Hydroacoustic Survey Report

River Thurne 2009

This report was prepared in draft form by an Environment Agency employee at the time of the data collection. It has been reviewed and prepared for publication by the current Analysis and Reporting Team in 2021. The facts and conclusions are valid as far as can be determined.

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1.0 Introduction

The River Thurne, located in east Norfolk, is a tributary of the River Bure. It flows from its source (between Horsey and Somerton) south south-west to its confluence with the River Bure at Thurne. The River Thurne is tidally influenced although the effects are attenuated compared to the larger rivers. The river and interconnected broads are slightly brackish due to the penetration of sea water under the coastal dunes. Saline concentrations are highest at the upstream end (Horsey Mere, Hundred Stream) and decrease towards the River Bure confluence. Navigation continues up-stream as far as West Somerton though only for small craft. 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. The River Thurne is famous as a pike fishery (once holding the national pike record) and attracts pike anglers from all over the country. The largest rod caught river UK pike was recently caught in the Thurne system in February 2009, weighing 45lb 8oz. The capture of such a large fish will reinforce the area's reputation as a premier pike fishery.

The survey started at Thurne Mouth, confluence with the River Bure, and extended to Dungeon Corner, down-stream of West Somerton. The survey also encompassed the main navigation channel through Hickling Broad. The overall total survey length is approximately 24km (both ways combined & inc. Hickling).

2.0 Methods

2.1 Hydroacoustics

An echosounder transmits short pulses of sound (known as 'pings') through a transducer beneath the boat. The transducer comprises housing containing ceramic plates that are clapped together in a controlled manner to provide the 'ping' under water. It is mounted forward of the craft to prevent background 'noise' interfering with the signal and the craft is piloted at approximately 3km/h, working along one side of the river and firing the transducer across the river width. 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 reliably identified is approx. 5cm. Density of fish is reported for each surveyed section as fish per $1000m^3$.

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. Each river is surveyed twice (once travelling upstream and once downstream) and the best quality data set is chosen for analysis and reporting.

2.2 Validation

Validation surveys were carried out at Catfield Dyke (Hickling) and Potter Heigham boat yard in March, 2010. Previous validation surveys have been in local boatyards (Potter Heigham) and dykes (Womack Water, Boundary Dyke (Thurne Lion)) where fish were present for over-wintering.

The fish were captured in the surveys by electro-fishing from a boat. The method involves the deployment of an electro-fishing box, powered by a 240v generator. Output is via hand held fibreglass rods, which hold anodes at the extreme end. The circuit is completed via a cathode trailed in the water adjacent to the boat. The resultant current induces galvanotaxis in fish within range, permitting their subsequent capture. Once captured the fish are identified, measured and scale samples taken for subsequent analysis (for age and growth rates).

The results give an indication of the composition and health of the fish community in the river as a whole, based on the assumption that the boatyard aggregations are representative of the wider population. Over-wintering in boatyards, backwaters and dykes has been described for various coarse fish species including cyprinids, percids and esocids (per obs.; E.A Boatyard Reports; Jordan & Wortley, 1985; Copp, 1997). The presence of various size classes of pike, and their relatively low numerical representation, would suggest that pike may follow/track the prey fish to such locations as opposed to displaying active over-wintering behaviour, since many pike are still caught by anglers on the main river during this time. Match catch data and personal observations also suggest that larger bream and roach generally stay in the river rather than entering boatyards and dykes. Therefore, the validation surveys are thought to under-represent pike and large bream and roach.

3.0 Results

3.1 Hydroacoustics

This survey report represents the 5th hydroacoustic survey of the River Thurne, previously in 2004, 2005, 2006 & 2008. There were no annual hydroacoustic surveys during 2007. The River Thurne was surveyed 8th September 2009.

