Preliminary Survey for Asian clams (*Corbicula fluminea*) in Owasco Lake, Cayuga County, NY

A Report to the Cayuga County Soil and Water Conservation District

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Executive Summary

Targeted areas of Owasco Lake, Cayuga County, NY, were surveyed for the presence and general distribution of Asian clams (*Corbicula fluminea*) between July 26 and 29, 2011. Survey methods were qualitative and based on preliminary sampling conducted by the members of the Owasco Lake Asian Clam Task Force. Surveys were conducted by divers with the assistance of the Owasco Lake Asian Clam Task Force. Additional spot checks were conducted at points along the lake shore that were possible sites for Asian clams based on depth and sediment profiles.

Asian clams were found to be limited to the very northern portion of the lake in a shallow bank composed mainly of sand and silty sand. Clams occupy an area of no more than 123 acres (49.8 hectares) and possibly somewhat less than 123 acres. The area occupied by clams is shallow, approximately 3-6 feet deep, and free of vegetation. One deeper spot was potentially identified but this will require more detailed survey techniques.

Clams in the densest assemblage, west of the Owasco River / Owasco Lake outlet, had a mean density of 1018 per m^2 and a maximum density of over 2400 per m^2. Lengths of these clams ranged from just over 4 mm to nearly 13 mm, all clearly young of the year or young second year clams. The population was dominated by young clams suggesting that winter mortality has been significant. Conditions for winter refugia are discussed.

Management of lake levels may be the most prudent means for eradication unless there is a deeper water refuge as yet unidentified. If lake levels could be reduced by 5 or 6 feet and were accompanied by a cold winter with ice cover of 18-24 inches, we believe that the current invasion of Owasco Lake could be eradicated.

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Thanks also to Ed for allowing us to enjoy an evening at the ballpark. There are few things more exciting than minor league baseball on a summer evening.

Introduction

Staff of Cayuga County contacted Dr. Nierzwicki_Bauer, Mr. Resler and Dr. Marelli in late June 2011 to inquire about conducting a survey of Owasco Lake for Asian clams (*Corbicula fluminea*) and providing training in surveying and identifying the clams. The local Asian Clam Task force had conducted preliminary surveys based on visual observations of empty shells and had made preliminary estimates of areal coverage for the Asian clams. At the County's request the joint group composed of InnerSpace Scientific Diving, Scientific Diving International and the Darrin Fresh Water Institute (a research center of Rensselaer Polytechnic Institute) submitted a proposal. We proposed to conduct a phased survey of Owasco lake, to estimate the depth distribution and areal coverage of the population, to provide preliminary density estimates of Asian clams in the targeted area and to provide information on how to identify, sample and survey for Asian clams.

Surveys and meetings with task force members were conducted July 25 through July 29 and a preliminary report was provided on August 5.

Methods

Targeted areas of Owasco Lake, Cayuga County, NY, were surveyed for the presence and general distribution of Asian clams (*Corbicula fluminea*) July 26-29, 2011. Survey methods were qualitative and based on preliminary sampling for empty Asian clam shells conducted by the members of the Owasco Lake Asian Clam Task Force. Based on this information a series of shore based points were chosen and assigned geographical reference data. Points were located every 1/8 (0.125) mile along the shoreline to the east and north and also to the west and north starting where the Owasco River / Owasco Lake outlet leaves the lake. An additional mile of shoreline was added to each end of the target area in an effort to fully survey the Asian clam population. Origin points of every ¼ (0.25) mile were chosen to conduct surveys and additional origin points were held in reserve in case a finer detail was required in an area. Surveys were conducted by divers with the assistance of the Owasco Lake Asian Clam Task Force, which provided a vessel, captain, and volunteer divers.

