A Comparative Study of the Effects of River Flow Rates on Decomposition

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Introduction

Although it is widely accepted that water decomposition differs from terrestrial decomposition, relatively few studies have been conducted to understand the different ways in which water effects decomposition (1). Previous water decomposition studies compared the rate of decomposition in a single water environment to decomposition on land (2,3,4,5). Water composition varies in mineral content, temperature, flow, and scavenging aquatic organisms; therefore, this study focused on regionally specific effects of river flow rates on decomposition using feral pigs (*Sus scrofa*) as human proxies. This study tests the hypothesis that pigs in rapidly moving water will decompose faster than in slower moving water. The proposition suggests that the faster water flow will cause flesh to deteriorate more rapidly than the slower water flow. If water flow has an effect on the rate of decomposition, then the specimens placed in the river will decompose at different rates.

Materials and Methods

The Amite River is a meandering river that begins in southwestern Mississippi and flows approximately 117 miles before draining into Lake Maurepas in southeastern Louisiana (7,8). At the study site in Prairieville, Louisiana, the mean water discharge is around 2300cfs, the width is about 80 meters, and the bankfull depth is approximately five meters.

Three wild boars (*Sus scrofa*) weighing near 100 pounds each were used as human proxies. Each pig was protected by a large metal dog crate, tethered to the bank with chain, and equipped with an Onset HOBO temperature logger to monitor ambient temperature around the specimens. Three sites were chosen to understand the effects of river flow rates on decomposition (**Figure 1**):

- Site 1: Land Control Site. Chosen due to its proximity to the water sites.
- Site 2: Slow Water Site. Located in a slow, recirculating zone off the main part of the river flow, downstream from Site 3. This is an area of slower flowing water.
- Site 3: Fast Water Site. Located in the downstream-oriented flow of the main part of the river. This is an area of faster flowing water.

The sites were visited regularly to note the stage of decomposition using Payne (1965) and Payne and King (1972) (9,2). For the purpose of this study, the designations “Slow Water” and “Fast Water” were chosen to concisely describe the zone of recirculating flow and the downstream-oriented flow, respectively.

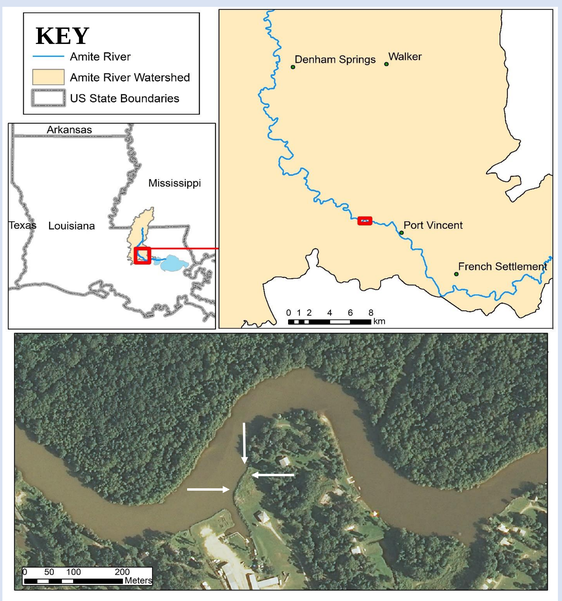

Figure 1. Location of the three sites on the Amite River. Site 3, left arrow; Site 2, top arrow; Site 1, right arrow

Results

Land Control Site

The Land Control specimen was fresh for one day and bloated for several days. Maggots arrived on Day 2 and completely covered the carcass on Day 4 (**Figure 2**). The specimen continued to dry out from Days 7 to 13 and skeletonized between Days 14 and 16 (**Figure 3**).

Slow Water Site

The Slow Water specimen was fresh and submerged on the first day, but bloat caused the carcass to float on Day 2. On Day 7, the carcass was in a state of active decay (**Figure 4**). The carcass remained floating for several days before sinking on Day 11. During the third week of the study, bones disassociated from the flesh . By Day 21, no bones remained in the cage , and the Slow Water Specimen was skeletonized.

Fast Water Site

The Fast Water specimen was fresh and submerged on the first day, but bloat caused the carcass to float on Day 2. On Day 7, the carcass was in a stage of active decay (**Figure 5**). The carcass remained floating until Day 14. Similarly to the Slow Water specimen, bones disassociated from flesh during the third week. The Fast Water specimen was skeletonized between Days 21 and 22 when all the flesh was gone from the cage. **Figure 6** compares the Slow Water Site and Fast Water Site on Day 19, showing the similar rates in decomposition.

Figure 2. Land Control Site on Day 4

Figure 3. Land Control Site on Day 14, skeletonized

Figure 4. Slow Water Site on Day 7, active decay

Figure 5. Fast Water Site on Day 7, active decay

Figure 6. Comparison of the Slow Water Site (left), and the Fast Water Site (right) on Day 19, almost skeletonized

Temperature Data

Figure 7 shows the temperature data captured by the Onset HOBO temperature loggers. During the first four days of the experiment, the temperature logger on the Fast Water specimen was exposed to the air, recording air temperature rather than water temperature. Once that logger was submerged on Day 4, the difference in temperature between the Slow Water and Fast Water specimens was minimal. The greatest difference between the Slow Water specimen and the Fast Water specimen was 1.3 degrees Celsius where both temperature loggers were submerged. The average difference for the same range of data was 0.018 degrees Celsius.

Figure 7. Temperature Change over Time

Discussion

Despite controlling for many variables, such as water temperature and composition, the results of this research suggest that river flow rate has little effect on the rate of decomposition in this environment; therefore, the hypothesis that the pig in the faster section of the river would decompose more quickly than the pig in the slower moving water was rejected.

The possibility exists that factors such as oxygen levels, temperature, or a greater disparity in river flow rates play a stronger role in the rate of decomposition than the river flow rate observed at these sites. Future research should focus on determining what other factors might be significant in water decomposition, such as temperature or oxygen levels. Unfortunately, a greater disparity in river flow rates would invite a difference in aquatic organisms. If this study or future studies used sites with a greater disparity in river flow rates, then distinguishing between decomposition due to river flow rate or scavenging of aquatic organisms would be difficult. Future studies might eliminate scavengers altogether by performing controlled laboratory tests to determine how the sheer force of water velocity impacts decomposition.

Conclusion

Skeletonization occurred rapidly

- Land Control Site: 14 to 16 days
- Slow Water Site: 19 to 21 days
- Fast Water Site: 21 to 22 days

The water specimens decomposed at different rates, indicating that river flow rate had little effect on the rate of decomposition in this environment. This study offers insight into what water decomposition looks like in the variously flowing waters of the Amite River in southeastern Louisiana.

This research

- Adds to the current knowledge about the effects of water on decomposition
- Acts as a reference for water recovery cases in southeastern Louisiana
- Provides a model for future water-related decomposition research in different environments, seasons, and rivers

References

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