

2016

American Eel Oakland Stream Study



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Introduction

Bluenose Coastal Action Foundation

Bluenose Coastal Action Foundation is a community-based charitable organization with a mandate to address environmental concerns along the South Shore of Nova Scotia. Coastal Action's goal is to promote the restoration, enhancement, and conservation of our ecosystem through research, education, and action. The organization has been an established member of the Lunenburg County community since its inception in December 1993. Over the past 20+ years, Coastal Action has successfully completed a vast number of projects within the South Shore Region of the province. Recently, four of our projects have specifically targeted species at risk within local watersheds – the Roseate tern and the Atlantic whitefish (SARA listed endangered), the Southern Uplands Atlantic salmon (COSEWIC listed endangered), as well as the American eel (COSEWIC listed threatened). Coastal Action has been diligently working on American eel fisheries research projects since 2008, focused on different stages of the American eel lifecycle (Figure 1).

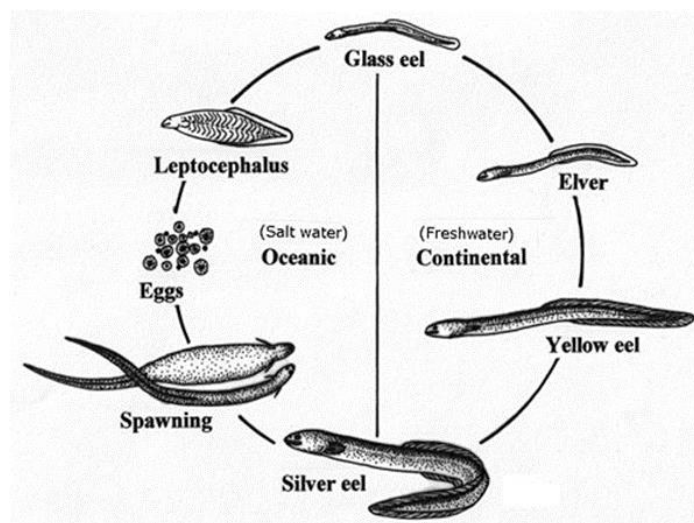


Figure 1: Various life stages of the American eel.

Background and Rationale

Elvers are baby eels that migrate from the ocean up to rivers and lakes where they will spend the majority of their life growing as a yellow eel. An elver study was conducted at Oakland Stream from 2010-12, but was discontinued as results did not warrant the effort at this particular location and the decision was made to focus elver recruitment efforts at East River, Chester. The Oakland Lake American eel potting study was conducted from 2008 to 2014, where eel pots were baited in varying habitats around the lake. Primarily yellow eel were captured, measured, and PIT tagged. Often PIT tagged eel were recaptured several times over the years. The Oakland Stream project began in 2009, and has continued annually (with the exception of 2010) with a goal of monitoring silver, or sexually mature, eel escapement as they

migrate to spawning grounds in the Sargasso Sea. A fraction of the eels captured in the stream are expected to contain PIT tags from the previous lake potting study. The PIT tagged eels provide information on length of time spent as a yellow eel in the lake before reaching spawning maturity, as well as changing biological characteristics of individual eel. Additionally, eels are defined as facultative catadromous, meaning they typically spend most of their life in freshwater and spawn in saltwater; however, they sometimes choose to spend some, or all, of their life in saltwater. Oakland Stream is the only outflow from Oakland Lake and only a short distance to the ocean. PIT tagged eels in Oakland Lake and Oakland Stream may also provide insight into the migratory habits of eel in the Maritimes region. A similar silver eel study in a larger area within the East River, Chester has also been ongoing from 2014 and continued annually.

Study Area

Oakland Lake (Figure 2) is located approximately one kilometer northeast of the Town of Mahone Bay. The surface area of the lake is roughly 0.65km², with depths up to 15m. The surrounding watershed is approximately 4.05km². The lake serves as the drinking water supply for the Town of Mahone Bay, and has been designated as a protected watershed where human activity in the area is regulated and restricted in an effort to protect the water quality of the lake. The protected status of the lake makes it ideal for the American eel study. Potential human disturbances in the area include a walking trail along one side of the lake, as well as the Town of Mahone Bay pump house, storage buildings, and water treatment intake pipe which was recently expanded in the last year.

The only outgoing water flow from Oakland Lake is Oakland Stream, which drains into the Mahone Bay estuary. The stream runs through two culverts; the furthest upstream runs under Sleepy Hollow Road and the other downstream under Oakland Road and into Mahone Bay estuary.