Fish density in 2009 approximately equalled the lowest seen in any survey so far as shown in the Table 1 and Fig 3. Typical densities seen were 0-10 fish/1000m^3 with the highest density of 75-100 fish/1000m^3 only seen in 2 sections (Fig. 1). Previous surveys have recorded some or many sections with densities >100 fish/1000m^3.

In the river upstream of Martham Ferry, these low densities are typical of previous years. However, previously the river below Potter Heigham has always had moderate to high densities. The intermediate section of river (Potter Heigham to Martham Ferry) has had variable results and on several surveys technical problems have meant incomplete coverage. Densities in Hickling Broad and Heigham Sound have often been variable in the past, but always with hot spots of densities >100 fish/1000m^3. This year only a handful of results showed density >10 fish/1000m^3.

Figure 1. River Thurne fish density distribution (fish/1000m^3), Thurne confluence to Dungeon Corner,
2009.

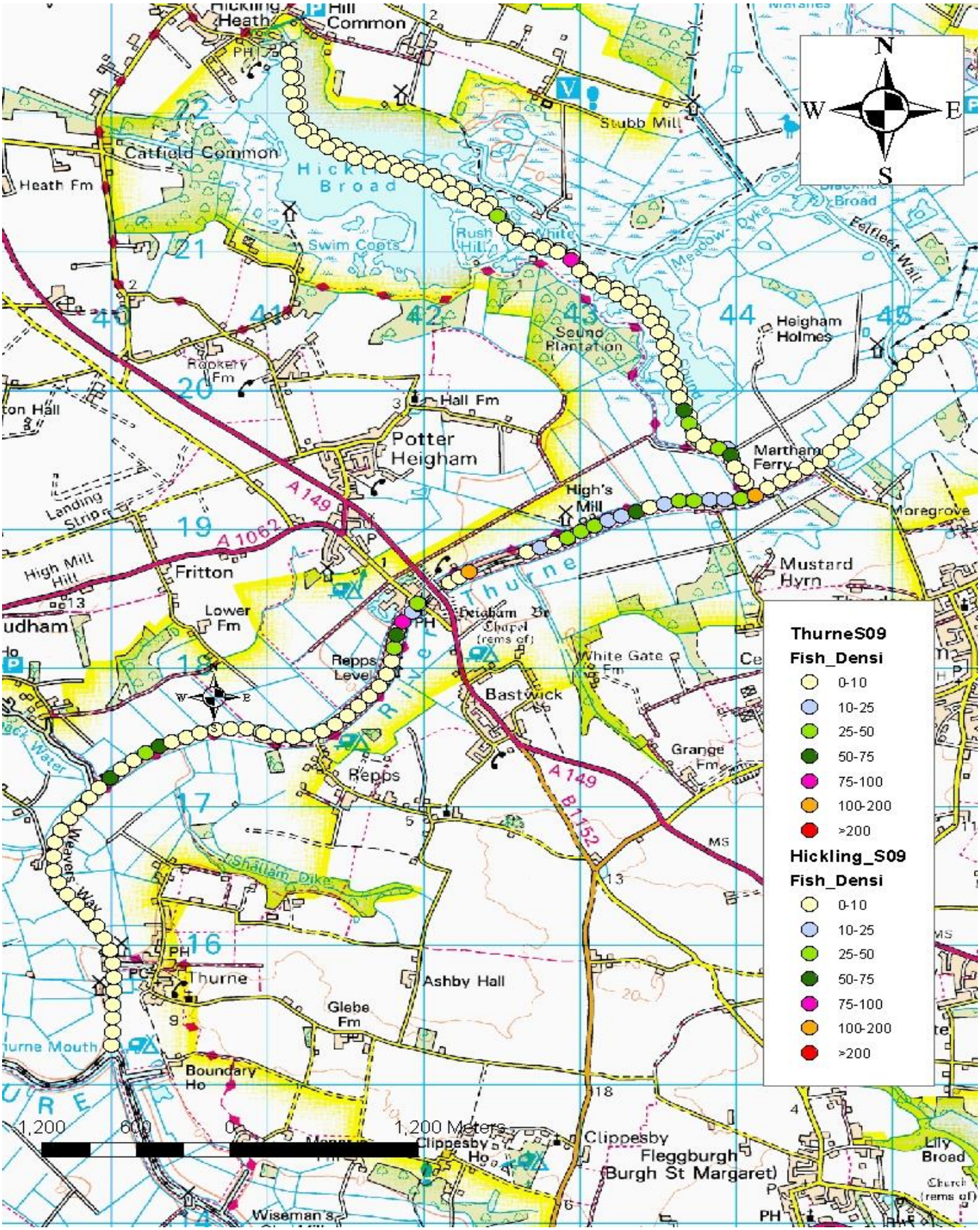


Figure 2. Density of fish/1000m^3 vs river sample volume, Thurne confluence to Dungeon Corner, 2009.
NB Density scale on RHS has minimum set to -50 not zero.

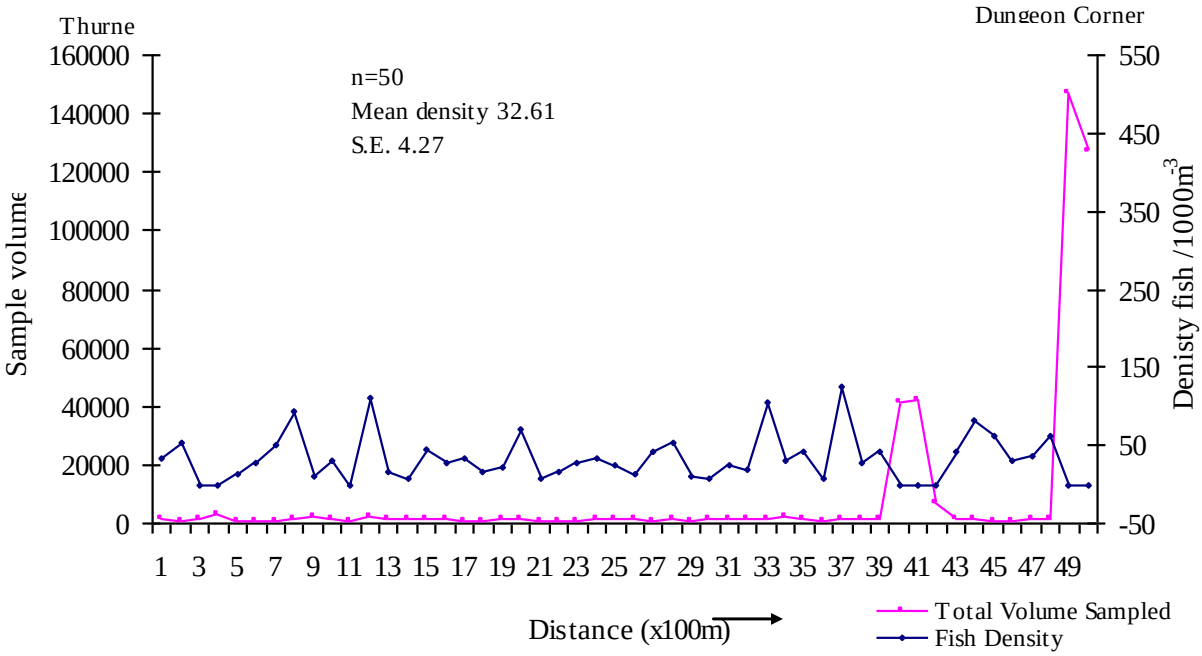
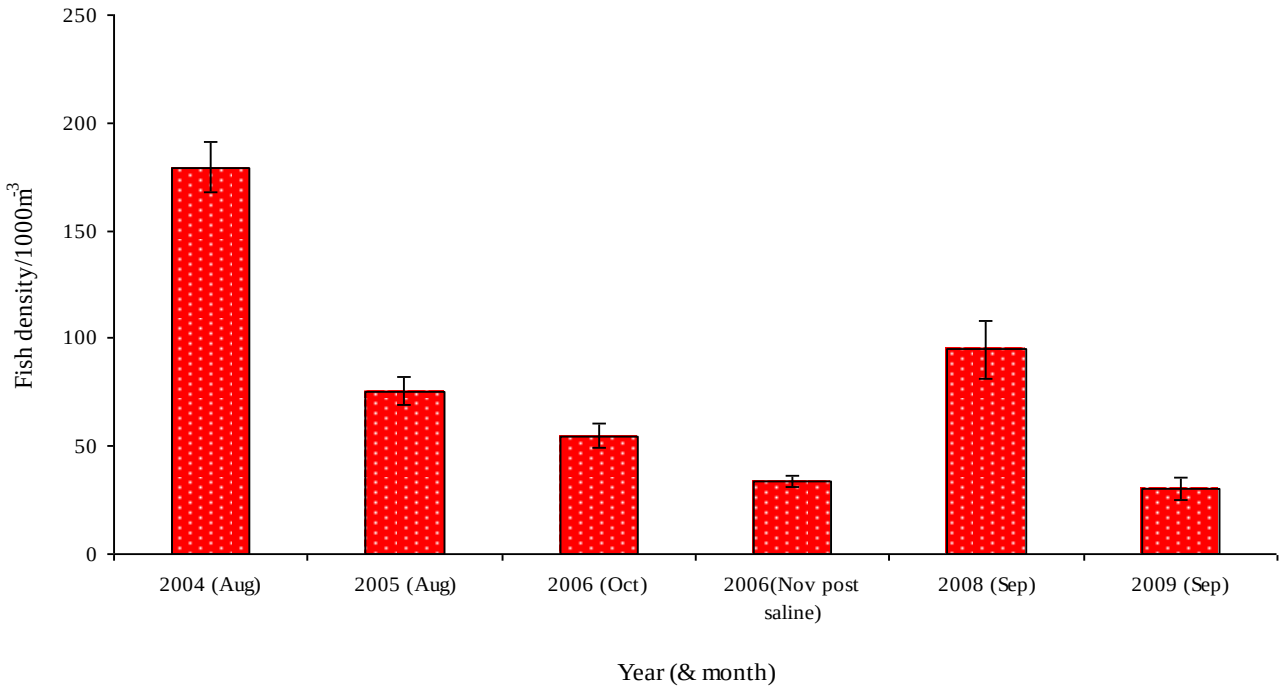


