

# Advances & Challenges in Topo-Bathymetric Lidar Processing

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The coastal zone is a challenging place to map, techniques for mapping the land elevation do not work under water and echo-sounding methods for mapping the seabed elevation work well in deep water but are dangerous and expensive in shallow water. Airborne topo-bathymetric lidar (TB-lidar) is an ideal tool to collect data in this environment provided the water clarity conditions are suitable. TB-lidar sensors continue to improve with advances in data processing techniques. For example, the NSCC's Leica Chiroptera system was upgraded to 4X which increased the bathymetric point density by a factor of 4. Experiments were carried out to evaluate and validate the potential benefits of the increased point density for a study site in Nova Scotia that has been surveyed regularly since 2014. The 4X upgrade aided in the maximum depth increase of 2-3 m. Solid 1 m-3 cubes (white & green) were deployed at various depths on the seabed. In all cases, the number of points defining the white cubes increased by 25% and the apparent size of the cubes increased with depth. The point density of the green cube was less than that of the white cube, confirming the importance of reflectivity of the seabed for target detection. Practical applications of the enhanced point density include improved detail of the seabed morphology (charting) and the ability to map submerged aquatic vegetation (seagrass) within the point cloud directly (benthic habitat mapping) as well as more detailed riverbed morphology. Challenges still exist to extract benthic habitat maps from TB-lidar datasets that were not originally intended for those purposes and recommendations are presented to improve specifications to ensure the data collected for charting can be used for multiple applications.

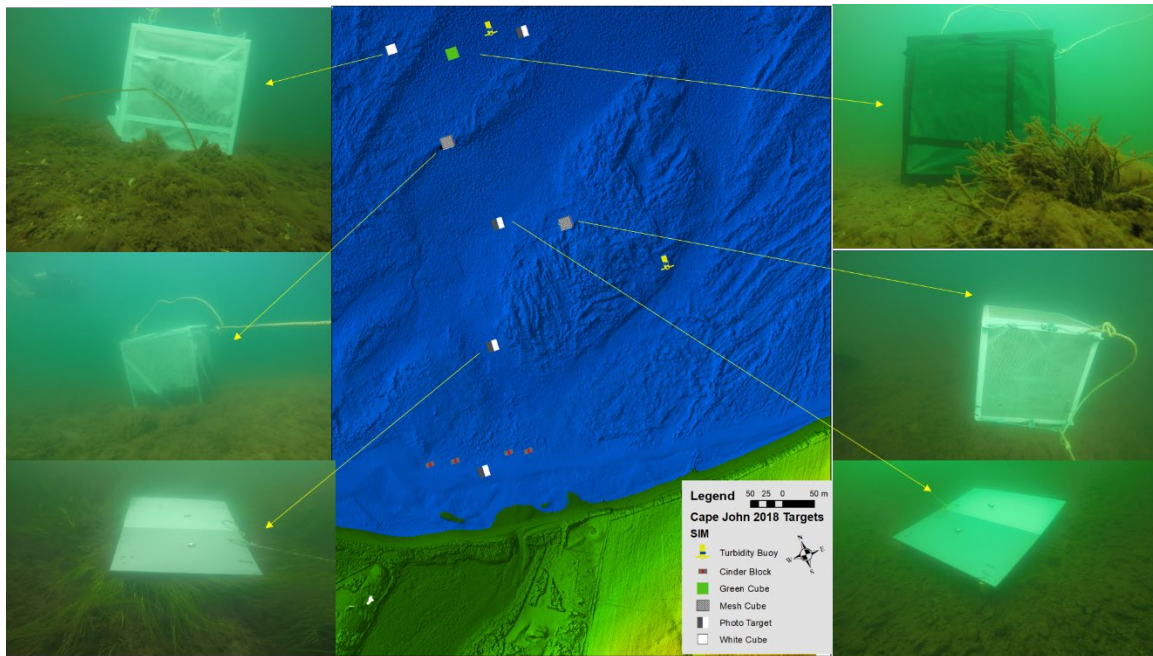


Figure 1 Example of solid and mesh cubes and flat targets deployed on seabed for TB-lidar experiment.