

# USE OF ACOUSTIC SYSTEMS FOR UNDERWATER ARCHAEOLOGY

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Underwater archaeological investigations begin with search for artifact/monument lying below the water mass. The object of interest may be a shipwreck or a sunken structure of erstwhile flourishing harbour or port. The search by diver has limitations as the exact location may not be known and direct visual prospecting is not always feasible for longer periods.

The use of acoustic systems, mainly developed for marine geological mapping, can help in narrowing down the area for underwater search. The acoustic systems which can be used in deciphering geological parameters are such that essentially converts electrical energy into a series of sound pulses which propagate through water or water sediment interface, get reflected and recorded onboard after reconversion of sound pulse to electrical energy. It is the nature of this pulse, i.e. pulse-length, pulse-width, beam-width and beam-degree that determines its utility. As a rule of thumb, resolution is directly proportional with frequency, while penetration is inversely related with it. Hence, for different purposes various systems have been developed having requisite characteristics.

The high resolution geological and geophysical surveys involve use of dual frequency echosounder, side-scan sonar and subbottom profiler. It is necessary that such surveys are supported by an accurate position fixing system, preferably electronic one. Collection of surficial sediment samples usually

follows such surveys to enable proper interpretation of the indirect information collected.

The shallow water echosounders generally have 210 and 30 KHz frequencies for better resolution and optimum penetration. The echograms provide accurate depth and also the nature of the seabed. The subbottom profiler has dominant frequency of 5 KHz and therefore is useful in obtaining the cross section of the seabed where spatial variations in strata can be traced. The sonographs (records of side-scan sonar) are like aerial photographs as they provide the plan view of the area. Topographical and lithological variations are recorded on sonographs by tonal contrasts.

In initialising the underwater archaeological surveys, the first step is to consider the authenticity and accuracy of the source of information. This would help in deciding total area to survey. Similarly, the size and shape of expected object in original form and deformed condition along with the accuracy of the position fixing system is considered next to decide the grid spacing and scale for surveys and the sweep range of side-scan sonar. Usually about 25% of the area is overlapped while deciding the grid spacing to take care of the deviation of vessel from the planned track due to currents, wind, obstructions, etc.

After the data collection, integrated analysis of the same is carried out to interpret the local geological set-up of the area. Though there are some limitations, comparison with the local land and offshore geology of surrounding area help in identifying the

anomalous features which otherwise may appear to have some interest from the marine archaeological point of view. Such locations are

then selected for the purpose of detail investigations by divers.