

Shad in the Classroom Program Final Report

To
APNEP

By
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NC Museum of Natural Sciences

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American Shad Embryos, Watha Hatchery

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This report summarizes the activities that were accomplished for the 2013 Shad in the Classroom Program. Twenty schools participated in the program: 7 elementary schools, 9 middle schools, and 4 high schools. Originally 21 schools were enrolled in the program, but one withdrew early. The program included teacher training, successful raising and release of American shad in classrooms, a canoe-camping experience for teachers on the Roanoke River, and some new extended educational activities.

Tank Inventory

At the start of the program, tank parts and chemicals were inventoried and items purchased as needed. Tanks were retrieved from schools no longer participating in the program. New tanks were constructed and old tanks refurbished, as needed, with the assistance of Museum exhibits staff.

Teacher Orientation and Training Session

A teacher orientation and training session was conducted on 23 February 2013. Melissa Dowland and Danielle Pender co-led the session, and Josh Raabe, NCSU, was a guest lecturer. Teachers were provided information about American shad life history, restoration, and management. They received equipment and instructions for raising shad and learned ways to incorporate shad and aquatic ecology into their curriculum. We also facilitated networking among the schools involved in the project. Fourteen teachers attended the workshop. Of those, 11 responded to the survey regarding the workshop. The results of the survey are summarized in the attached addendum (Addendum 1). (Photo – teachers learning tank construction)



Egg Delivery and Larval Fish Release

Danielle Pender coordinated the arrival of the eggs and the release of the larval fish with the schools, hatchery, and fisheries biologists. This involved foremost the timing of the spawning of the American shad, but also took into account school schedules. Many people assisted with the delivery of the eggs and with the release of the larval fish and are mentioned in Addendum 2 – Assistance with the program. (Photo – Red Oak MS release at Weldon)

Four schools with five classes (2 classes at one school, 1 class with two tanks – five classes with six tanks total) received eggs on Monday, 8 April 2013, and of those, three classes released larval fish on Thursday, 11 April 2013, and 2 released on Friday, 12 April 2013. Eleven schools with 13 classes (2 classes at 2 of the schools – 13 tanks total) received eggs on Monday, 15 April 2013, and of those, 9 classes released larval fish on Thursday, 18 April, 2013, and 4 released on Friday, 19 April 2013. These classes all received eggs from the Edenton National Fish Hatchery (approximately 19,000 eggs total) and released larval fish into the Neuse River basin. One school with two



classes operating tanks received eggs from Watha Fish Hatchery (approximately 2,000 eggs total, Roanoke River basin) on Monday, 22 April 2013 and released larval fish on Thursday, 25 April 2013 at Weldon.

Egg and Larval Release Timing and Release Site Information

Educator	School	Received Eggs	Released Eggs/Larva	Release Site
Sonja Younger	Woods Charter MS	4-8-2013	4-11-2013	Neuse (West Point Eno)
Karen Curry	East Wake MS	4-8-2013	4-12-2013	Neuse (Anderson Point)
Michelle Amato	East Wake MS	4-8-2013	4-12-2013	Neuse (Anderson Point)
Jennifer Howard	Southern Vance HS	4-8-2013	4-11-2013	Neuse (Cliffs of the Neuse State Park)
Shannon Hardy	Exploris MS	4-8-2013	4-11-2013	Neuse (Milburnie Dam)
Anne Paris	Bunn HS	4-15-2013	4-18-2013	Neuse (Falls Lake Dam)
Emily Coppes	Angier ES	4-15-2013	4-19-2013	Neuse (Anderson Point)
Catherine Apostolides (Tina)	Hall Woodward ES	4-15-2013	4-18-2013	Neuse (West Point Eno)
Daniela Jacobs	Sandy Grove ES	4-15-2013	4-19-2013	Neuse (West Point Eno)
Christina Edmiston	Upchurch ES	4-15-2013	4-19-2013	Neuse (Anderson Point)
Sarah Lancaster	Daniels IBMYP Magnet MS	4-15-2013	4-18-2013	Neuse (Lassiter Mill)
Tracy Mulligan	Lakewood Montessori MS	4-15-2013	4-18-2013	Neuse (West Point Eno)
Laine Staton	Lakewood Montessori MS	4-15-2013	4-18-2013	Neuse (West Point Eno)
Sarah "Kristen" Bright	South Iredell HS	4-15-2013	4-18-2013	Neuse (West Point Eno)
Kelly Riley	Tiller School (Carteret County Charter School)	4-15-2013	4-19-2013	Neuse (Cliffs of the Neuse State Park)
Jolene Slonac	Forest Pines Dr ES	4-15-2013	4-18-2013	Neuse (Falls Lake Dam)
Judy Compton	Central Park School for Children	4-15-2013	4-18-2013	Neuse (Cliffs of the Neuse State Park)
Melissa Oakley	Bunn HS	4-15-2013	4-18-2013	Neuse (Anderson Point)
Alyce Therrien	Red Oak MS	4-22-2013	4-25-2013	Roanoke River at Weldon
Elizabeth Dawn Maynard	Red Oak MS	4-22-2013	4-25-2013	Roanoke River at Weldon

