The Buck Lake Association Inc.

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"To enhance people's enjoyment of Buck Lake now and for future generations"

Buck Lake News – 2013 August

Presidents Message:

We really need to be careful what we ask for. For most of May and June we wondered where summer was. Now we know! Thank heavens for air conditioning, even at the lake where we were told that we didn't need it because of the breeze. Again, thank heavens I am a sceptic.

With summer comes my reporting on the fauna of the lake, especially in front of my home on the South Branch in front of Birch Island. I am very happy to report that the dreaded Canada geese, the subject of several rants last summer, have not returned to my waterfront and lawn. I have no idea how that happened but I suspect a greater power read my columns and is giving me a respite. Saundra Rider tried to send her flock of about 40 birds my way but they declined thankfully. I offered to rent her the plastic alligators I used to deter them, unsuccessfully, last summer but she isn't playing!

So this summer I must return to reporting on my favourites, the loons. Two summers ago I reported that the pair nesting in front of our home successfully raised two chicks by each taking responsibility for a chick. This year I witnessed something even more intriguing. We noted a pair with a single chick about three weeks before the Boatilla 29 June. While assembling for the Boatilla, Pat Hegerty noted that he had seen what appeared to be a loon pair with two chicks of different size. It turns out that the pair was my pair and that they had somehow acquired a second and much younger chick, probably two or three weeks younger than the first! Perhaps it was an orphan from another pair or perhaps it was a late hatching member of my pair's brood. Nonetheless, the happy trio was now a foursome. As I witnessed two years ago, the adults each took responsibility for a chick. I named then Arnold and Danny after the identical twins film of several years back. Arnold (Schwarzenegger) is the bigger chick. Danny (DeVito) is still alive and thriving. I think this is incredible given that Arnold is so big and can easily dominate to get all of the food. Nature is truly wonderful I think you will agree.

We held our AGM and I am proud to say that no one challenged me for leadership of the Buck Lake Association; world domination is my next step! Thanks to those who came out to support our association. As announced, we are always looking for folks to step up and assume roles of responsibility on behalf of all Buck Lakers.

In concluding, I must say that this year's Boatilla was again a huge success both financially and in terms of community building. It is my sense that we are getting to feel pretty good about

ourselves and the fact that we managed to raise more than $21,000 this year. There are many to thank for this worthwhile endeavour but I think the real ringleaders are Liz and Ross Trudel. They have a great cast behind them but I think they are the driving force. Thank you very much Liz and Ross; you make Buck Lake an even better place to live with your presence.

Enjoy the rest of your summer and I hope to see you at our annual picnic in August.

Best regards,

Peter

Coming Events:

Friday, August 16, 5 to 7 PM
Fish Fry at Perth Road Sunday School Hall

Saturday, August 17 at 4 PM
Annual Buck Lake Picnic
Harris Hall in Perth Road Village
Adults $5.00, Children under 10 free

Sunday, September 8
Rider Cup Golf Tournament
Closing date for entries August 15th

Boatilla Final Count for 2013:

$22, 100.00
11 Kids to Camp Merrywood!

Over the past 9 years, the Buck Lake Boatilla has donated $108,244.00 to send 54 Easter Seals Kids to Camp Merrywood.

Be Very Proud Buck Lakers!

More pictures have been posted on SkyDrive and can be viewed here:
http://sdrv.ms/135ef5Z

Ecological impacts of the zebra mussel on inland lakes: What can you do?

Invasive species are a current topic of concern as each year the number of new non-native species entering ecosystems exponentially increases, altering ecosystem functioning, interactions with other species, and nutrient cycling[i]. Most aquatic introductions are the result of ship ballast water transfer and the movement of recreational boaters between lakes[ii]. Some aquatic invaders have many ecological impacts in freshwater systems, reducing an ecosystem's ability to resist change. One such example is the zebra mussel, *Dreissensa polymorpha*[1].

Zebra mussels, native to the Ponto-Caspian region in Europe, were first detected in North America in the mid-1980s and have since invaded the Great Lakes, all connecting waterways, and many inland lakes[iii]. Zebra mussel survival is limited by both calcium and pH thresholds. Previous research has shown lakes with levels of calcium below 28 mg/L and a pH <7.3 restricted zebra mussel survival[4], while other studies have found lakes with <20 mg/L of calcium to restrict mussel survivorship[5]. When successfully colonized in a lake, zebra mussels can develop high-density populations on hard and soft substrates such as sand, rocks, piers, boats etc., by byssal thread attachment from within their shells[3]. These threads provide strong attachment enabling mussels to withstand water currents and wave action in the shallow regions of a lake[iv]. These large communities create many spaces for invertebrates such as snails and crayfish to hide, which reduce the ability of young fish to find food during critical growing stages. High-density zebra mussel communities are usually found in large, scattered patches ranging in depth from ~2-8m, but have been found in areas as deep as 25m[6].

