Investigating the fish stocks of Hoveton Great Broad
A multi-method approach to a complex system
Recap of baseline surveys for BASG ESG 17 Jan 2019

Steve Lane[1]   Andy Hindes[2]
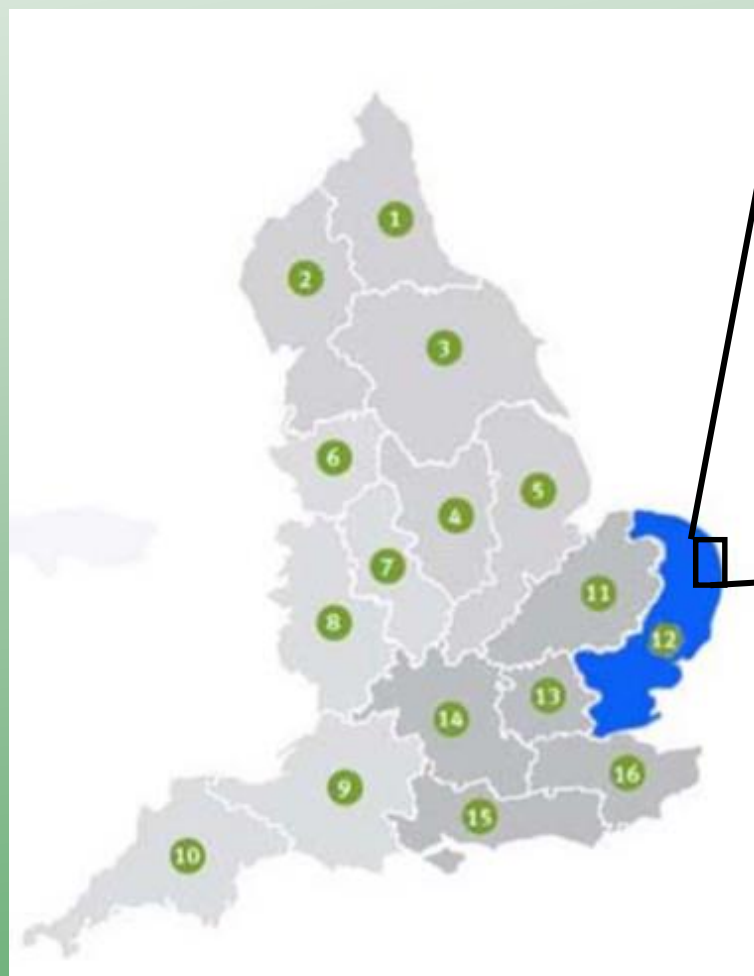
[1]Environment Agency   [2]Fishtrack

Bringing the Bure back to LIFE: Hoveton
Wetland Restoration Project - LIFE14 NAT/
UK/000054

Outline

- Introduction

- Location and complexity

- Baseline data set collection

- Multi-method approach for a complex system-

  - Point Abundance Sampling by Electrofishing – **PASE**

  - Fixed Station Sonar Assessment – **FSSA**

  - Mobile High Resolution Sonar Assessment – **MHRSA**

- PASE data output

- FSSA post processing & output

- MHRSA Spawning work

- Hydroacoustic-driven comparative site selection

- Hoveton Great Broad restoration is a Partnership project led by Natural England

- Aims to restore 'Good Ecological' condition to Hoveton Great Broad

- Biomanipulation required to restore clear water and stable, diverse water plant community

- This requires removal of fish & isolation of the Broad from the river system for up to 10 years

- EA has a statutory duty to maintain, improve & develop fisheries and regulate fish movements

- Norfolk Broads are perhaps most important single natural freshwater fishery in the UK - Broads anglers contribute between £92 million - £153 million direct expenditure to local economy (Lane, 2015)

- Anglers currently supportive of project objective, but concern over impacts of biomanipulation, especially:

  - Spawning pike

  - Bream populations

The Broads

NORFOLK

R. Ant
Stalham
Hickling
Hickling Broad
Horsey
R. Bure
Barton Turf
Neatishead
Barton Broad
Coltishall
How Hill
Horstead
Hoveton
Potter Heigham
Ludham
R. Thurne
Martham
Horning
Ormesby
Wroxham
Bure Marshes
Rollesby
Wroxham Broad
Cockshoot
Filby
Woodbastwick
Ranworth
Sth Walsham
Filby
Salhouse
Upton
Stokesby
R. Bure
NORWICH
Thorpe St Andrew
Acle
Brundall
Breydon Water
Whitlingham
Gt YARMOUTH
Bramerton
Rockland
Burgh Castle
Rockland St Mary
Cantley
R. Yare
Claxton
Reedham
Fritton
Chedgrave
Fritton Lake
R. Chet
St Olaves
Loddon
Haddiscoe
R. Waveney
Somerleyton
Burgh St Peter
LOWESTOFT
Stanley Carrs
R. Waveney
Geldeston Lock
Carlton Marshes
Shipmeadow
Oulton Broad
Bungay
Beccles
SUFFOLK

☐ Broads Authority area
🔴 Broads information centre
🟠 Broads Authority yacht station

