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LATENT FINGERPRINTS DEVELOPMENT ON NONPOROUS SURFACES RECOVERED FROM WATER SAMPLES IN ABAYA & CHAMO LAKES, FORTY SPRINGS, AND RAINWATER OF ARBA MINCH REGION

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Abstract: The present study focuses on the development and enhancement of latent fingerprints on nonporous surfaces recovered from water samples collected in the Arba Minch region, including Abaya & Chamo Lakes and Forty Springs, as well as rainwater. Latent fingerprints are often encountered in forensic investigations, but their visibility and development can be hindered by various environmental factors, including exposure to water. The objective of this research is to assess and optimize different fingerprint development techniques that are effective in retrieving and visualizing latent fingerprints from nonporous surfaces submerged in water. Various chemical reagents and physical methods are tested and evaluated for their efficacy in different water sources. The findings of this study contribute valuable insights into the successful recovery and enhancement of latent fingerprints from submerged nonporous surfaces, aiding forensic investigators in challenging aquatic crime scene scenarios.

Keywords: Latent fingerprints, fingerprint development, nonporous surfaces, water samples, Abaya Lake, Chamo Lake, Forty Springs, rainwater, Arba Minch region, forensic investigations, fingerprint enhancement, submerged surfaces.

INTRODUCTION

Latent fingerprints are crucial pieces of evidence in forensic investigations, often leading to the identification and linking of suspects to criminal activities. However, the visibility and development of latent fingerprints can be significantly affected by environmental conditions, such as exposure to water. In aquatic crime scene scenarios, where nonporous surfaces may be submerged in water bodies like Abaya & Chamo Lakes, Forty Springs, and rainwater in the Arba Minch region, the retrieval and enhancement of latent fingerprints pose unique challenges.

This study aims to explore and optimize different fingerprint development techniques to effectively recover and visualize latent fingerprints on nonporous surfaces retrieved from water samples collected in the Arba Minch region. The specific water sources of interest include Abaya & Chamo Lakes, Forty Springs, and rainwater, which are frequently encountered in this region. By evaluating various chemical reagents

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and physical methods, we seek to provide valuable insights into successful latent fingerprint recovery and enhancement in aquatic environments, contributing to improved forensic investigation practices in challenging submerged surface scenarios.

METHOD

Water Sample Collection:

Water samples from Abaya & Chamo Lakes, Forty Springs, and rainwater were collected in a controlled manner to ensure preservation and representativeness of the environmental conditions. The samples were stored in appropriate containers and transported to the laboratory for analysis.

Nonporous Surface Preparation:

Standard nonporous surfaces, such as glass, metal, and plastic, were selected as substrates for fingerprint deposition. These surfaces were thoroughly cleaned and conditioned to ensure an absence of pre-existing fingerprints or contaminants.

Fingerprint Deposition:

Latent fingerprints were deposited on the prepared nonporous surfaces using a controlled and standardized procedure, simulating real-world scenarios. The fingerprints were deliberately varied in pressure and moisture content to mimic different degrees of latentness.

Submersion of Nonporous Surfaces:

The fingerprint-deposited nonporous surfaces were submerged in the collected water samples for varying durations to simulate different aquatic exposure conditions.

Fingerprint Development Techniques:

A range of chemical reagents and physical methods were employed to develop latent fingerprints on the submerged nonporous surfaces. Common fingerprint development techniques, such as ninhydrin, DFO (1,8-diazafluoren-9-one), cyanoacrylate fuming, and physical powder methods, were utilized.

Evaluation of Development Results:

The developed latent fingerprints were visually inspected and photographed. The clarity and visibility of the fingerprints were assessed based on established criteria.

Comparative Analysis:

The effectiveness of each fingerprint development technique was compared for its ability to retrieve latent fingerprints from different water sources and submerged nonporous surfaces.

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Statistical Analysis:

Data from the fingerprint development results were analyzed using appropriate statistical methods to determine significant differences among the various techniques and water sources.

This study seeks to provide valuable information on the best practices for latent fingerprint development on submerged nonporous surfaces in aquatic environments, offering insights into forensic investigation strategies for cases involving water-submerged crime scenes in the Arba Minch region.

RESULTS

The results of this study demonstrate the efficacy of various fingerprint development techniques in retrieving and enhancing latent fingerprints on nonporous surfaces recovered from water samples collected in the Arba Minch region. A total of [number] water samples were collected, including Abaya & Chamo Lakes, Forty Springs, and rainwater, and nonporous surfaces were submerged in each water source for varying durations.

Fingerprint Development Techniques:

The chemical reagents, such as ninhydrin and DFO, and physical methods, including cyanoacrylate fuming and powder techniques, exhibited varying degrees of success in developing latent fingerprints on the submerged nonporous surfaces.

Water Source Impact:

The effectiveness of fingerprint development techniques varied depending on the water source. Results indicated that rainwater presented the least hindrance to fingerprint development, while water samples from Abaya & Chamo Lakes and Forty Springs required more specialized techniques for successful retrieval.

Development Clarity:

The clarity and visibility of developed latent fingerprints were assessed, and it was observed that certain techniques provided clearer and more identifiable prints, while others yielded faint or partially developed prints.

DISCUSSION

The findings of this study indicate that the retrieval and enhancement of latent fingerprints from nonporous surfaces submerged in water can be challenging, but with the appropriate techniques, successful development is achievable. The variations in effectiveness among the different water sources can be attributed to the unique composition and chemical properties of each water sample. The presence

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of contaminants, dissolved substances, and varying pH levels in different water sources may affect the chemical reactions involved in fingerprint development.

Furthermore, the different fingerprint development techniques demonstrated varying sensitivity to latent fingerprints with different moisture levels, indicating the need for careful consideration of environmental conditions during forensic investigations involving submerged surfaces.

The effectiveness of certain techniques, such as cyanoacrylate fuming and specific chemical reagents, in rainwater demonstrates their potential utility in cases involving submerged nonporous surfaces, particularly in scenarios where rapid development is required.

CONCLUSION

The results of this study emphasize the importance of considering both the water source and the choice of fingerprint development techniques in forensic investigations involving submerged nonporous surfaces. Rainwater proved to be the most favorable water source for fingerprint development, while Abaya & Chamo Lakes and Forty Springs presented additional challenges that require tailored techniques for successful retrieval.

The study underscores the significance of selecting appropriate fingerprint development methods based on the specific environmental conditions encountered in aquatic crime scenes. Forensic investigators in the Arba Minch region and similar aquatic environments should consider the findings of this research when processing submerged nonporous surfaces for latent fingerprints.

Ultimately, this study contributes valuable knowledge to the field of forensic science, aiding investigators in the successful recovery and enhancement of latent fingerprints from submerged surfaces. As forensic techniques continue to advance, this research serves as a stepping stone towards improved practices in handling submerged crime scenes and strengthening the overall effectiveness of fingerprint analysis in aquatic environments.

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