

Environment Agency

**Hydroacoustic Survey
Technical Report**

**River Ant
2011**

DRAFT

Executive Summary

- This is the third annual hydroacoustic survey (previous surveys 2004 & 2006).
- Hydroacoustic surveys cover the entire section of the river contiguously. They start and end at Ant mouth (confluence of the river Ant with the Bure), reaching Wayford bridge at the most upstream extent.
- The overall total survey length is approximately 12km (each way). This survey was carried out on 19th October 2011. Data presented is from both upstream and downstream runs combined.
- Overall mean fish density was 34 fish/1000m³ (\pm S.E. 5.9).
- Extensive areas of the lower river exhibited low fish density with higher densities upstream of Ludham Bridge.
- The highest fish densities surveyed (hot spots) (1122 & 1013 fish/1000m³) were located upstream of the Sutton Arm at Wind Pump near Chapel Field and downstream of Wayford Bridge.
- No validation data was available for this survey.

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1.0 Introduction

The River Ant, a tributary of the River Bure, is located in east Norfolk. It flows from its source at Antingham Pools, Antingham, down-stream through the North Walsham and Dilham Canal to Wayford Bridge where it becomes the main section of the river Ant. The River Ant flows south, down-stream to its confluence with the River Bure at Ant Mouth, above St Bennets Abbey (down-stream of Horning). Enroute, the river Ant flows through Barton Broad which is a popular sailing and angling venue.

The River Ant is tidally influenced although the effects are considerably attenuated compared to the larger rivers. The tidal effects for hydroacoustics are not significant and tidal limit is probably Honing Lock. Navigation continues up-stream as far as Wayford Bridge. In the past the North Walsham & Dilham canal, built in 1812 to take Norfolk Wherries, was a transport route for goods to North Walsham and Antingham bone Mills. However, only very small craft and canoes can currently use this part of the waterway. The river lies within the Broads Authority Executive area and forms part of the network of rivers and broads that are the Broads National Park. As such, it provides important recreational opportunities to visitors during the summer and for anglers throughout the year.

Hydroacoustic surveys were started on this system in 2004 following successful trials in two large main rivers (Yare and Waveney) in 2003. Another survey was conducted in 2006. Due to changes in Environment Agency national monitoring priorities, surveys ceased from 2006 until 2011, but are now planned on a triennial basis.

Surveys start at Ant Mouth confluence, are conducted in an upstream direction to Wayford Bridge and then repeated in a downstream direction back to Ant mouth. This allows both banks to be surveyed and gives 2 sets of data for robustness. The survey also encompasses the main navigation channel through Barton Broad. The overall total survey length is approximately 24km (both ways combined & inc. Barton Navigation channel).

2.0 Methods

2.1 Hydroacoustics

An echosounder transmits short pulses of sound (known as 'pings') through a transducer beneath the boat. The sound waves from these pulses reflect off objects with densities different to the surrounding water, such as fish swim-bladders. The transducer picks up these returning echoes and amplifies and records them onto a laptop.

Specialist software translates the survey data into a series of pictures called echograms that show the echo reflections from fish, as well as other material such as weed, silt and debris. An analyst must measure the size of the water column by drawing a line that cuts off weed and debris at the bottom of the river. This determines water volume and enables density to be calculated. Within this volume, the analyst looks for the strong echoes that denote fish, which are counted, and weak or untypical echoes, which seem not to be fish and are not counted. The minimum size of fish that can be identified is approx. 5cm. Density of fish is reported for each surveyed section as fish per 1000m³.

The surveys are conducted at night, since fish are more evenly distributed throughout the water column during hours of darkness and can be more easily surveyed. The absence of other boat traffic also helps greatly.

This method cannot identify the species of fish and only fish >5cm can reliably be seen. It provides an overall density of all fish; for information on species composition and age structure, separate validation surveys are needed by sampling winter fish aggregations. No such surveys were able to be carried out for the 2011 survey of the River Ant.