Overall, the shad rearing and release was successful for the schools. Each class was to receive approximately 1,000 eggs; however, counts may differ as to what the school actually reported receiving. A few of the schools had low pH problems, and one of those lost a majority of their larval fish, but was able to release potentially viable un-hatched eggs. A few also mentioned having difficulties with the fry chamber and siphoning system. A number of schools ended up releasing more eggs than larval fish this year. This was likely due to the young age of the eggs that they received (spawned on a Sunday) combined with the fact that most schools released on a Thursday. A couple of schools had low survivability, and a few of the schools reported receiving non-viable eggs. Percent survival ranged from as low as 0.005% up to 95% and averaged 59%, with two schools yet to report.

Egg and Larval Survival and Release Numbers

Educator	School	No. Eggs Received	No. Eggs/Larva Survived to Release	Percent Survival
Sonja Younger	Woods Charter MS	1000	950	95%
Karen Curry	East Wake MS	2000	1500	75%
Michelle Amato	East Wake MS	1000	879	88%
Jennifer Howard	Southern Vance HS	1000	630	63%
Shannon Hardy	Exploris MS	800	86 eggs/434 fry	65%
Anne Paris	Bunn HS	1450	997	69%
Emily Coppes	Angier ES	No report	No report	No report
Tina Apostolides	Hall Woodward ES	1000	500	50%
Daniela Jacobs	Sandy Grove ES	1000	900	90%
Christina Edmiston	Upchurch ES	1000	500-600	50-60%
Sarah Lancaster	Daniels IBMYP	500	200	40%
	Magnet MS			
Tracy Mulligan	Lakewood	1000	100	10%
	Montessori MS			
Laine Staton	Lakewood Montessori	1000	Unsure	No report
Sarah "Kristen" Bright	South Iredell HS	1312	356 eggs	27%
Kelly Riley	Tiller School	1000	100 eggs/300 fry	40%
	(Carteret County Charter School)			
Jolene Slonac	Forest Pines Dr ES	1000	5 fry (eggs?)	.005% (more?)
Judy Compton	Central Park School for Children	No report	No report	No report
Melissa Oakley	Bunn HS	800-1000	500-600 eggs (some fry)	62%
Alyce Therrien	Red Oak MS	1300	250	19%
Elizabeth Dawn Maynard	Red Oak MS	1300	250	19%

Shad Trek – Secrets of the Swamp

Ten teachers were originally scheduled to attend the shad trek; however, for various reasons, 6 attended from the program and one additional teacher from another school attended. Due to inclement weather, plans changed a bit from the usual trek schedule. Teachers received a tour of the Edenton National Fish Hatchery on Monday, 29 May 2013. Camping took place at a land accessible platform (Tillery). On Tuesday, 30 May 2013, teachers and museum staff canoed approximately 9 miles on Gardner Creek and Upper Deadwater Creek, tributaries of the Roanoke. During the two day trip, the group learned about local birds, aquatic invertebrates, amphibians, fish, and plants in the Roanoke River basin. Teachers responded very positively to the Trek, and many requested that the hatchery tour remain part of the program. (Photo canoeing on Gardner Creek)



