Physiological and behavioural effects of tagging post-metamorphic sea lamprey with a micro acoustic tag

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ABSTRACT:

Virtually nothing is known about the feeding behaviour or movements of parasitic juvenile sea lamprey following their downstream migration into near-shore and off-shore waters of the Great Lakes. Significant gaps exist in our knowledge of which fishes the juveniles feed on, how long they feed, their behaviour, survival, and movements. Such information would better inform sea lamprey damage estimates to fisheries and improve sea lamprey control strategies. Key to such efforts is the ability to track sea lamprey movements after they complete their downstream migration and enter river mouths and lakes. Some of the work we propose follows up on the recently completed project of Wagner et al., which demonstrated that the new eel and lamprey acoustic tag (ELAT) may be used effectively to track transformers in rivers. Understanding this tag's sub-lethal physiological effects is the next step to determine its usefulness in studies of lamprey behaviour. To establish this tag as a valid monitoring tool for the early feeding behaviour of juvenile sea lamprey, we must ensure that it does not result in a significant metabolic cost to the animal, which could alter its feeding and other behaviours. It will also be essential to know if tag implantation alters the lamprey's capacity and/or willingness to pursue and attach to prey. Additionally, we must determine how quickly these animals restore physiological homeostasis given the limited battery life of these tags. In this project, we explored various facets of sea lamprey metabolism and behaviour, to determine the extent of the potential sub-lethal effects of the ELAT. Specifically, we looked into metabolic rates using intermittent flow respirometry;, energy reserves in the muscle and liver, stress responses, proximate body composition, and changes in behaviour when in the presence of a host. While we are still in the process of analysing all the data collected during this project, the results already clearly indicate that the ELAT greatly impaired feeding and growth capacity of juvenile sea lamprey. Tagged juveniles were 41% less likely to attach to a host and displayed greatly impaired growth rates when they did attach. The observation of tag migration impairing the gastrointestinal functions and leading to one death also suggests that the internal pressure imposed by the free-floating tag could cause continuous discomfort. These findings indicate that the ELAT is unsuitable for representative studies aiming to detect the onset of parasitism in juvenile sea lamprey entering the Great Lakes. However, new opportunities will arise as the tag technology is further miniaturised. Ultimately, our project highlights the need to explore the physiological and behavioural impacts of tagging, which may not be immediately obvious but could introduce significant biases in the interpretation of data originating from tracking studies.