3.0 Results

The River Ant was surveyed on 19th October 2011. Fig 1 shows a map of the fish densities of each section of the u/s run survey. Typical fish density figures are 0-10 & 26-50 fish/1000m³. Overall mean fish density was 34 fish/1000m³ (\pm S.E. 5.9), a decrease over the previous 2006 estimate, 40 fish/1000m³ (\pm S.E. 4.8) and lower than the initial 2004 survey (Fig. 3a).

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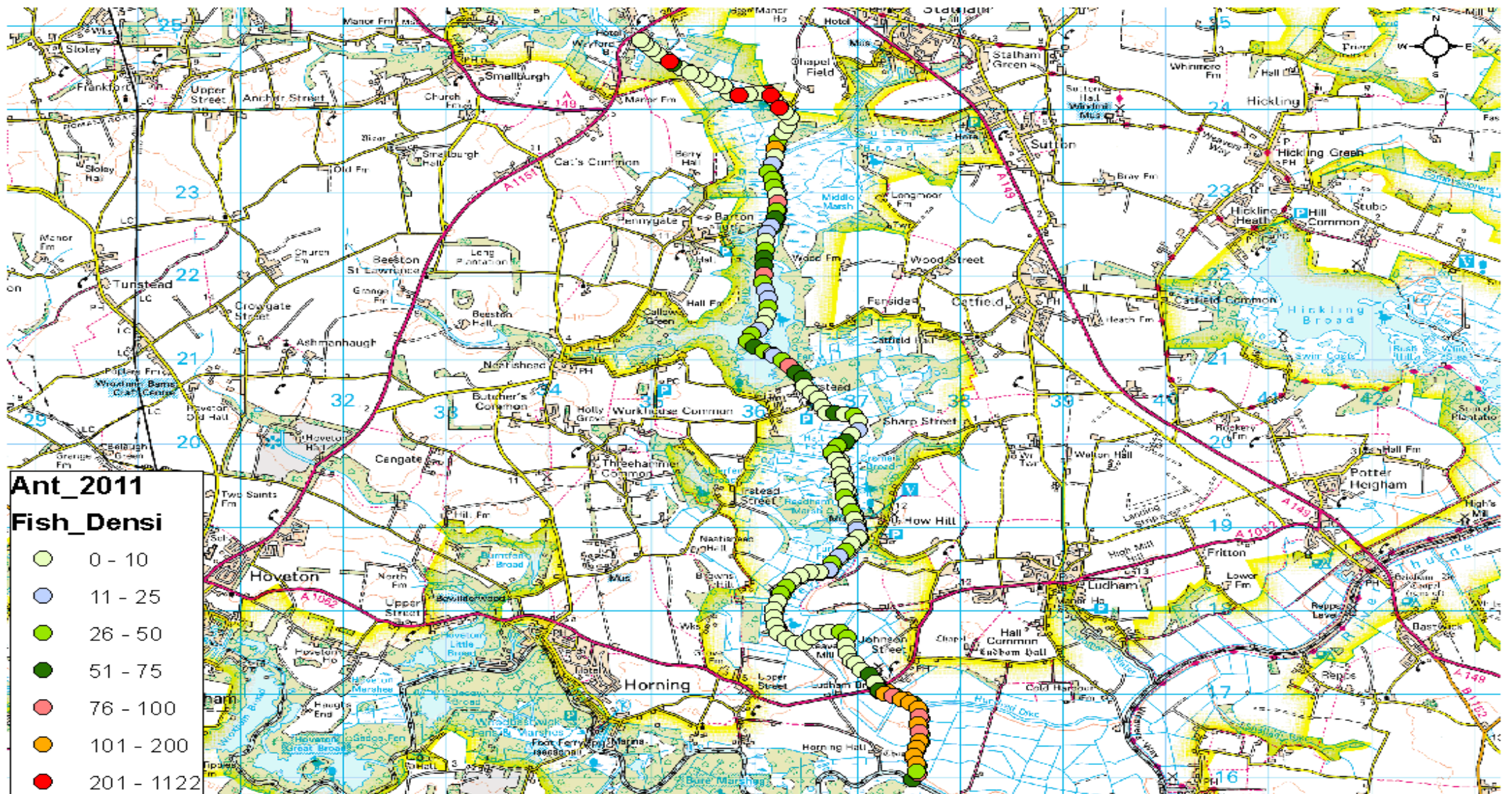


Figure 1. River Ant Summer fish density distribution (fish/1000m³), Ant Mouth to Wayford Bridge, 2011.

