H131 Colonization Rates of Barnacles (Crustacea: Cirripedia) on Different Fabrics as a Tool for Forensic Investigation of Human Remains in a Marine Environment

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Learning Overview: After attending the presentation, attendees will understand how long barnacles require to colonize four different fabrics (cotton, velvet, satin, and neoprene) in marine waters off the coast of Perth, Western Australia. The outcome of this research identifies which fabric was the most desirable substrate for colonization.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing information pertaining to the colonization, settlement preference, and growth of barnacles on various types of clothing in a marine environment. This research will contribute toward increasing the accuracy of the minimum Postmortem Submergence Interval (minPMSI) of clothed human remains in a marine environment.

Background/Introduction: The estimation of the time since death (i.e., minimum Postmortem Interval [minPMI]) is an important aspect of a forensic investigation in a terrestrial environment and is even more challenging when a body is found submerged or floating in a marine environment. Human remains discovered on land involve an estimation of the minPMI based on the presence of carrion insects, generally blow flies (Diptera: Calliphoridae). In the marine environment, the time spent underwater by the body (minPMSI or Floating Interval [FI]) is required for an accurate minPMI. The presence of barnacles (Crustacea: Cirripedia) are one parameter that have come under recent scrutiny, due to their colonization and permanent settlement on human remains and accompanying items, such as shoes and clothing. Research on the useful nature of barnacles in forensic investigations is scarce and, to date, has not considered the different clothing materials that may be associated with human remains.

Objectives and Methods: The current research is focused on the colonization, settlement preference, and growth of barnacles on cotton, velvet, satin, and neoprene. Polystyrene Floats (PF), covered with four types of fabric, and uncovered Polystyrene Float Controls (PFC) were submerged over a period of six months. The investigation was located off the coast of Perth, Western Australia. The aims of this research were: (1) the identification of marine species colonizing the fabrics, with special attention paid to barnacles; (2) the identification of which fabric provides the most desirable environment for colonization; and (3) the understanding of which fabric affects the growth rate of the different species of barnacles.

Results and Discussion: Results revealed the presence of three species of barnacles, in varying numbers and sizes. *Balanus trigonus* Darwin was found to be the most abundant and frequently present. The two other species, *Amphibalanus reticulatus* (Utinomi) and *Amphibalanus variegatus* (Darwin), were less abundant. The colonization process of the barnacles happened rapidly, with colonization observed in the first month (28 days) on neoprene and PFC. Statistical analyses were used to determine significant relationships between barnacle diameter (measure of growth) and fabric. Overall, the most favorable substrates that were colonized by barnacles were neoprene and PFC, followed by satin. Cotton showed a low colonization rate, possibly due to the partial deterioration of the material over time, and velvet showed an inconsistent colonization rate. The settlement preference of barnacles on all fabrics and the PFC was on the bottom half of the floats (away from sunlight exposure) and areas where the fabric folded. This study is the first to provide data to support the estimation of PMSI of clothing fabrics that may be associated with human remains in Australian marine waters.

Barnacle, Colonization, Postmortem Interval

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