

Freshwater Habitats

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Freshwater

- Water with low salt content
 - Usually less than 500 ppm
 - Can be 1,000-3,000 ppm
 - Includes non-salty mineral rich natural waters
- Not saltwater, sea water, or brackish water

Freshwater Ecosystems

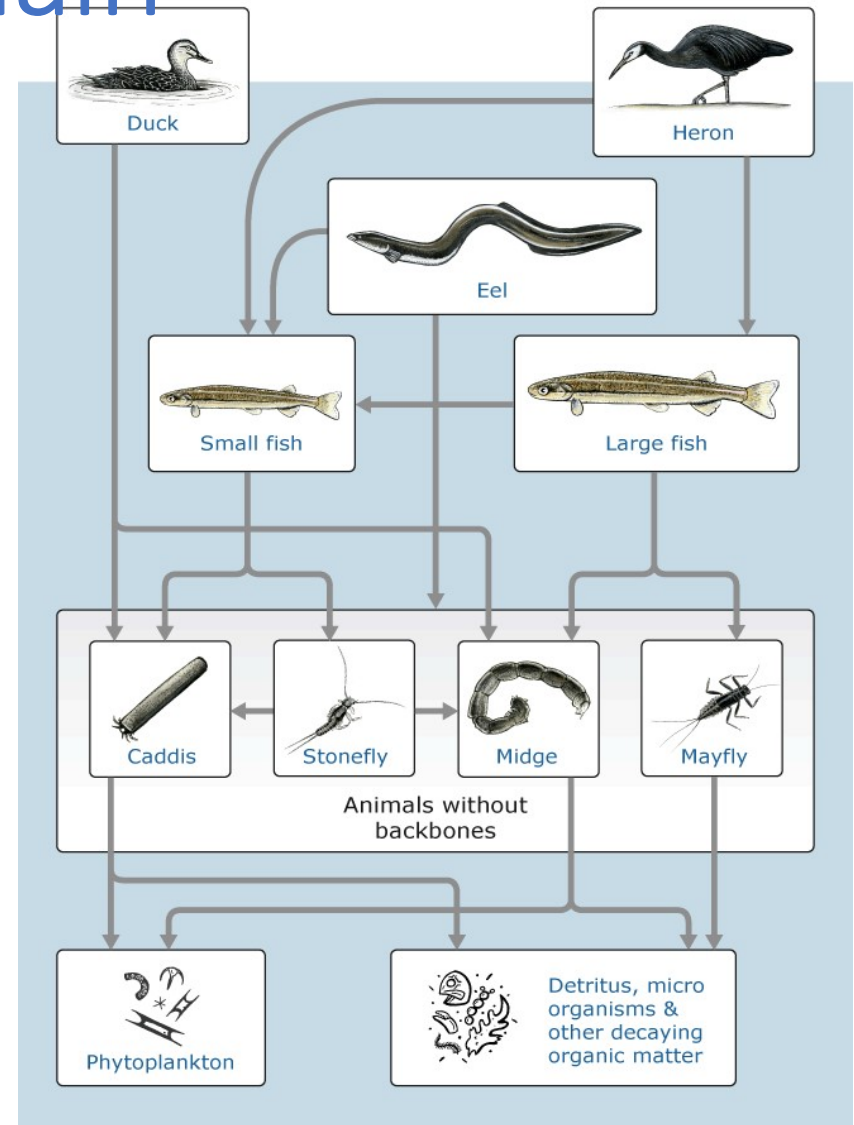
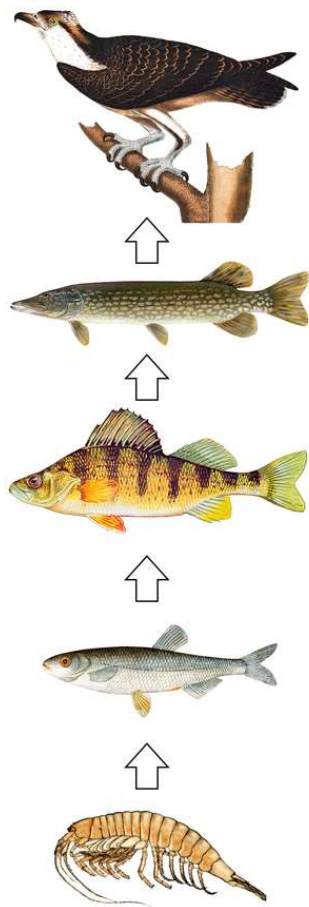
- Lotic Ecosystems
 - Flowing water
 - Rivers, streams, springs etc
- Lentic Ecosystems
 - Still water, ie Relatively slow moving
 - Lakes, Ponds etc
- Wetlands
 - A distinct ecosystem that is flooded or saturated by water either permanently or seasonally
 - Marsh, Fen, Bog, Swamp etc

Each a potential topic in its own right

Biodiversity

Although rivers cover just 3% of UK land area, they support 10% of the country's species.