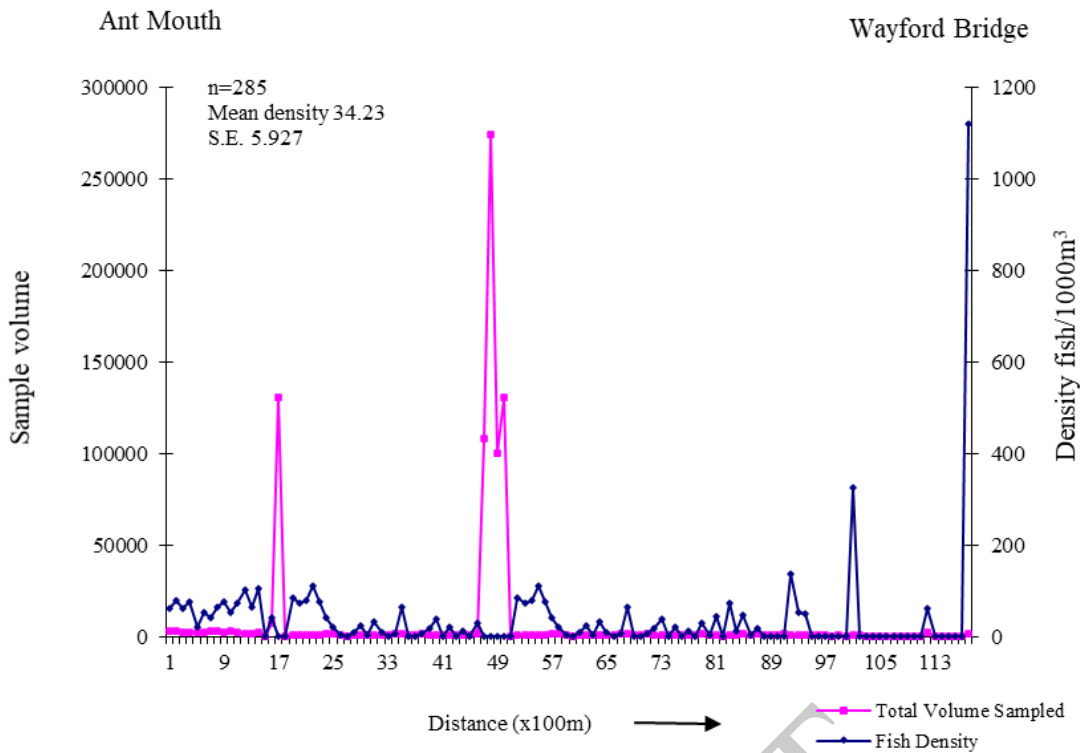


Figure 2. Density of fish/1000m³ vs river sample volume, Ant Mouth to Wayford Bridge 2011.

Overall mean fish density exhibits some fluctuation between survey years, particularly when compared to the 2004 survey (Fig.3a). Fish density was highest in 2004. Error bars indicate unlikely significant difference between 2006 & 2011 (T test, $P < 0.109$). Comparison between 2004 & 2011 shows the 2004 survey to be significantly different from this year's survey (T test, $P < 0.000$).

