

Comparison of Invasive Mussels in Otsego Lake, NY

Madelynn Ackley, Erika Ligouri, Riley Smith, Sierra Stickney, Kari Minissale, Paul Lord, and Kiyoko Yokota

Summary

Zebra (*Dreissena polymorpha*) and quagga mussels (*Dreissena bugensis*) are both invasive to Otsego Lake, NY. They are native to Eastern Europe and were introduced to the lake at different years. Zebra mussels were discovered first in 2008 and quagga mussels were likely introduced later around 2018. This study aimed to examine the competition between the zebra and quagga mussels on a new substrate. Overall, the quagga mussels are in greater densities than the zebra mussels at all three depths for this sample set, with the greatest difference in the deepest depth. The average age of the quagga mussels was younger than the zebra mussels, and the average length of the quagga mussels collected were smaller than that of the zebra mussels.

Introduction

Quagga and zebra mussels (Fig 1) have a large impact on the ecosystem of lakes (Hetherington et al. 2019). They are great filter feeders, so they filter the algae from water and cause it to become very clear (Karatayev et al. 2015). When they filter the algae, they tend to not filter the cyanobacteria because the algae are more nutritious for the mussels (Baker et al. 2003). Due to this these mussels are often associated with harmful cyanobacterial blooms. Otsego Lake (Fig 2) experienced its first harmful cyanobacterial bloom in the summer of 2022 and is expected to continue to experience them.

Zebra mussels were discovered first in 2008 and the quagga mussels were likely introduced around 2019 (Coney 2020). With the recent invasion of the quagga mussel to the lake, this study was designed to examine the competition of the newly introduced quagga mussel against the previously established zebra mussel on a new substrate. There have been two sample sets examined from this study so far. The first sample set was the wintertime samples from the lake, and the more recent sample was from the summertime.

The previous wintertime sample set showed that the quagga mussels were outcompeting the zebra mussels in all the depths that were studied (Smith et al. 2022). The summertime samples were taken and examined and then compared to the wintertime samples to see if the quagga mussels were still outcompeting the zebra mussels.



Figure 1. A) picture of a quagga mussel that was collected, and B) picture of a zebra mussel that was collected.