approx scale
0 — 2 km
0 — 2 miles

Contains Ordnance Survey data
© Crown copyright and database right 2014

Essex , Norfolk & Suffolk Area
(Marked in blue)
Size of ENS area = 9,000km²

The Broads Executive Area
(shaded in white on inset map – Source: Broads Authority)
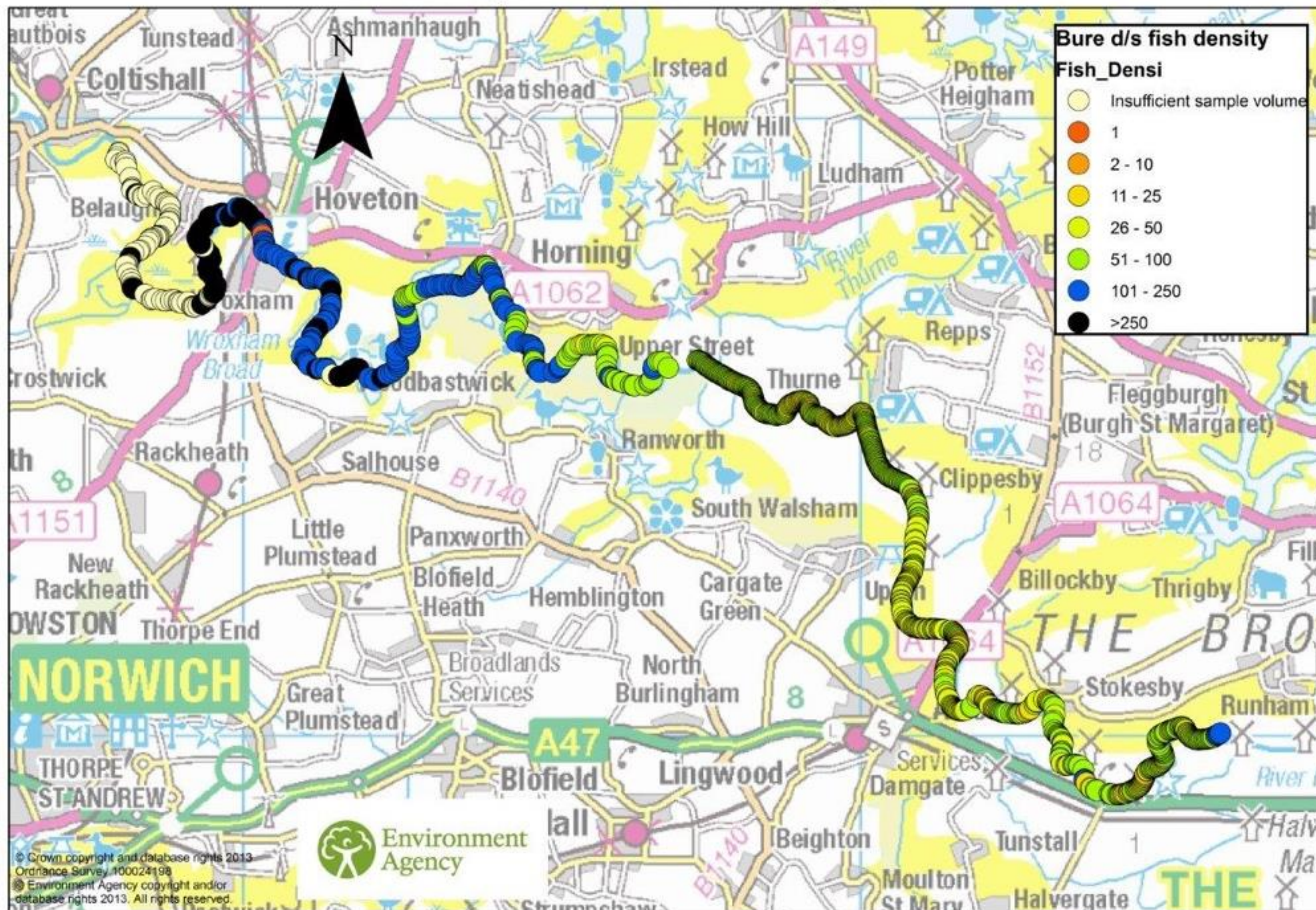Size: 303 km²
Length of tidal rivers: 179km[3a]

Baseline Surveys

- No historic fish data for the broad

- No contemporary fish data for HGB or surrounding broads

- Hydroacoustic data available for tidal rivers

- Seasonal surveys:

  o   Spring - May

  o   Summer - September

  o   Autumn - November

  o   Winter - February

  -        Complex system requires a Multi-method approach......

River Bure: Hydro acoustic fish density 2014.

Bure d/s fish density

Fish_Densi

- ○ Insufficient sample volume
- ● 1
- ● 2 - 10
- ● 11 - 25
- ● 26 - 50
- ● 51 - 100
- ● 101 - 250
- ● >250

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0   1   2   3 km

PASE electric fishing – e.g. Hoveton Marsh Dyke

Significant numbers of juvenile roach refuging in complex habitats during daylight – Winter 2015

- 100's of 1000's of juvenile roach found in structure-rich dykes & channels during the day

- Move out to feed in open water at night

Fixed points and Fuel Cells: ARIS sonar monitoring fish movements between Broad & River
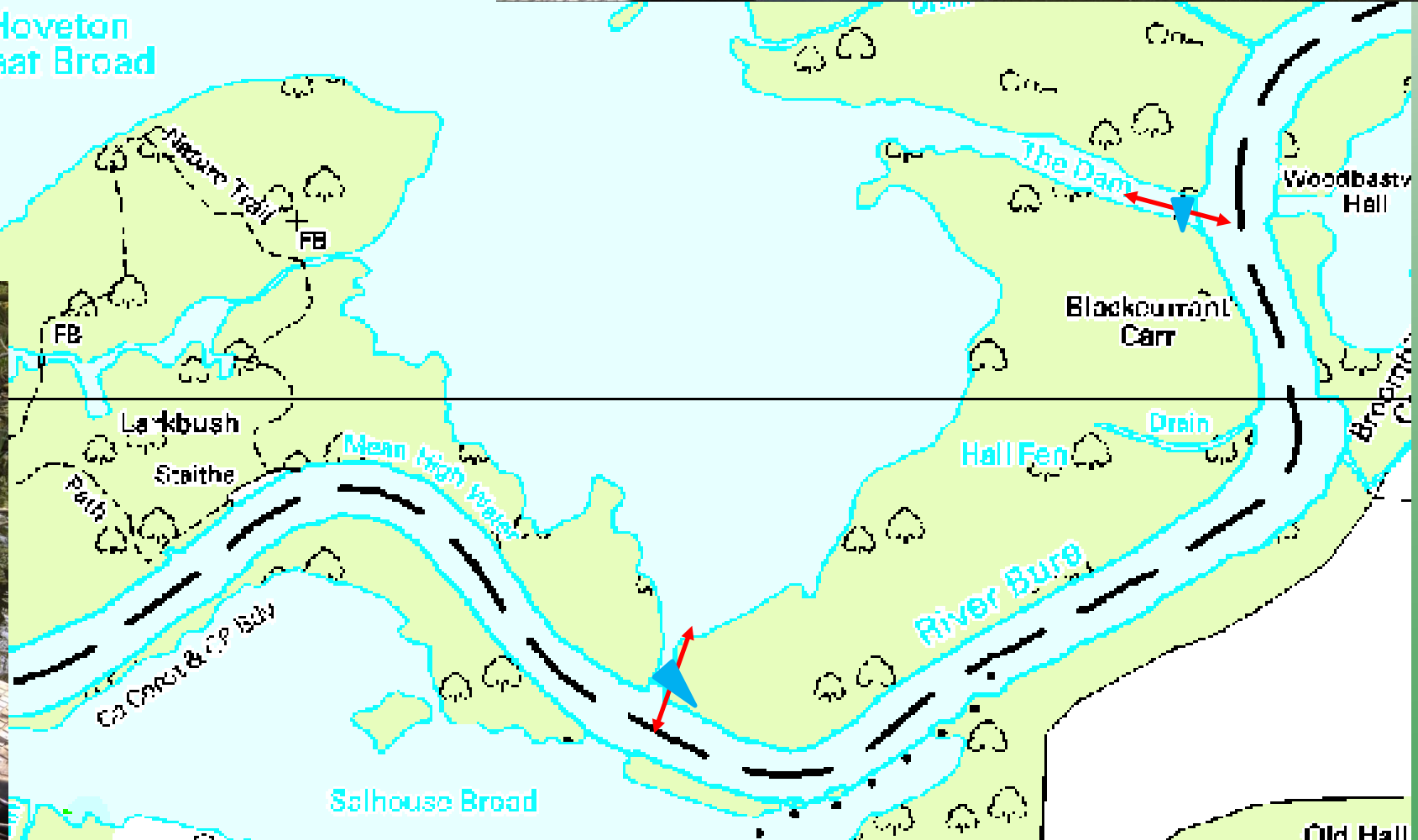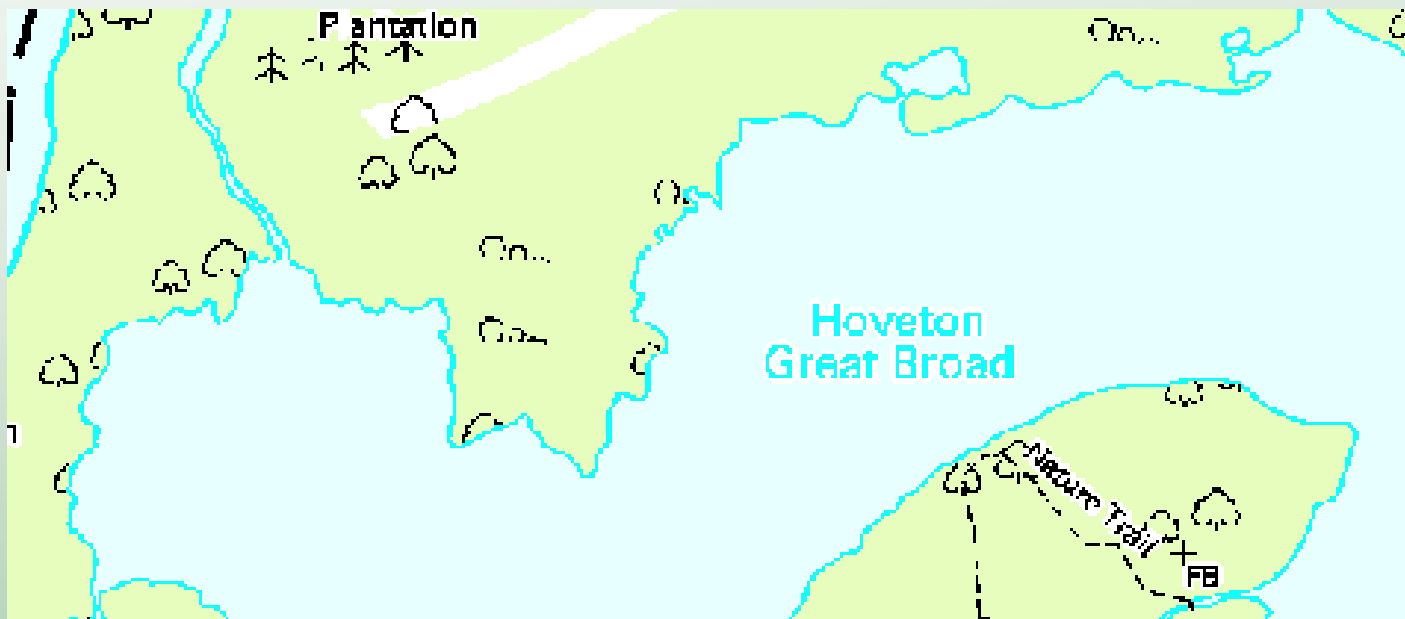
FSSA Fixed point sonar – The Gate @ dusk

