Solent & South Downs fish monitoring report 2015

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Foreword

Welcome to the annual fish report for the Solent and South Downs area for 2015. This report covers all of the fisheries surveys we have carried out in Hampshire and West & East Sussex in 2015 and is the ninth annual report we have produced in succession.

In 2015 our fisheries monitoring programme was dominated by Eel Index surveys on the rivers Itchen & Sussex Ouse and 6-yearly spatial monitoring for salmon parr and brown trout on the Itchen. The monitoring programme in 2015 has focussed on generating in depth data on specific fish species in specific rivers, allowing us to gain a greater understanding of these fish populations and their variability over time. We also carried out Principal Coarse Fishery surveys on several rivers in West & East Sussex, focussed on locations where coarse fishing takes place.

The 2015 fish programme began in May and ran through to the end of October. There were a small number of rescheduled surveys due to heavy bouts of rain in August, but all surveys were completed within their respective timeframes.

As always, weather and climate had a large influence on our fish populations, and we analyse how the 2015 results demonstrate this throughout the report. In 2015 our area did not have the dramatic scenes of previous years, with little in the way of extreme flooding, droughts, heatwaves or cold snaps. However, the summer was remarkable in its absence, the average temperature over the summer months being the coolest since 1999 and over 1°C cooler on average than 2014. Degree days over 12°C (a figure used to demonstrate favourable growth conditions for coarse fish) was also the lowest figure since 1999. 2015 ended on a much warmer note- November was above average for temperature, and December was the warmest on record.

Acknowledgements

As always, we would like to thank all landowners, keepers, fishing clubs and stakeholders who have allowed us access onto the riverbank in 2015. It would be impossible for us to carry out these vital surveys without this help and local knowledge and this is greatly appreciated.

Executive summary

- In 2015 we carried out just over 100 fish surveys throughout the Solent & South Downs area which included 27 on the River Itchen, 15 on the River Ouse and spring & autumn estuarine surveys.

- We carried out 10 surveys on the River Itchen to estimate abundance and distribution of salmon parr. These were a repeat of surveys carried out in 2009 and salmon parr were found to have a similar distribution in 2015. No salmon parr were found above Winchester, whereas salmon parr were only absent from one site downstream of the city. A very high abundance of salmon parr were found at Shawford Park, where 322 were caught.

- Eel numbers continue to decline in the River Itchen. Eel numbers have reduced by two-thirds since 2009, and there has been a similar decrease during each round of Eel Index surveys (every two years). The largest decline has been in adult eels, suggesting a lack of recruitment.

- Results from the fish counters we have on the Test and Itchen showed exceptional numbers of returning adult salmon, with both recording the highest figures since the counters were established in 1990. An estimated 903 adult salmon returned to the Itchen and 2,007 to the Test.

- In the five Principal Coarse Fishery surveys carried out on the Sussex Ouse in 2015, dace and roach abundance were at the highest recorded level since 2011, whereas the abundance of chub had declined slightly compared with 2013.

- Water Framework Directive surveys were carried out across the region, giving us the opportunity to look at some stretches of river that are rarely surveyed. This can often give some unexpected results; in 2015 we caught a salmon parr in the River Ems, the first recorded in the river. These surveys also highlighted the importance of small coastal streams for eel populations.

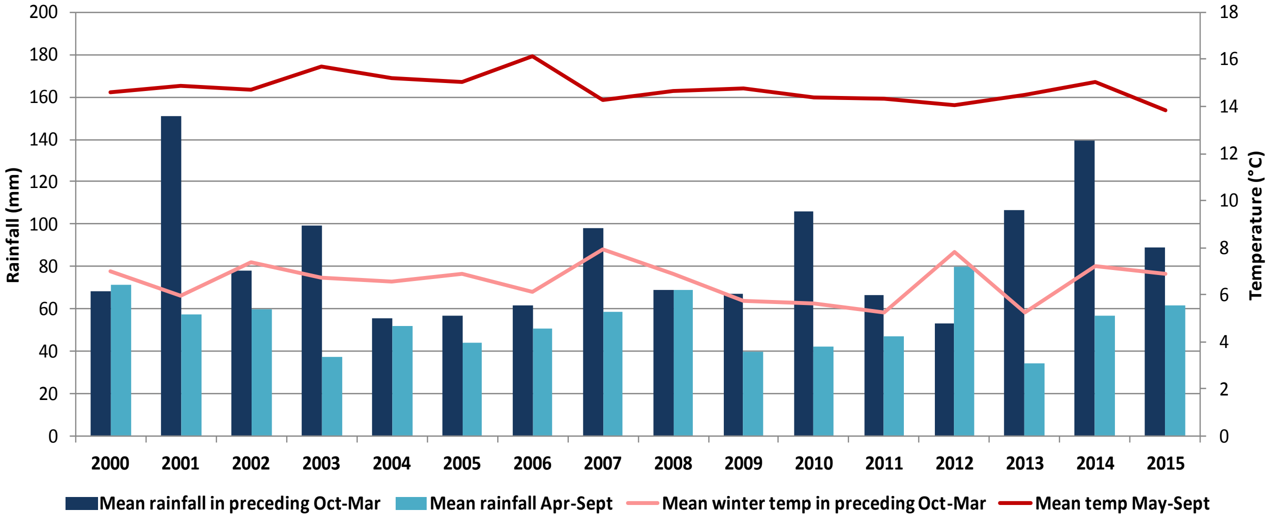
- Estuarine TrAC surveys were carried out in spring and autumn in 2015, in both Southampton Water and the Adur estuary. We caught 40 species of fish in Southampton Water, including the first incidence of a sea trout smolt in these surveys, and 15 species in the Adur. Overall catches were slightly down on average, probably due to lower summer sea surface temperatures.