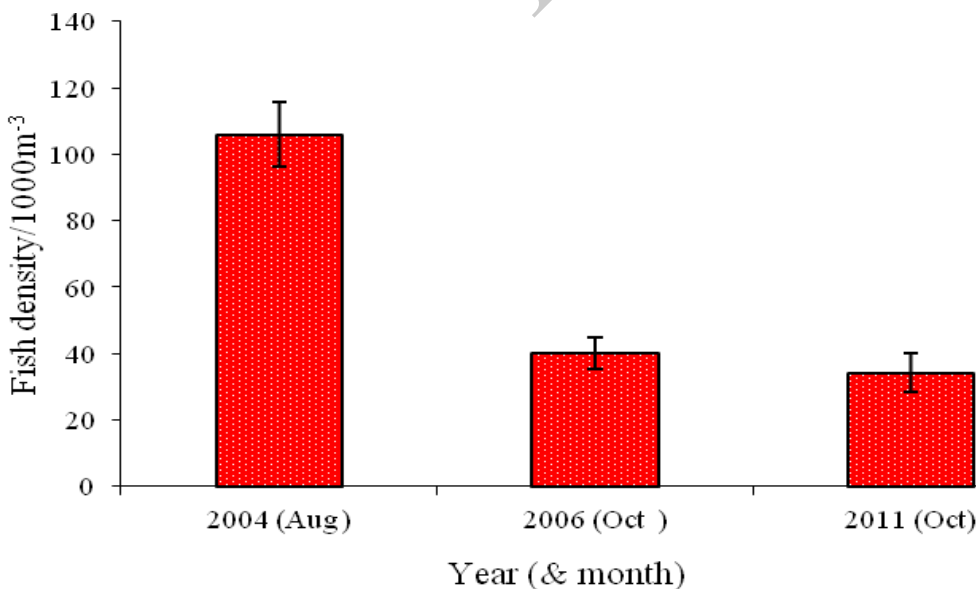


Figure 3a. Comparison of overall mean (± 1 S.E.) fish density between surveys, 2004, 2006 & 2011.

NB Editor's note – there is an error in the month of the 2006 survey which was August and not October. This can't be corrected on the graph.

The 2011 Ant average density estimate is in the middle of the range of densities across all the 5 rivers surveys in 2011, but the lowest since surveys began on the Ant (Fig. 3b). Overall performance of the River Ant has been moderately poor for the last two surveys when compared to the nearby River Thurne (Fig. 3b). However, performance from 2006 & 2011 surveys is comparable to the neighbouring River Bure from these years, exceeding the Bure in the 2004 survey estimates (Fig. 3b).

