Terrestrial and Marine Decomposition and Scavenging in Temperate and Tropical Environments

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Background

Large Land Mass Taphonomy

- The decomposition of carcasses on large land masses has been studied extensively since the 1960s.[1] It is highly variable, but there are five general stages of decomposition.

Figure 1. The five stages of decomposition.

- The progression of these stages is fluid and is affected by scavenging, insect activity, temperature, and humidity, among others. Knowing how these factors influence taphonomic processes is key in determining time since death and time since deposition estimates.

Small Island Taphonomy

- Decomposition on such environments can be drastically different than that on large land masses because of the differences in environmental factors and scavengers present. Small islands typically have smaller animals and fewer species, so scavenging is often limited in these locations.
- Environmental factors and scavenging, and therefore taphonomic processes, can vary greatly among small islands as well. For example, tropical and temperate islands differ drastically in these areas.

Marine Taphonomy

- Like small island taphonomy, marine taphonomy is not well-studied.
- Decomposition progresses more slowly than with terrestrial carcasses due to cooler temperatures and inhibited insect activity.[2]
- Carcasses sink initially, but float beginning with the onset of the putrefaction stage.
- As the species of scavengers present varies by location, as does scavenging activity. This feeding activity affects decomposition rates and leaves artefacts on remains. The interactions between and within species as they feed on remains requires further global research to expand the marine taphonomic knowledge base.

References

[1] Payne, J. A. (1965). A summer carrion study of the baby pig *Sus scrofa* Linnaeus. *Ecology* 46:592-602.

[2] Rodriguez, W.C. (1997). Decomposition of Buried and Submerged Bodies. In *Introduction to Forensic Sciences*.

Materials and Methods

Curaçao

Tropical taphonomy was studied in Curaçao with the help of CARMABI (Caribbean Research and Management of Biodiversity) research center.

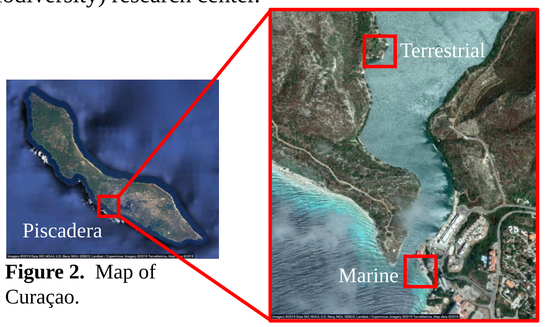

Figure 2. Map of Curaçao.

Figure 3. Map of Piscadera with terrestrial and marine experimental sites.

Horse Island, Connecticut, USA

Temperate taphonomy was studied on Horse Island in the Long Island Sound.

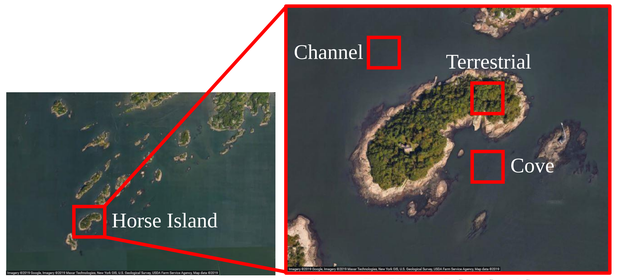

Figure 4. The Thimble Islands in the Long Island Sound.

Figure 5. Horse Island with one terrestrial and two experimental marine sites.

Experimental Setup

Figure 6. Terrestrial experimental setup.

Figure 7. Marine experimental setup (Horse Island).

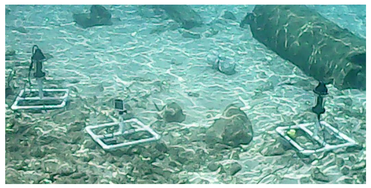

Figure 8. Marine experimental setup (Curaçao).

Results

Table 1. Overview of Tropical vs. Temperate Small Islands and Terrestrial vs. Marine Decomposition and Scavenging

Environment	Tropical Small Island (Curaçao)	Temperate Small Island (Horse Island, CT, USA)
Terrestrial	• 5 species of scavengers • Limited insect activity • Fresh: Day 0 • Putrefaction: Days 1-4; ended when dogs took the neck	• No scavengers • Abundant insect activity • Fresh: Day 0 • Putrefaction: Days 1-3 • Active decomposition: Days 4-5 • Advanced decomposition: Days 6-12
Marine	• 13 species of scavengers* • Fresh stage: Days 0-1 • Putrefaction stage: Day 2-7, ended when the experiment was stopped	• 1 species of scavengers • Cove leg: no scavengers; remained in putrefaction until at least day 12. Skeletonized by day 20. • Channel leg: scavenged by crabs; remained in putrefaction until at least day 6. Flesh was missing due to scavenging. Skeletonized by day 12.

*Only species identified to their family were considered.

Table 2. Species of scavengers found at each experimental site.

Curaçao Terrestrial Scavengers	Curaçao Marine Scavengers		Horse Island Marine Scavengers
Blue Land Crab (*Cardisoma guanhumi*)	Banded Butterflyfish (*Chaetodon striatus*)	Bicolor Damselfish (*Stegastes partitus*)	Common Spider Crab (*Libinia emarginata)*
Feral Cat (*Felis catus*)	Chain Moray (*Echidna catenate*)	Ocean Surgeonfish (*Acanthurus tractus*)	
Feral Dog (*Canis lupus*)	Princess Parrotfish Initial Phase (*Scarus taeniopterus*)	Redband Parrotfish (*Sparisoma aurofrenatum*)	
Hermit Crab (*Coenobita* sp.)	Redtail Parrotfish Initial Phase (*Sparisoma chrysopterum*)	Smooth Trunkfish (*Lactophrys triqueter*)	
Whiptail Lizard (*Cnemidophorus murinus*)	Spotted Goatfish (*Pseudupeneus maculatus*)	Striped Parrotfish (*Scarus iseri*)	
	Unidentified Black Damselfish (*Pomacentridae* family)	Unidentified Parrotfish (*Scaridae* family)	
	Unidentified Wrasse (*Labridae* family)		

Discussion

- Increased decomposition rates of terrestrial remains on Horse Island compared to those on Curaçao can be attributed to more abundant insect activity
- Dry conditions on land prevent skin from sloughing as exhibited in submerged remains, so the putrefaction stage appears drastically different in terrestrial and marine remains.
- The skeletonization of the Horse Island cove leg can be attributed to the sloughing off of skin due to taphonomic processes since scavenging was not observed.

Conclusion

- Scavenging and decomposition vary greatly between terrestrial and marine environments.
- Marine decomposition proceeds more slowly than terrestrial decomposition.
- Locations with larger and more numerous scavengers exhibit faster decomposition rates.

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