Contents

Rainfall & Temperature

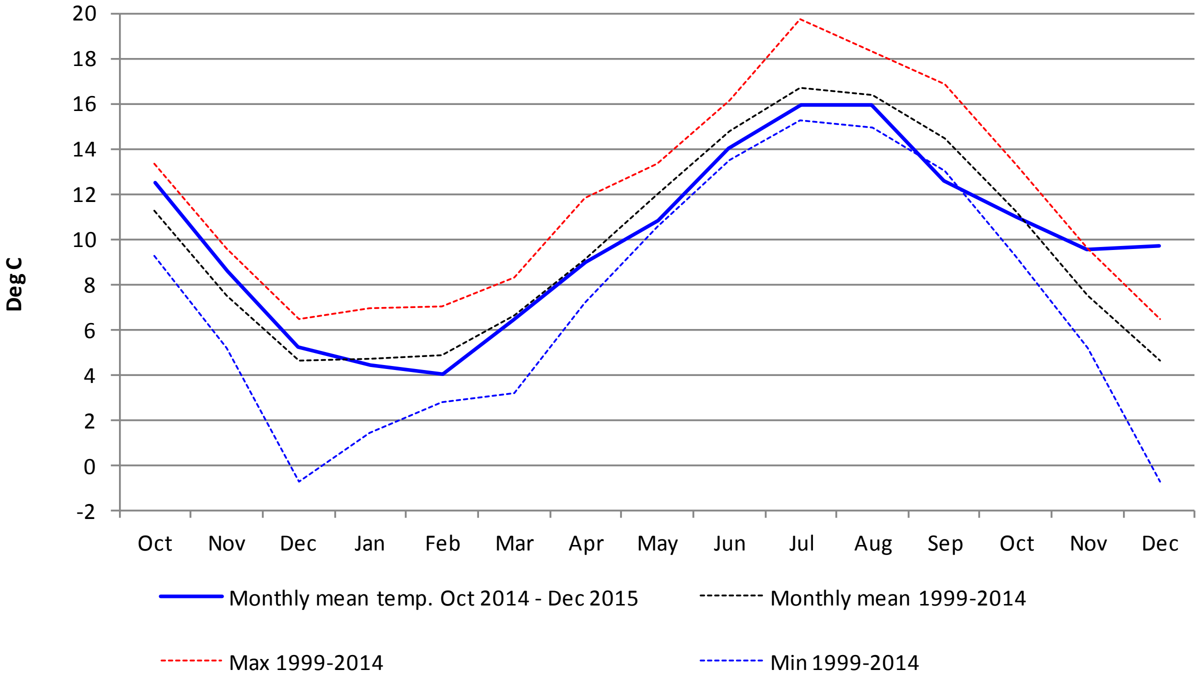
Climatic conditions have a major influence on fish populations in both freshwater and marine environments. Rainfall can influence flows, with high rainfall leading to flooding and low levels leading to drought conditions. Temperature affects the rate of fish growth and also the amount of oxygen available in the water. The following graphs highlight how these two variables have changed both over the 2015 survey year and over the course of our long term fisheries dataset.

Graph TR1 shows the mean summer and winter rainfall each year, based on an average of rain gauge data from Romsey and Worthing, and the mean temperature for the summer and preceding winter of each year. The temperature data is calculated using the Central England Temperature (CET) dataset. Rainfall is measured in mm and temperature in degrees Celsius.



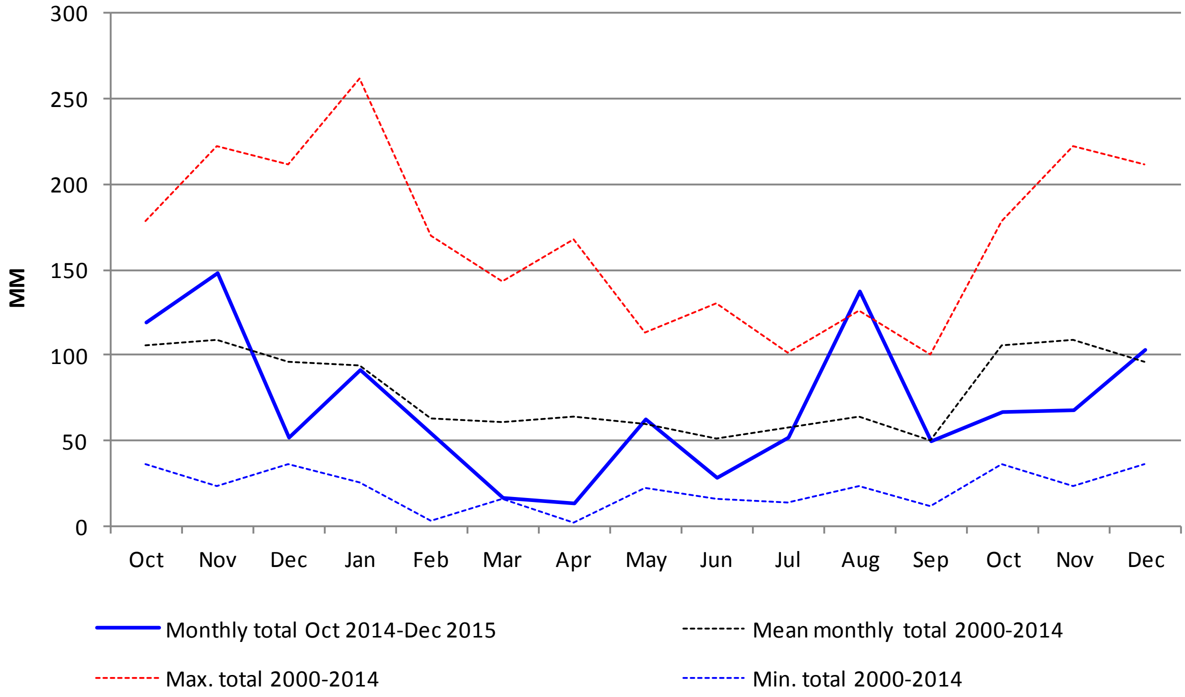
Graph TR1- mean winter and summer temperature and rainfall over the past 15 years.

Graph TR2 shows the mean monthly temperature from October 2014 to December 2015. Also shown is the average figure based on the previous 15 years and the minimum and maximum average for each month. All figures are calculated using the CET dataset and shown in degrees Celsius



Graph TR2- Monthly mean temperatures from October 2014 to December 2015

Graph TR3 shows total monthly rainfall between October 2014 and December 2015. This is shown alongside the average monthly total between 2000 and 2014 and the maximum and minimum value for each month during this time period. All values are in mm.



Graph TR3- Monthly rainfall totals from October 2014 to December 2015

Graph TR1 demonstrates how the weather in 2015 compares with that in previous years. Overall, rainfall levels were close to average for the winter 2014/15 period and for summer 2015. Graph TR3 shows how this rainfall was distributed on a monthly basis, where we can see that after a wetter than average October & November 2014, rainfall was lower than average for each month until August, with the exception of May which was close to the 15-year mean. We received more rainfall in August than in any other month in 2015 and it was the wettest August we have recorded since 2000.

Summer floods can have detrimental effects on young of the year coarse fish, which haven't yet gained the swimming ability to deal with increased flow velocities. The benefit of this rainfall can be to alleviate low flows and droughts in rain fed river catchments. Salmonid species such as Atlantic salmon and brown trout benefit from elevated flow velocities to an extent, and cooler summers often result in good recruitment years. The end of 2015 saw slightly below average rainfall amounts, and we avoided the record-breaking rainfall recorded in the north of the country.

