Department into local lakes for conservation purposes.

Discussion

By removing this year's extended growth walleyes from the ponds earlier than last year, fish numbers were higher yet total poundage remained similar to last year's harvest of 1,151 lbs. This year's harvest of 940 lbs was much higher than the 2006 or 2005 harvests of 507 and 511 lbs, respectively.

Implications of the last two years of our research in walleye rearing and management suggests that you can successfully produce approximately 1,000 pds. of extended growth walleye in two 0.4 acre outdoor earthen ponds. Size and number of fish will be determined by time of harvest from the pond, initial stocking numbers, good water quality parameters, and proper feeding protocol. This may provide a valuable insight for hatchery personnel who need to produce specific numbers or sizes of walleye for different programs.

Total estimated cost to produce the extended growth walleye was $16,273 ($0.95 per fish) which included forage, fish health testing, fertilizer, and miscellaneous expenses. No labor or capitol cost was included in this estimate.

Acknowledgements

Special thanks to Paul Christel at LCO Natural Resources Department for working with us on this project. We also would like to thank the WiDNR Tommy Thompson State Fish Hatchery staff for collecting walleye eggs on behalf of LCO to start the project. Mark Duffy and Larry Deragon assisted with harvesting of fish. Thanks to UWSP NADF interns Jessica Kavenaugh and Mike Defoe, and Federal University of Santa Catarina, Brazil intern, Marcos Wiengartner for monitoring ponds, sample counting and harvesting walleyes. Thanks to Dr. Chris Hartleb, Co-Director and Sarah Kaatz, UW-Extension Central Aquaculture Outreach Specialist for reviewing and cleaning up the rough drafts of this paper.

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