An Historical Comparison of Lake Superior Sea Lamprey Fecundity and Egg Size

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Background

- Lake Trout *(Salvelinus namaycush)* populations in Lake Superior collapsed in the early 1960's due to overfishing and predation by invasive Sea Lamprey *(Petromyzon marinus).*
- Continual lampricide treatments have helped maintain lower densities of Sea Lamprey in Lake Superior.
- Fecundity and egg size of Sea Lamprey may be greater at these lower densities of Sea Lamprey.
- However, fecundity and egg size of Lake Superior Sea Lamprey have not been studied since 1960 (Manion 1972; Trans. Am. Fish. Soc. 101:718-720).

Objective

- Determine if fecundity or egg size of Lake Superior Sea Lamprey have changed since 1960.

Field and Lab Methods

- 35 Sea Lamprey were collected in 2016 from the Bad, Brule, and Middle Rivers (Wisconsin; Fig. 1) using portable traps and a fish ladder.
- Total length (mm) and weight (g) were recorded for each Sea Lamprey.
- Whole ovaries were preserved in 10% formalin.
- Total fecundity was estimated by expanding the counts of eggs in three 0.5 g subsamples from the ovary.
- Average egg diameter measured from digital images of 30 eggs was computed for each fish.
- Data were also obtained from Manion (1972) for 29 Sea Lamprey from the Chocolay River (MI) in 1960 (Fig. 1).

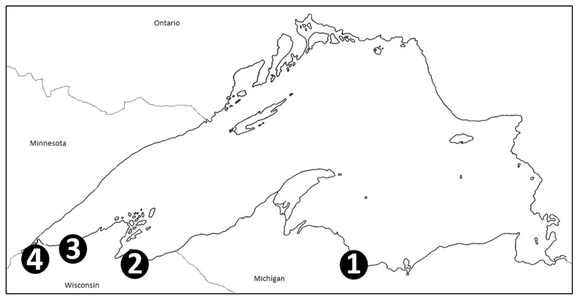


Figure 1. Lake Superior showing the Chocolay (1), Bad (2), Brule (3), and Middle (4) Rivers.

Analysis

- Indicator variable regressions were used to determine if the relationships between fecundity or egg diameter and total length differed by sampling location (i.e., river).
- Fecundity increased slightly with increasing total length (p=0.022), but the relationship between fecundity and total length did not differ among the four rivers (p=0.216; Fig. 2).

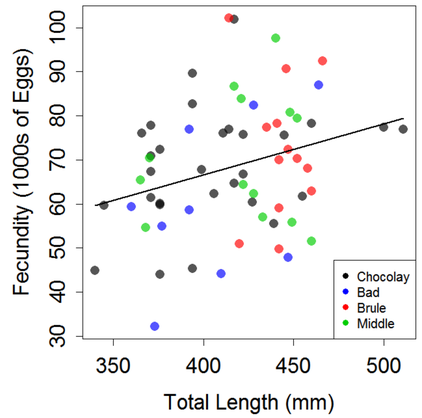
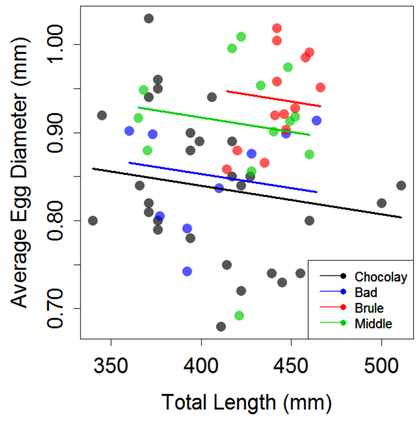


Figure 2. Total fecundity versus total length of Sea Lamprey collected from four Lake Superior rivers. The regression line is for all data regardless of river.

- No relationship between egg diameter and total length was detected (p=0.504), which was consistent among the four rivers (p=0.100).
- Mean egg diameter (i.e., intercepts) for the Chocolay River differed from the Brule (p<0.001) and Middle (p=0.013) Rivers, but not the Bad River (p=0.963). In 2016, the mean egg diameter for the Middle River did not differ from the Brule (p=0.641) or Bad (p=0.199) Rivers, but the Bad and Brule Rivers did differ (p=0.017; Fig. 3).

Figure 3. Average egg diameter versus total length of Sea Lamprey collected from four Lake Superior rivers. The regression lines fit to each river assume the common slope among rivers.



Summary

- Fecundity of Sea Lamprey in Lake Superior does not appear to have changed since 1960.
- The relationship between fecundity and total length is similar among rivers in 2016 and was not different from the Chocolay River in 1960.
- Egg diameter may have increased since 1960, but this increase was not consistent among rivers.
- These results are tentative because different rivers from different regions were sampled in 2016 than 1960 (Fig. 1).

Recommendation

- Sample Sea Lamprey from more locations, including the Chocolay River, to further assess spatial differences in fecundity and egg size.

Acknowledgments

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