At the preselected origin points the survey team navigated as close to shore as possible and deployed a dive team. The team chose a compass bearing approximately perpendicular to the lake shore and communicated this with the support boat and the surface data collector (Brett D'Arco from DFWI). Brett followed the dive team in a kayak flying a diver down flag. The team then swam along the bearing and conducted a qualitative survey along the transect progressing from shallow to deeper water. Along the transect divers fanned the bottom sediments or sieved sediments every few feet using a 1 mm sieve to search for Asian clams. When the dive team determined that the distribution of Asian clams had stopped a signal was given to the surface data collector and the end point was identified using a hand held GPS unit. Divers made every attempt to be conservative so that we were confident in the end points. Relative numbers of clams seen were recorded by the surface data collector as were the starting and ending depths of each survey. Substrate type was qualitatively determined by the dive team. On day two of the survey the team decided to move the starting points further offshore to limit the distance swum by the divers, assuming that the deeper limit was more important to identify.

Following completion of transects we used local information to conduct spot checks on a number of sites to the south on both eastern and western shores. Because Asian clams seem to be associated with sand or sand and gravel sediments, some of the targeted areas were

places reported to have these sediment types. A final transect was swum along the domestic water supply intake pipe to the east and south of the Owasco Lake outlet. Asian clam shells had been reported in the water intake system and we wanted to verify our suspicion that clams were not living along the pipe nor at the intake crib. At all sites representative samples of clams and snails were collected for later identification.

Finally we conducted some quantitative sampling for Asian clams in an area west of the Owasco Lake outlet. The goal was to demonstrate the methods for conducting quantitative density surveys and also demonstrate a method for collecting finer scale distributional data. At each of 15 haphazardly chosen sites in the study area we tossed a ¼ m^2 quadrat into the water.

We gathered geographical reference data for the center of the quadrat and then took sediment cores from 3 haphazardly chosen points within the quadrat. The coring device consists of a length of 3" ID PVC schedule 40 pipe with an end cap that has a ½" hole drilled into it. The area of the core is 45.6 cm^2 or 1/219.3 of a square meter and the core is taken to a depth of 10 cm. Coring is done by pushing the core tube into the substrate, covering the tube with the cap, placing a finger over the vent hole and withdrawing the contents. Contents were sieved in the field using a 1 mm sieve and materials retained on the sieve was placed in labeled bags for transport to a biology lab at Cayuga County Community College. Field samples were sorted in the lab. All mollusks were retained, and Asian clams were counted and measured to the nearest 0.1 mm. Core data were used to generate density estimates and produce a size frequency plot for the population.

Survey data was plotted using Google Earth by importing the gpx file from the hand held GPS unit used in the field. Transects were created by connecting the start and end point taken by the surface data collector. The transects were then given a color scheme, red for Asian clam presence and black for no Asian clam presence). Areal extent of the Asian clam population was estimated by drawing a polygon via heads up digitizing. The shoreline was traced for the land ward edge of the area and the ends of the transects were used to determine the lake ward edge. The boundary used to delineate presence or absence of Asian clams was half way between a transect with clams and one without.

Results and Discussion

Living Asian clams were located at the northern end of Owasco Lake in shallow water of depths ranging from 3 to 6 feet. One location to the west of the Owasco Lake outlet was recorded to be approximately 8 feet deep, but all other Asian clam populations were limited to depths of less than 6 feet. Because of the conservative methods used to determine population distribution it is likely that the 8 foot depth is incorrect. On the transect where the 8 foot depth was reported the bottom topography dropped off at a much sharper angle than in other areas and we were quickly in deeper water at the end of the transect. Clams were only located in the area previously defined by the local task force. During spot checks it was believed that a single living clam had been collected on the eastern shore south of Burtis point, but examination of samples

in the laboratory did not support this. No living clams were found along the domestic water intake pipe nor in the vicinity of the intake crib.