The winter preceding our 2015 fish monitoring season was relatively benign, to accompany the near average rainfall, temperatures were also near to average, with the first part of the winter slightly warmer and the latter half slightly cooler than the 15-year mean. From April until October each month was cooler than the average, with May being close to the coolest on record and September cooler than in any of the past 15 years. The last two months of the year saw a dramatic turnaround with November close to the warmest observed in 15 years, and December breaking records nationally, being the warmest recorded in the CET dataset by over a degree.

These conditions raise some interesting questions with regards to our fish populations;

- Did the settled conditions of winter 2014/15 provide good spawning and incubation conditions for salmonids?
- Did the high August rainfall and low summer temperatures reduce juvenile coarse fish recruitment?
- Are there any lasting impacts from the winter floods of 2013/14?

Interpreting results

Fish survey methods

The majority of fish population surveys covered in this report were conducted using electric fishing, either from a boat or wading. Electric fishing involves the placement into the water of a pole with a large metal ring at the end (the anode), which is energised with electricity from a small generator or battery. A circuit is formed through the surrounding water between the anode and a length of copper braid (cathode) placed in the water a few metres away. The current is carefully controlled via specialised circuitry in a control box and causes fish to swim towards the anode and become partially anaesthetised so they can easily be collected in a hand net. The type of current used is known as Pulsed Direct Current. Voltage, pulse frequency and pulse "width" (duration) are all adjusted for each specific location with the aim of capturing fish, with the minimum electrical power and therefore the minimum risk of injury.

All electric fishing surveys reported involve the team wading or boating slowly upstream, usually for 100 metres, until they reach a stop net placed across the channel to prevent fish escaping from the survey reach. All Water Framework Directive and salmonid surveys discussed in this report involve a single upstream electric fishing run or pass ("single run"), whereas Principal Coarse Fishery and Eel Index surveys involve three successive runs ("catch depletion").

Some electric fishing surveys for juvenile salmon and trout (parr) take place in sections of river that are too wide, shallow and weedy for stop nets to be used and for two anodes to fish the whole width effectively. Under these circumstances a reasonable measurement of parr abundance can be made by fishing with an electric fishing backpack unit and wading in a straight line upstream, through suitable parr habitat, for a set distance and period of time. If the time fished and the distance covered is kept consistent, then data can be compared between sites and between years. We use this method for several of our salmon parr surveys on the Test and Itchen, fishing for exactly five minutes and covering approximately 75 metres.

Captured fish are placed in a container of cool, aerated water and identified and counted before being returned to the river. Scales are sometimes taken so that fish ages can be checked.

Estuarine fish surveys don't use electric fishing, because of the very high conductivity of salt water. Instead, a combination of beach seine netting, small beam trawling and fyke netting (a type of static fish trap) is used. Seine netting is sometimes also used to conduct fish surveys in very wide, slow rivers.

To monitor adult returning salmon we have two fish counters; one at Nursling on the River Test and one at Gaters Mill on the Itchen. These counters work by detecting the change in resistance when a fish swims over a set of electrodes in the channel. By having three electrodes, we can tell whether the fish is moving upstream or downstream according to the pair that were triggered first. As the electrodes detect a change in resistivity, a count is made and a photograph is taken either from above (at Nursling) or through a glass screen to the side (Gaters Mill). These fish counters do not provide an exact count of fish as they only cover one possible route of ascent, however through previous monitoring we can estimate the proportion of fish using the monitored route compared to others, and we apply a correcting calculation to our count to address this. Our counts therefore are an estimate of the total number of salmon ascending our rivers each year.

Fish survey results

Single-run electric fishing surveys don't catch every fish in the reach they cover, so the catch is a minimum estimate and gives a general idea of the species present and their abundance.

Catch depletion surveys catch the majority, but usually not all, of the fish in the survey reach. However, the difference in catch in each successive run allows a reliable estimate of the total population of each species to be calculated. Catch depletion results shouldn't be compared directly with single run results, although sometimes single run results are compared to the first run of a catch depletion survey. The results from both types of survey are expressed as the number or weight of fish per $100m^2$ of river.

Water Framework Directive surveys

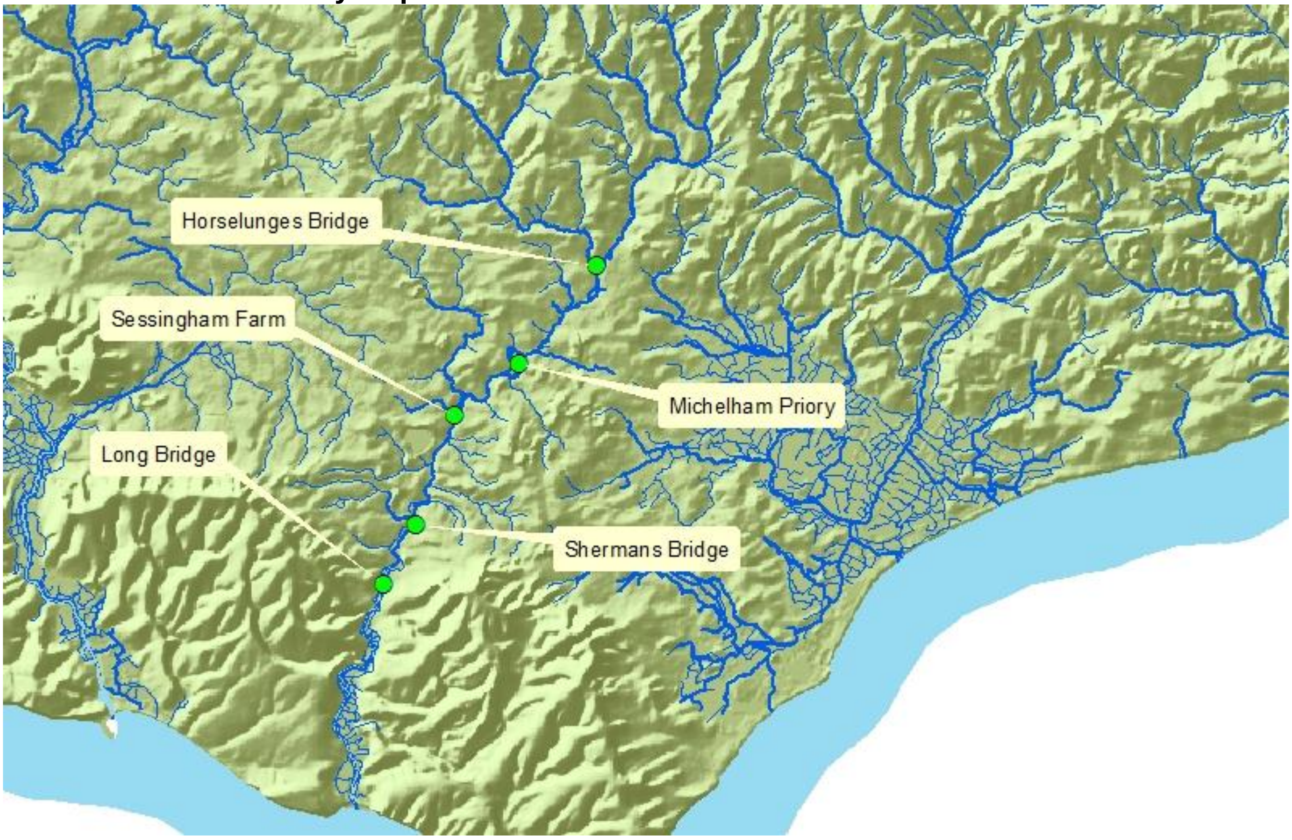
Water Framework Directive surveys consist of one single run, either between stopnets, or with one upstream stopnet. The results are collated each year and classified using FCS2 (the Fisheries Classification Scheme, Version 2). This produces the formal classification we use for WFD, from High to Bad. These surveys are only carried out once in every six years, and so are best represented in tabular form (see below). This example WFD table shows the number of fish caught of each species, the total number of species and the total density of fish excluding minor species such as minnow, bullhead, stoneloach, brook lamprey and three-spined stickleback.