Once established in a lake, zebra mussels can completely change aquatic interactions between species. Zebra mussels forage by filtering, consuming phytoplankton and small zooplankton from the water column, and debris[v] (Figure 1). The remains are deposited as waste on the lake bottom (benthic) environment, increasing nutrients in benthic communities. Consequently, large reductions in phytoplankton increase water clarity and light transparency, facilitating the growth of large inedible algae masses on the surface and throughout the water column of a lake[8]. Since the early 1990s, algal blooms have intensified and entire food webs have shifted as turtles, fish and other invasive species

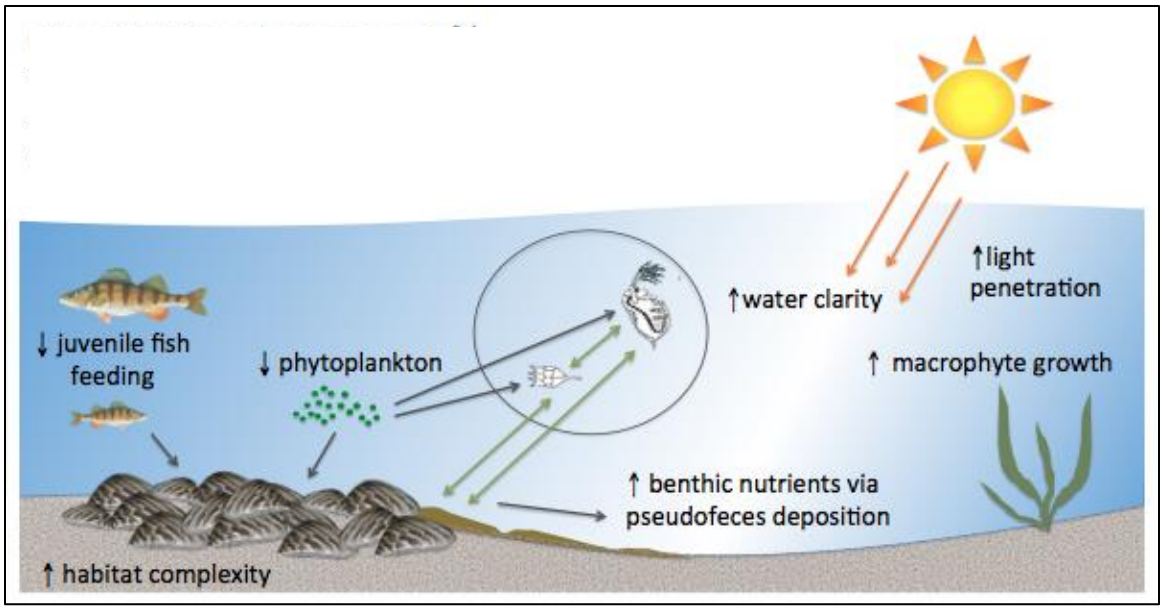

Figure 1: A diagram showing the main ecological impacts of zebra mussel in a lake. The arrows represent the direction of energy flow. (Diagram not to scale).

(e.g. the round goby) have started switching to mussels as their primary food source[vi]. Significant grazing by zebra mussels results in species composition changes in zooplankton communities, including reductions of abundance, diversity and richness, thereby removing food sources for other species[vii]. Large zebra mussel communities are a constant financial burden when found on surfaces such as buoys, boats, and docks, and they can block pipelines of water purification and sewage systems. Millions of dollars have been spent on environmentally safe eradication techniques, however few have proved successful[viii]. Some of the techniques previously used include chlorine and potassium permanganate water treatments, oxygen deprivation, thermal treatments, electric currents and sonic vibration. However, many of these techniques have harsh effects on the environment and other species[ix]. Prevention and boater care between lakes is therefore the most successful method in reducing inland lake vulnerability to zebra mussels.