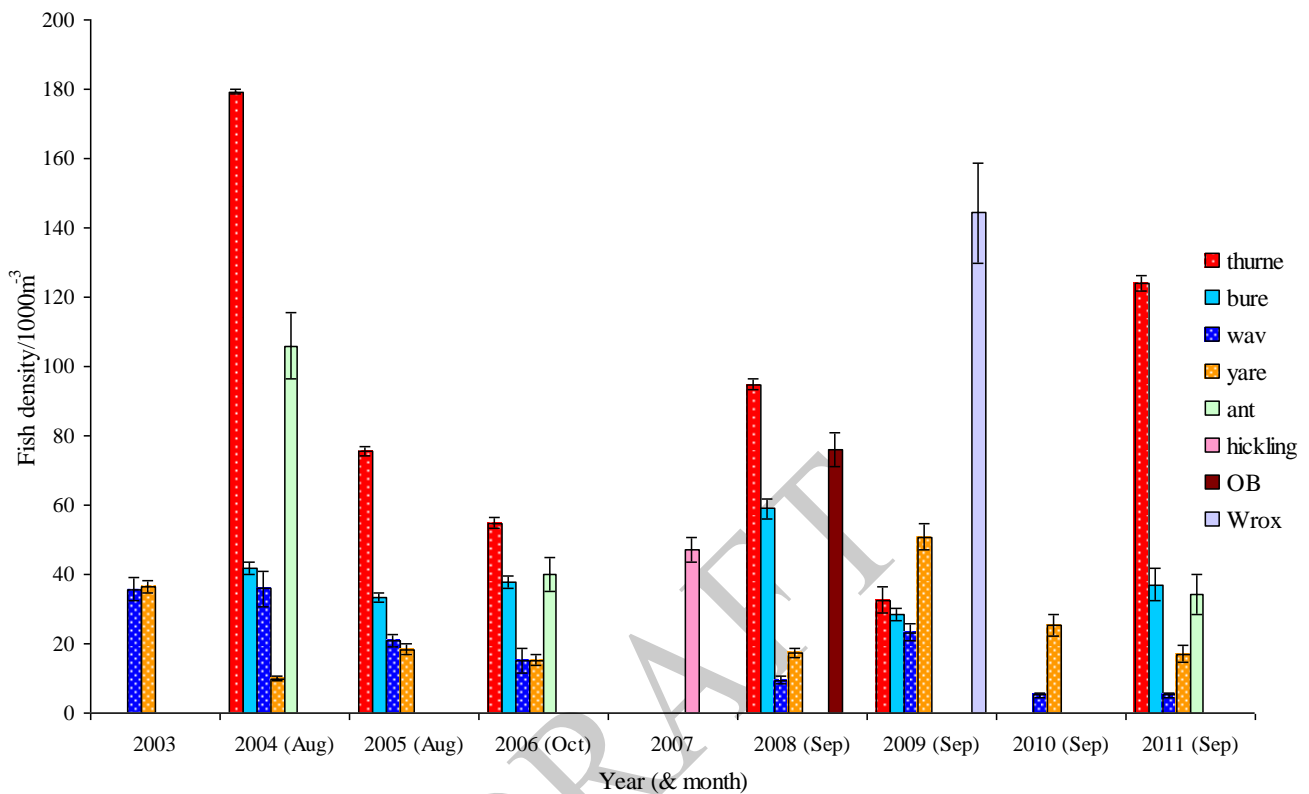


Figure 3b. Comparison of overall mean (± 1 S.E.) fish density between rivers and survey years, 2003 – 2011. Broad's data are also shown.

NB Editor's note – there is an error in the month of the 2006 survey which was August and not October. This can't be corrected on the graph.

Fish distribution was clumped in many locations, giving elevated densities in some sections (Plate 1.)

