BioBase survey report

Semer Water, 21 September 2023

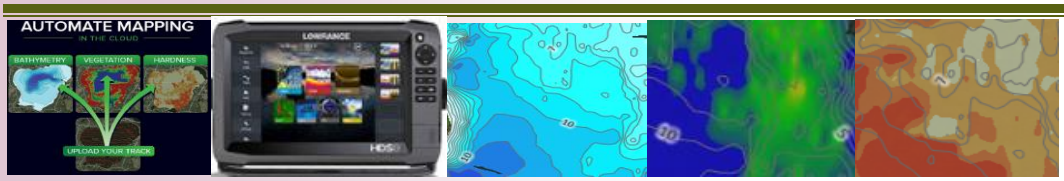
This report is a summary of the results from a BioBase acoustic habitat mapping survey. The survey was carried out by A&R Yorkshire to supplement a lake macrophyte survey. The primary information provided is bathymetry, vegetation and bed type mapping of the lake. There is some discussion of fish distribution within the lake. These acoustic results aim to support an evidence-based approach to fisheries and environmental management.



North shore 4 September 2023 during macrophyte survey.

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Survey date	21 September 2023

"You can't protect and manage water, habitats and fisheries without good data."



Site and method information

Semer Water is situated in the Yorkshire Dales, England, and it is the second largest natural lake in North Yorkshire after Malham Tarn. It is a glacial lake which was formed at the end of the last Ice Age when huge amounts of glacial till blocked the outflow. It is half a mile (800 m) long, covers 100 acres (0.40 km2) and lies in Raydale, and is the source of the River Bain. The lake is a Site of Special Scientific Interest, first notified in 1975. A private pay and display parking area is present at the northeast end of the lake. Semer Water attracts canoers, windsurfers, yachtsmen and fishermen. The lake is reported to have both trout and coarse fish. The survey was conducted on the 21 September 2023 and there had been heavy rain in the previous days and the lake level had risen significantly and started to drop since the Lakes macrophyte survey carried out on the 4 September 2023.

Data was collected using a Lowrance HDS sounder with a standard 83/200kHz skimmer transducer. The transducer was fixed to the side of the boat using a mounting bracket and fixed at a depth of approx 30cm and the sounder set to record SL2 files. 21 Parallel transects were then run from the south west end of the lake. Transects were spaced at approx. 35 m intervals with variable speed of data collection. Occasional wider spacing, due to wind drift, resulted in an analysis buffer spacing of 35 m to prevent data gaps in the report maps. Coverage was as complete as possible, avoiding only those areas where shallow water or obstructions may cause transducer damage. After completion of the survey the data was uploaded to the cloud based automated vegetation mapping platform BioBase. BioBase (biobasemaps.com) is a commercial cloud platform specifically focused on automating the processing and map creation from off-the-shelf sonar (EcoSound) and very high resolution satellite imagery (EcoSat).



Figure 1. Site location (red diamond) map.



Figure 2. Semerwater and tributaries

- NGR (centre of lake): SD 9194187223
- 31.2 hectares (29.9 surveyed)
- Altitude approx. 246m
- Transducer depth = 0.3 m below water surface.



Figure 3. Survey data collection setup (Hay a Park)



Figure 4. The north east end Semer Water, 21 September during the BioBase survey



Figure 5. levels at the outflow on the 21 September 2023 and wrack line showing the previous days level



Figure 6. Survey transect design.

Habitat survey results

Data Glossary

[1] Geostatistical Interpolated Grid: Interpolated and evenly spaced values representing kriged (smoothed) output of aggregated data points.

[2] A single point represents a summary of sonar pings and the derived bottom and canopy depths. Individual point data create an irregularly spaced dataset that may have overlaps and/or gaps in the data resulting in an increased potential for error.

[3] Percent Area Cover: Refers to the overall surface area that has vegetation growing.

