The Effect of River Substrate on Stonecat Habitat

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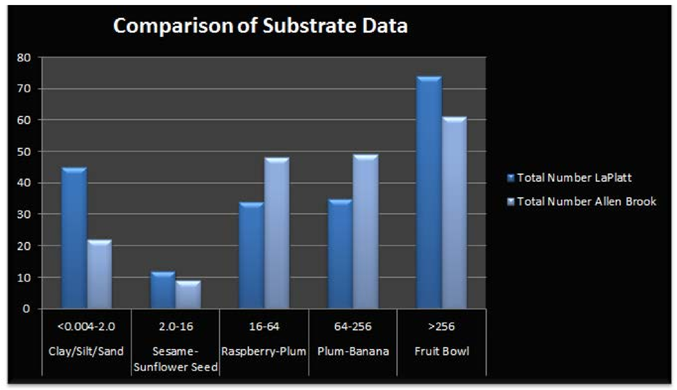
Introduction

Like all animals, the stonecat has particular habitat preferences. There are only two streams in Vermont that have been found to contain the stonecat (*Noturus Flavus)*: LaPlatte River and Missisquoi River. The purpose of this investigation was to determine the unique characteristics of the LaPlatte River vs Allen Brook to determine why stonecats prefer the LaPlatte. The Allen Brook in Williston, Vermont is a similar stream to LaPlatte River with respect to macroinvertebrates found in the streams and climate. One of the main differences between the two sites is the river substrate. Substrate conditions (type, and size of sediment) provide habitat for a variety of biological elements. Stonecats have been found to prefer freshwater and temperate climates. This species of freshwater catfish occupies riffles with rocky and gravel bars. Stonecats prefer fast moving riffles, which increases total suspended solids (TSS) in water. They are nocturnal invertivores, feeding primarily on mayfly larvae, stoneflies, and crayfish. They are eaten by larger freshwater fish, and are sometimes mistakenly used by humans as bait.

Hypothesis: The difference in river substrate between the LaPlatte River and Allen Brook is a factor that determines stonecat presence in the LaPlatte.

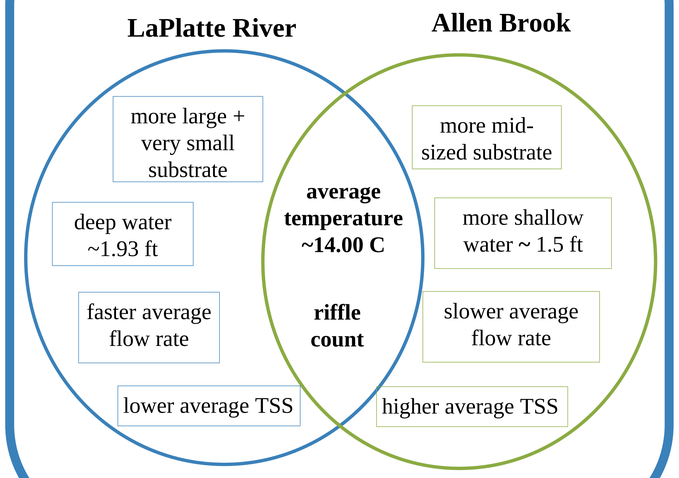
Substrate collections and observations from both sites were taken using RACC protocol and analyzed to test the hypothesis.



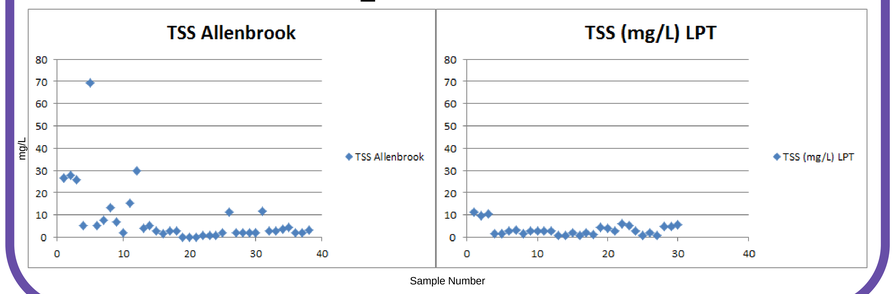
Allen Brook

LaPlatte River

Habitat Comparison



Total Suspended Solids



River Flow Rate

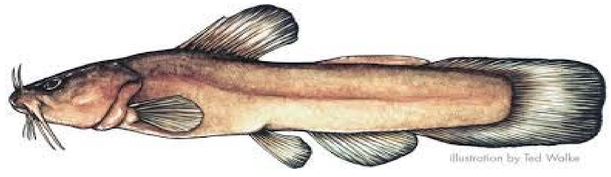
Allen Brook	
Sample 1	0.043 m^2/s
Sample 2	0.393 m^2/s
Sample 3	NA
LaPlatte	
Sample 1	0.152 m^2/s
Sample 2	2.45 m^2/s
Sample 3	0.336 m^2/s