As a cottager, there are successful methods that can be taken to prevent zebra mussel transport between lakes, especially when recreationally boating. Zebra mussels can enter bilge water and attach to boat hulls, therefore, cleaning the exterior of boats and all equipment (e.g., anchors, paddles) before transporting between water bodies is crucial. This can be done using bleach, hot water, power washing, or overnight drying in the sun. For zebra mussels specifically, bleach is not effective as adult mussels can close their shells. However, rinsing surfaces with hot water (41-44° Celsius) for ~5 minutes is successful in killing any zebra mussels present[12]. All trailers should be cleaned of weeds and sediments, as zebra mussels can survive up to 7 days out of water before entering a new system[6]. Thorough cleaning will prevent veligers, larval zebra mussel life stages, from being transported on boats and trailers and will greatly minimize introductions to new lakes.

As lakes are becoming increasingly susceptible to non-native species, natural resistance mechanisms in aquatic systems may help to maintain local species populations. Regional dispersal (the movement of organisms from an existing location to another source) of zooplankton from surrounding lakes may provide a natural mechanism to increase local resistance by providing a diversity of locally adapted species to colonize stressed communities[13] (Figure 2). Zooplankton, the primary food source of many fish and birds, naturally move between lakes using wind, animals (e.g., duck feet), boats and stream connections. Zooplankton from regional lakes can supplement or replace individual and population loss in lakes with zebra mussels. By doing so, regional zooplankton can cause a rescue effect to bring stressed zooplankton communities to a recovered, pre-invasion composition to allow the predation and competition interactions between species to resist zebra mussel impacts[14].

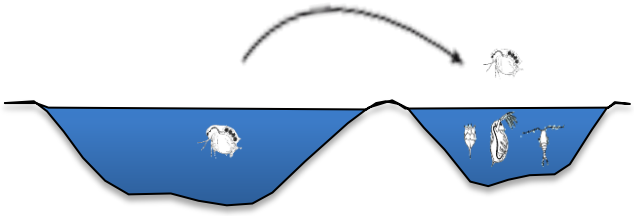

Figure 2: Zooplankton dispersal from one regional lake to another.

As part of my undergraduate thesis project, I was interested in whether there is an effect of regional zooplankton dispersal in influencing zooplankton responses to the invasion of zebra mussels. In the summer of 2012, I examined how zooplankton dispersal could potentially mitigate the effects of zebra mussels on zooplankton community total abundance, species richness and diversity through a field experiment set up at the Queen's University Biology Station (Q.U.B.S) on Lake Opinicon.

My experiment was employed in 20 large cattle drinking tanks (Figure 3) to observe zooplankton community response to (1) the presence and absence of zebra mussels, and (2) the presence and absence of regional disperser zooplankton. Each of the 4 treatments had 5 replicates. All zebra mussels were collected from Lake Opinicon at depths of <2m. An initial zooplankton community was collected from Warner Lake, added to the tanks, and left to acclimatize for a week. Regional zooplankton were collected from six surrounding non-invaded lakes <30km from Lake Opinicon including Elbow Lake, Buck Lake, Upper Rock Lake, Lindsay Lake, Round Lake and Long Lake. The zooplankton were brought back, evenly split into 100mL jars, and added to the tank treatments every two weeks. On alternating weeks, the tanks were sampled for water chemistry (pH, temperature, dissolved oxygen and conductivity),

chlorophyll-a (a measure of algal biomass), and zooplankton communities, which were preserved in ethanol for later identification.

Figure 3: Tank set-up at the field site.

To determine whether zebra mussels were in the above-mentioned lakes, we canoed and swam in shallow regions of the lakes looking for patches of zebra mussel communities on hard and soft substrates. We would observe whether zebra mussels were in the sediments, attached to plants, docks, and cottager boats, or any evidence of shells on the lake bottom. This was done at the boat launch of Buck Lake off Perth Road, and preliminary visual observations found no evidence of zebra mussels in that section of the lake. However, further water chemistry testing would need to be done to definitively determine whether zebra mussels could successfully establish in Buck Lake.

To summarize my findings, zebra mussels significantly reduced phytoplankton (the base food source for aquatic food webs), which would decrease the food resources available for other species. Zebra mussels also decreased the abundance of zooplankton of different size classes and species. Interestingly, zooplankton dispersal did not cause a rescue effect for zooplankton communities. Treatments with dispersal showed a further decrease in zooplankton abundances. This indicates that regional zooplankton may have consisted of the same species found within the local species pool, or consisted of stronger predators and competitors. Overall, my results indicate that zebra mussels significantly alter zooplankton communities, and in certain cases, regional dispersal may reduce the potential for community recovery. Stronger prevention methods and community awareness are encouraged to reduce the vulnerability of inland freshwater lakes to the introduction of future invasive species.