[4] Percent biovolume (otherwise known as Percent Volume Inhabited or PVI) represents the percent of the water column occupied by plant matter at each GPS location. It's a simply plant height divided by water depth multiplied by 100 for the collection of pings bound to each GPS location along a travelled path. Biovolume ranges from 0% (bare bottom) to 100% (vegetation growth to the surface).

[5] Bed hardness is a measure of acoustic 'reflectivity'. The hardness data generated is on a relative but continuous scale that ranges from 0-0.25 (soft), 0.25-0.4 (medium), 0.4-0.5 (hard) and >0.5 (v. hard). Soft bottoms include loose silt or sand. Hard bottoms are compacted sand, gravel and rock.

Survey Results

The Figures 7-9 below show a summary of Bathymetry, substrate hardness measured by acoustic reflectivity and an assessment of macrophyte biomass and coverage. At present, no post-survey processing of the fish population data is conducted by BioBase. Future software developments that are in progress will hopefully enable the analysis of fish data. In the interim three screenshots Figures 10-12 have been included that also contain the raw echograms showing fish tracks from the transects. The red lines are the transect and the yellow dot is the position of the boat on the screenshot.

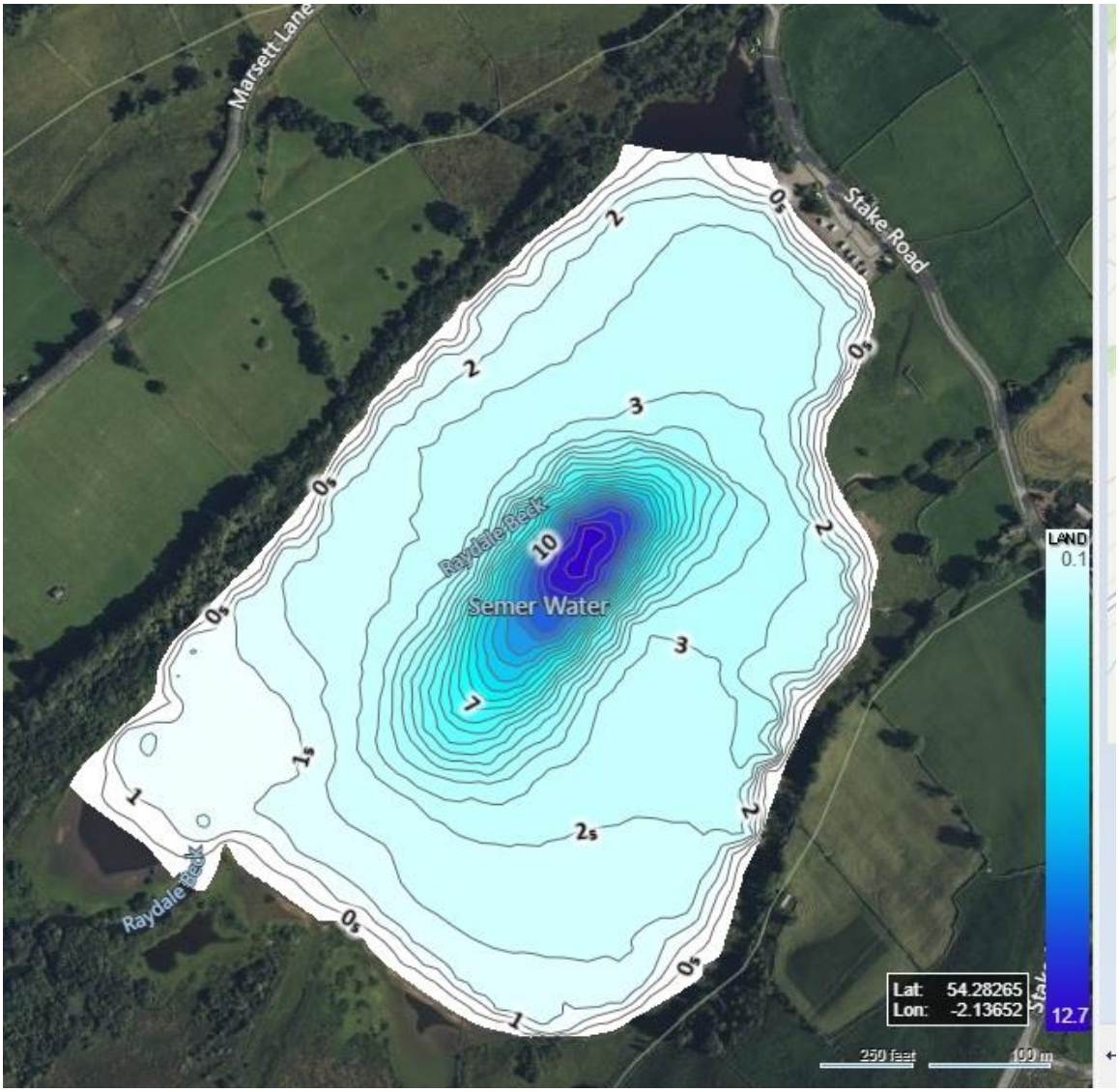


Figure 7. Bathymetry map (0 m – 12.8 m).

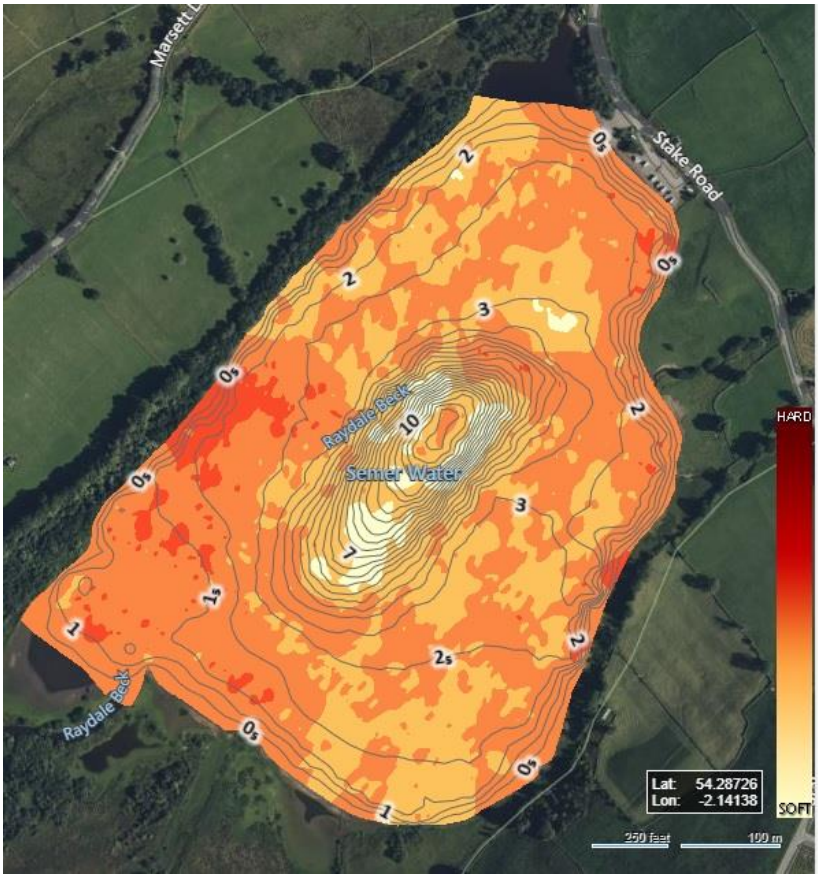


Figure 8. Bed hardness map (relative hardness: soft – v. hard)[5]