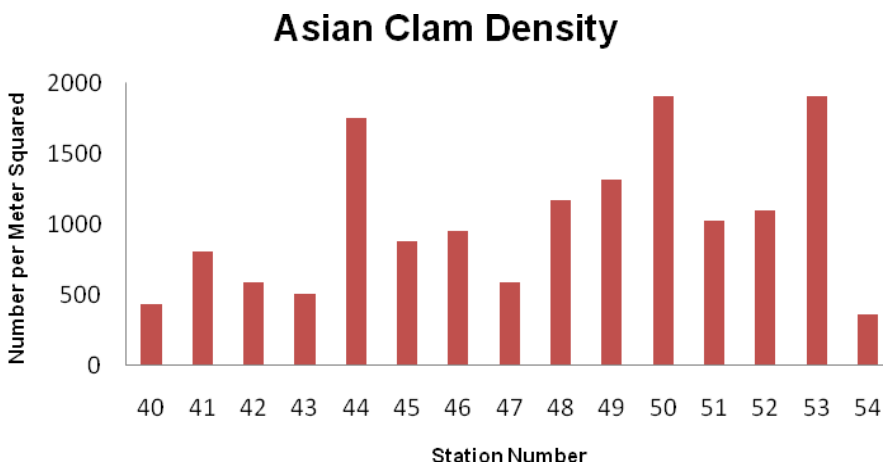
Northern Owasco Lake estimated Asian clam distribution. Depth contours are in 3 foot increments.

The areal distribution of the Asian clam population in Owasco Lake is approximately 123 acres (49.8 hectares). This is somewhat misleading since the areal estimates interpolate between data points and the actual extent of the clam population is most likely smaller than 123 acres. Raw presence and absence data collected during transects may be valuable in understanding where clams were found versus where the graphical chart interprets where clams may be.

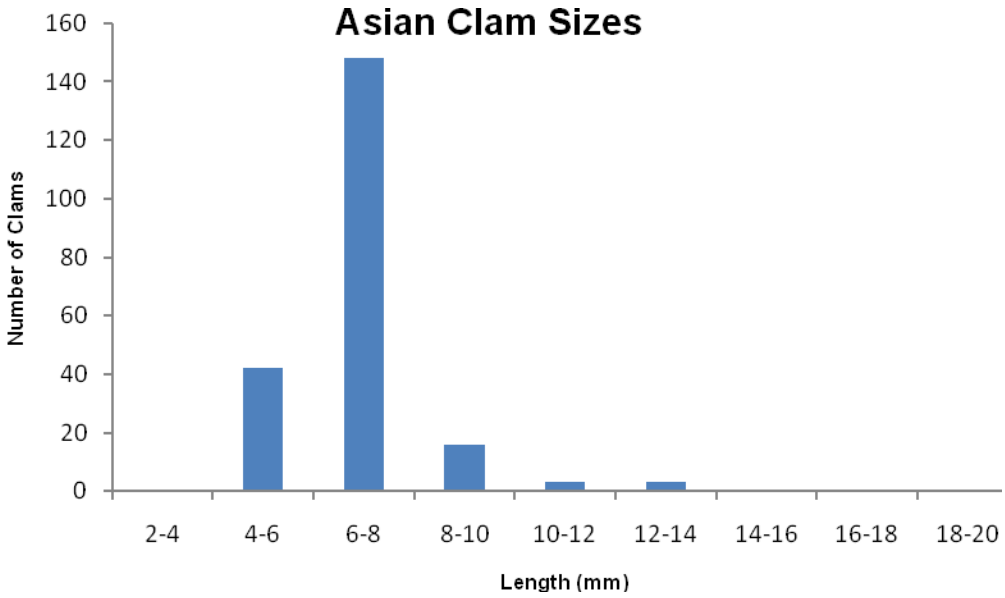
Asian clam transect data. Red indicates presence of clams.

Bottom sediments in the northern end of Owasco Lake are mainly sand and silty sand in the shallow areas of the lake. As the bottom becomes deeper sediments become finer, softer and populated with rooted plants and algae. No clams were found in the softer plant choked sediments. We did not do a formal aquatic plant survey but Owasco Lake seems to have typical communities for lakes of this latitude. The green alga *Chara* forms dense patches in many areas of the lake that we surveyed. The area just south of Burtis Point did have a narrow band of sand and gravel near shore but no Asian clams were collected there.