Site	NGR	Atlantic salmon	Brown / sea trout	Perch	Pike	Roach	Rudd	Tench	Common carp	European eel	Minnow	Stoneloach	Bullhead	3 spined stickleback	10 spined stickleback	Brook lamprey	Flounder	Number of species	Total density (excl minor species)
Sefter Farm Footbridge	SU8916600324			1		6		3	1	45								5	16.6
Brook Meadow Footbridge	SU7505506271	1	46							15			50					4	16.5
Apuldrum STW	SU8454003755									49				2			1	3	14.0
Goose Green	SU7704521512		29					1					75			2		4	12.3
Southbrook Farm	SU8087006794									55			33	10				3	10.1
Westbourne	SU7567807789		27							7			500					3	9.4
Heaver Farm Footbridge	SU8128105709		3							40			34	28	1			5	9.0
Pagham Rife	SZ8824598786				2	22	2		1								1	5	3.9
Mizzards Farmhouse	SU8034722630		3					1		1	9	26	25			3		7	1.6

1. East Sussex

1.1. Cuckmere

Five coarse fish population surveys were conducted in the Cuckmere catchment in 2015. Four of these are also classified for the Water Framework Directive (WFD). The locations of these sites are shown by Map Cuckmere 1.

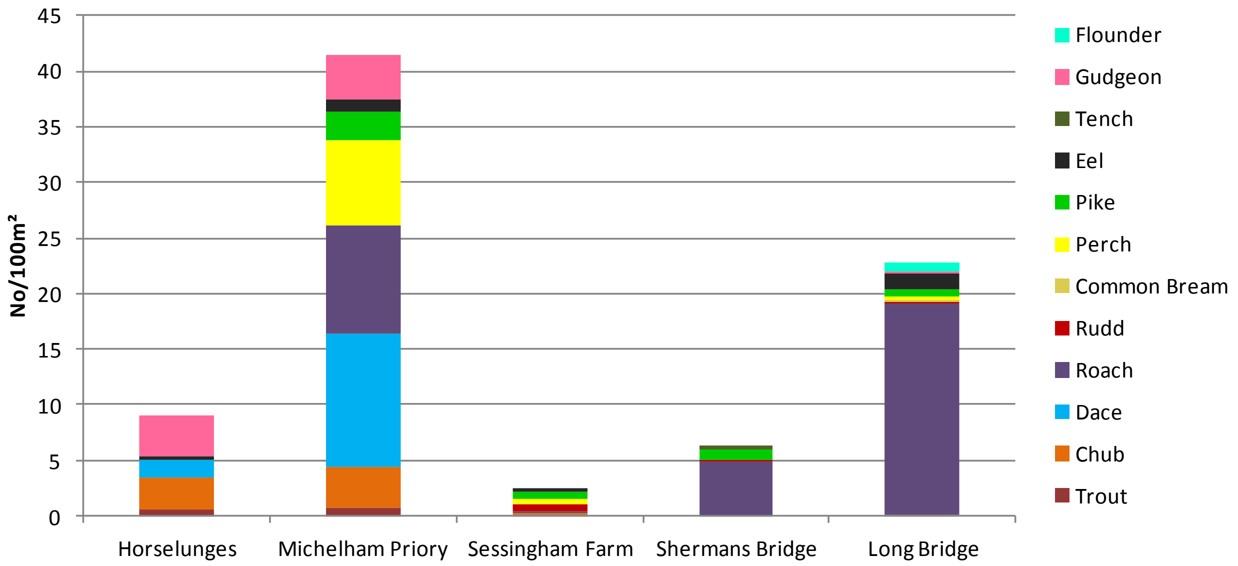


Map Cuckmere 1: 2015 survey sites on the Cuckmere River.

- Michelham Priory produced the highest catch density of all the Cuckmere sites in 2015.

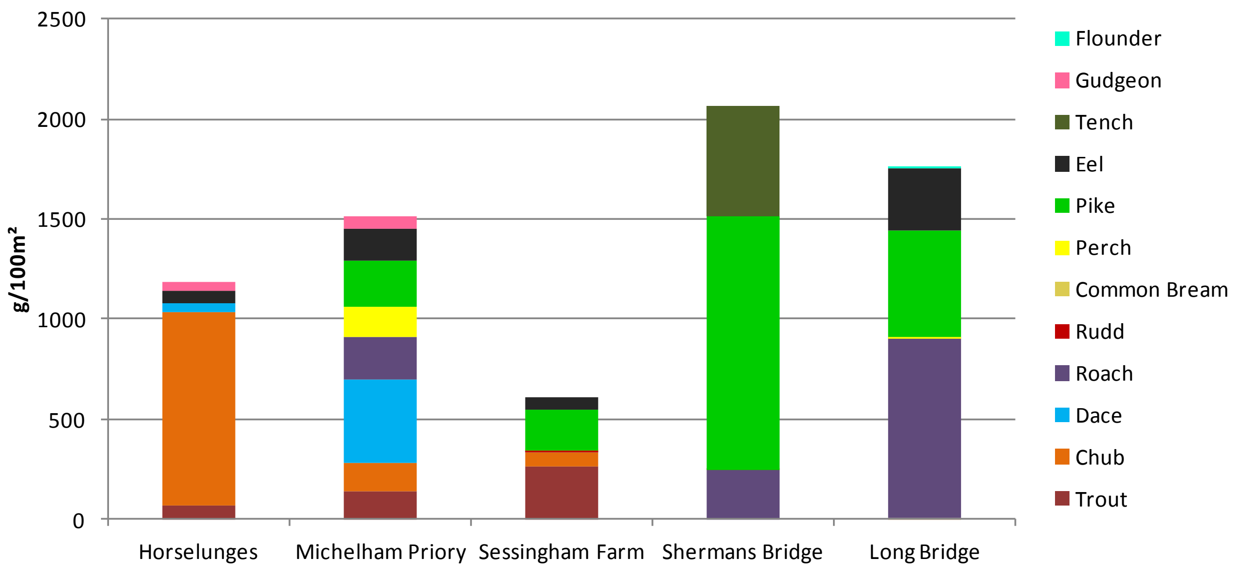
- At Long Bridge, roach abundance was at the highest level we have recorded since 2009.

