

## 3DSS Sonar Data Example: Detection and Identification of Moored Mine-like Objects

Sonar Model: 3DSS-DX-450  
 Sonar Mount: USV 2600 Catamaran center pole  
 Sonar Depth: Approximately 1m below surface,  
 Sonar Control Software: 3DSS-DX Control Application (by Ping DSP)  
 Sonar Display Software: 3DSS-DX 3D Sidescan Display (by Ping DSP)  
 Data Location: Halifax, NS, Canada  
 Average Water Depth: 15m

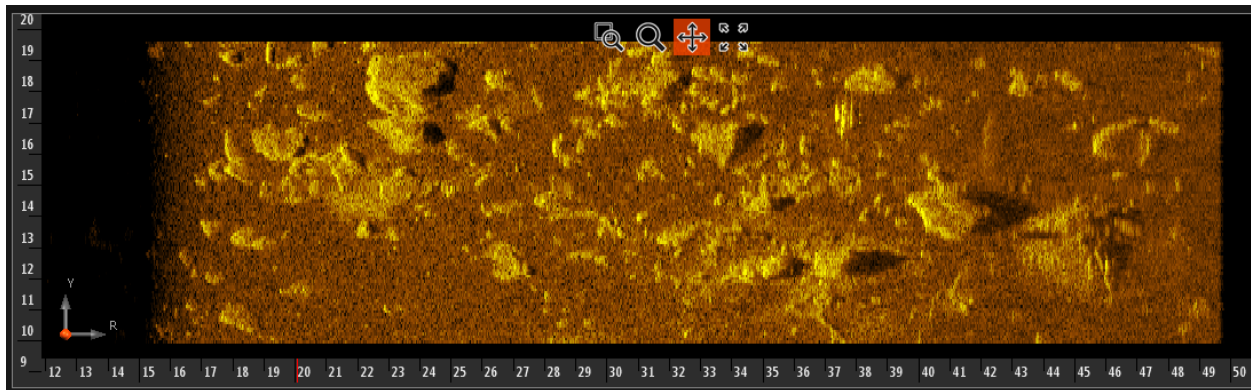


Figure 1: Detection of Mine-like objects can be challenging using 2D Sidescan - especially in rocky areas

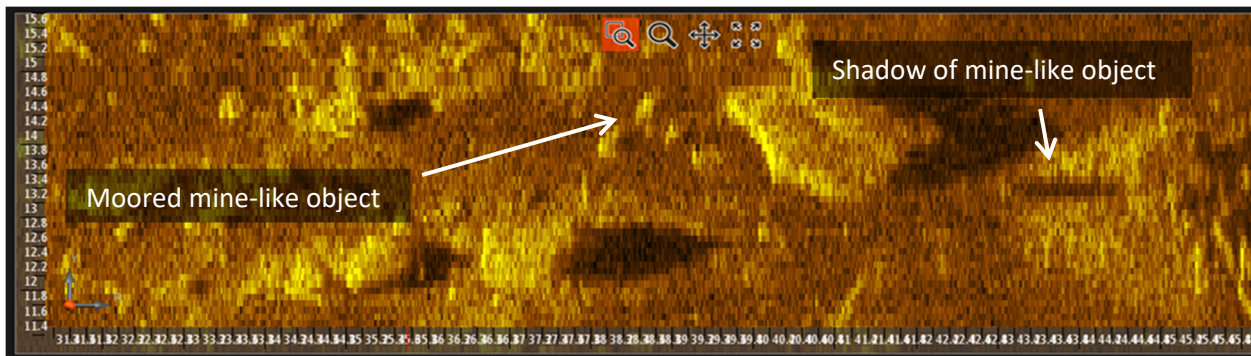


Figure 2: Expanded view of 2D Sidescan image (stbd only) indicating location of moored mine-like object and its shadow. Note how difficult it is to detect the target without prior knowledge of its location.

Figures 1& 2 show a small section of 2D sidescan data (starboard side only displayed) from the 3DSS-DX output in a rocky region of Halifax Harbour. A moored mine-like object (1m steel sphere) is anchored ~3m above the seabed and its shadow can be seen in the expanded view of Figure 1b. Shadows from the rock debris along with the separation between the target and its shadow make it difficult to detect the mine-like object by eye and even more difficult using Automatic Target Recognition (ATR).