Dawn & dusk fish migration – the 'fish motorway'
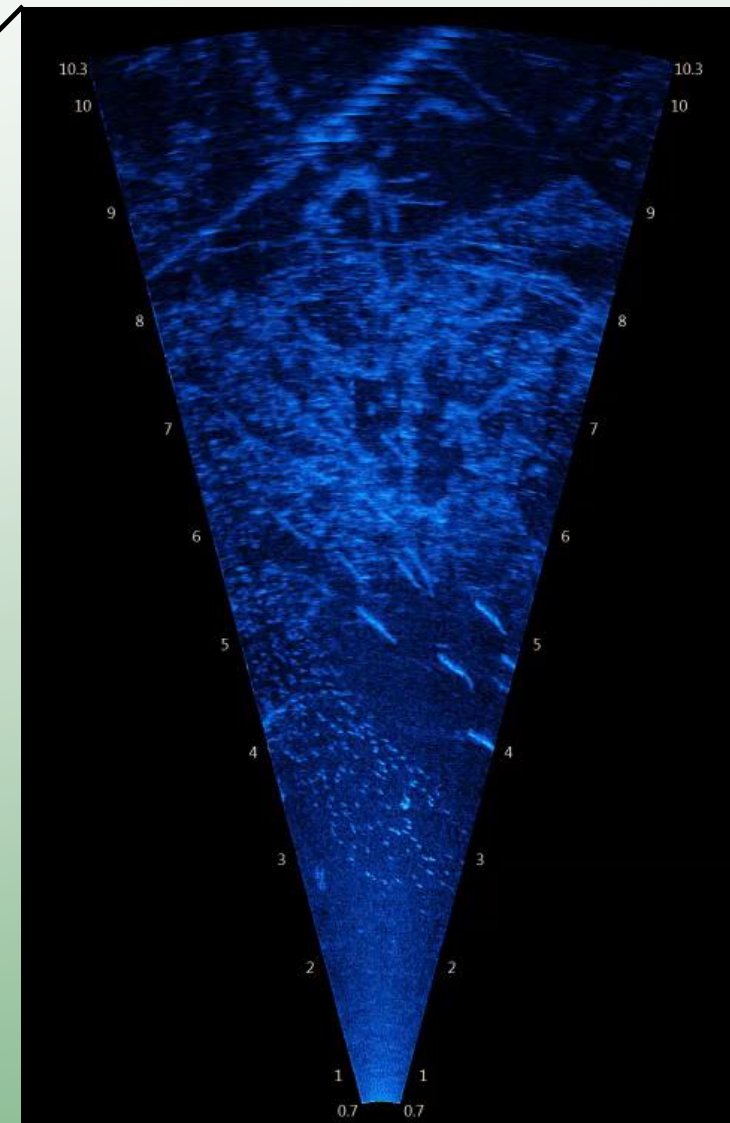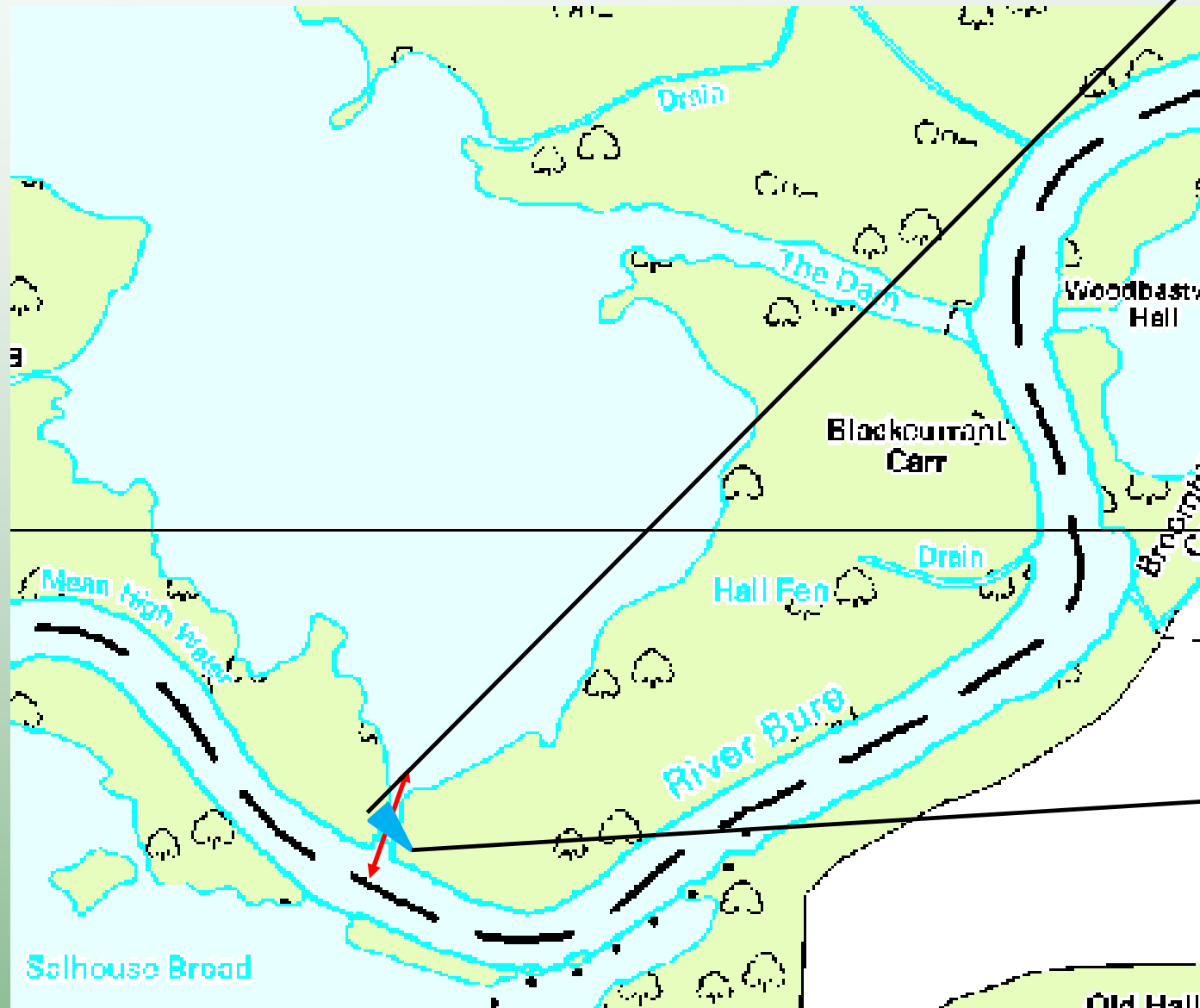
- Adult bream move into the river to feed