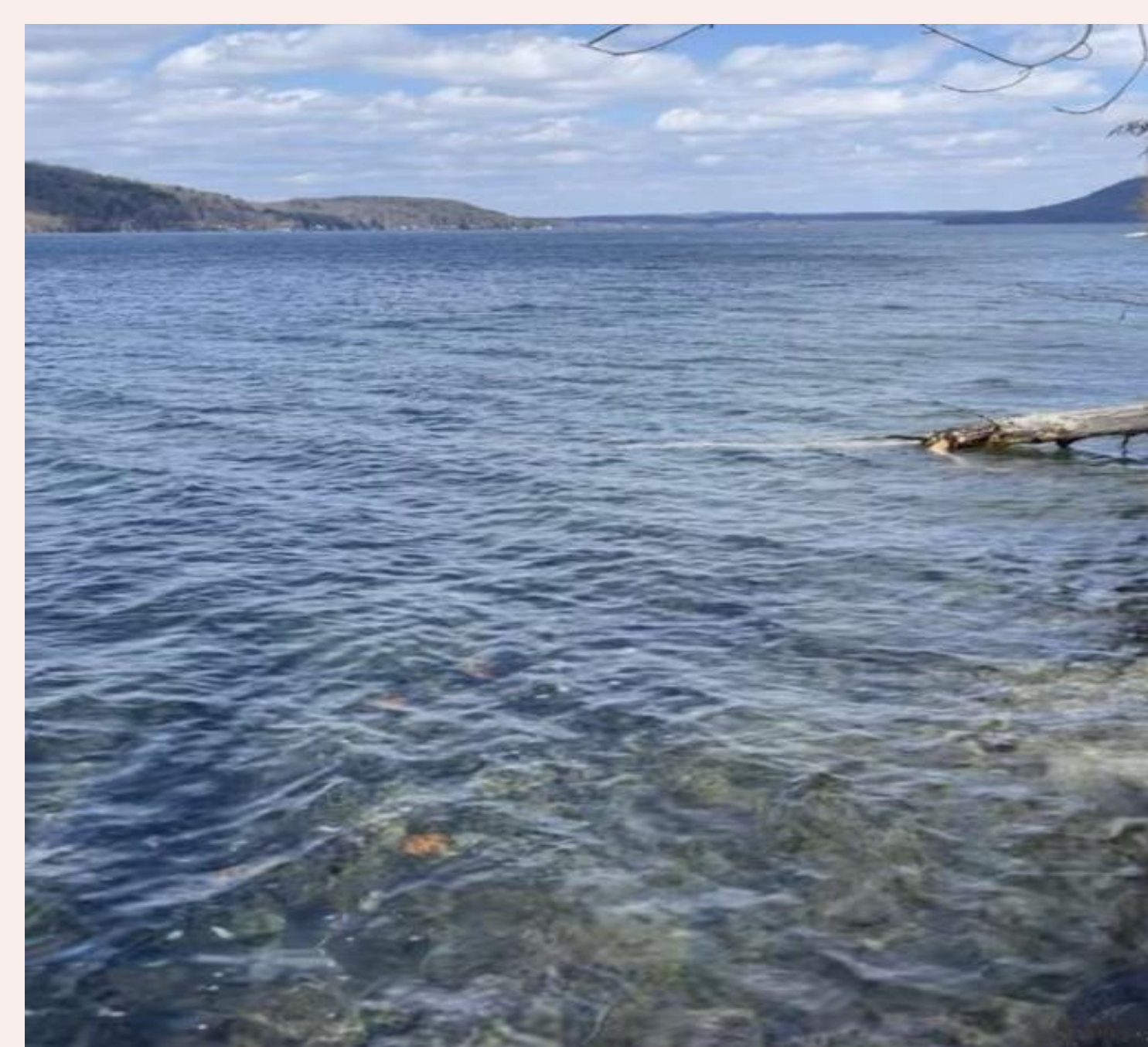


Figure 2. Image of Otsego Lake

Methods

- Samples were taken from Otsego Lake during 2021 using a multiplate sampler
- The plates were placed at three different depths, 7.6 meters, 12.2 meters, and 21.3 meters
- For this set of samples, the plates were deployed on June 17th, 2021, and retrieved on October 17th, 2021.
- After the plates were retrieved, the mussels found on the plates were scraped off and then cleaned using the lake water
- The mussels were placed into jars with a 70% ethanol solution to preserve them and they were taken back to the lab to be identified as either a zebra mussel or a quagga mussel, they were aged, and they were measured.
- The data from this set of samples- the summertime samples were then compared to the data from the previous set of samples- the wintertime samples (February 28th 2021- May 19th 2021) (Smith et al. 2022).