Graph Cuckmere 1 shows the estimated density (number of fish per 100m²) for each of the five Principal Coarse Fishery (PCF) sites on the Cuckmere.



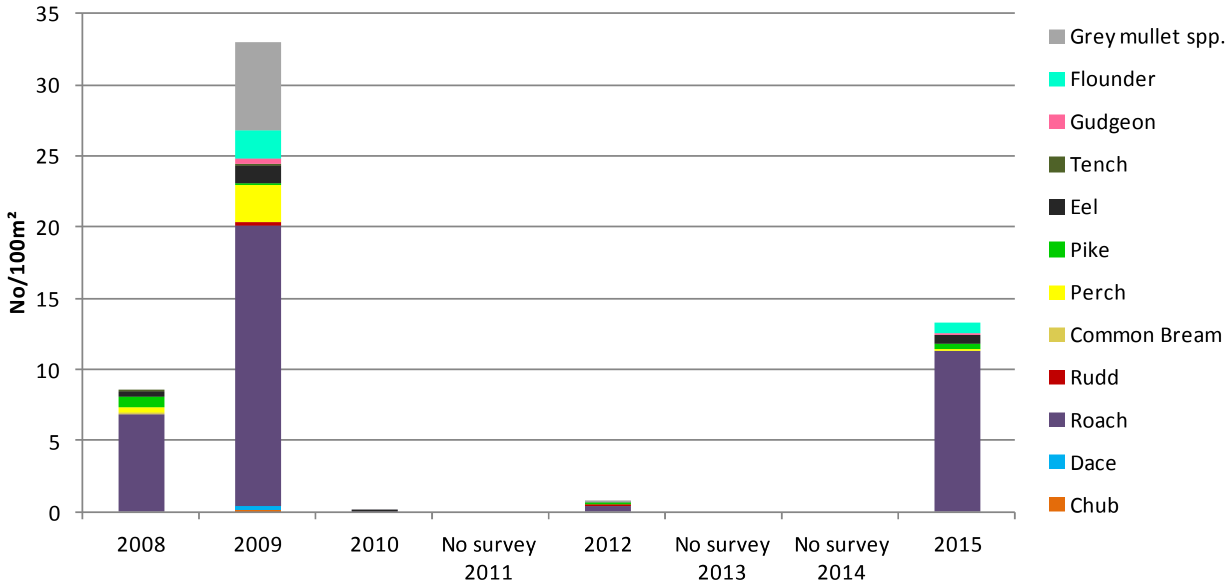
Graph Cuckmere 1: Estimated density, Cuckmere PCF, 2015

Graph Cuckmere 2 shows the estimated biomass (grams per 100m²) for each PCF site on the Cuckmere



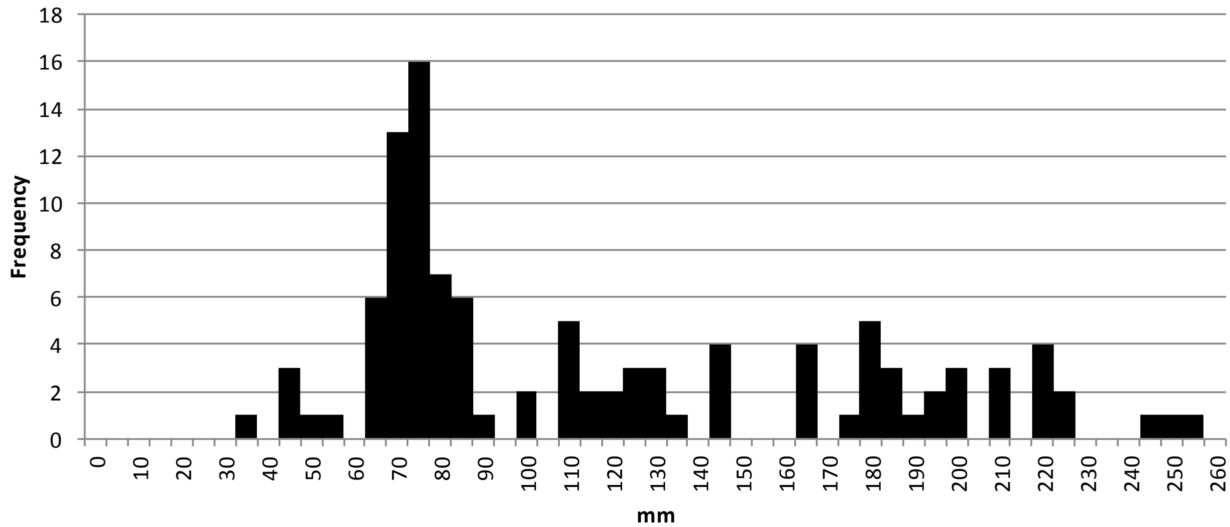
Graph Cuckmere 2: Estimated biomass, Cuckmere PCF, 2015

Graph Cuckmere 3 describes the first run density (number of fish per 100m²) at the Long Bridge survey site between 2008 and 2015. Years with no survey are marked on the X-axis.



Graph Cuckmere 3: Long Bridge, first run total density, 2008-2015

Graph Cuckmere 4, below, is a length frequency histogram showing the size range of roach caught at Long Bridge in 2015. Fish are grouped into 5mm size bands.



