

Hydroacoustic fish population survey

The Middle Level Main Drain

Surveyed April 2023

This report provides a summary of results from our recent hydroacoustic fish population survey of the Middle Level Main Drain between Mullicourt Aqueduct and St Germans. The survey was carried out to assess the health of the river and enable management of our principal fisheries.



Image 1: Our 'mini' hydroacoustic boat moored at St Germans pumping station. The vessel is based upon a small aluminium punt which we have modified to mount twin acoustic units (split beam and side scan). Such a small craft is ideal for short surveys such as on the Middle Level Main Drain.

Summary

- The Middle Level Main Drain (M.L.M.D) was surveyed on the 20th of April 2023.
- A total of 25km of channel was sampled.
- For ease of analysis the data reported is split into three reaches, the limit of each being demarked by an obvious feature.
 1. Mullicourt Aqueduct to Neeps Bridge
 2. Neeps Bridge to Magdalen Bridge
 3. Magdalen Bridge to St Germans
- Sampling occurred along each bank and both passes were completed on the same night. This will minimise the influence that fish movement between passes may have on the stock distribution recorded.
- Although the M.L.M.D is not a traditionally flowing watercourse, our survey passes will be described as upstream and downstream for ease of description with Mullicourt Aqueduct considered the upstream location and St Germans the downstream point.
- The average fish density derived from the upstream and downstream runs equate to 6.6 fish per 1000m³ and 7.8 Ind./1000m³ respectively, giving an overall population estimate of 7.2 Ind./1000m³.
- These results seem somewhat low, particularly when compared to recent surveys on the Ely Ouse and Relief Channel (44 Ind./1000m³ and 20 Ind./1000m³ respectively)

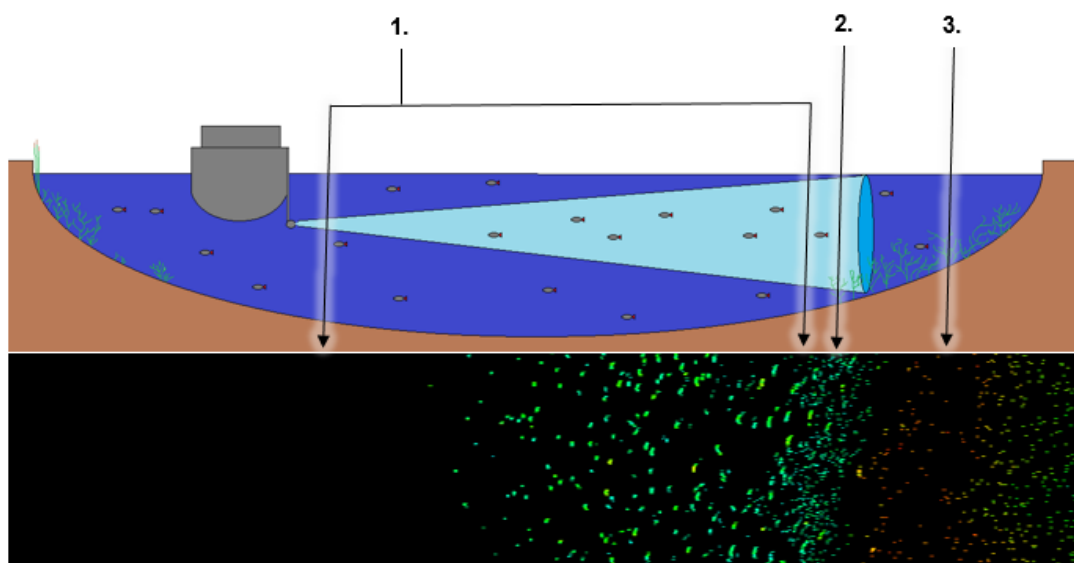
- There is currently no viable long-term population estimate against which the 2023 result can be assessed. This shortcoming will be explained later in this report.