Food Chain



River Blyth



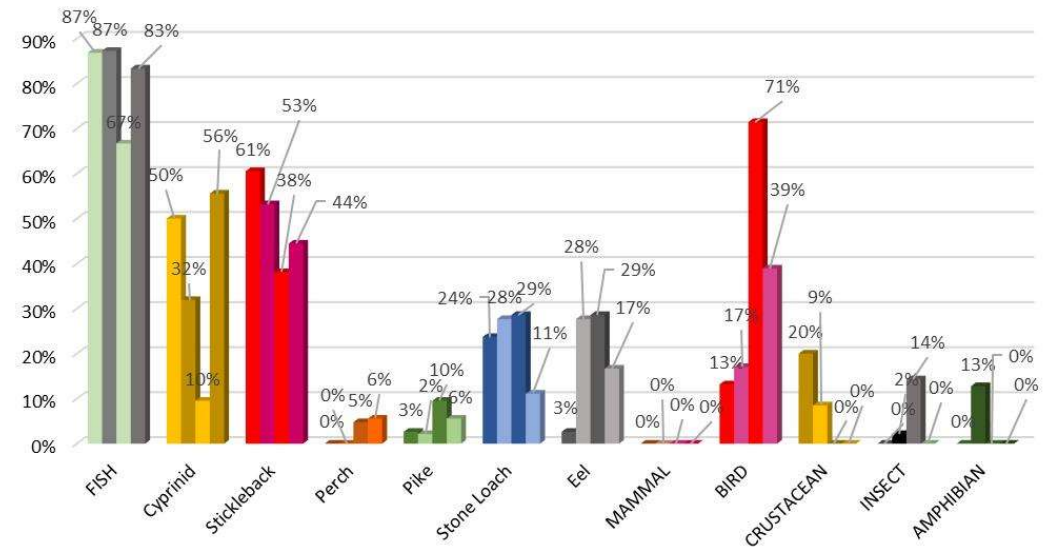
Blyth Otter Group

Spraint Analysis

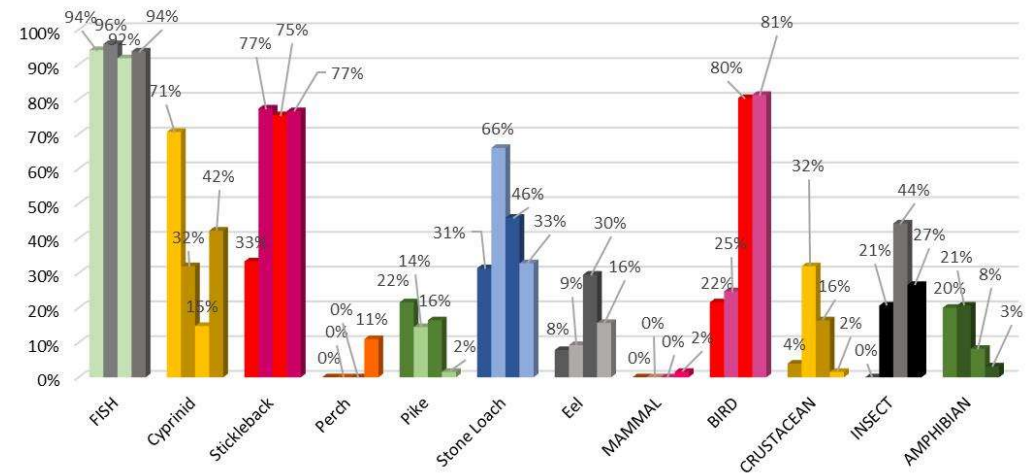
Examples of analysis of spraint collected over two years.