Figure 1: Geometrically correct 3D Sidescan viewed from directly overhead and colored by backscatter intensity.

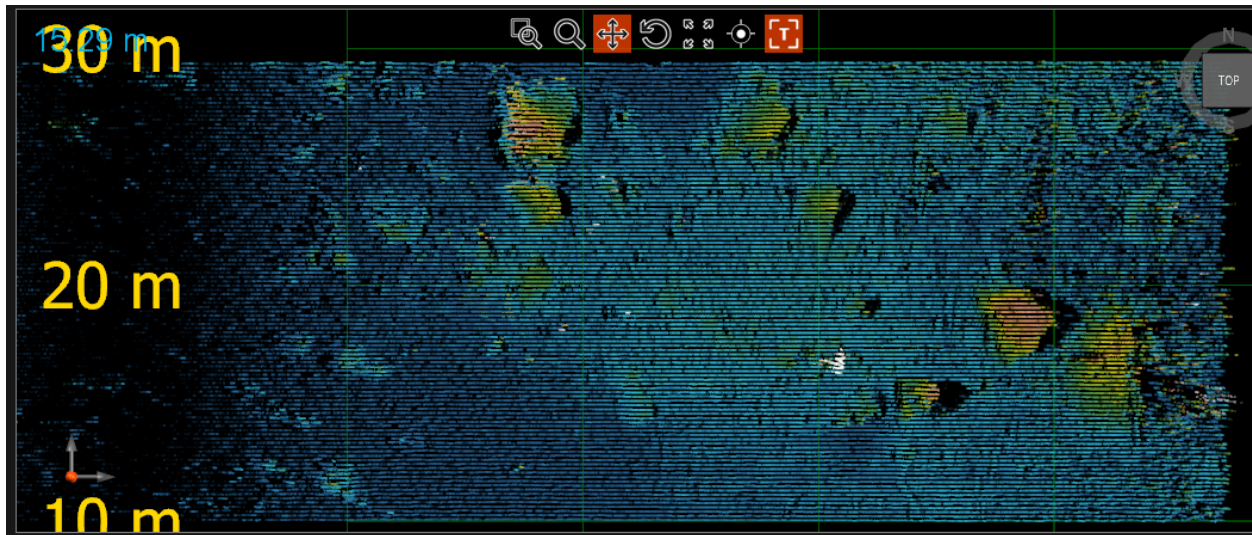


Figure 2: Geometrically correct 3D Sidescan viewed from directly overhead and colored by depth. Note that the target is now readily identifiable.

Figures 3 & 4 show the same section of the seabed imaged using geometrically correct 3D sidescan viewed from overhead for comparison with 2D sidescan. Figure 4 then colorizes the 3D image data by depth which highlights the mine-like target making it easy to detect even in this 2D overhead view.