Survey technique

- Our hydroacoustic survey technique utilises sound waves (pings) that are fired across the river channel at a rate of 10 'pings' per second. These 'pings' are reflected back to the transducer from objects within the 4m x 10m elliptical beam and depending on the strength of the returning echo the nature of the reflective object can be determined.
- Solid items such as the far bank, bridge supports and riverbed give extremely strong returns; whilst echoes from fish, or more accurately from fish swim bladders, give a moderate return and surface scatter gives a much weaker echo (See **Image 2**).
- Reflected echoes are recorded and analysed by an on-board laptop computer.
- The survey craft is piloted at approximately 6 km/h, working just off the edge of the marginal shelf to avoid submerged macrophyte growth from wrapping around the sounder unit or minimising sample range.
- The surveys are conducted at night since fish are distributed more evenly throughout the water column during the hours of darkness and this allows them to be easily distinguished from substrate, macrophyte growth and bankside 'clutter'.
- Our hydroacoustic surveys are scheduled by lunar cycle to coincide with a new moon to provide the minimum illumination during the survey period.
- After the survey is complete the acoustic echograms are post-processed and interpreted. Output from this analysis is provided as a fish density estimate (Ind./1000m³) and can also be displayed as density groupings in map format.
- Our survey apparatus uses G.P.S to log the position of the survey vessel and because of this, the data-points on maps 1&2 have been manually offset to the location the acoustic beam was pointing at. This will better reflect stock distribution and avoid data from the left-hand bank being plotted on the right-hand side, and vice versa.

Image 2: A simplified image of the hydroacoustic survey technique and raw echogram output (below).

1. Open water and clearly visible fish echoes.
2. Limit of the 'usable' data surface scatter (light blue) and echoes from rooted plants (light green).
3. Heavy (red and brown) echoes from marginal slope and river bank.



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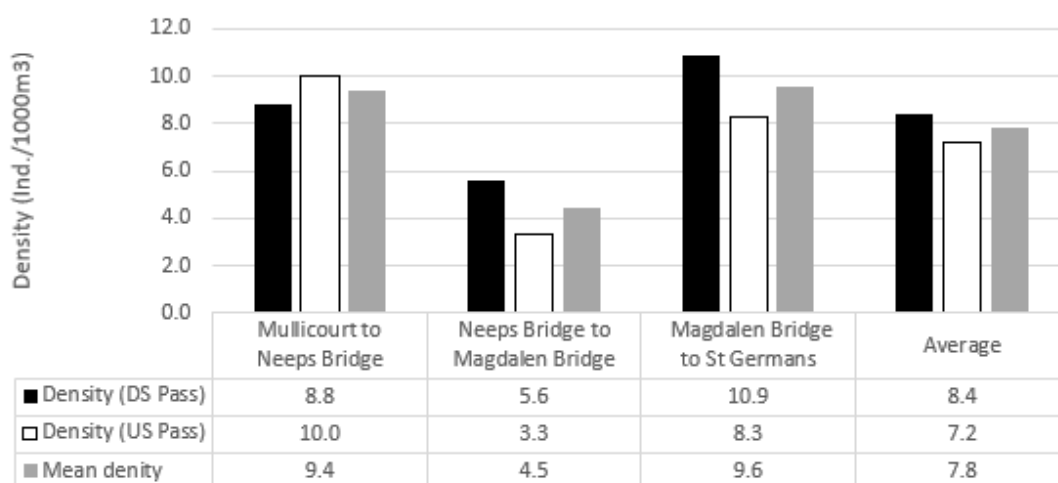
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Results:

The fish density estimate derived from each survey reach is provided as **Figure 1** (below). Stock distribution is also expressed overleaf as **Figure 2** and at the end of the report as **Maps 1 and 2** which display fish density for each 100m length of channel sampled.

Figure 1: Fish density (Ind./1000m³) by survey reach and transect direction



Our survey found somewhat clumped fish distribution with higher stock density noted at either extent of the drain; one area centred on Morton's Bridge, and a second situated between Magdalen Bridge and St Germans. The middle reach between Neeps Bridge and Magdalen Bridges produced the lowest average population estimate, however there were still some areas of elevated density, and these were particularly apparent during the downstream transect. **See Maps 1&2 and Figure 2.**

Long term density:

There is currently no viable long-term dataset or population estimate against which this recent survey result can be meaningfully compared. This is because the M.L.M.D has been difficult to sample effectively (despite seeming well suited for the survey technique) with prior efforts curtailed by extensive macrophyte growth that greatly reduced both survey area and sample volume. Also, the M.L.M.D survey is scheduled to be sampled triennially, rather than annually such as the Ely Ouse and Relief Channel, meaning there is a smaller dataset to examine.

