



Physical Anthropology Section – 2009

H95 Skeletal Remains in a Fluvial Environment: Microscopic Evidence of Glycoproteinous Adhesive of *Balanus Improvisus* on the Occlusal Surface of Mandibular Teeth

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After attending this presentation, attendees will understand how microscopic analysis can detect glycoproteinous adhesive of barnacles and may help determine placement of remains in a fluvial environment. This study may help determine the placement of mandibular or maxillary teeth, and possibly skeletal elements, in a fluvial environment even when only one or a few teeth are present and, with further research on the glycoproteinous adhesive, it may help determine postmortem interval in fluvial environments.

This presentation will impact the forensic community by showing the necessity of microscopic analysis of the human skeleton even if macroscopically it appears nothing is present on the remains. Microscopic analysis revealed this mandible had been in a fluvial environment even though there were no visual indicators it had been.

Barnacles are crustaceans that typically inhabit shallow salt waters with 75% living in water depths of less than 100 meters and 25% inhabiting intertidal zones. During the larval stage, the cypris antennae secretes a glycoproteinous adhesive that attaches to a hard substrate prior to metamorphosing to an adult form. Barnacles adhere themselves to substrates such as rocks, ship hulls, and oyster beds.

In a recent microscopic examination of human dentition from skeletal remains brought to the Galveston County Medical Examiner's Office, Texas City, Texas, the adhesive protein of *Balanus improvisus*, an acorn barnacle, was found on the occlusal surfaces of left PM₁, PM₂, and M₁ of the mandible. Other than the mandible found separate from the remaining skeletal elements, no other fluvial indicators, such as algal staining, circumferential staining, silt staining, or matrix compaction were present on the mandible. Without the microscopic analysis of the dentition, the presence of the adhesive protein and ultimately the determination that this mandible had been in a fluvial setting may not have been discovered.

B. improvisus found on PM₁ measured 1.99mm in diameter. Two small adhesions of *B. improvisus* were found on PM₂, one measuring 4.09mm and the other measuring 1.82mm. The adhesion on M₁ measured 1.55mm.

The adult *B. improvisus* lays eggs which hatch into the larval stage. In the initial larval stage, the nauplius larva has a pelagic swimming period before it molts into a bivalve larva, known as a cypris. The cypris searches for a short period of time for a settlement spot and eventually settles on a substrate where it lives out its adult life. In general, most barnacles live two years. The larva of *B. improvisus* typically settles during the late summer or early fall months and grows into an average diameter size of 10mm but can reach diameters of 20mm. *B. improvisus* has been found in the estuarine system in Galveston Bay, Galveston, Texas.

Research shows that *B. improvisus* prefers smooth surfaces with which to attach. The highly cross-linked proteins deposited to attach to the substrate are so strong that they can remain on the substrate even after the carapace (body) of the barnacle is gone.

This case report will show how the detection of the glycoproteinous adhesive of the barnacle may: (1) help determine placement of remains in a fluvial environment sometime during the taphonomic process, (2) help determine placement of mandibular or maxillary teeth, and possibly skeletal elements, in a fluvial environment even when only one or a few teeth are present, and (3) with further research on the glycoproteinous adhesive, it may help determine postmortem interval in fluvial environments.

***Balanus Improvisus*, Glycoproteinous Adhesive, Human Dentition**