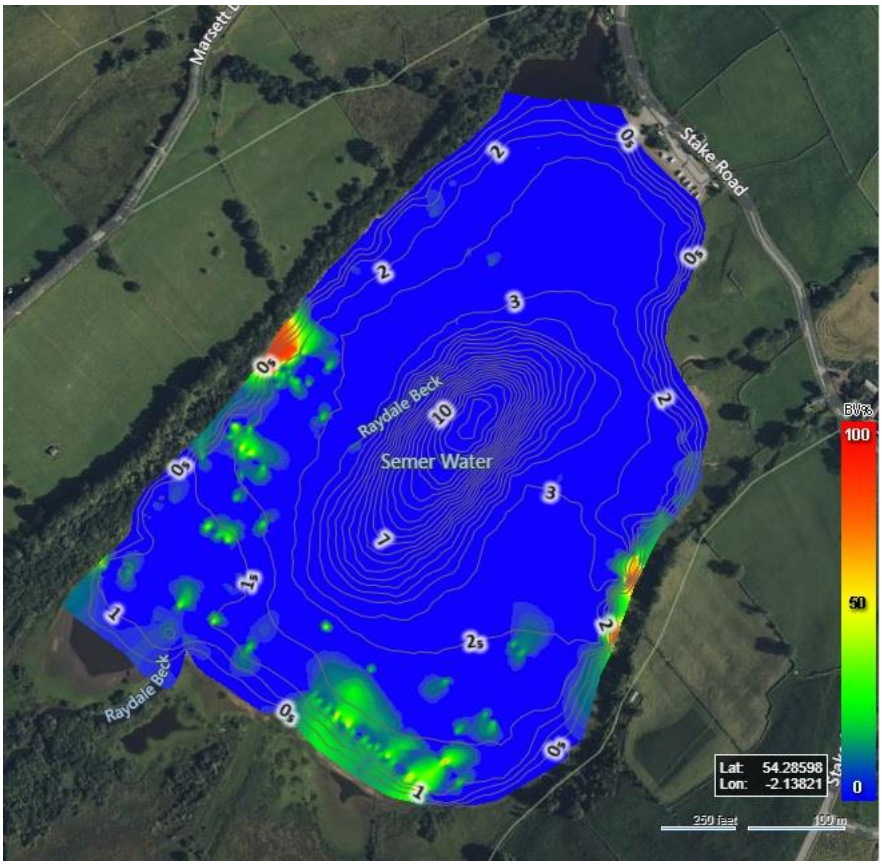


Figure 9. Vegetation map (percent biovolume: 0-100)[4]

