Herbivore abundance and distribution on *Myriophyllum spicatum* in Hodges Pond, Neawha Park, Oneonta, NY and Rat Cove, Otsego Lake, Cooperstown, NY

Christopher Ward

**INTRODUCTION**

Eurasian watermilfoil (*Myriophyllum spicatum*) is a submerged aquatic plant that was introduced to North America in the early 1900s (Smith and Barko, 1990). It is a troublesome weed that grows rapidly and tends to form a dense canopy on the surface of the water (Grace and Wetzel, 1978). Since Eurasian water-milfoil (EWM) is a problem in many freshwater lakes, safe alternative to herbicides are being sought. Aquatic herbivores are under investigation as possible biological control agents in managing water milfoil (Creed and Sheldon, 1995; Kangasniemi, 1983; Kangasniemi et al., 1992; Johnson et al., 1998; Painter and McCabe, 1988).

*Euhrychiopsis lecontei* is a herbivorous aquatic weevil indigenous to North America that is highly specific to milfoil plants. The weevil prefers the non-native form of water-milfoil, *Myriophyllum spicatum* (Sheldon and Creed, 1995). If *E. lecontei* is to be used as a biological control for EWM, then understanding the conditions (water depth/distance from shore) at which the weevil thrives is crucial. For example, if it were known that *E. lecontei* was limited to within some distance from shore it would provide insight into management limitations.

In this study two different habitats were observed to see if water depth and distance from shore had any affect on herbivore abundance and distribution. Two dissimilar aquatic habitats were evaluated, Hodges Pond in Neahwa Park, Oneonta, N.Y. and Rat Cove on Otsego Lake, Cooperstown, N.Y. Hodges Pond was included due to the scarcity of *E. lecontei* at Rat Cove.

Hodges Pond is in Neahwa Park within the city limits of Oneonta. The pond is 103.6 m long, 44.1 m wide and had a maximum depth of 2.1 m when visited. The pond is fed through an inlet from two sources. One source is the city's storm drain. The other is a flood control loop (Mill Race) that flows through Hodges Pond and back into the Susquehanna River. The storm drain is the only part of the water system that does not contain EWM.

The aquatic herbicide Sonar® was used in Hodges Pond in the spring of 1999. The herbicide was effective in controlling EWM for that year. Early in the spring of 2000, EWM was found again, and by August had spread throughout the pond. It is assumed that EWM entered the pond via the Mill Race.

Rat Cove on Otsego Lake is an entirely different aquatic habitat compared to Hodges Pond. Otsego Lake is glacially formed and is generally considered as being biologically mesotrophic (Albright, 2000). The lake's plant community is diverse, although it is impacted by EWM (Harman et al., 1997).

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1 SUNY Oneonta MA candidate enrolled in Bio. 681. Biological Field Station, Cooperstown, NY.
METHODS

Milfoil sampling

Hodges Pond

Population estimates of *E. lecontei* were based upon transect line samples. Each transect spanned a distance of sixty feet from shore toward the center of the pond. The transects were marked at lengths of 10, 20, 30, 40, 50, and 60 feet. Samples of fifteen EWM apical meristems 25cm long were collected at each distance and the water depth was recorded.

Rat Cove

Four transects were established that started from shore and extended about ~200 ft (60 m) into the lake. At each transect, fifteen EWM apical meristems 25cm long were collected at 70, 100, 150 and 200 feet from the shore using a plant rake. Stems were placed in plastic bags, and the depth and distance were recorded.

Tip analysis

Milfoil samples were brought into the lab and examined under dissecting microscopes. All four life stages (egg, larvae, pupae, adult) of the weevil were counted. Two other herbivorous insects, *Psectrocladius simulans* (Chironomidae) and *Acentria ephemerella* (Pyralidae) were also noted. Damage by herbivores was also evaluated. One hundred and five apical meristems were examined. All EWM samples were processed within one day of sampling.

RESULTS AND DISCUSSION

Hodges Pond

A water temperature of 22° Celsius was recorded on the first day of the study, July 27, 2000. Weevil population density varied from location to location (Table 1, Figure 1). No association between weevil density and distance/depth were observed. In a small, shallow pond distance from shore may have little impact on the population density of *E. lecontei*. An average of one weevil per stem was found on the west side of the pond. Many stems contained numerous pupa chambers with developing larvae. It is likely that in the weeks following the sampling there was a potentially-controlling population of adult weevils in the future.

A filamentous alga was found in the Mill Race and at the inlet of the pond at the east end (Lord, 2000) which decreased in abundance from the inlet of the pond to the outlet. This may have been a factor in the absence of *E. lecontei* on that side of the pond.
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<th>Eggs</th>
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</table>

Table 1. *Euhrychipsis lecontei* distributions at various distances from shore and depths at Hodges Pond.

Weevil densities are scattered somewhat evenly across distances from shore as shown in Figure 1. Gaps in milfoil beds had low weevil population densities. The weevil population may shadow the distribution of EWM along a transect, with distance from shore and water depth probably having little influence.

Rat Cove

Unlike Hodges Pond, Rat Cove had little canopying *M. spicatum* at the surface and the EWM beds appeared unhealthy and patchy in their distribution. Other differences were greater wave action and a high concentration of calcium carbonate precipitate on the EWM.

One adult weevil was discovered at a distance of 76 feet from shore at a depth one m. No adult weevil scars were found more than one hundred and fifty feet from shore. The absence of *E. lecontei* at Rat Cove is likely due to the condition of EWM found there. The EWM beds at shallow depths were unhealthy which could affect the *E. lecontei* population at Rat Cove (Johnson, 2000). After microscopic examination, it was evident that the EWM in the shallow depths was damaged. Leaflets were missing and apical meristems had not reached the surface of the lake. Beyond 150 ft. the EWM appeared healthier.

The study at Rat Cove started in early July, but the EWM looked as though it had been damaged earlier in the season. Of 105 *M. spicatum* samples, 59 had tissue damage associated with herbivory. Most damage involved leaflets, which is not a characteristic of weevil herbivory. Ninety of the EWM meristems contained the herbivorous midge (Chironomidae) identified as *Psectrocladius simulans* using Fagnani and Harman (1987). It is a common midge and occurs on many submersed aquatic plants. Larva aquatic moths (*A. ephemerella*) damage EWM by girdling the leaves or stems and by eating leaflets (Batra, 1977). This insect was the most common herbivore encountered (Figure 2), averaging 0.88 per stem. Densities were highest at shallower depths, corresponding to EWM damage. The patchy distribution of relatively unhealthy EWM reflects herbivory by *A. ephemerella* and/or *P. simulans*. Continuing research on herbivory next season would likely provide more insight into the dynamics of EWM growth.
Figure 1. Mean number of weevils (*Euhrychiopsis lecontei*) per stem at Hodges Pond.

Figure 2. Mean number of moths (*Acentria ephemerella*) per stem at Rat Cove.
and control in Rat Cove.

REFERENCES