Figure 3. Comparison of overall mean fish density (± 1 S.E.) between surveys, 2004 - 2009.



3.2 Validation

Validation surveys were carried out in both Catfield Dyke and Potter Heigham boatyard in March 2010.

Roach dominated the fish community (89%) in Catfield Dyke (Fig. 4a), which is a fairly typical proportion compared with other validation surveys in the Broads. However, in Potter Heigham boatyard much lower numbers of roach were caught and the proportion was only 53% (Fig 4b). Bream were more numerous in the boatyard and formed a much higher proportion; 45% compared with 16% in Catfield Dyke. Pike comprised 5% of the catch in Catfield but were absent in the Potter survey. Only low numbers of other species were caught.

Figure 4a. Species assemblage and proportional representation of individual species within the sub-sample, Catfield Dyke, 2010.

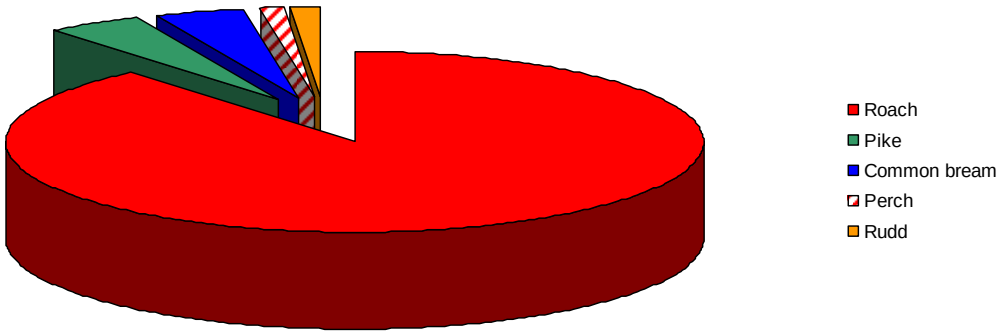


Figure 4b. Species assemblage and proportional representation of individual species within the sub-sample, Potter Heigham, 2010.

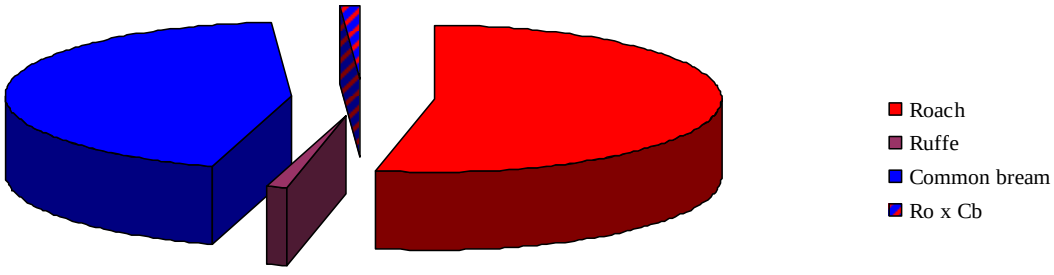
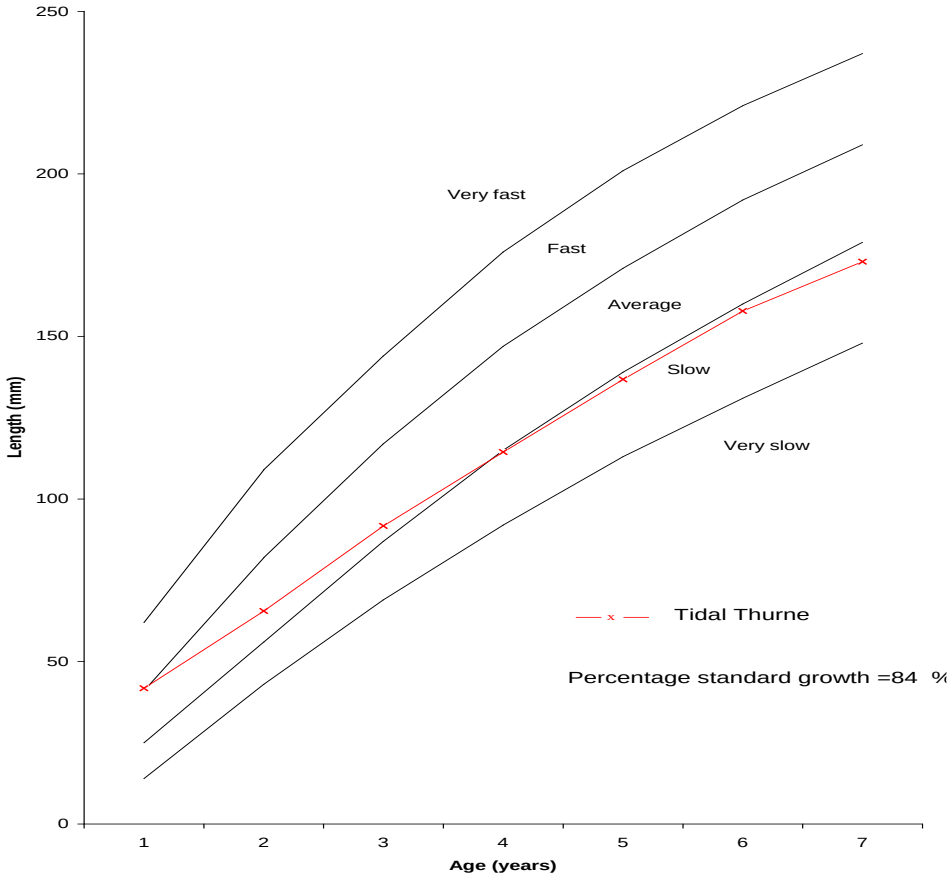