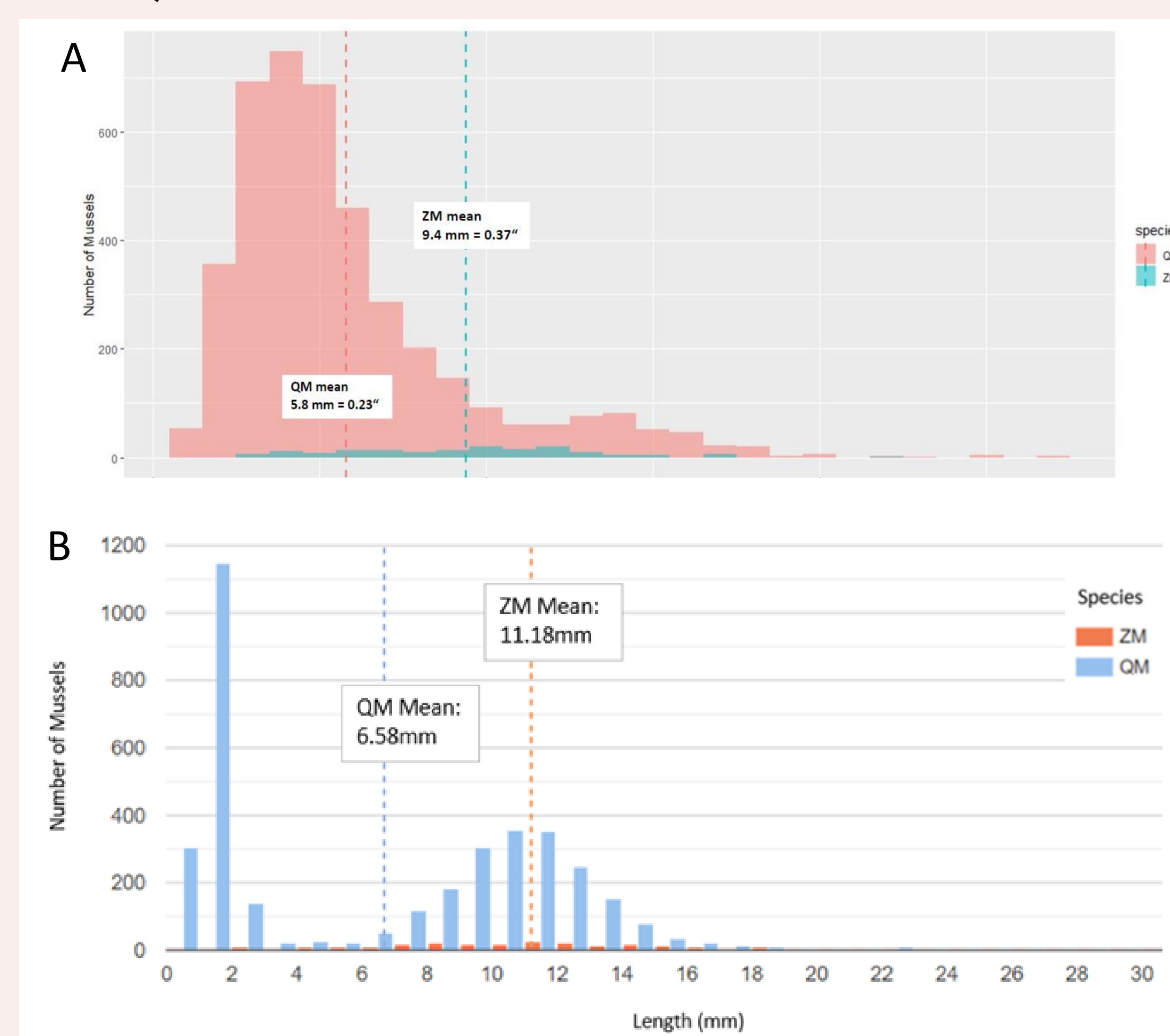


Figure 3. The total number of mussels collected compared to the measured lengths of the mussels. Quagga and zebra mussels are separated A) summertime samples. B) wintertime samples. Note the color differences between ZM and QM represented between A and B.

Results

- The quagga mussels are outcompeting the zebra mussels in both the summer and wintertime sample sets.
- The average age of the zebra mussels is older than the average age of the quagga mussels (Fig 3).
- There are more numbers of quagga mussels at each of the depths sampled (Fig 4).
- The deepest depth had the largest difference between the number of quagga and zebra mussels collected for both sample sets.