- 1000's of juvenile roach move onto Hoveton Broad to disperse & feed

- Counter-migration at dawn

FSSA Fixed point sonar – The Gate @ dawn

- Echogram showing 10 minutes of activity (06:10 - 6:20):

  - 601 adult bream migrating onto Broad to rest up

  - @1.2 tonnes of bream @ over 1 fish per second

  - Juvenile roach begin migrating off Broad @ 06:14

35 − 55cm bream returning to Broad to rest
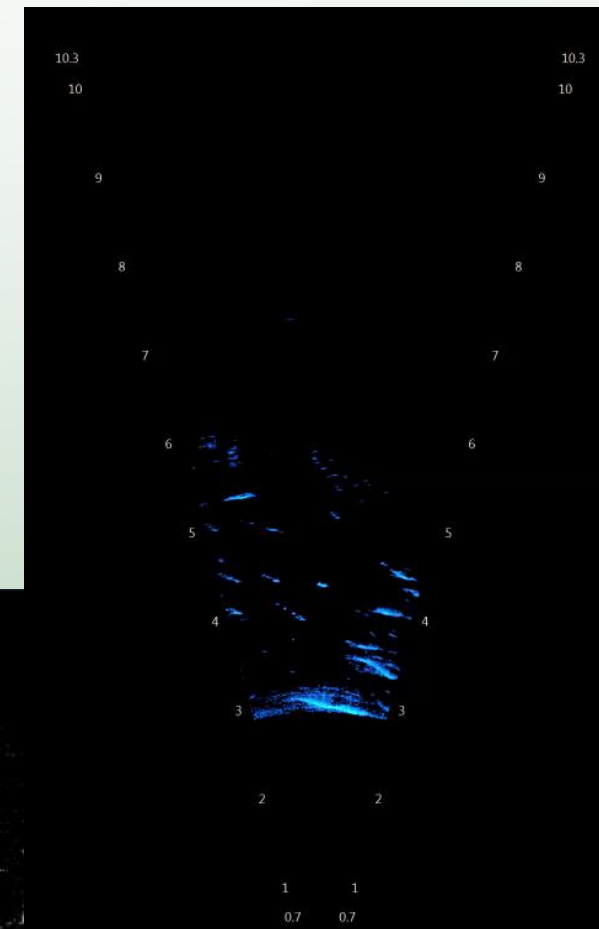
Adult bream returning to Hoveton Broad

