H118 Comparison of Faunal Colonization: Taphonomic Macro- and Micro-Skeletal Changes in Pig Carcasses Submerged in a Deep Coastal Marine Environment During Spring and Fall

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After attending this presentation, attendees will have a greater understanding of the impacts of marine submergence on animal carcasses used as human proxies and on the tremendous potential offered to forensic science by the use of underwater cabled laboratories.

This presentation will impact the forensic community by: (1) illustrating, through photos, video, and micrographs, the effects of deep coastal marine submergence on pig carcasses; and, (2) showing the taphonomic changes found in two different seasons, spring and fall.

The studies presented here are part of an ongoing marine-based, high-resolution, data-rich study of the effects of submergence on faunal colonization, decomposition, skeletal dispersal, and survival, in a variety of habitats, seasons, and depths in the coastal waters of Western Canada. The studies utilize the Victoria Experimental Network Under the Sea (VENUS) underwater observatory which allows for real-time observation using a number of remotely controlled cameras and sensors.

Methods: Two sets of two fresh pig carcasses (*Sus scrofa domesticus*) were placed on the seabed in 2012; the first set was placed in February and the second in August. In both cases, the carcasses were observed using a remote connection to the camera. The carcasses were placed on a custom-built platform directly beneath a video camera mounted on a tripod. One carcass was caged, while the other was fully exposed. The cage bars were spaced to allow sufficient access to large crabs and fish, but small enough to prevent shark access. The platform supporting both carcasses, and the tripod and camera, were lowered onto the sea bed in the Strait of Georgia at a depth of 300m. The video camera was programmed to turn on, with lights, every 15 min and scan both pigs for a total of three minutes. An array of sensors recorded physical and chemical water conditions every minute. These included an oxygen optode recording dissolved oxygen and temperature, a vector current meter, and a CTD measuring conductivity, density, pressure, salinity, Sigma T, and sound velocity. Recording continued for six months. At the end of this time (six months of submersion), the skeletal remains were recovered in order to investigate any surface and microstructural changes using Environmental Scanning Electron Microscopy (ESEM) and sectioned material using Backscattered Electron (BSE) imaging. Sections from several different skeletal elements were embedded in plastic and polished in transverse section for assessment.

Results: In the spring study, the carcasses immediately attracted sixgill sharks (*Hexanchus griseus Bonneterre*) to the area. The cage bars successfully protected the caged carcass and, although the exposed carcass was frequently attacked during the first 24 hours after placement, only a few pieces of tissue were removed. Small (<1mm) amphipods were attracted to both sets of remains within a few hours, although shark disturbance of the exposed carcass prevented settling for 24 hours. After this time, thick layers of amphipods settled on both carcasses to a depth of 2 – 3cm, as well as spreading onto the sediment and cage bars. By the end of Day four, both carcasses were skeletonized and the amphipods had displaced skeletal elements. Other arthropods, such as the three spot shrimp (*Pandalus platyceros Brandt*), were originally attracted to the remains but were competitively excluded by the amphipods. Once the remains were skeletonized, the shrimp returned, as did a variety of crab species. Despite the early shark damage, skeletonization and colonization were very similar in both carcasses. Faunal attraction was greatly reduced by Day 12. A biofilm began to develop on the skeletal elements from Day 28 and extended over the sediment by Day 36. The skeletal elements appeared to degrade, and only the crania were visible by Day 117. The study was repeated in the late summer/early fall. The histotaphonomy from the two pigs will be presented and cross-referenced to the events seen during the exposure experiment, particularly the presence of the biofilm.

Taphonomy, Marine Submersion, Microstructural Change

