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SIDE SCAN SONAR WHAT IS IT?

Sonar (SOund, NAvigation and Ranging) is a technique that uses sound waves to detect and locate objects underwater. Side scan sonar is a specific type of sonar used to image the topography of the seafloor.

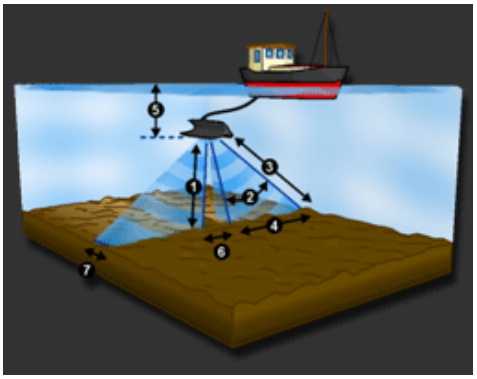
Side scan sonar; also referred to as side-looking sonar and side-imaging sonar; is often towed from a survey vessel and has the ability to capture hundreds of metres of seafloor on each side of the moving vessel. The near photographic quality images produced by side scan sonar along with its ability to map large areas of seafloor quickly make it an essential piece of kit for anyone requiring high definition images of the seabed.

Side scan sonar is used extensively for many commercial, military and leisure applications. Some examples include search and rescue operations, pipeline and cable route surveys, mine detection, fish finding, wreck hunting, recovery of drowned victims, marine archaeology and geological surveys.

Read about more seabed imaging applications using side scan sonar.

SIDE SCAN SONAR HOW DOES IT WORK?

Side scan sonars transmit a narrow fan-shaped acoustic pulse (ping) perpendicular to its direction of travel. As the acoustic pulse travels outward from the side scan sonar, the seabed and other objects reflect some of the sound energy back in the direction of the sonar (known as backscatter). The travel time of the returned pulse is recorded together with its amplitude as a time series and sent to a topside console for interpretation and display. The topside console stitches together data from successive pulses, creating a long continuous image of the seafloor as the side scan sonar is towed from a survey vessel.



The numbers on the diagram show...

1. Depth to inside of acoustic path.
2. Vertical beam angle.
3. Range setting in software (maximum acoustic range).
4. Swath width accross seafloor.
5. Tow depth of side scan sonar.
6. Port and starboard channel separation.
7. Horizontal beam width.

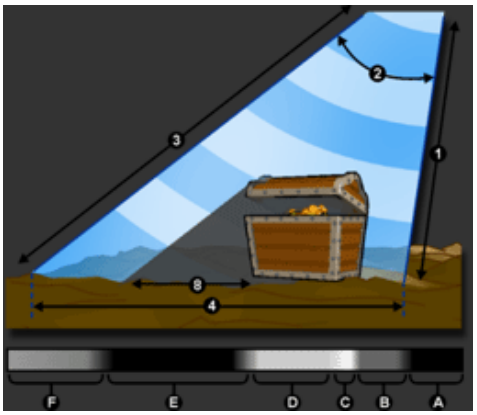
SIDE SCAN SONAR INTERPRETATION OF IMAGES

As with any acoustic sonar, side scan sonars only show echoes of objects that reflect sound back to the side scan sonar transducer, such that hard shiny surfaces are sometimes only seen when they are at right angles to the sonar and rough seabed textures can blot out smaller targets completely.

Materials, such as metals, boulders, gravel or recently extruded volcanic rock, are very efficient at reflecting acoustic pulses (high backscatter). Finer sediments like clay and silt, on the other hand, do not reflect sound well (low backscatter). Strong reflectors create strong echoes, while weak reflectors create weaker echoes. Knowing these characteristics, you can use the strength of acoustic returns from the side scan sonar to examine the composition of the seafloor and any objects which may lay on it.

Have a look at the diagram below to see how a typical sonar scanline is built from the strength of acoustic returns to the sonar.

1. Depth to inside of acoustic path.
2. Vertical beam angle.
3. Range setting in software (maximum acoustic range).
4. Swath width accross seafloor.
8. Acoustic shadow length, corresponding to



height of target.

A. Area before first "bottom" return (no sound = black).
B. Seabed texture.
C. Very reflective corner of object (brightest intensity).
D. Reflective object (target).
E. Acoustic shadow of target (no returns in here!).
F. Seabed texture.

Interpretation of side scan sonar data develops with experience. Side scan sonar reflections of isolated small objects give no indication of shape or attitude. Man made structures, such as platforms or rock walls tend to have regular patterns that are easier to identify.

Using a side scan sonar is rather like looking at a world made of shiny black plastic, in the dark, with only a narrow torch beam for illumination. Remember that when close to large objects, or in a depression in the seabed, that the viewing range of the side scan sonar may be severely limited.

Very strong reflectors may give multiple echoes along a bearing line, and are identified by being equispaced in range. The plan view provided by the side scan sonar also does not show how high an object is, unless an acoustic shadow is cast, in which case the length of the acoustic shadow is related to the height of the object, its range, and the height of the side scan sonar.

View side scan sonar images at the StarFish Gallery.