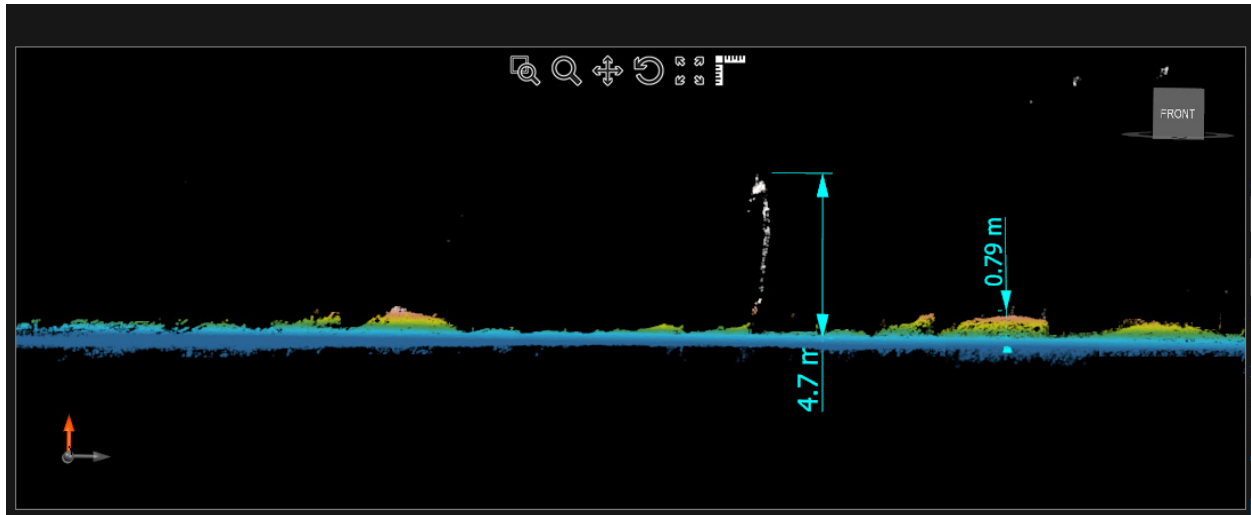


Figure 3: 3D Sidescan profile view, colored by depth and showing the target and its mooring extending above the seabed with a height measurement. Note that seabed relief and other vertical features such as rocks are also easier to visualize and measure correctly as true three-dimensional objects.

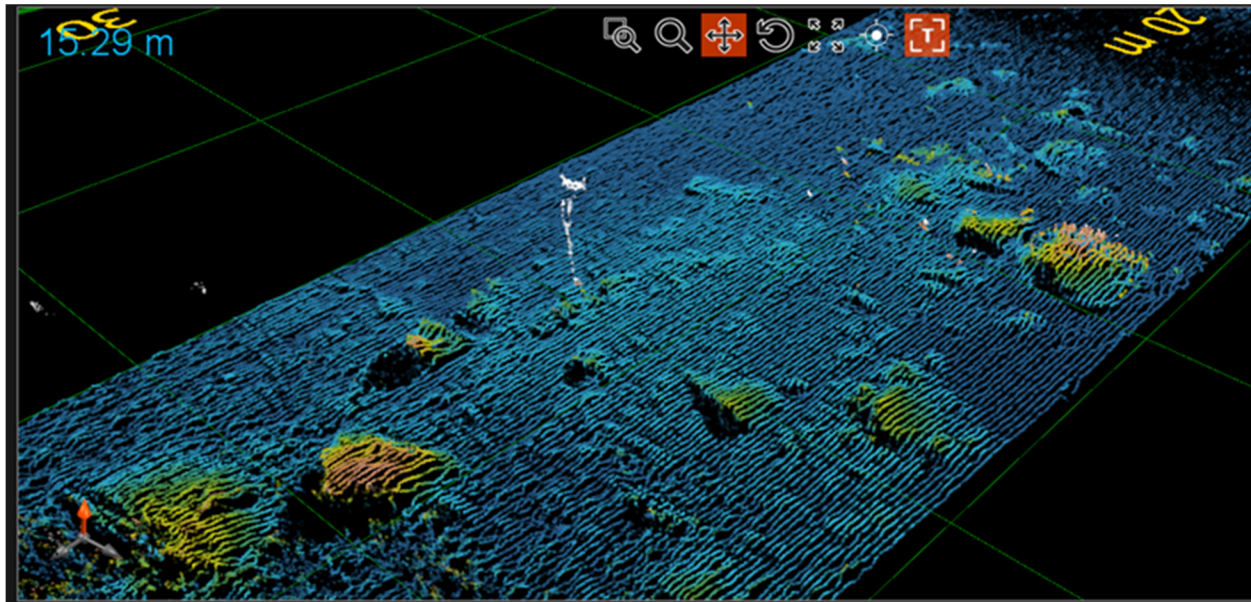


Figure 4: Reversed and tilted 3D Sidescan view showing target and mooring above the seabed and distinct from the rocky debris.

Figures 5 & 6 again show the same section of the seabed imaged using geometrically correct 3D sidescan viewed from two additional perspectives. In Figure 5 the view is rotated to show a side view of the seabed and the moored mine-like object and its anchor chain are readily apparent. Height measurements made with the real-time software are also shown for the moored target and a rock on the seabed. Figure 6 shows a perspective view looking back towards the sonar showing the moored target and the rock debris.