Juvenile roach moving back to river

06:10   06:20

Fixed point sonar @ the Gate

Autumn 2014

- E.g. dawn movement of 1,138 bream onto HGB at an average of 12.6 bream per minute at peak
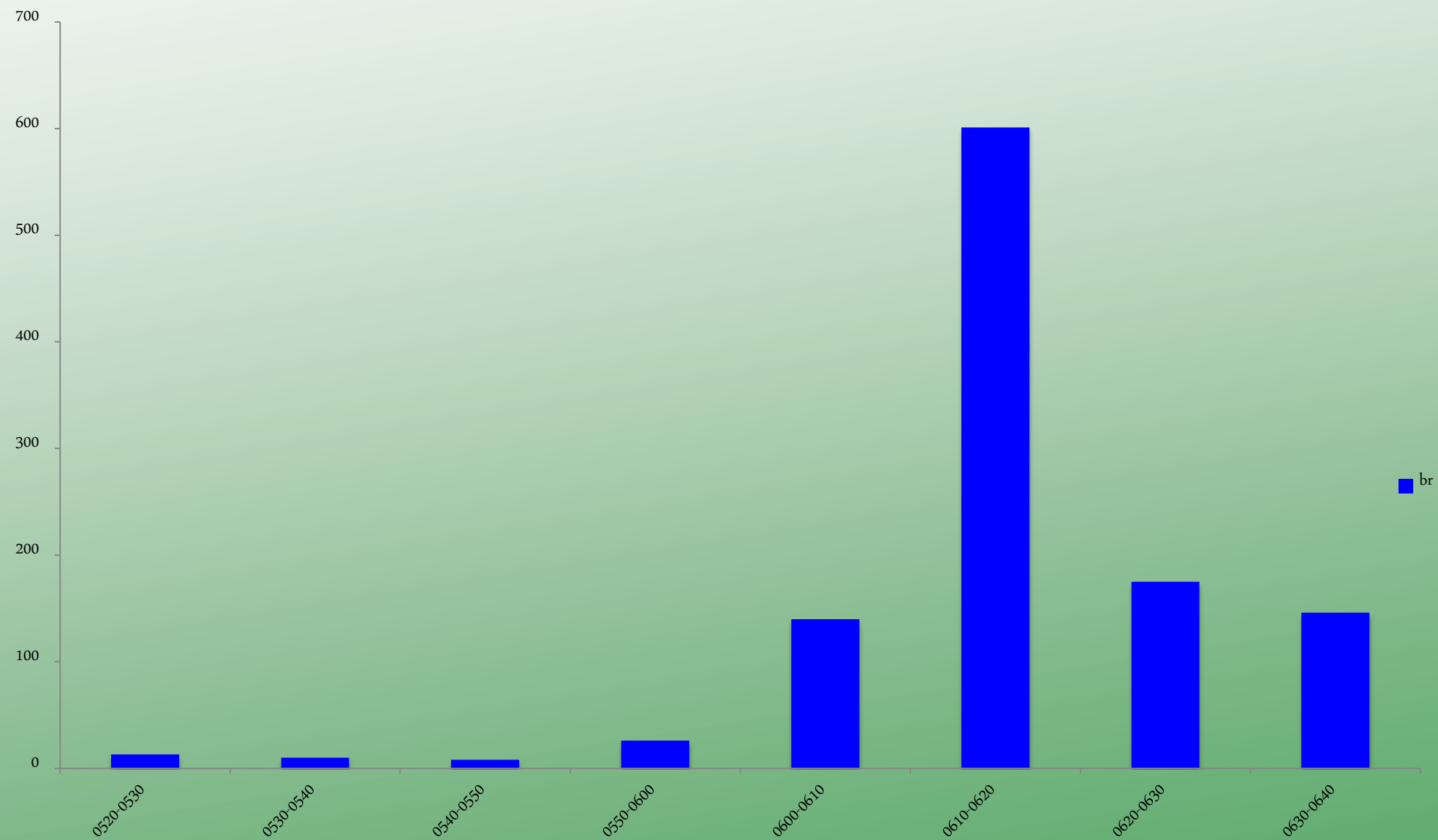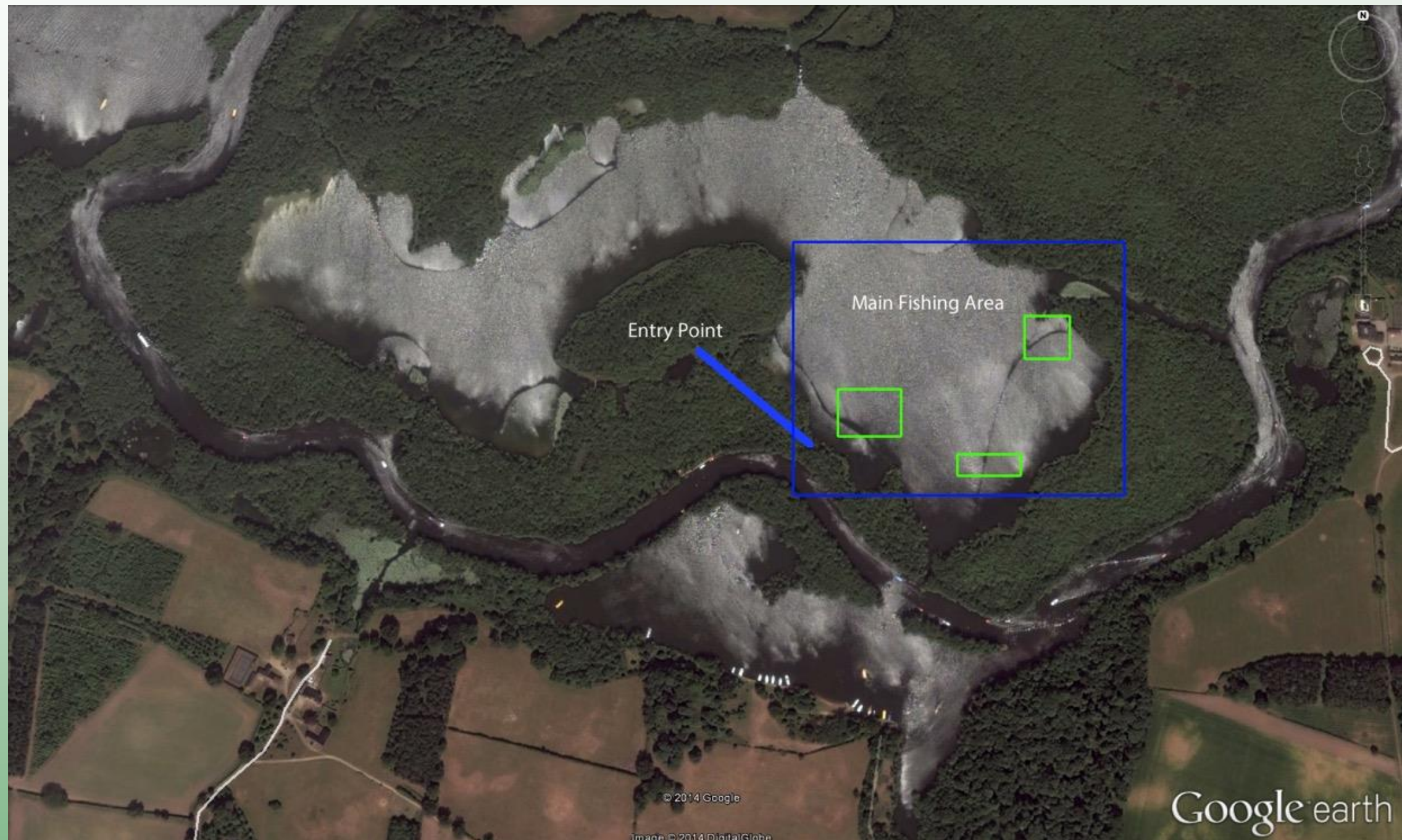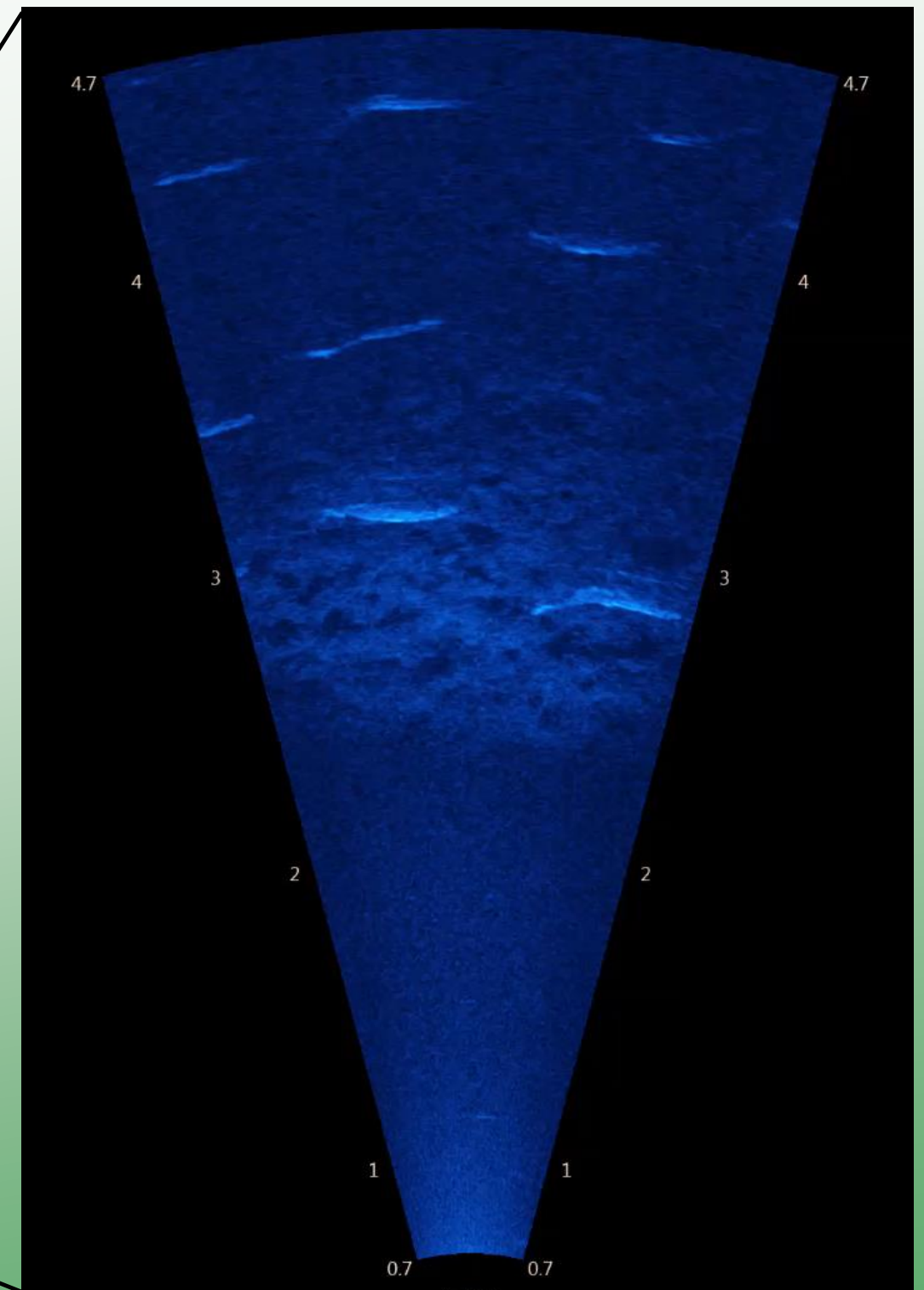
MHRSA Mobile high resolution sonar in open water

