H92 An Experimental Study of Scavenging in Aqueous Environments

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After attending this presentation, attendees will have an increased understanding of the process of decomposition in different types of aquatic environments and knowledge of how fast certain organisms consume animal remains in a controlled aquatic tank setting.

This presentation will impact the forensic science community by demonstrating the need for decomposition studies to include macro-scavengers. The presence of macro-scavengers can actually delay decomposition before it accelerates decomposition and therefore are important factors in estimating postmortem interval.

The hypotheses of this study are that tanks with organisms (experiments) would decompose faster than those without organisms (control), that the salt experiment would decompose faster than the fresh experiment, and that both controls would precede at the same rate.

Four tanks (two freshwater and two saltwater) were assembled including sediment, filtration system, air pumps, thermometers, and light control timers. The saltwater experiment tank held six red-legged hermit crabs, one fiddler crab, and six Nassariid snails. The freshwater experiment tank contained six ghost shrimp, one red-clawed crab, and six mystery snails. Two rabbits (sold as food) were weighed, photographed, measured, and quartered. One hind leg was photographed, weighed, and measured for each tank before being placed into a cage secured with zip-ties and lowered into the tank and held into place with suction cups. During two experimental trials, remains were allowed to decompose for 45 days. On a daily basis, tanks were photographed and water quality tests (pH, ammonia, nitrite, and nitrate) were performed. Hourly (minimum of four hours a day and maximum of 12 hours a day) water and ambient temperature readings were taken as well as other observations on the appearance of the remains, color of the water, odor of the water, level of foam and organism activity. At the end of the experiment, the cages were removed, photographed, and opened. The bones and remaining flesh and adipocere were weighed.

During the first trial, the water temperature in the saltwater tanks was lower than the water temperature in the freshwater tanks. The ambient temperature had a broader range during the second trial, but the tanks matched more closely to the ambient. Except for brief periods, the water temperatures in the first trial were higher than the second trial. The appearance of the remains in all four tanks looked obviously different: both freshwater tanks had filamentous algae; whereas the saltwater tanks had encrusting algae, but the controls had more, longer, and thicker algae than the experimental tanks did. Furthermore, gas bubbles that were trapped in the adipocere and algae appeared different between the salt tanks: the control's bubbles were short and flat whereas the experiment's bubbles were tall and peaked. Stages of decomposition were defined as float, total float, floating decay, disarticulation, and sunken remains for this experiment. The presence of scavengers initially delayed decomposition and then decay preceded faster in the experiment tanks than the controls. In the first trial, the freshwater experimental tank hit floating decay a day before the saltwater experimental tank, but in the second trial, the saltwater experimental tank hit floating decay 14 days before the freshwater experimental tank. In both trials, the freshwater remains reached a further stage of skeletonization than the saltwater remains, even though the saltwater remains occasionally entered the next stage first. The remains from the first trial had less flesh, less algae, and less adipocere on the bone than the remains from the second trial.

In conclusion, scavengers affect the rate of decomposition by direct consumption, indirect consumption of the microbial layer, or by disbursing the algae growing on the remains. This research showed that changing the number of macro-scavengers present greatly changed the visible qualitative results of the appearance of the remains.

Despite the problems and limitations with laboratory settings, this experimental study suggests that studies that exclude scavengers are not showing the entire picture and might lead to inaccurate models of decomposition in a specific region.

Aquatic Decomposition, Scavenging, Taphonomy

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