Analyses of 1,858 spraint samples collected in the Blyth catchment Nov 2015 – Oct 2019 were used for an MSc study (see sources)

River Blyth Millennium Green. Comparison of Four Seasons 2016
Winter, Spring, Summer, Autumn (n=125)

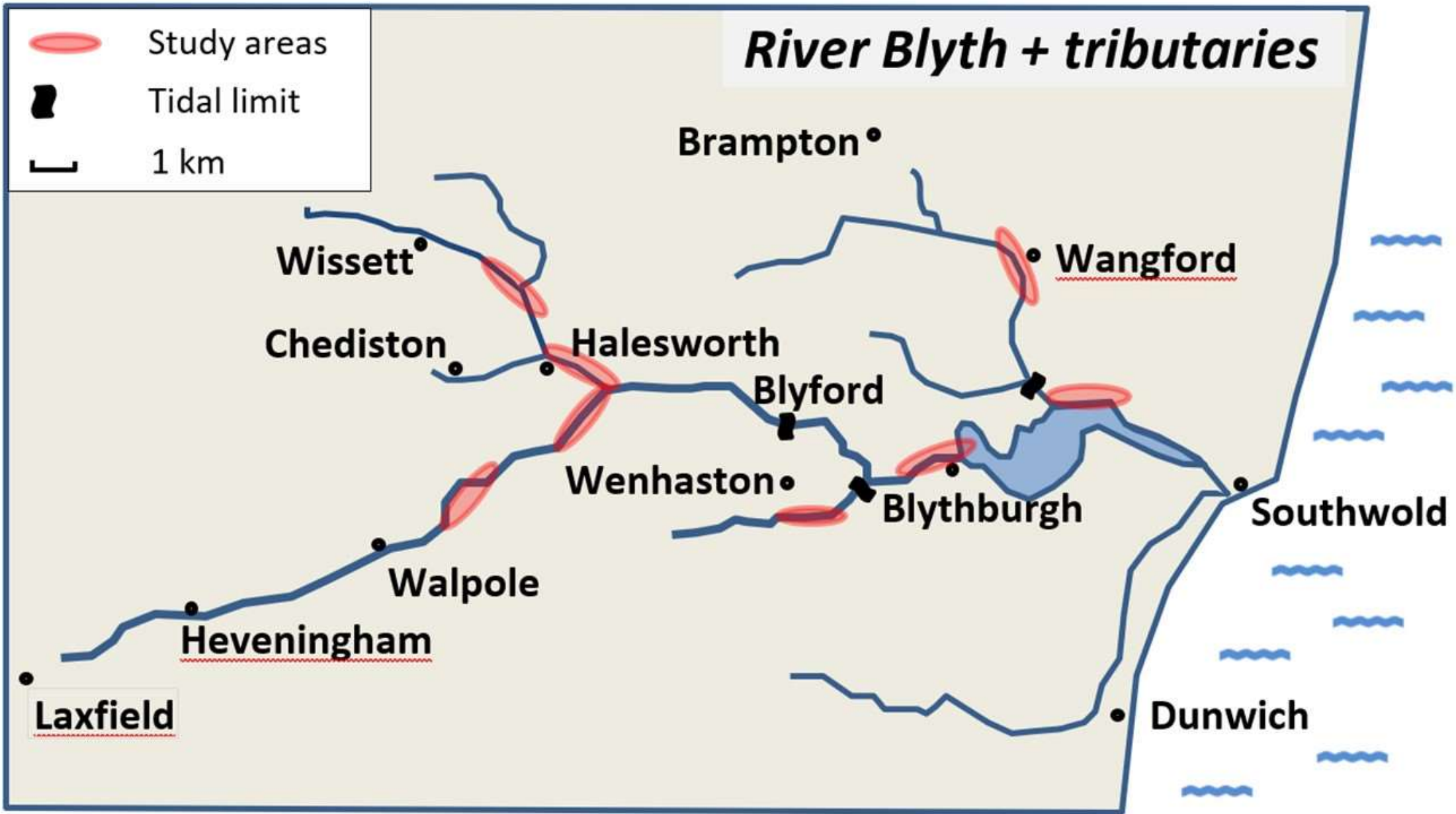


River Blyth Millennium Green. Comparison of Four Seasons 2017
Winter, Spring, Summer, Autumn (n=273)



The whole-river study

- An attempt to get an overview of otter activity in the defined area.
- Sightings have been recorded at some 25 locations during the period from the start of 2020
- Otters tend to occupy a range of river of several kilometres
- About 9 cameras in operation at any one time
- Enables us to see videos of otter behaviour and sometimes to track movement of an otter from one camera location to another
- More instructive to be able to identify where there are distinctly different otters at different locations



Some Observations from the Otter Study

- Otter activity is at least as great in the upper reaches of the Blyth as it is in the lush and more hospitable reedbeds near the estuary.
- We have records of otters at different locations around the same time, ie different otters, on approx 85 occasions in 3.5 years.
- Occasionally otters have been recorded in three different locations at the same time, indicating at least three distinct ranges of single otters or family groups. E.g. simultaneously at
 - Blyford, Halesworth Millennium Green, nr Walpole
 - Hen Reedbeds, Blyford, nr Walpole