Additional Education

An educational exercise titled “Who’s your Shaddy” was developed with the help of Dr. Morgan Raley and Dr. Heather Evans of the Museum. The purpose of the exercise is to identify the parents of a particular juvenile shad by examining graphs of the genes of the fish. Danielle Pender coordinated three American shad genetics lectures between Morgan and three of the participating schools and an additional video recording. She also coordinated two fish dissection/anatomy lessons that were given by Daniel Brown, NCSU graduate student. The “Who’s your Shaddy” exercise will be added to the Shad in the Classroom Activities on the website. The NC Standard Course of Study numbers were updated to correspond with the Shad in the Classroom Activities located on the website. (Photo – Dr. Morgan lecture to Exploris MS)



Eight teachers requested the additional lecture on the genetics, the dissection, or both. However, due to scheduling, two teachers (2 of 5) received the dissection/anatomy lecture (one by Skype, one in person) and three (3 of 8) received the genetics lecture (one in person, two by video conference). We also taped the genetics lecture so that it will be available to more schools. Teachers felt that some polishing could occur on the genetics lecture, but were very positive about it, and they also provided positive feedback on the dissection/anatomy lecture. Seventy-two percent (13 of 18 reporting) of the teachers indicated that they used the curriculum located on the website, 17% used the “Who’s your Shaddy” exercise (3 of 18 reporting); however, four more indicated that they will use it this year or next, and all (100%, 17 reporting) stated that they used the videos.

This was a productive and fulfilling Shad in the Classroom year. Teachers and students provided positive feedback on the program for the workshop, the Trek, and the overall program. All teachers reported, except for one (responded as maybe), that they would like to continue with the program next year. Additional educational programs were implemented this year, which added to the student’s learning experience. We had a lot of assistance from others with the deliveries of eggs, attendance at releases, and educational lectures.

Geodome Filming/Presentation

An additional video piece, being produced by Art Howard, is close to readiness for presentation in the Museum’s inflatable immersion theater, the Geodome. We are seeking funding from Dominion Power for next school year (2013-14) that will aid in the development of curriculum materials to support this piece, and will provide contract staff and transportation to bring this presentation to Red Oak Middle School in Nash County. Following this pilot program, we plan to expand this offering to a wider range of schools in the APNEP region.

Budget (NOTE: budget as of 6/27/13 – there are still a few outstanding expenses)

Tank construction/refurbishment supplies	\$2400
Shad Trek	\$2500
Teacher Training Session	\$250
Travel to Release Sites (schools)	\$6000
Production of Geodome video piece	\$21000
Part-time staff wages	\$5000
Egg delivery travel	\$1200
TOTAL	\$38350

Addendum 1

Results of the Shad in the Classroom Workshop Survey

1. The workshop explained the importance of the shad restoration and management program.
– *all teachers felt it was explained extremely well (100% - 11 teachers).*
2. The workshop explained the life history of shad.
– *82% reported extremely well (9 teachers) and 18% felt it was explained very well (2 teachers).*
3. The workshop explained the proper components for raising shad from the egg to the larval stage.
– *73% reported it was explained extremely well (8 teachers) and 27% (3 teachers) felt it was explained very well.*
4. Confidence in building their tank on their own after the workshop.
– *64% (7 teachers) felt extremely confident and 36% (4 teachers) felt very confident.*
5. The leadership team was resourceful in answering their questions.
– *91% (10 teachers) reported that they were extremely resourceful and 9% (1 teacher) felt they were very resourceful.*
6. Comfort in contacting other teachers met at the workshop with questions.
– *55% (6 teachers) felt extremely comfortable, 36% (4 teachers) felt very comfortable, and 9% (1 teacher) felt moderately comfortable.*
7. Sufficiency of information learned to incorporate shad into their curriculum.
– *55% (6 teachers) reported extremely sufficient, 36% (4 teachers) felt very sufficient, and 9% (1 teacher) felt moderately sufficient.*
8. Responses to how the teachers intend to use the experience in their teaching.
 - a) As a team builder as part of service-learning. Collecting data for math analysis Common Core. Box and Whisker Plots, Scatter Plots, Stem and Leaf Plots, Frequency Tables -- Range, Mean, Median, Mode, outlier.
 - b) The Shad Project will reinforce several of the goals included in the Hydrosphere Essential standard and will coincide with Ecosystems.
 - c) We are going to be using the lesson plans, videos, and real life experience. I also intend to share the knowledge with teachers who are not part of the program.
 - d) I plan to incorporate it into my lessons the week prior to receiving the fish eggs, also during the week of growing the eggs and a post assessment after we release the fish into their environment.
 - e) Water quality testing, stressing the importance of a healthy water system.
 - f) To relate how shad survival is an example of how humans impact their environment.
 - g) As a model of all sorts of ecological and biological concepts as well as to develop science skills.
 - h) I've already started sharing background information with my students and incorporating it with our unit of study.
 - i) I have a week of activities planned to top off my water quality and populations units!

