H43 Detecting Submerged Remains: The Application of Side-Scan Sonar to Forensic Contexts

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After attending this presentation, attendees will understand the application of side-scan sonar to forensic contexts, and specifically how this technology is used to detect submerged human remains. Successful case studies will be presented so that attendees will be introduced to both the advantages and the limitations of utilizing side-scan sonar to detect submerged bodies.

This presentation will impact the forensic science community by providing a better understanding of the application of side-scan sonar to the search for submerged bodies and associated evidence.

Forensic anthropologists and archaeologists frequently work with law enforcement to search for and recover bodies and associated evidence. At the same time, they are continually involved in improving various search methods, particularly with the use of geophysical tools for grave and buried evidence detection. The challenges of forensic searches can be even more confounded when dealing with submerged bodies. While traditional search methods involve multiple divers, side-scan sonar is increasingly replacing divers for the initial search. Side-scan sonar has been an important search tool for locating sunken ships, downed airplanes, and associated debris. Recently, improvements in the resolution of side-scan sonar have enabled the detection of smaller targets such as submerged bodies and evidence. As a result, more law enforcement agencies have acquired and incorporated side-scan sonar into their search and recovery protocols; therefore, forensic anthropologists should be familiar with this remote sensing technique and be involved with the recovery of submerged remains, particularly with mass disasters such as plane crashes resulting in body fragmentation. The goal of this paper is to discuss the methodology of side-scan sonar while emphasizing how this technology can be utilized to detect submerged human remains by drawing from forensic case examples.

Side-scan sonar consists of a towfish, containing the transducer, connected by a cable to a monitor with an attached differential global positioning system (GPS) unit. The operation of the sonar involves a boat dragging the towfish, which emits repetitive pulses into the water. The returning echoes are received by the towfish, which are converted into a digitized signal to discern features on the bottom surface. The sonar operator uses the differential GPS to plot the path of the sonar and ensure that the entire search area is covered. Once a feature is detected, a surface float is used to mark the location so that divers can then investigate. The experience of the sonar operator is paramount when interpreting the sonar data. Targets, such as submerged bodies, are recognized by the combination of the shape and shadow formation, with confirmation of the approximate target size. Additionally, the operator must distinguish between features and aspects of the terrain that reduce visibility, such as thick vegetation, irregular bottom surfaces, and debris. There are numerous advantages for using this technology for water searches. These include decreasing the time involved in searches, reducing the number of divers as well as the risk to the divers, and increasing the area searched. Additionally, since the submerged remains are located quicker than traditional methods, the taphonomic effects to the body are decreased.

Side-scan sonar has been used by the Orange County Sheriff's Office Marine Unit since 2007 to search for submerged remains resulting from homicides, plane crashes, car crashes, boat accidents, and accidental drownings. Two successful submerged human remains cases are highlighted to demonstrate the value of this technology for locating submerged bodies. The first case involved a boating accident that resulted in a drowning. Witness statements reported a specific location of the victim, but the victim was located once the search area was expanded. Since the search continued after dark, this case illustrates the utility of side-scan sonar for night-time searches. This case provides an example of ideal conditions resulting in clearly discernable features. The second case discussed involved a jet-ski accident. In this case, the witness accounts provided an accurate location for the search, but the terrain of the lake bed produced additional challenges and highlighted the importance of operator experience. Additionally, this case demonstrated the difficulty involved with data interpretation when the terrain is irregular. Both of these cases illustrate the application of side-scan sonar for forensic contexts and demonstrate the advantages and limitations of this technology when searching for submerged human remains.

Submerged Bodies, Forensic Geophysical Searches, Side-Scan Sonar

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