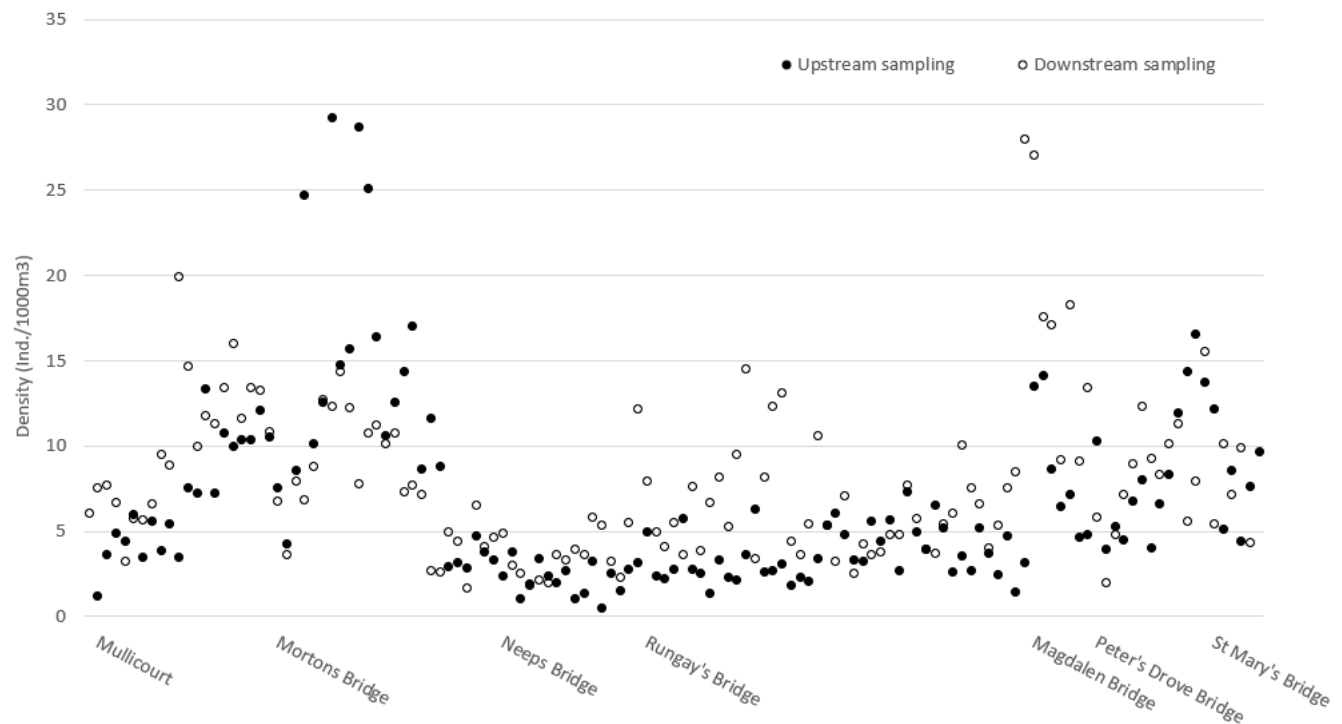
Because of the macrophyte issues experienced in previous surveys it was decided that we should attempt sampling before submerged plant growth could proliferate, and this appears to have been successful, with large survey volumes achieved and excellent acoustic images gained throughout the channel length. There is, however, one drawback to this survey; this being the comparatively low water temperature experienced during the rather cool spring may have reduced fish activity and dispersal, potentially leading to fewer fish observed during the survey. This means that the low-density estimate observed during this recent survey may be an underestimation of the stock currently residing within the channel.

A review of the historic data available from this channel did allow some interesting comparison against results from some seasonal sampling conducted in March, May and August 2009. These surveys found population estimates of 4 Ind./1000m³, 12 Ind./1000m³ and 39 Ind./1000m³ respectively, suggesting significant seasonal variation in the population estimates gained. The recent result from April 2023 (7.2 Ind./1000m³) sits comfortably between the March and May 2009 results, possibly suggesting the current population remains similar to that observed in 2009; however, this is a somewhat tenuous observation, and a second survey would be required later in the season to assess this supposition. It is suggested that a second nights sampling should be attempted (if resource is available), and the resulting population estimate should be reassessed against the 2009 dataset. Of course, this does risk that macrophyte growth will proliferate over the summer and make the survey unfeasible (the very issue which led to this recent survey being rescheduled to April!) It is suggested that the survey should occur in late June or Early July.