- j) As a science teacher it covers all curriculums 3-5 for me.
- k) The students will work and prepare for the fish. They will share responsibilities and raise the fish carefully.

9. Reported usefulness of various workshop aspects.

- a) Getting to know the other teachers exercise – 63.64% (7 teachers)
- b) Presentation on the life history of shad by the biologist – 100% (11 teachers)
- c) Presentation on the shad restoration and management program by the biologist – 100% (11 teachers)
- d) Videos – 100% (11 teachers)
- e) Building the tank exercise – 90.91% (10 teachers)
- f) Egg siphoning practice – 36.36% (4 teachers)
- g) Round table exercise where you heard other teacher's experiences and challenges – 90.91% (10 teachers)

10. The overall satisfaction of the workshop was rated at 100% (11 teachers).

Addendum 2

Assistance with the Program

Workshop

Josh Raabe jkraabe@ncsu.edu – NCSU post-doc researcher

Justin Dycus justin.dycus@ncwildlife.org – NCWRC – ended up not being able to attend, but provided lecture material along with Chad Thomas of NCWRC chad.thomas@ncwildlife.org

Melissa Dowland melissa.dowland@naturalsciences.org – Museum

Additional Education

Dr. Morgan Raley morgan.raleigh@naturalsciences.org – genetics lecture

Dr. Heather Evans heatherkevans@msn.com – genetics lecture

Tamara Poles Tamara.Poles@naturalsciences.org – assisted genetics lecture via video conference

Matt Zeher Matt.Zeher@naturalsciences.org – assisted genetics lecture via video conference

Daniel Brown dtbrown2@ncsu.edu – NCSU student, fish dissection and anatomy lecture

Paul Begue p.begue@yahoo.com – NCSU student (offered the fish dissection and anatomy lecture, but couldn't help until after May 9th)

Kelsey Lincoln kjlincol@ncsu.edu – NCSU student helped coordinate with the graduate students

Field Trek – Museum staff

Megan Chesser megan.chesser@naturalsciences.org

Liani Yirka Liani.Yirka@naturalsciences.org

Brandon Sherrill brandon.sherrill@naturalsciences.org

Melissa Dowland melissa.dowland@naturalsciences.org

Egg Delivery and Larvae Release

Wilson Laney wilson_laney@fws.gov – USFWS

Mike Wicker mike_wicker@fws.gov – USFWS

John Ellis john_ellis@fws.gov – USFWS

Emily Jernigan emily_jernigan@fws.gov – USFWS

Jim Hawhee jim.hawhee@apnep.org – APNEP (attempted to come to release, but had car trouble)

Jeremy McCargo jeremy.mccargo@ncwildlife.org – NCWRC

Ben Ricks ben.ricks@ncwildlife.org – NCWRC

Jerry Reynolds jerry.reynolds@naturalsciences.org – Museum

Lynn Cross lynn.cross@naturalsciences.org – Museum

Melissa Dowland melissa.dowland@naturalsciences.org – Museum