HISTORICAL PERSPECTIVES ON THE *DIPOREIA* DEMISE: PALEOLIMNOLOGICAL AND GUT CONTENT EVIDENCE OF FOOD LIMITATION

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The amphipod *Diporeia* is a key component of the benthos of the Great Lakes, converting the pelagic algal rain to secondary production, which is critical for most fish species in the Great Lakes. However, declines in *Diporeia* populations in the Great Lakes since the 1980s have been rapid and widespread. There is a temporal relationship between decline of *Diporeia* and spread of zebra *Dreissena polymorpha* and quagga *D. rostriformis bugensis* mussels in the Great Lakes, but establishing a mechanistic link has been a research challenge. *Diporeia* declines are thought to result from competition for food resources with zebra/quagga mussels, but conflicting evidence suggests food limitation may not be the direct link. To test the food limitation hypothesis, we analyzed gut contents of *Diporeia* collected between the 1980s and 2009 from two offshore (>100 m depth) and one nearshore sampling station (~50 m depth) in southern Lake Michigan. We further used paleolimnological analysis of sediment cores from nearshore and offshore southern Lake Michigan to resolve historical relationships among food resources, *Diporeia* diet shifts, and diet selectivity during the pre- and post-dreissenid invasion. Results showed that in spring *Diporeia* fed selectively and almost exclusively on large centric (*Stephanodiscus* spp.) and filamentous centric diatoms (*Aulacoseira* spp.). Diets differed among *Diporeia* size classes, sampling stations, and years. Springtime diets in offshore *Diporeia* populations showed significant shifts during the 2000s that included greater proportions of small *Cyclotella* spp., small *Stephanodiscus* spp., and araphid planktonic diatoms, coincident with widespread *Diporeia* declines and rapid expansion of quagga mussels into offshore regions of Lake Michigan. Sediment cores recorded changes in diatom communities from 1960 to 2009 including declines in *Aulacoseira* and large *Stephanodiscus*, and increases in small centrics especially after dreissenid introduction. Accounting for high selectivity in spring *Diporeia* diets, the community changes in the sediment record are consistent with changes observed in the diet of *Diporeia*, and suggest the decline in *Diporeia* populations has been exacerbated by a shift in diatoms from more nutritious and highly preferred species to less nutritious and negatively selected species.

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