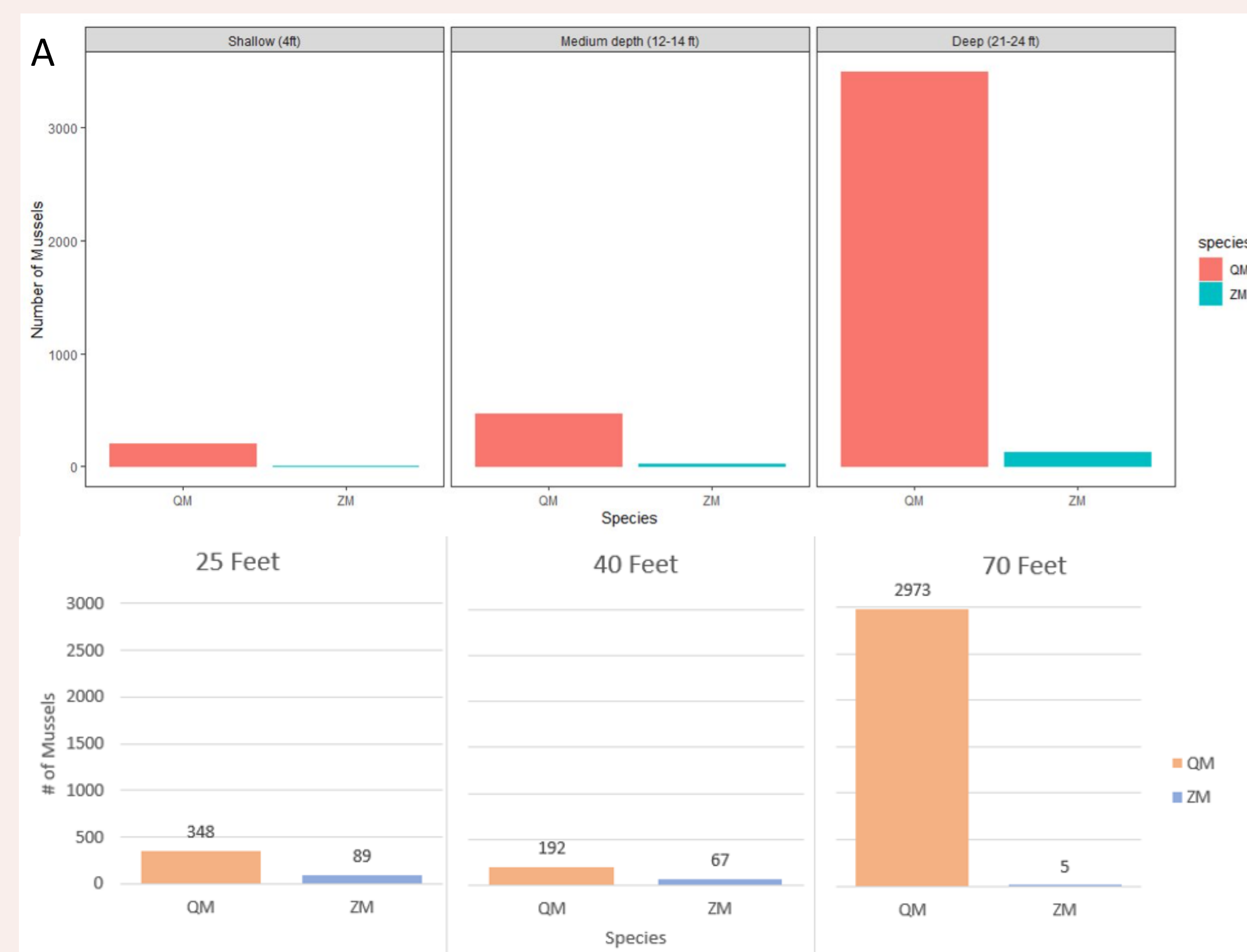


Figure 4. Number of mussels collected at each depth split up by species. A) previous wintertime data B) summertime data. Note the different depths between the two sample sets.

Significance

These results are consistent with past studies, where the quagga mussel population will outcompete a previously existing zebra mussel population (Hetherington et al. 2019). The interaction of these mussels has a huge impact on the ecosystem of Otsego Lake.

References

- Baker, S.M., Levinton, J.S. Selective feeding by three native North American freshwater mussels implies food competition with zebra mussels. *Hydrobiologia* 505, 97–105 (2003). DOI: 10.1023/B:HDR.0000007298.52250.99
- Coney, S. 2020. Quagga mussel (*Dreissena rostriformis bugensis*) establishment in Otsego Lake, 2020. SUNY Oneonta Biological Field Station
- Hetherington, A.L., Rudstam, L.G., Schneider, R.L. et al. Invader invaded: population dynamics of zebra mussels (*Dreissena polymorpha*) and quagga mussels (*Dreissena rostriformis bugensis*) in polymictic Oneida Lake, NY, USA (1992–2013). *Biol Invasions* 21, 1529–1544 (2019). DOI:10.1007/s10530-019-01914-0
- Karatayev, A.Y., Burlakova, L.E. & Padilla, D.K. Zebra versus quagga mussels: a review of their spread, population dynamics, and ecosystem impacts. *Hydrobiologia* 746, 97–112 (2015). DOI:10.1007/s10750-014-1901-x
- Smith, R., Stickney, S., Minissale, K., Yokota, K., and P. H. Lord. The impact of aquatic invasive mussels in Otsego Lake, NY. 29 April 2022. New York State Federation of Lake Associations Annual Meeting. Lake George, NY, USA.

Acknowledgements

BFS Volunteer Dive Team, Belmonte-Flynn Family, VanHeusen Family, BFS for boats and dock access, and SUNY Oneonta Student and Faculty Research Grant Programs