Graph Cuckmere 4: Roach length frequency histogram, Long Bridge, 2015

Discussion

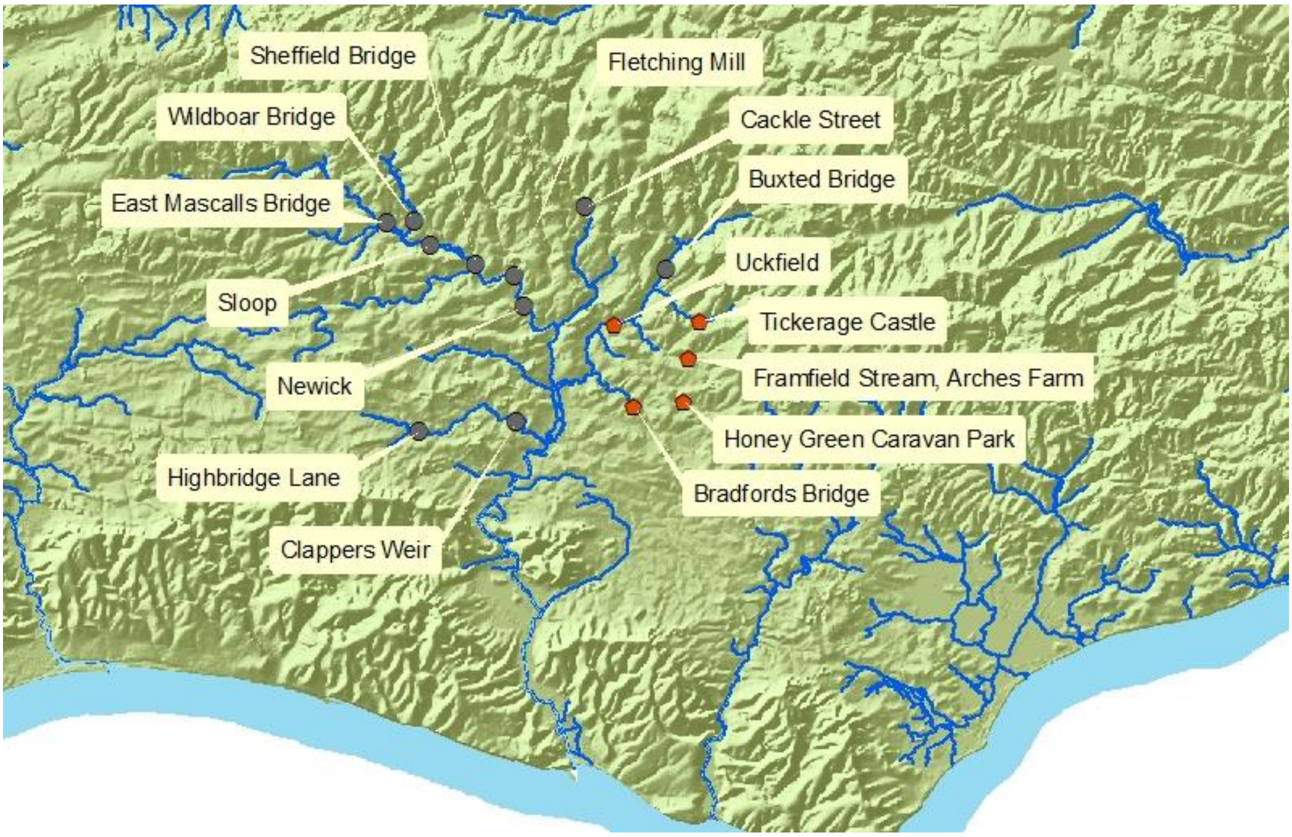
In 2015, catches were variable across the five Principal Coarse Fishery (PCF) sites surveyed on the Cuckmere (graphs Cuckmere 1 & 2). The highest density of fish was found at Michelham Priory, with just over 40 fish per 100m². This catch largely consisted of roach, perch and dace.

At Long Bridge we caught around half as many fish, with an estimated density of approximately 20 fish per 100m² of river channel surface area. This catch was dominated by roach, but also included flounder, illustrating that this site is strongly influenced by the estuary a short distance downstream. The roach at this site exhibited a typical length frequency distribution, with a higher proportion of young fish and a lower number of larger adults (graph Cuckmere 4). This reduction occurs as fish are lost from the population through mortality. The density of roach at Long Bridge was the highest we have recorded since 2009.

A tench caught in the survey at Sherman's Bridge

1.2. Sussex Ouse

In total fifteen fish population surveys were carried out on the River Ouse Catchment in 2015. The exact locations are shown on Map Ouse 1 (below). The surveys were delivered under various purposes as outlined in Table Ouse 1. Ten locations were Eel Index sites and five were PCF.



Map Ouse 1: Site locations where surveys were carried out in 2015

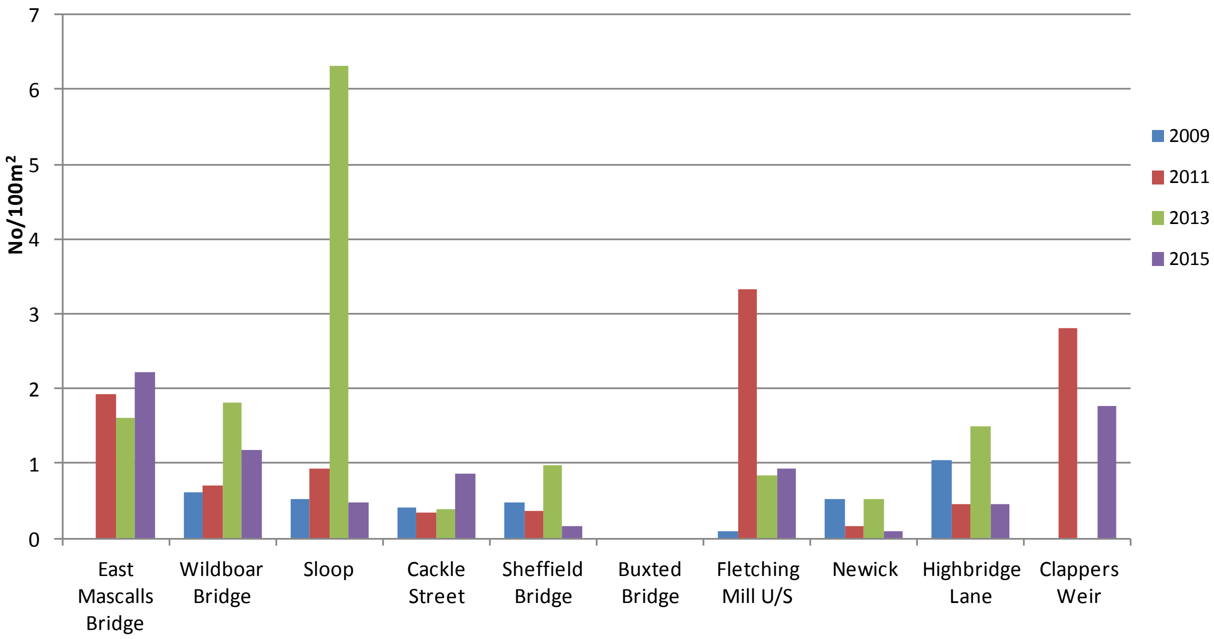
	Newick	Sloop	Sheffield Bridge	Fletching Mill Upstream	East Mascalls	Highbridge Lane U/S bridge	Buxted Bridge	Cackle Street	Clappers Weir	Wildboar Bridge	Tickerage Castle	Bradfords Bridge	Framfield Stream, Arches Farm	Uckfield	Honey Green Caravan Park
Eel Index	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
PCF	✓	✓	✓	✓	✓										
WBT						✓	✓								
WFD	✓	✓	✓						✓	✓	✓	✓	✓	✓	✓