Common bream – resting up historic context Angler obs 1993-97

Strong fidelity for loafing habitats?

MHRSA Mobile sonar finds thousands of common bream – resting up

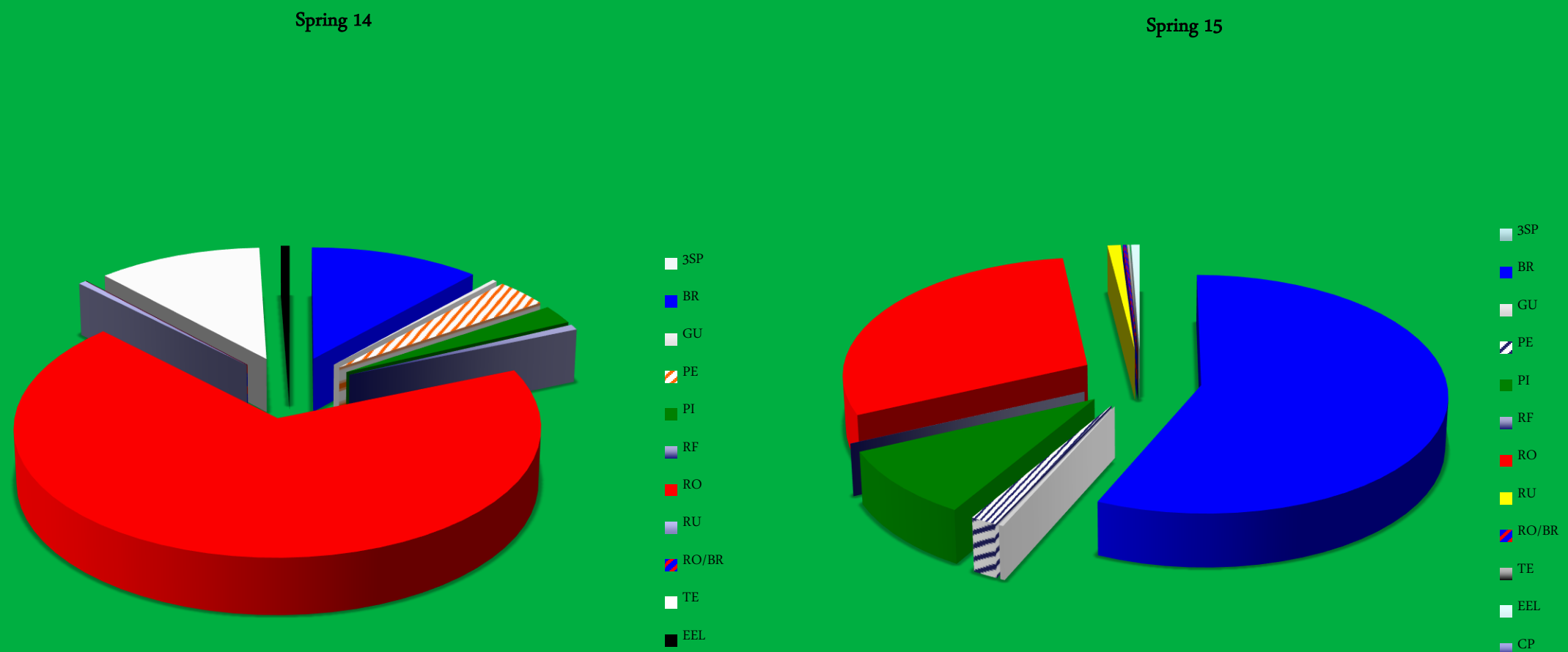Each fish between 35 – 55 cm
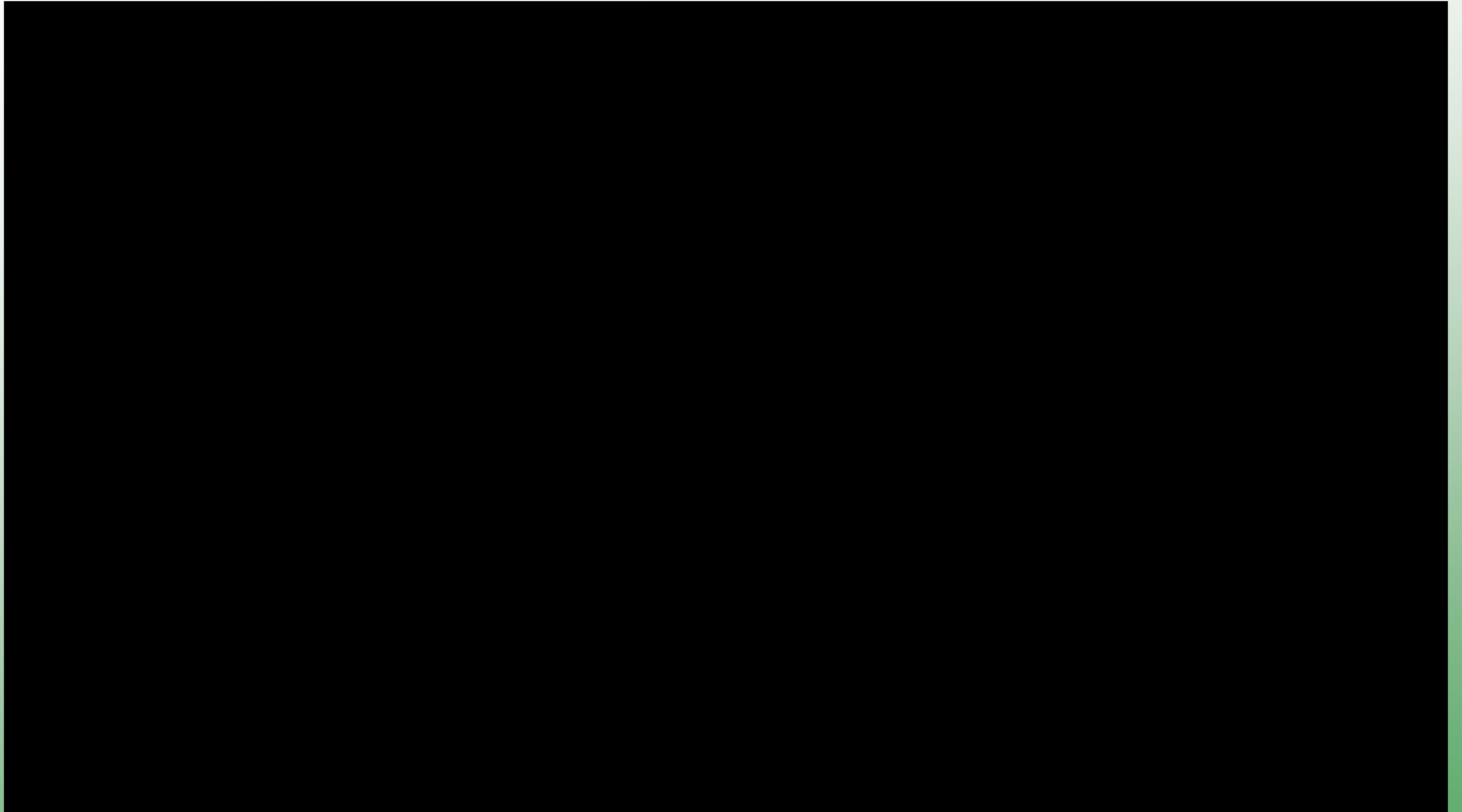
(av. 2Kg or 4lb weight)

Managing fisheries at a catchment scale - Barriers to fish migration?

Multi-method baseline fish survey work on HGB/Hudsons Bay May 2015 indicated significant spawning activity e.g. PASE – relative fish biomass, all zones, HGB