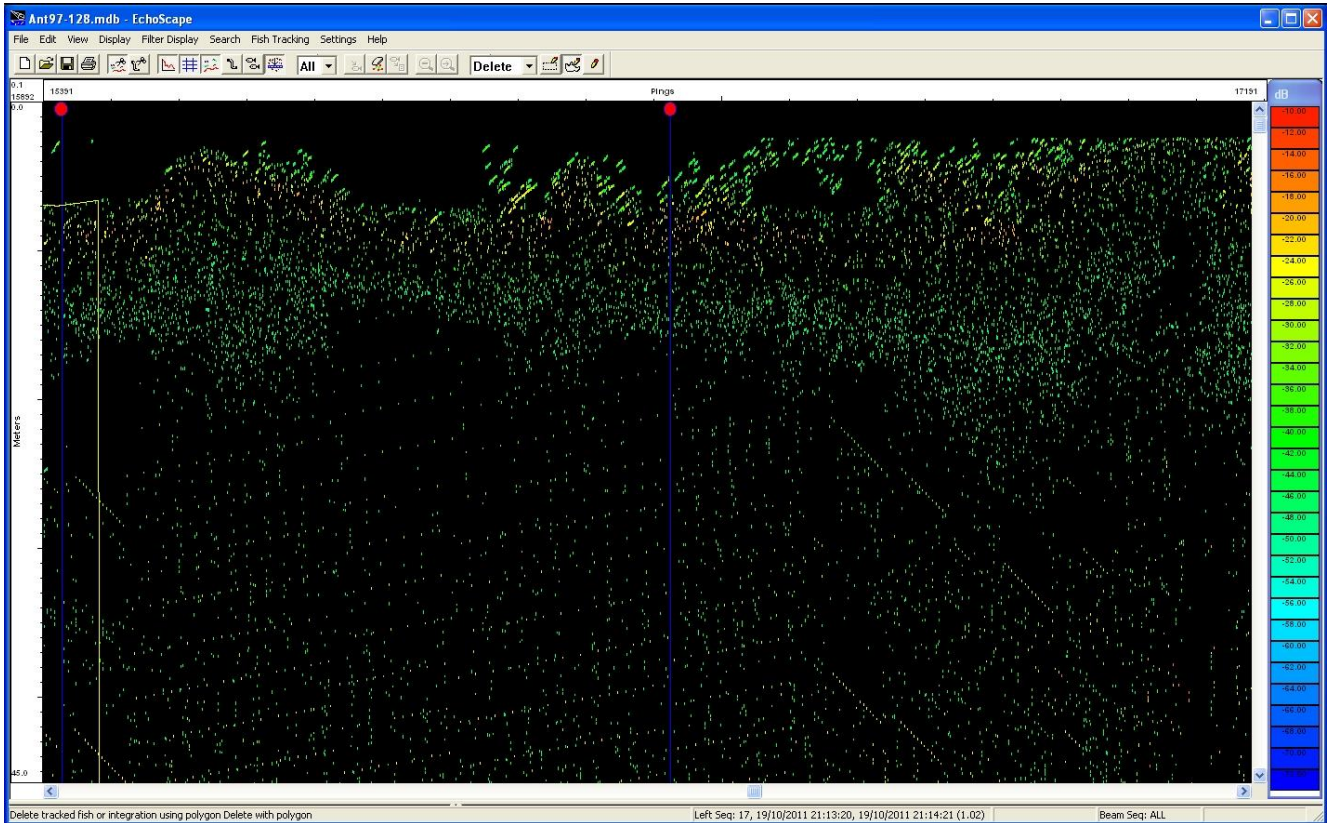


Plate 1. Echogram of high fish density, River Ant 2011.

3.2 Validation

No validation surveys were conducted during 2011 for the River Ant system, therefore, no data is presented.

4.0 Discussion

The first hydroacoustic fish survey of the River Ant was conducted in summer (August) in order to test the river for suitability for hydroacoustic surveys. However, surveying in autumn greatly reduces the incidence of weed entrapment on the transducer, rotator and associated mountings. This in turn results in clearer echograms and less down time clearing weed from the equipment. Accordingly, this survey was carried out in early October.

Due to technical reasons the survey presented is from Ant Mouth to Wayford Bridge

Fish density distribution from Ant Mouth to the A1062 was consistently high (100-200 fish/1000m³ (Fig. 1a). This differs from the previous 2006 survey where density estimates were overall lower in this section (10-25 & 25-50 fish/1000m³) (River Ant Hydroacoustic Survey Report, 2006). Upstream of the A1062 the overall fish density was lowest of all the river and lower than that of the previous survey. Fish densities were typically 0-10 & 10-25 fish/1000m³ as far as just downstream of Sharp Street. From upstream of Sharp Street to just downstream of Barton Broad fish density improved and continued to do so through the navigation channel of Barton Broad and as far as the Sutton Arm. Densities were typically 25-50 fish/1000m³. From Sutton Arm upstream fish density declined overall to typically

density estimates of 0-10 fish/1000m³. There were much higher hot spots within this stretch such as upstream of Sutton Arm where the highest densities of the survey were located (1122 fish/1000m³). This area is also the site of the highest densities of fish during the 2006 survey, though at much lower numbers (308 fish/1000m³). The only distinction between the two estimates was the 2006 estimate was achieved immediately downstream of the wind pump near Chapel Field whereas the 2011 survey estimate was immediately upstream. The other high estimate (1013 fish/1000m³) was several hundred meters downstream of Wayford Bridge. This coincided with the location of high densities produced from the last survey, further suggesting a consistent pattern of elevated fish density, maybe due to a local favourable feature. Within this section there are a number of moored boats that would provide refuge from predation during daylight and it may be these fish that are being sampled during darkness when the risks of predation are reduced.

The overall mean density for the River Ant between Ant Mouth and Wayford Bridge was 34 fish/1000m³ (\pm S.E. 5.9). This estimate is to be considered representative of the river rather than definitive, since no method is able to portray the fish population 100%. The survey indicates overall fish density of fish >5cm. Fish within the littoral margin may be excluded due to background noise preventing post processing analysis and/or reflecting echoes from entrained air, weed and mudbanks.

5.0 Conclusions

- River Ant is suitable for hydroacoustic surveys
- Fish density 'hot-spots' exist in the river (Fig.1) at Wind Pump near Chapel Field, upstream of Sutton Arm, and downstream of Wayford Bridge
- Overall mean fish density was 34 fish/1000m³ (\pm S.E. 5.9)
- Highest fish densities surveyed (1122 & 1013 fish/1000m³) were located upstream of the Sutton Arm