Table Ouse 1: Showing all the sites that were surveyed and the purpose for each

- In 2015, dace and roach abundance was at the highest recorded level since 2011, whereas chub have declined slightly on 2013.
- In 2015 we recorded high abundances of dace in the upper sites, with both East Mascalls and Sloop showing around 50 dace at each site. Many of these were larger, adult fish.
- Some large chub were captured at East Mascalls, Sheffield Park and Fletching Mill.
- We recorded a sea trout at Newick for the first time since 2004.
- At Fletching Mill we found the highest abundance of trout since we began surveying this site in 2009.

Ouse Eel Index

Graph Ouse 1 shows the estimated density of eels in the ten Eel Index survey sites on the River Ouse. Data is shown from the four Eel Index survey years (2009, 2011, 2013 & 2015) and is grouped per site.



Graph Ouse 1: Eel density, Ouse Eel Index sites, 2015

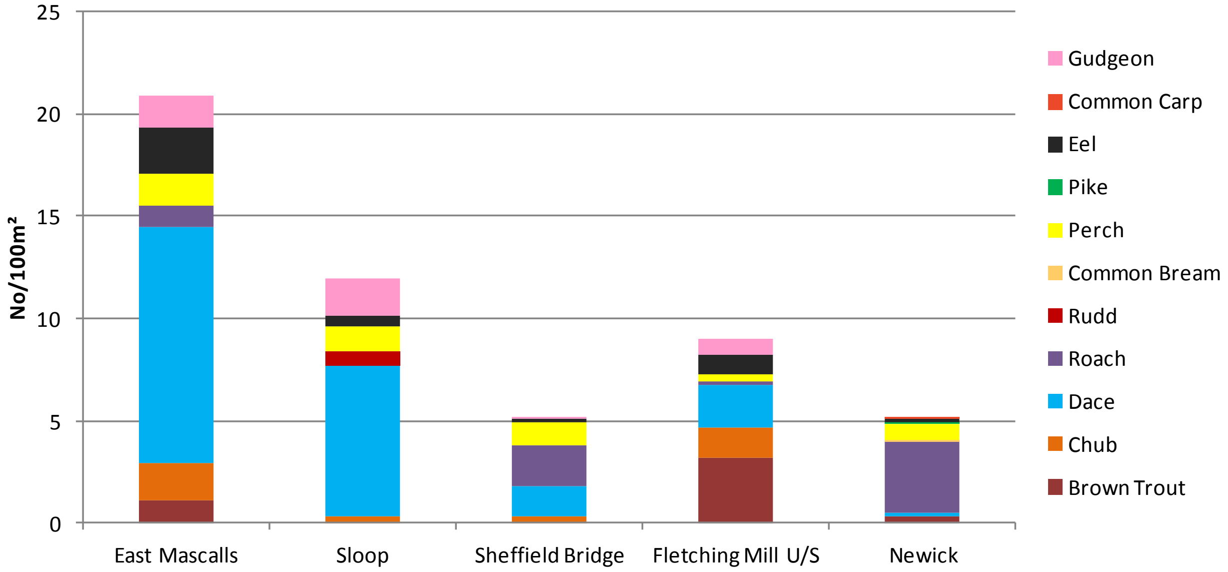
Discussion

Eel abundance remains at a low level throughout the Ouse catchment. The maximum density of eels recorded at any site is just 2 per 100m². Due to this low abundance, any trends in data are likely to be random noise around a very low figure. For example, although eel abundance at Cackle Street has more than doubled since 2013, in reality this is the difference between one fish (2013) and three fish (2015).

Eels continue to be absent from Buxted Bridge, and we have recently removed two weirs downstream of this location, improving passage for fish moving upstream in the future.

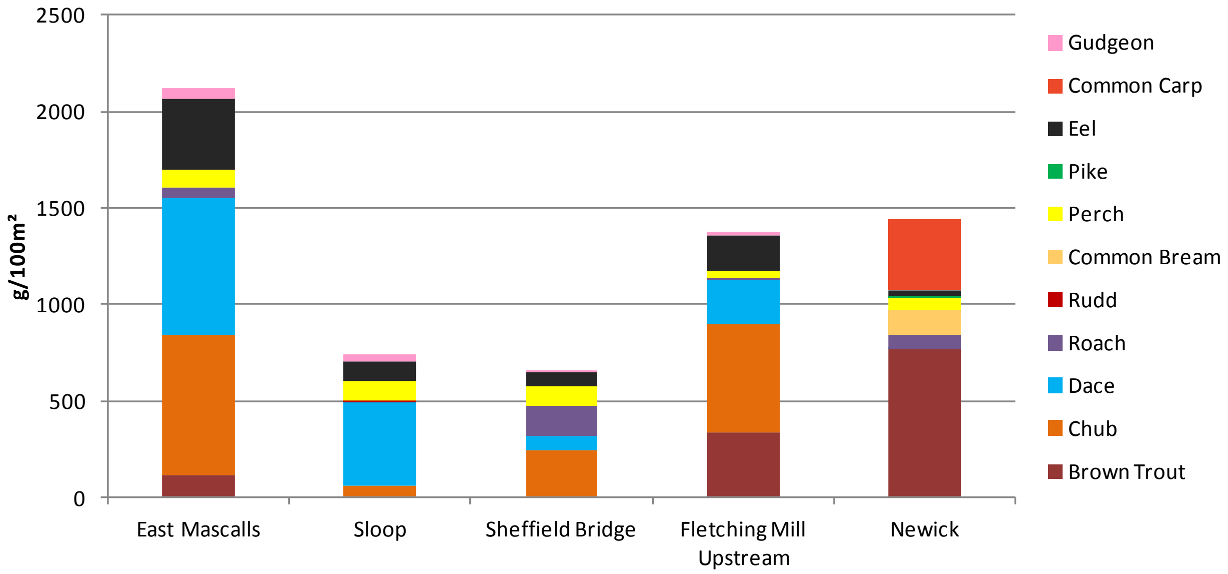
Principal Coarse Fisheries

Graph Ouse 2 shows the estimated density for each PCF site on the River Ouse.