Spring 14

Spring 15

3SP
BR
GU
PE
PI
RF
RO
RU
RO/BR
TE
EEL

3SP
BR
GU
PE
PI
RF
RO
RU
RO/BR
TE
EEL
CP

17

Multi-method assessment spawning bream – May 2015

Pike spawning assessment –

Stage 1: Develop Habitat scoring assessment tool and undertake survey of HGB and surrounding Bure system:

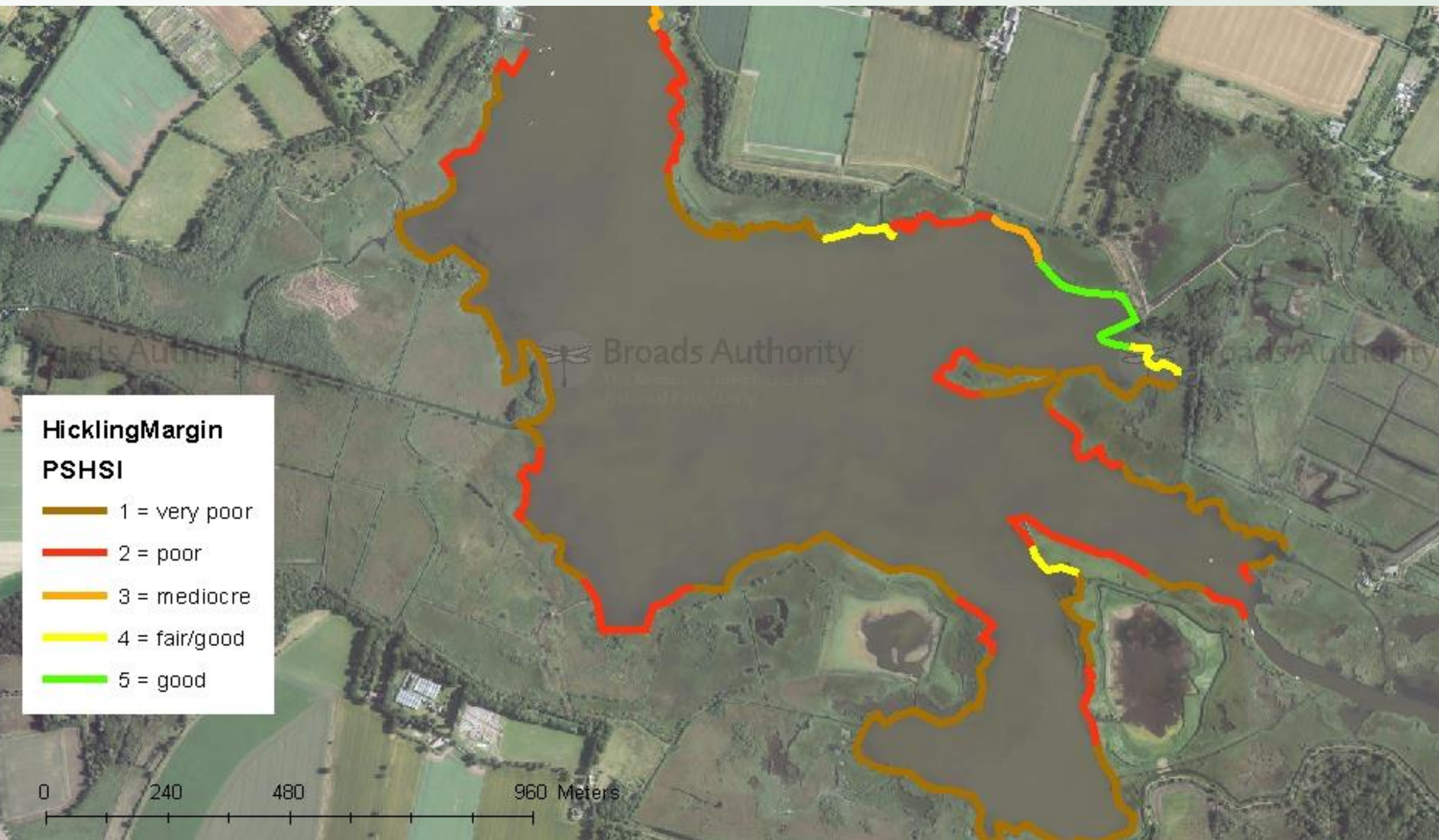| Variable	Base score Potential	Area	Rank (Log10) R	Potential (R x Variable)	Description
V					
T					
S					
Sc					
E					
L					
Overall m^{-2}					