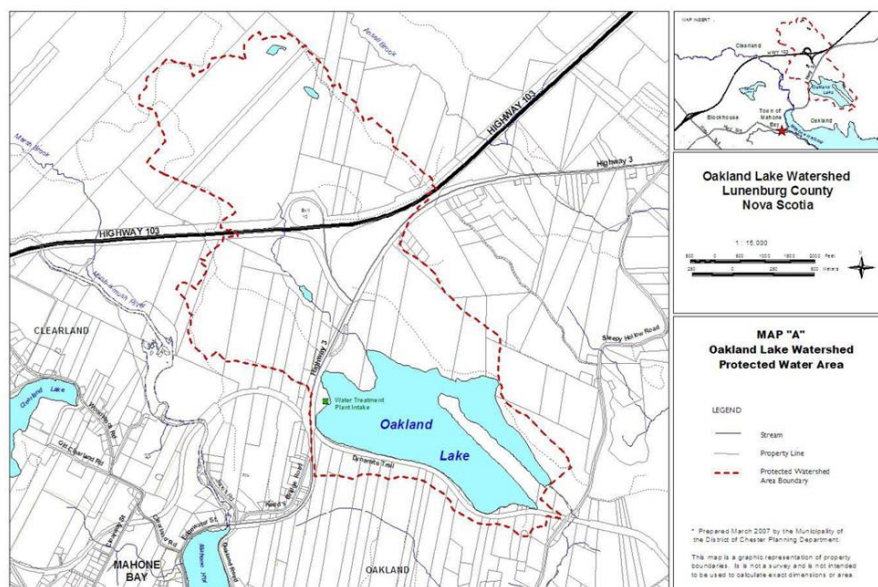


Figure 2: Oakland Lake, Mahone Bay, NS.

Materials and Methods

A trap was placed in Oakland Stream from August 22 to November 3, 2016. A new wire trap, similar to the trap used in previous years, was constructed for the 2016 field season, with a larger holding box to reduce stress on the eel during big catches. The trap consisted of a large plastic funnel, plastic tube, and large rectangular 8' long holding cage. The funnel encompassed the entire width of the stream, while rocks and moss were built up around it. Therefore, everything traveling downstream must enter the funnel, pass through the plastic tube, and into the large square holding cage, which is partially submerged in the stream. The dimensions of the new trap caused the funnel to sit slightly higher in the stream than previous designs. Coupled with low water conditions, the trap was unable to fish. When drought conditions persisted through September and into mid-October, an additional small fyke net was placed below the wire trap to see if eel were getting past the wire trap. After catching eel below the wire trap, indicating that eel were in fact finding their way past, the wire trap was removed and a fyke net put in its place. The fyke net fished well with varying water conditions in the small stream; however, mink predation became a new problem. Holes were found in the net on multiple occasions, releasing any captured eel. On nights when eel were expected to migrate, the trap was checked and monitored immediately after dark, in an effort to catch eel before they were able to escape.

The site was checked seven days a week. Anything caught was removed from the trap to be counted and recorded. Sampling of each individual eel included length measurements and colouring or phase. Each eel was also scanned for PIT tag presence, to see if any eel were recaptures from the 2008-2014 Oakland Lake potting. Additional measurements; such as vertical and horizontal eye diameter, pectoral fin length and head length measurements, were taken with digital calipers. A thermograph was also placed beside the trap to monitor and record stream temperatures throughout the duration of the study.

PIT tagged eels that were caught in the stream were sacrificed, collected and bagged on ice, then frozen in water. The eel were thawed and examined following the end of the field season. External measurements such as length, weight, vertical and horizontal eye diameter, as well as head and pectoral fin length were taken before the eel were opened for internal examination. Gonads were extracted and weighed to $d = \pm 0.005g$ and determined as either male or female. The head was cut vertically between the eyes with a set of sharp shears and the otoliths were extracted and stored in vials. Swim bladders were examined for presence of the invasive swim bladder parasite, *A. crassus*.

Results and Discussion

In previous years, Oakland Stream has been an easily accessible site with minimal issues. However, in 2016, the persistent low water presented difficulties throughout the entire season. Efforts were made daily to modify or change traps, and check the trap more often to avoid issues from mink. Despite best efforts, the majority of the eel run was missed. Only 153 eel were captured, including two PIT tagged females. Over the past few years, annual catches have typically been over 500 (Table 1).

Table 1: Annual catches of American eel in Oakland Stream, 2009 to 2016 (excluding 2010). *Traps were inefficient in 2016, the numbers shown do not truly reflect the 2016 run.

Year	2009	2011	2012	2013	2014	2015	*2016	Total
Days trap was in place	29	26	45	81	70	70	*73	
Total eels captured	221	283	405	559	513	555	*153	2689
Recaptures	2	1	13	17	10	9	2	54

Early in the season, when a fyke net was set below the wire trap, a large number of eel were captured in it, indicating that eel were clearly finding their way around the trap. Each year, similar methods of setting the trap are used – moss, screen, and rocks are built up around the funnel in an attempt to force eel into the trap. During the first stormy night, when eel were expected to be active, the site was visited after dark and a number of eel were observed swimming in the pool above the funnel. Since the water level was low, there was no flow of water through the funnel and pipe. However, the eel found their way through, as they were captured in the fyke net downstream. This was the first time an additional trap has been placed below the wire trap. It is unknown, but possible, that a number of eel do bypass the trap annually; however, this was the first true indication of this.

Due to trap inefficiency, only two PIT tagged eels were caught and sacrificed from Oakland Stream in 2016. Both sacrificed eel were female silver eel, and one contained a visible parasite *A. crassus*.

Over the years, the project has dealt with both high and low water level conditions, as well as mink and muskrat predation. For next field season, redesigned traps that will be efficient or manageable in all conditions have been proposed.