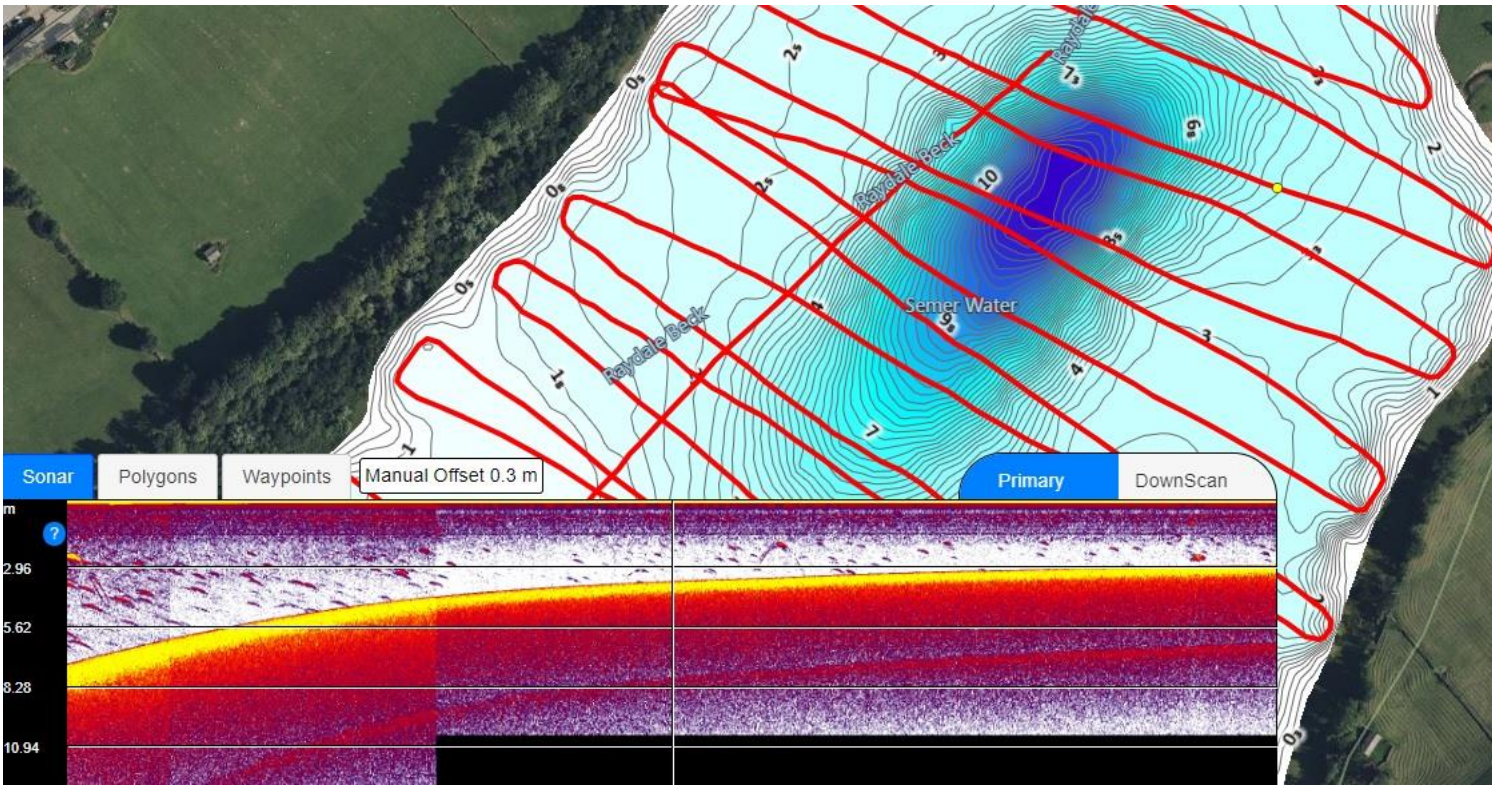


Figure 10. Bathymetry with echogram of eastern shore showing the acrs of fish echoes