River Substrate Census

A reach was established by measuring a transect upstream and a second transect 6.5 m downstream. The reach was divided into a 4x4 grid. Using a meter stick, 25 random spots were chosen across one row of the reach; the substrate of each spot was recorded. The substrate of each row was recorded and the process was repeated a second time in columns unidirectional to the stream.

Discussion and Analysis

- The stonecat prefers rocky streams due to specific **habitat** preferences. The LaPlatte River has a variable substrate with small and large pebble counts (37% > 256 mm, 23% <2.0 mm), but very little in the mid-size range (17% 16-64 mm). In contrast, the Allen Brook substrate is composed of primarily mid-sized pebbles (52% 16-256 mm). This difference may account for the ability of the stonecat to thrive in the LaPlatte.
- Variability in substrate is better for stonecat **reproduction**. The females lays eggs under rocks. A variable substrate provides ample space for reproduction. The differences in these sizes at the LaPlatte River provides ideal locations for stonecat reproduction. The more homogenous substrate at Allen Brook may inhibit reproduction.
- The larger substrate in LaPlatte also increases **protection** for stonecats. A rocky streambed provides hiding spots from larger fish. Stonecats are nocturnal, so rockier stream allows them to hide under rocks during day and feed at night. Larger rocks also provide better shelter for the stonecat.
- Stonecats prefer more **riffles**, which would be indicated by a higher flow rate and higher TSS levels. Lower TSS levels indicate a healthier stream, which stonecats would prefer. Low TSS levels indicate lower flow rate. Interestingly, the flow rate and TSS data are somewhat contradictory. The LaPlatte River average flow rate is *higher* than Allenbrook (0.979 m^2/s vs 0.05 m^2/s for Allen Brook), but has *lower* TSS. The average TSS at Allen Brook is 7.34 mg/L with a maximum of 69.35 mg/L, the average TSS level in LaPlatte is 3.57 mg/L with a maximum of 11.36 mg/L. This leads to the possibility that low TSS levels are a greater factor than high flow rate for stonecats.
- The stonecat **diet** consists of mayflies, stoneflies, and crayfish. A more variable streambed means better habitat for macroinvertebrates, providing more food for the stonecat. The more varied types of macroinvertebrates in the LaPlatte River increase the diversity of stonecat feeding options. Allenbrook also contains more macroinvertebrates that the stonecat likely does not eat (true flies and caddisflies). Specifically, the LaPlatte hosts 2% more mayflies (baetidae). It is also home to 49% true flies (chironomidae) and caddisflies (hydropsychidae), compared to 61% in Allenbrook. In addition, there are 42 unique species in LaPlatte compared to only 29 species in Allen Brook.



Conclusion

The difference in river substrate between the LaPlatte River and Allen Brook is a factor that determines stonecat presence in the LaPlatte. The LaPlatte has a more varied substrate size as compared to the more homogeneous substrate at Allen Brook. A more diverse substrate provides an ideal environment for stonecat reproduction, protection, and diet.

Resources

- Changes to Substrate Conditions (rivers)." *Change in Substrate Conditions (rivers)*. Web. 14 Mar. 2016.
- "LaPlatte River - Tier 2 Report - Ashley Eaton, 09/17/14." *LaPlatte River*. Web. 14 Mar. 2016.
- "Learning Center." *Leaf Pack Network: Data Analysis*. Web. 14 Mar. 2016.
- US Department of the Interior. "Current conditions for Vermont: streamflow." 13 Mar. 2016. *USGS Current conditions*. Web. 13 Mar. 2016. <http://waterdata.usgs.gov/VT/nwis/current?type=flow>.

Acknowledgements

Funding provided by NSF Grant EPS-1101317