Comparing the sublethal effects of sea lamprey parasitism on long term reproduction, growth and recruitment of siscowet and lean lake trout

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ABSTRACT:

The energetic demands of stressors like parasitism requires hosts to reallocate energy away from normal physiological processes to survive. Host life history adaptations likely dictates the optimal reallocation of energy following parasitism. To test this, we examined the sub-lethal effects of sea lamprey parasitism on lean and siscowet lake charr, two ecomorphs with different life history strategies. Leans are shorter lived, faster growing, and reach reproductive maturity earlier than siscowets. Following a parasitism event of four days, we assessed changes to energy allocation by monitoring endpoints related to reproduction, energy storage, and growth. Results indicate that lean and siscowet lake charr differ considerably in their response to parasitism in predictable ways. Severely parasitized leans slightly increased their reproductive effort and maintained growth and energy storage, consistent with expectations given that leans less likely to survive parasitism and have shorter lifespans than siscowets. Siscowets nearly ceased reproduction completely following severe parasitism and showed evidence of altered energy storage, consistent with a strategy that favors maximizing long term reproductive success. These findings suggest that life history can be used to generalize stressor response between populations and can aid management efforts. Furthermore, our data was used to calibrate dynamic energy budget models to capture the effects of sea lamprey parasitism and model the skipped spawning phenomenon that will be used for a follow up modeling project that embeds these models into an individual based model to capture impacts of sublethal effects on entire populations of lake trout in Lake Superior. Our study system was also used for two follow-up smaller projects that examined the efficacy of field crew subjective assessment of wounding status and to identify objective protein biomarkers of sea lamprey parasitism. Using lake trout with known wound status, we found that field crew assessed the correct wound status only around 36 % of the time, even after training efforts.

Accordingly, we identified some putative protein biomarkers related to blood clotting that persisted six months after a parasitism attack that could provide an objective metric for wound assessment.