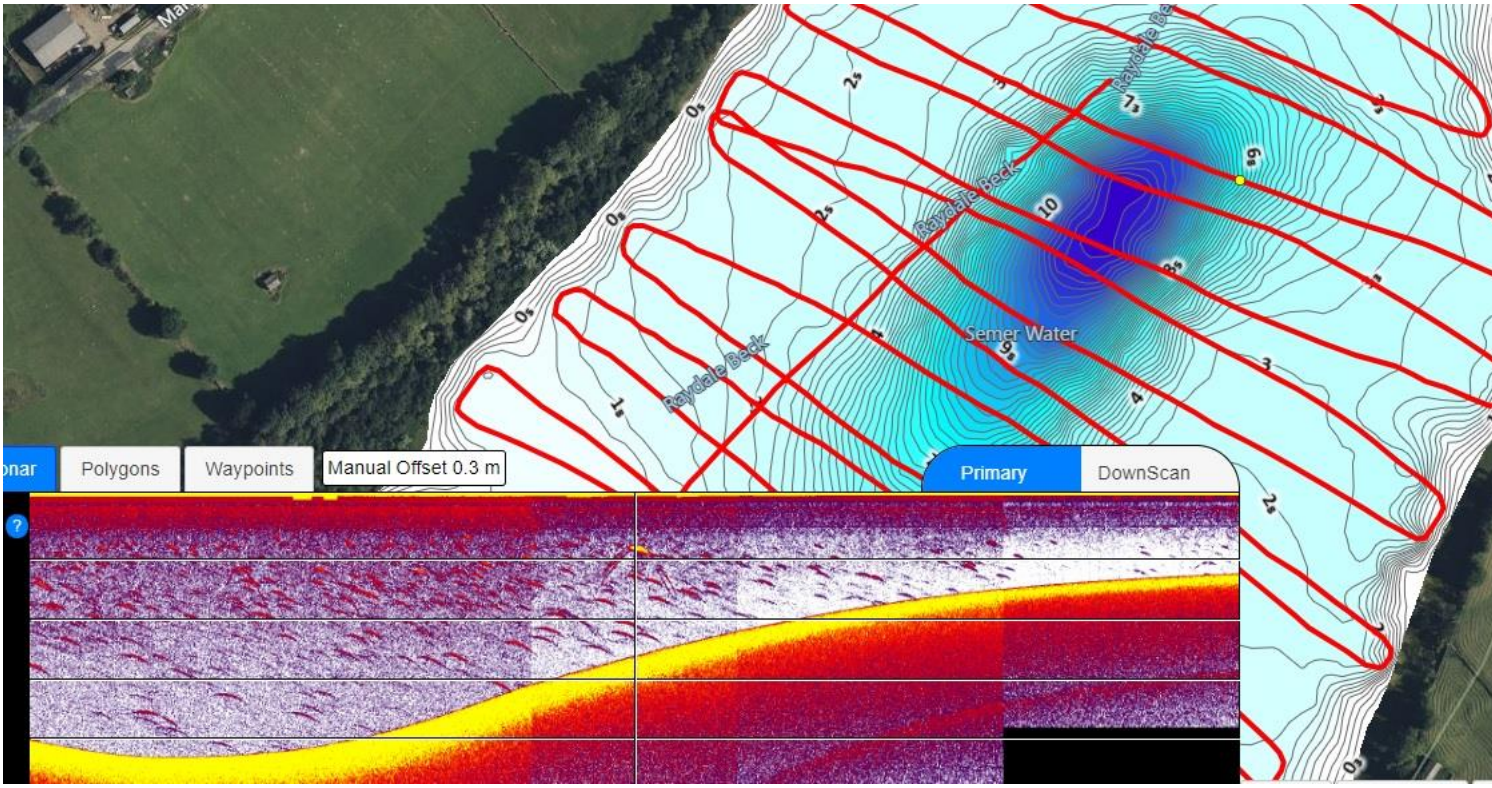


Figure 11. Bathymetry with echogram showing eastern edge of deeps with the acrs of fish echoes.