The River Blyth – Water Quality

Halesworth Town River meets the Blyth



Poor water quality in 2022 drought



Environment Agency Assessment of River Blyth

Classification Item	2019	2022
Ecological	Poor	Moderate
Biological quality elements	Poor	Poor
Invertebrates	Poor	Poor
Physico-chemical quality elements	Moderate	Moderate
Ammonia (Phys-Chem)	High	High
Dissolved oxygen	Moderate	Moderate
Phosphate	High	High
Temperature	High	High
pH	High	High
Hydromorphological Supporting Elements	Supports good	Supports good
Hydrological Regime	Does not support good	Supports good
Supporting elements (Surface Water)	Good	Good
Mitigation Measures Assessment	Good	Good
Chemical	Fail	Does not require assessment
Priority hazardous substances	Fail	Does not require assessment
Benzo(a)pyrene	Good	
Dioxins and dioxin-like compounds	Good	
Heptachlor and cis-Heptachlor epoxide	Good	
Hexabromocyclododecane (HBCDD)	Good	
Hexachlorobenzene	Good	
Hexachlorobutadiene	Good	
Mercury and Its Compounds	Fail	
Perfluorooctane sulphonate (PFOS)	Good	
Polybrominated diphenyl ethers (PBDE)	Fail	
Priority substances	Good	Does not require assessment
Cypermethrin (Priority)	Good	
Fluoranthene	Good	
Other Pollutants	Does not require assessment	Does not require assessment

UK Water Quality

- Not one English waterway is in good ecological chemical health (EA)
- Due to pollution from
 - Water Treatment Plants
 - Agricultural runoff
 - Leakage from Landfill
 - Urban runoff
 - Runoff from roads
- Over extraction concentrates pollution and causes other deterioration of water ways

Let's end with some good news from science

- Tiny “water fleas” can play a big role in removing drugs, pesticides and industrial chemicals from wastewater
- Treatment plants do not remove all persistent chemical pollutants
- Many of the current options are expensive and carbon-costly, and can be polluting themselves
- The genus *Daphnia* are not fleas but tiny crustaceans
- They filter feed, ingesting small particles of detritus, algae & bacteria

Pollutant-eating *Daphnia*

- Birmingham University scientists selected four types of *Daphnia* that consume pollutants of great concern:
 - The pharmaceutical, Diclofenac
 - The pesticide, atrazine
 - The heavy metal, arsenic
 - And perfluoro-octanesulfonic acid (PFOS)
- Tests were carried out in a 2,000 litre treatment facility
- Next step will be to scale up to 21m litres
- The *Daphnia* removed 90% of the diclofenac, 60% of the arsenic, 59% of the atrazine and 50% of the PFOS

Sources

- Food Chain

- Composition by Amada44 -
File:The_birds_of_North_America_(PL._XVI)_(6022686172).jpgFile:Esox_lucius1.jpgFile:Yellow_perch_fish_perca_flavescens.jpgFile:Ichthyologie;_ou,_Histoire_naturelle_des_poissons_(Plate_8)_(7064394907).jpgFile:FMIB_46282_Tasmanian_'Mountain_Shrimp'_(Anaspides_tasmaniae),_a_living_represe
ntative_of_the_Syncarida.jpeg, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=53128434>
- Roger Young, 'Life in fresh water - Plants and recyclers', Te Ara - the Encyclopedia of New Zealand, <http://www.TeAra.govt.nz/en/diagram/11628/freshwater-food-web>

- Otters

- **Otter Activity on the River Blyth:** Freshwater Sections – 2016/2018, Richard Woolnough, 2019
- **The predatory patterns of the European otter (*Lutra lutra*) along the River Blyth**, Suffolk
Claire Roberts, MSc Dissertation, Dept of Geography, University College London, 2020
- **Otters in the River Blyth catchment**, N Rowbottom & K Derham, Blyth Otter Group. White Admiral #111-Spring 2023

- Water Quality

- Environment Agency - <https://environment.data.gov.uk/catchment-planning/WaterBody/GB105035046070?cycle=3>

- Wastewater clean up

- Luisa Orsini, Prof of Evolutionary Systems Biology & Environmental Omics, and Karl Dearn, Prof of Mechanical Engineering, University of Birmingham
- Reported in the Guardian, 27 Sept 2023, on a publication in the journal “Science of the Total Environment”