A seine netting survey is due to be conducted on the M.L.M.D at Neeps Bridge in summer 2023 to provide species composition and age structure of fish present and the results of this sampling will be added to this report once available.

Justin Mould
A&R
May 2023

Figure 2: Fish density (Ind./1000m3) recorded during upstream and downstream sampling.

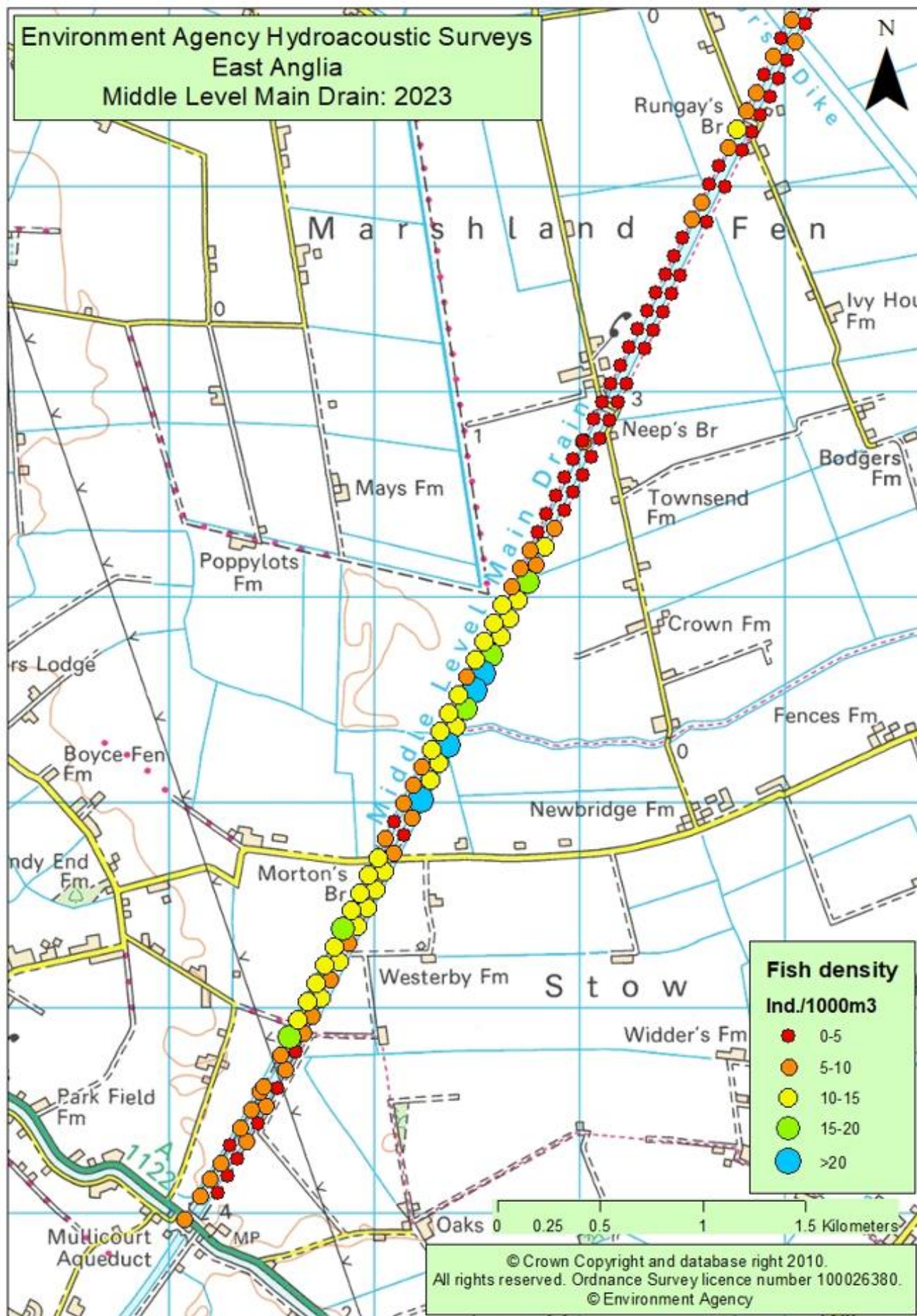


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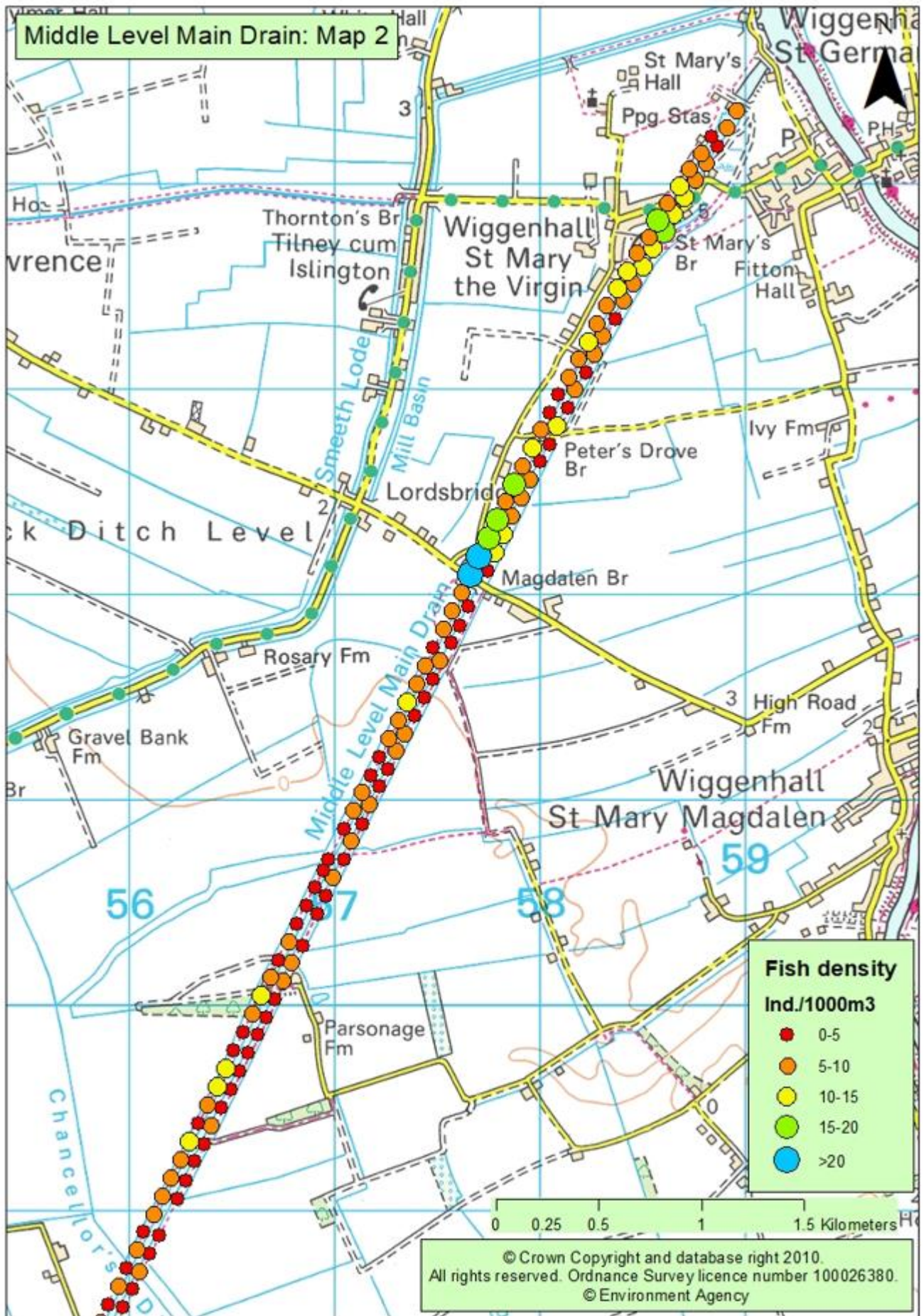


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