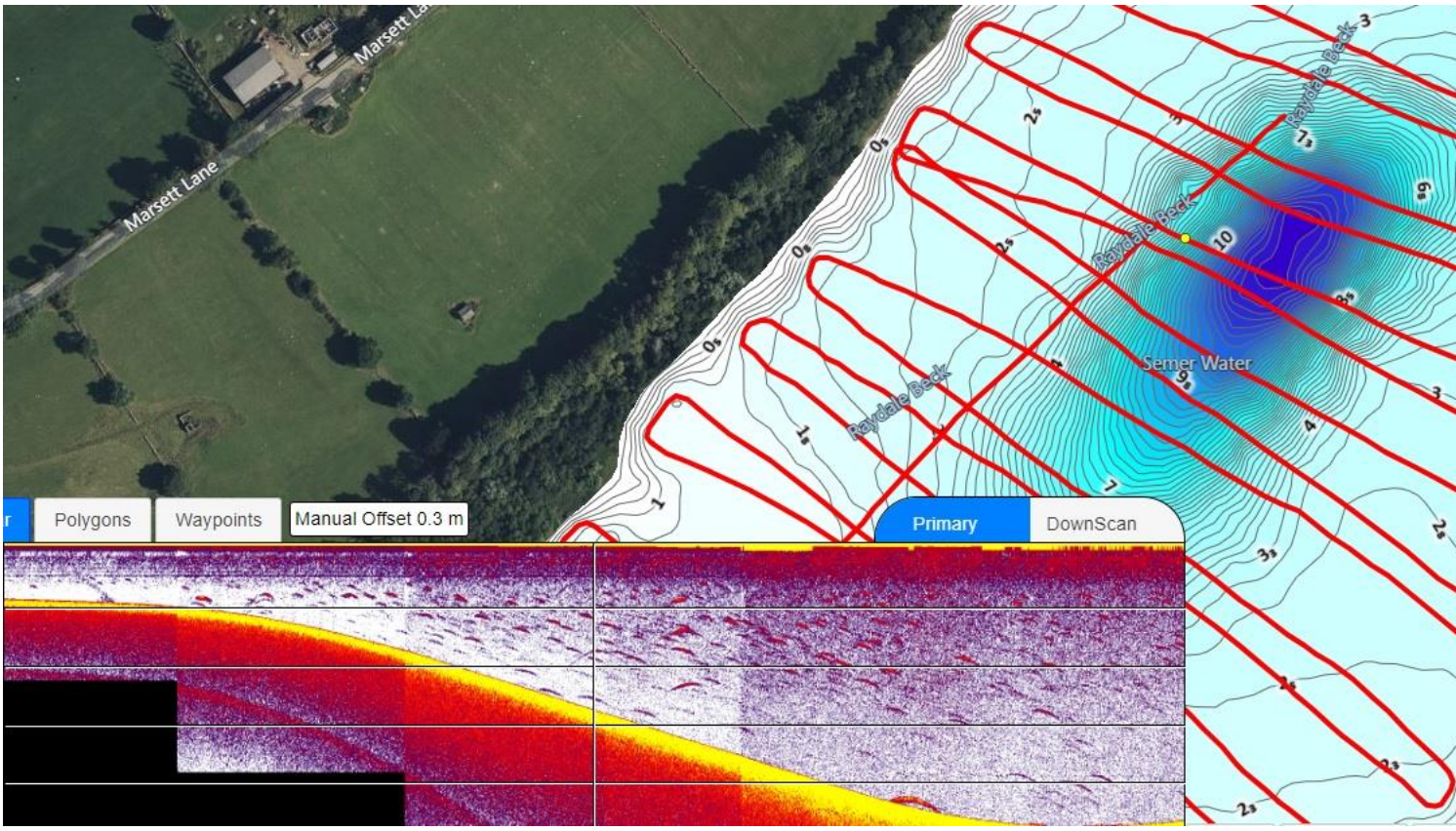


Figure 12. Bathymetry with echogram showing western edge of deeps with the acrs of fish echoes

Summary

The total transect length covered was 8.4km. Although all effort was made to achieve constant data collection, individual point data created some irregular spaced data with overlaps and/or gaps resulting in an increased potential for error. Bathymetry, vegetation and bed composition analysis therefore used grid data for most analysis with point information confined to singular point metrics such as maximum depth.

Bathymetry data shows a maximum depth (point) of 12.7 m. The deepest water was recorded in the middle of the lake. A deep hole was found in the centre. The shallowest (<1m) water is confined to the lake margins. The total lake volume, based on the collected depth data, is estimated at 887226 m^3.

Submerged vegetation was scarce and covers only a small percentage of the lakebed. Where present, it remains close to the bed and did not extend substantially into the water column.

Lake bed surface composition data indicates a relatively varied bed hardness. Accurate assessment of the exact bed type would require the collection of samples to ground truth the acoustic data. Bed composition data is based on the reflective nature of the surface material. No information on sub-surface bed material type or strata depth is provided.

Although not strictly part of the BioBase survey some interesting trends were seen in the pattern of fish targets in the transect lines echograms and figures 9-12 illustrate this. It must be borne in mind that fish distribution over time will vary with conditions, and this represents a snapshot in time. There were very few fish in the shallow <3m areas of the lake and the tracks that are visible seem to represent smaller fish. Larger numbers of fish of a larger size are recorded in the deeper sections of the lake where the depth is greater than 3m and at a variety of depths. There seem to be a greater variety of sizes of targets in the deeper areas and there seems to be an aggregation of the largest fish on the western edge of the deep section. This is a preliminary assessment of these echograms and the BioBase technical team have been contacted and a meeting is scheduled in late November where there will be an opportunity to discuss the echograms from a fish perspective.

Further information

A copy of the automated vegetation analysis report for this survey is available

If you would like to discuss the information presented in this report, please contact Barry Byatt:

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