Figure 5. Growth rates of roach (compared to National growth rates for Southern rivers NFL unpubl.), validation survey, Catfield Dyke, 2010



Growth rate of roach, calculated from scale analysis, is equal to the national average for very young fish but declines to slow growth rates as the fish age.

4.0 Discussion

4.1 Hydroacoustics

The first hydroacoutic fish survey of the River Thurne was conducted in mid-late summer (August). 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. As a consequence of summer surveys weed growth has been so extensive in the past that it was not possible to survey beyond Martham Ferry, although the rest of the system was successfully surveyed. Macrophyte growth has been considerable on all major rivers over the past 2 years leading to problems with consistency during surveying. Therefore, to avoid the associated problems with such growth, surveys have been conducted slightly later. This survey was conducted in the last week of September.

The reduced presence of macrophytes enabled surveys to be conducted up stream of Martham Ferry. However, the narrow channel width in this section can create different technical problems and the low fish densities seen in this stretch this year could be at

least partly caused by this problem. Nevertheless, high fish densities were recorded close to Martham Ferry in 2008, before the channel narrows. There is therefore some evidence of reduced fish densities in this section of river in 2009.

Although overall fish densities are lower in this survey compared to previous year, the pattern of 'hot spots' is consistent, particularly around High's Mill and the channels up and downstream of Heigham Sound. The pattern of fish favouring the junction of rivers and broads is seen elsewhere in the Broad's surveys but the reasons are unclear.

The overall mean density for the survey was 32.6 fish/1000m^3 ($\pm$ S.E. 4.27), almost identical to the lowest density seen in Nov 2006 following the tidal surge. The reasons for the reduced observed densities are not at all clear. It does not fit with the previously seen season pattern where lower density estimates are recorded in later surveys (Oct and Nov). It is possible that fish had started to disperse from their river and mid-broad locations to overwintering in dykes, boatyards and margins, but there is no known reason for them to so this early in the year.

It should be pointed out that the coverage of the 2008 survey was reduced due to technical problems, including no data from Hickling Broad and Heigham Sound. This means the results are not strictly comparable.

Survey estimates are 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 >75mm. Fish within the littoral margin or within extensive macrophyte beds (i.e. Hickling, off main channel) may also be excluded due to background noise preventing post processing analysis and/or reflecting echoes from entrained air, suspended organic matter, weed and mudbanks.

4.2 Validation

The over wintering sites selected for validation survey were Catfield Dyke, off Hickling Broad and Potter Heigham boat yard. Results at Catfield Dyke are very similar to the majority of validation surveys conduced in the Broads, with high dominance by roach. The relatively large proportion of bream in Potter Heigham boat yard is more unusual. It possibly reflects that a large aggregation of bream happened to be in the River Thurne at the time the temperature was dropping, triggering them to seek overwintering safety.

Overwintering sites are used less by pike and large roach and bream so the presence of these fish in the Thurne system is evidenced by the fact these fish are caught by anglers and indeed it is a well-known pike fishery.

5.0 Conclusions

- River Thurne and Hickling Broad complex are suitable for hydroacoustic surveys
- Mean density 32.6 fish/1000m^3
- Much reduced density compared with 2008 and lowest except Nov 2006 (following tidal surge). No known cause for the decrease
- Fish density 'hot-spots', such as they were, were consistent with the pattern in previous surveys