Table 2. Stage 2 Pike Spawning Habitat Suitability Index (PSHSI)

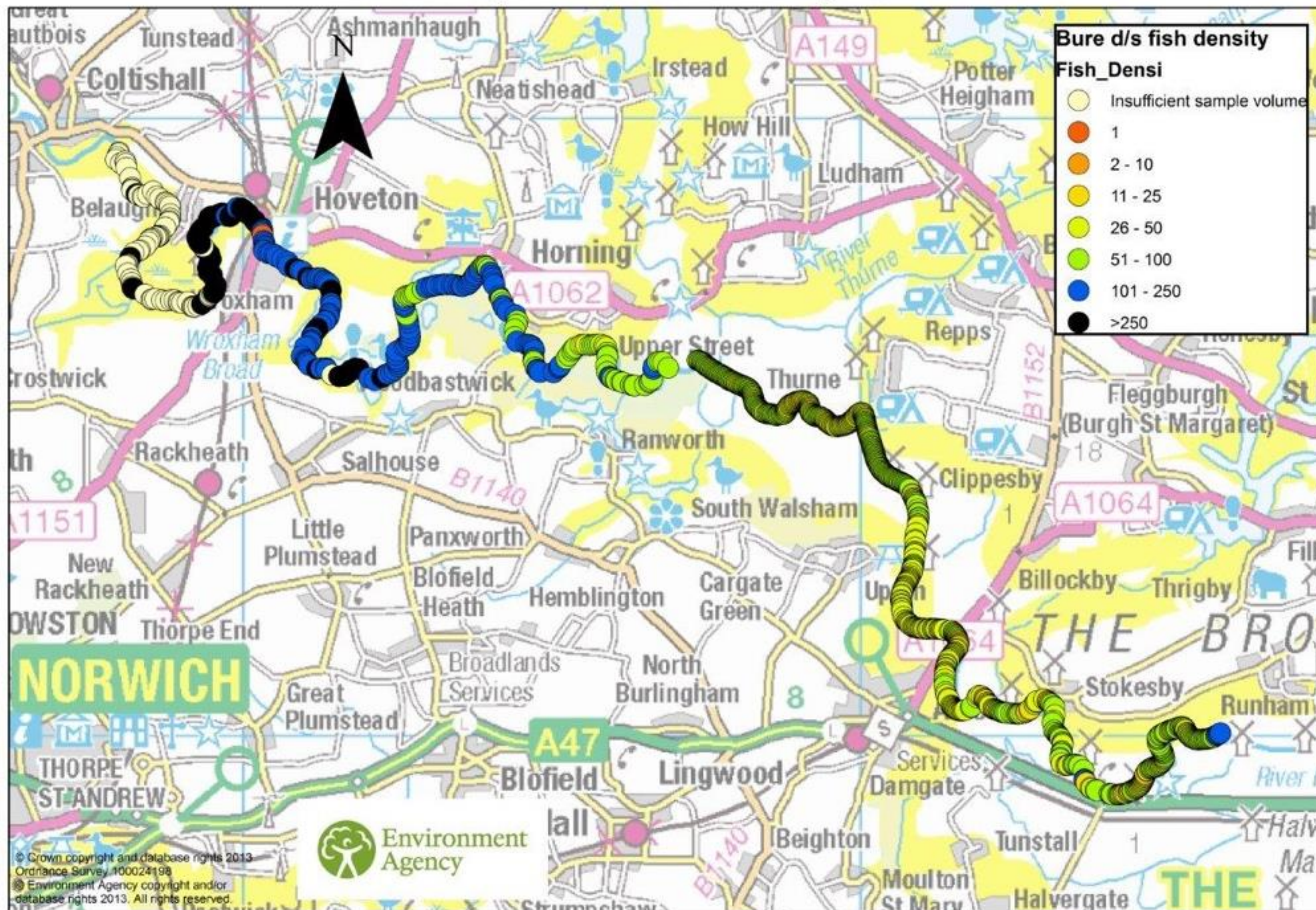We then used outputs from field assessment to focus our effort on assessing pike spawning events around the Bure system...........

PSHSI

HicklingMargin PSHSI

- 1 = very poor
- 2 = poor
- 3 = mediocre
- 4 = fair/good
- 5 = good

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Bure d/s fish density

Fish_Densi

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- ● 26 - 50
- ● 51 - 100
- ● 101 - 250
- ● >250

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Recap conclusions of baseline surveys, and the next steps:

- Multi-method approach of baseline surveys has proven benefits to a complex system:-

- FSSA. Strong diurnal movement 'in and off' broad/wider system for bream and roach :- post processing

- HGB/HB is important to bream and roach. Significant Bream spawning activity observed - further work required

- PASE/MHRSA/FSSA indicates significance of HGB/HB for juvenile roach; spawning/nursery/winter

- HGB does not appear to be unique for pike spawning c.f. wider area

- Strong association with laterally connected habitats:- indicates their importance in future considerations. This is evidenced elsewhere too

- Setting HGB into context:- comparative survey work (AH to present) + Hoveton PhD/Northern Broads Fish tracking project (EW to present)

- MHRSA. Developing methodolgy for wider applications

- Further MHRSA work required:- investigate bream spawning, sediment 'feeding pit' analysis

Acknowledgements

- Jake Reeds

- Ian Welby

- Tom Howard

- Neil George

- Rory Sanderson

- Chris Bielby

- ......and everyone one who's helped over the past 3 years