Mean Asian clam density in the study area was 1018.43 per m^2. Only 1 core had no clams and the highest density in a single core was 2412.08 per m^2. Most stations averaged over 1000 per m^2. We purposefully chose an area that we suspected had higher densities of clams so that we could demonstrate the coring techniques to the local task force members. Though we found consistently high numbers of clams in the Owasco Lake study area, densities in some parts of Lake George exceed 3000 per m^2, and Asian clams have been reported by some researchers to exceed densities of well over 10,000 per m^2.



The lengths of clams collected during the coring study ranged from 4.23 to 12.67 mm (0.17 to 0.49 in) and had a mean size of 6.94 mm (0.27 in). The live clams in Owasco Lake are very small and it was difficult to find larger live clams, although larger empty shells were clearly present in lake sediments. The distribution of sizes suggests a population dominated by young of the year, and though adults must be present somewhere to produce this year class they are not common. This suggests that there is massive winter mortality in the population but that a portion of the population survives to reproduce in the spring.



The Asian clam is near the northern end of its reported range in the Finger Lakes and Great Lakes region, but our experience in Lake George leads us to theorize that certain habitats are available for and conducive to invasion of Asian clams. Sediment character (grain size) is important, but equally important in this climate zone appears to be the presence of groundwater sources seeping into the water body. Groundwater temperature at the latitude of Owasco Lake is probably in the range of the lower 50s F. This seems cold in the summer, but may be

essential to survival of some of the Asian clam population in the winter. This may be why there are large numbers of empty shells in the lake sediments but very few large clams. Groundwater seepage may support the winter refugia, as we suspect they and anti-icing circulators do in Lake George.

One issue that needs to be addressed is the depth distribution of the Asian clams in Owasco Lake. More specific surveys to pinpoint the areal and depth distributions of the Asian clams need to be conducted in the area west of the outlet channel. This is particularly important in light of possible management strategies and could easily be conducted in less than a week. We recommend that the task force conduct such a survey. One of us could return to supervise the specific survey and further refine the population distribution in Owasco Lake.

Other species of mollusks were collected during the qualitative surveys or identified in shell collections that were examined during our visit. At least fifteen species of snails and clams apparently inhabit Owasco Lake, many native. Not all were seen live in the lake. We are particularly concerned with the native unionid mussels that were observed only as empty shells. These mussels are very important to the diversity of bottom communities and many species of mussels are threatened or endangered in the waters of North America. Particular interest should be paid to these mussels.

Information on other mollusks in Owasco Lake will be important in future lake surveys, research, and public outreach efforts.

Mollusks of Owasco Lake

Bivalves

Sphaeriidae

Pisidum compressum	Ridgeback peaclam
Pisidium nitidum	Shiny peaclam
Pisidium casertanum	Ubiquitous peaclam
Sphaerium striatinum	Striated fingernailclam
Sphaerium nitidum	Arctic fingernailclam

Unionidae

Pyganodon grandis	Giant floater
Lampsilis radiata radiata	Eastern lampshell

Gastropods

Campeloma decisum	Pointed campeloma
Viviparus georgianus	Banded mysterysnail
Bellemya chinensis	Chinese mysterysnail
Pleurocera acuta	Sharp hornsnail
Planorbella campanulata	Bellmouth rams-horn
Physa spp.	
Valvata spp. (at least 2 species)	

Management

Management of lake level may be the most prudent and least expensive means for eradication unless there is a deeper water refuge as yet unidentified. If lake levels could be reduced by 5 or 6 feet and were accompanied by a cold winter with ice cover of 18-24 inches, we believe that the current invasion of Owasco Lake could be eradicated. Subsequent spring or early summer surveys would confirm the success of the strategy. If lake drawdown alone does not eradicate Asian clams, limited benthic barrier matting may be considered concurrently with another lake drawdown during the winter of 2012-2013.