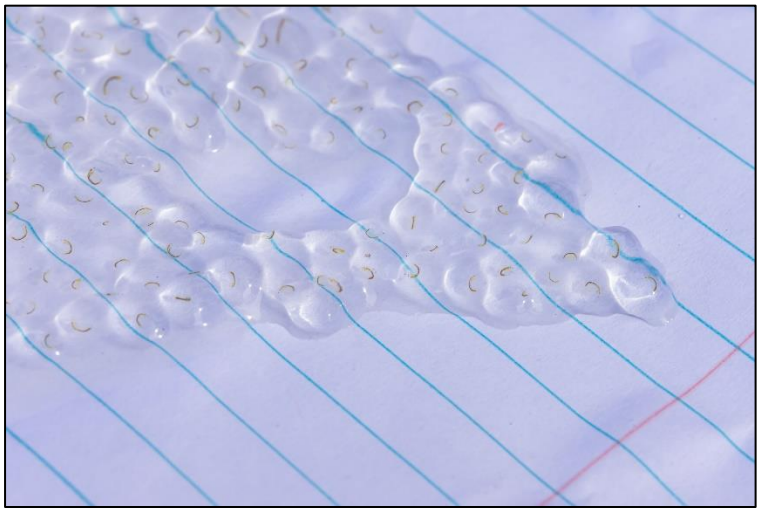
News Update : Jelly-Like Beads in the Water

As was reported on the KLRA 'News' portal about this time in 2021, there has been a noticeable increase in the population of *Holopedium glacialis* found in the waters of Kahshe Lake over the past few days. I've confirmed their presence with a plankton net at our location near Denne's and have updated the notice that was posted last year to provide additional information on them.

What are they?

These and other zooplankton like *Daphnia sp.* are a type of water flea that are naturally found in inland lakes of Ontario. They are from 1.5 to 2.2 mm in size; however, because they are surrounded by a pea-sized gelatinous mantle comprised of one or more acid muco-polysaccharides, they are actually around 5mm in diameter. There are both males and females, with the female producing resting eggs that are fertilized by males. The female then carries its developing young in a brood pouch within the jelly-like coating. They can also reproduce asexually, and typically undergo a diurnal migration each day, rising to the surface near sunset and returning to deeper waters during the daylight hours. As part of their life cycle, they leave their protective mantle and as a result, these globs can then be blown in towards shore, where they float near the surface.

I've included a picture of several of them taken off the end of our dock near Denne's marina using a kitchen sieve and placed on a white lined paper. Also included is a picture I found on-line showing their entire body structure.



What role do they play in the aquatic food web?

While they are consumed by fish and other larger aquatic organisms, the gelatinous mantle increases their size, offering them considerable protection from predation by other organisms. They are also much less nutritious than the *Daphnia* they are replacing, and as such, their growing dominance is a concern for fish and other species further up the food chain.

Why are they increasing in numbers?

The main reason for the increase in the population is related to gradual changes in the chemistry of lake water. As calcium levels in lakes of the Canadian shield gradually decrease (because most of the calcium in soils was leached out due to acid precipitation impacts in the 1970s, 80s and 90s), species like *Daphnia* which have significant requirements for calcium and phosphorus are losing out to *Holopedium glacialis* which require only about $1/10^{th}$ the amount of calcium. I've been reporting on this in my Lake Steward

reports for several years in the discussion of calcium, but I had never actually seen them in the water, as the gelatinous blobs are just too clear to notice. However, as a result of their recent population increase in late August, they were definitely noticed by swimmers.
Other reasons cited in some research in 2014 as possibly contributing to the population shift from *Daphnia* to *Holopedium* are listed below:

- In some lakes, predation of *Daphnia* by the invasive spiny water flea has been increasing, resulting in greater opportunities for *Holopedium* to thrive. However, studies have shown that while this may be involved, many lakes have seen increases in *Holopedium* in the absence of the spiny water flea. The Conservation Committee carried out an invasive aquatic species study in 2017 and 2019 and did not find any spiny water fleas in Kahshe, so this is an unlikely driver of the shift to *Holopedium* in Kahshe.
- *Daphnia* is also under pressure from predation by other zooplankton as a result of anatomical changes in their defense mechanisms triggered by reduced calcium availability.

So, to summarize, while the gradual increase in the population of *Holopedium* is well documented, I have found no research that would explain the very rapid increase in the population this year.

Are they harmful?
I have found no evidence in my review of the *Holopedium* literature to indicate any negative impact on human health via dermal contact or limited oral exposure via recreational use of lake water. However, the absence of any reports of this nature may reflect on my search capabilities and limited expertise in human health.

As the 2014 study findings on the jellification of north temperate lakes across eastern North America have clearly demonstrated the increasing abundance of *Holopedium*, this signals a shift in ecological states and this is likely to reduce vertical energy and nutrient transport in lake food webs. This is a complex and interactive process, and is likely linked to or associated with other long term changes in aquatic ecosystems that are being driven by a changing climate and its impact on water temperature, increasing ice-free conditions, oxygen depletion in lake-bottom waters and increases in dissolved organic carbon. One of the more significant undesirable consequences could be the increased sensitivity of our lake to algal growth, as *Daphnia* are herbivores – i.e. algae consuming, while *Holopedium* are omnivores and not as reliant on algal growth for survival.

Another possible impact is that these gelatinous organisms may impede the withdrawal of water for residential use by plugging in-lake pumping systems. There's no evidence of this happening, but it certainly can't be ruled out.

Is there anything we can do to stop the increase?
Unfortunately, I've not found any reports on the potential to change or even modify the long-term trend of increasing populations of *Holopedium* and decreasing numbers of the more desirable *Daphnia*. A significant change in this trend would necessitate increasing lake water levels of calcium, and this is just not feasible in the short term. The only related action that might help increase calcium levels over the long term, would be to deposit wood ash around the base of trees located well back from the water. Wood ash contains elevated levels of calcium and over time, these will migrate towards the lake. However, it is important that the wood ash not be placed directly into the water either via dumping or through the burning of trees on the ice in the winter. These actions will result in an increase in calcium levels, but at a rate that would negatively influence other aquatic organisms.

Ron Pearson, Kahshe and Bass Lake Steward