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[i] Strayer, D.L. 2010. Alien species in freshwaters: ecological effects, interactions with other stressors, and prospects for the future. Freshwater Biology. 55:152-174

[ii] Ludyanskiy, M.L., McDonald, D., and D. MacNeill. 1993. Impact of the zebra mussel, a bivalve invader. BioScience. 43:533-544.

[iii] Mills E. L., Leach, J.H., Carlton, J.T. and C. L. Secor. 1993. Exotic species in the Great Lakes: A history of biotic crises and anthropogenic introductions. Journal of Great Lakes Research. 19:1-54.

[iv] Beekey, M., McCabe, D.J., and J.E. Marsden. 2004. Zebra mussels affect benthic predator foraging success and habitat choice on soft sediments. Oecologia. 141: 164-70.

[5] Whittier, T,R., Ringold, P.L., Herlihy, A.T., and S.M. Pierson. 2008. A calcium-based invasion risk assessment for zebra and quagga mussels (*Dreissena* spp). The Ecological Society of America. 180-184.

[6] Griffiths, R.W., Schloesser, D.W., Leach, J.H., and W.H. Kovalak. 1991. Distribution and dispersal of the zebra mussel (*Dreissena polymorpha*) in the Great Lakes region. Canadian Journal of Fisheries and Aquatic Science. 48: 1381-1388.

[7] Ricciardi, A., Whoriskey, F.G., and J.B. Rasmussen. 1997. The role of the zebra mussel (*Dreissena polymorpha*) in structuring macroinvertebrate communities on hard substrata. Canadian Journal of Fisheries and Aquatic Sciences. 54: 2596-2608.

[8] MacIsaac, H.J. 1996. Population structure of an introduced species (*Dreissena polymorpha*) along a wave-swept disturbance gradient. Oecologia. 105: 484-492.

[9] Kirsch, K.M., and A.R. Dzialowski. 2012. Effects of invasive zebra mussels on phytoplankton, turbidity, and dissolved nutrients in reservoirs. Hydrobiologia. 686: 169-179.

[10] Molloy, D.P., Karatayev, A.Y., Burlakova, L.E., Kurandina, D.P., and F. Laruelle. 1998. Natural enemies of zebra mussels: predators, parasites, and ecological competitors. Review of Fisheries Science. 5: 27-97.

[11] Grime, T. 1995. The Great Lakes' other mussel menace! Research 10. University of Guelph, Canada. http://www.uoguelph.ca/research/publications/Assets/HTML_MAGS/oasis/environ4.html/

[12] McDonald, K. 2013. Decontamination strategies for recreational boaters: thermal and chlorination tolerances of three invasive aquatic invertebrates. Undergraduate Thesis, Queen's University.

[13] Liebold, M.A., Mouquet, N., Amaresekare, P., Chase, J.M., Hoopes, M.F., Holt, R.D., Shurin, J.B., Law, R., Tilman, D., Loreau, M., and A. Gonzalez. 2004. The metacommunity concept: a framework for multi-scale community ecology. Ecology Letters. 7:601-613.

Post-script to Katrina's article:

From the data analyzed by Reg Genge in his Water Quality Review of Buck Lake (2010), the mean value of calcium for the South Branch is 25.24 mg/L and for the North Branch is 12.55 mg/L. The difference in calcium content between the basins is related to bedrock geology and soil deposits.
The pH (acidity/alkalinity) levels in the 2 branches are also different for the same reasons. And the levels are different at the surface and at the bottom until the lake undergoes mixing or turnover in the fall. Most of the levels Reg Genge had access to (up to 2007) were above the 7.3 level that Katrina refers to or very close to it.
The relevant sections in Reg Genge's review are on page 6 for calcium and page 24 for pH. The water chemistry data is in Appendix 1-A. To access the complete report, go to 2009 Water Quality Report for Buck Lake.

Submitted by Liz Whelpdale

A little more on invasive species can be found here:
http://www.cbc.ca/news/technology/story/2012/02/23/f-invasive-species.html

REMINDER – The last date to submit pictures for the Buck Lake calendar is August 31st... We have some great shots but would love more... Send to your pictures to Donna Neumann: dneumann@kingston.net

Does anybody recognize this dock? Sue Berezny reports that this dock drifted into her shoreline on July 26th. It's tied up to a tree along the east side of the north point of Buck Island. If it's yours please come and claim it!

In order to promote the spirit of Buck Lake People, we invite your comments and suggestions for newsletter articles or announcements. Mail to: info@bucklake.ca