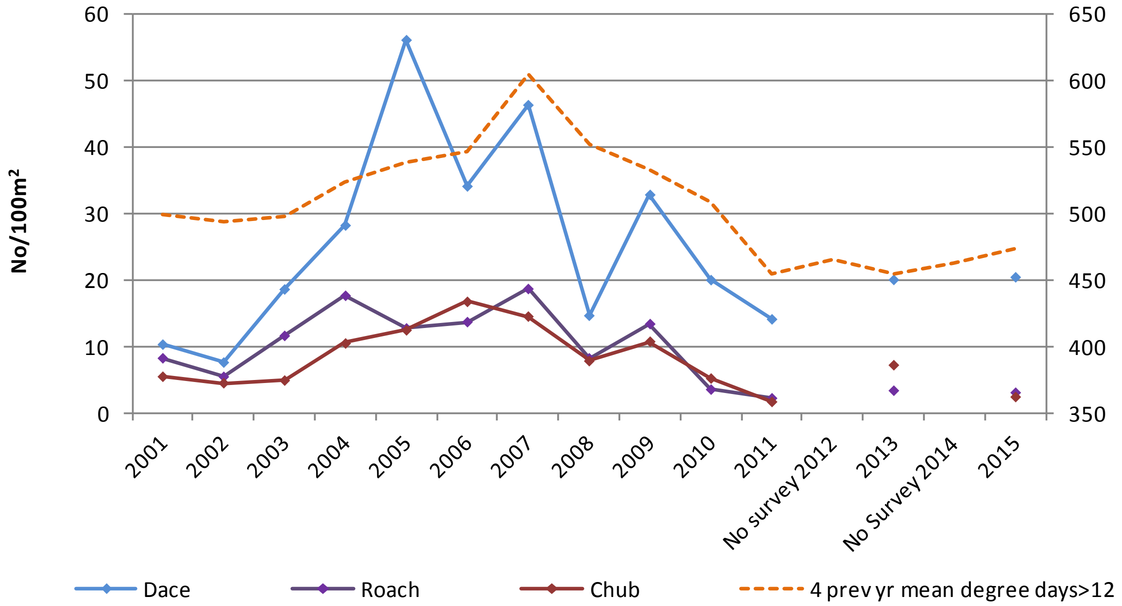
Graph Ouse 2: Estimated density, Ouse PCF, 2015

Graph Ouse 3 shows the estimated biomass for each PCF site on the River Ouse



Graph Ouse 3: Estimated biomass, Ouse PCF, 2015

Graph Ouse 4 shows the combined total estimated density for dace, roach and chub compared to the number of degree days >12°C (four previous years mean). A degree day over 12°C is a 24 hour period where the average temperature exceeds 12°C by a degree. For instance a day with an average temperature of 15.2°C is 3.2 degree days over 12.



Graph Ouse 4: Dace, Roach and Chub total estimated density against degree days >12°C (4 year mean), River Ouse, 2001-2015

Discussion

In 2015 we recorded the highest density of fish at East Mascalls since 2009 but in contrast we observed the lowest density at Sloop over the same time period (graph Ouse 2). The reason behind the drop in density at Sloop seems to relate to the absence of chub which have previously been found in much higher numbers than in 2015. Chub density in 2015 was approximately 0.3 fish per 100m² compared to an average of 3.3 per 100m² during the four surveys completed between 2009 and 2013.

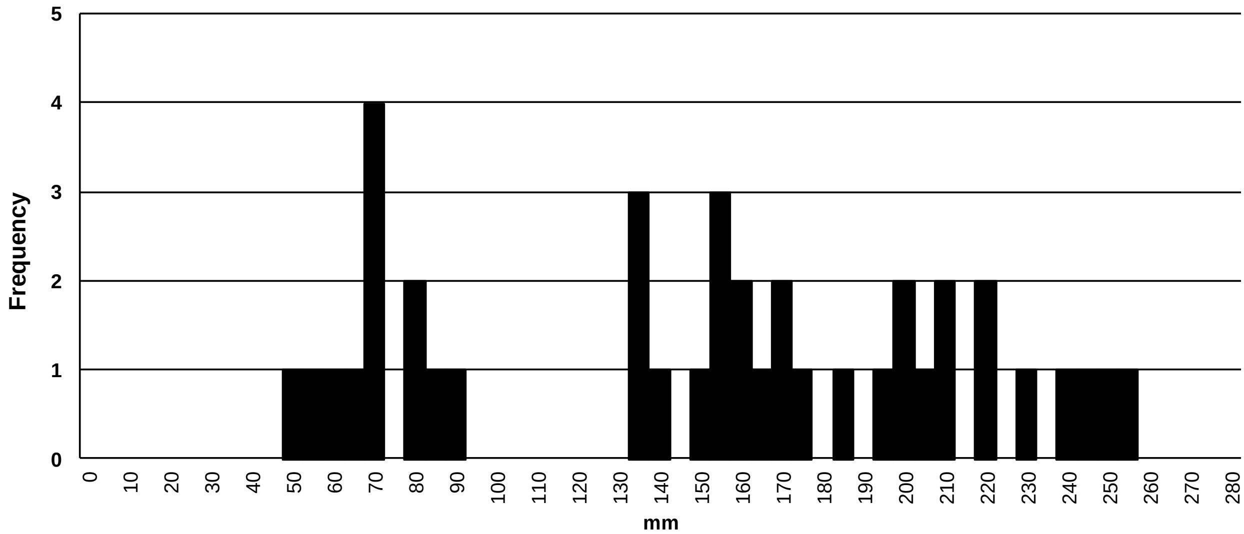
At Newick we recorded three large sea trout in 2015. These fish formed a high proportion of the overall biomass for that particular site and this can be seen on graph Ouse 3. This is the first time that sea trout have been recorded at this site since 2004.

Long term trends in summer temperature appear to be the driving factor behind coarse fish populations on the Ouse, and other lowland rivers, with warm, low flow summers proving beneficial to coarse fish recruitment. Graph Ouse 4 demonstrates this relationship between temperature and fish population densities. The abundance of dace increased slightly between 2013 and 2015 as did the mean number of degree days >12°C over the past four years. Over the same time period chub abundance decreased and dace numbers decreased slightly.

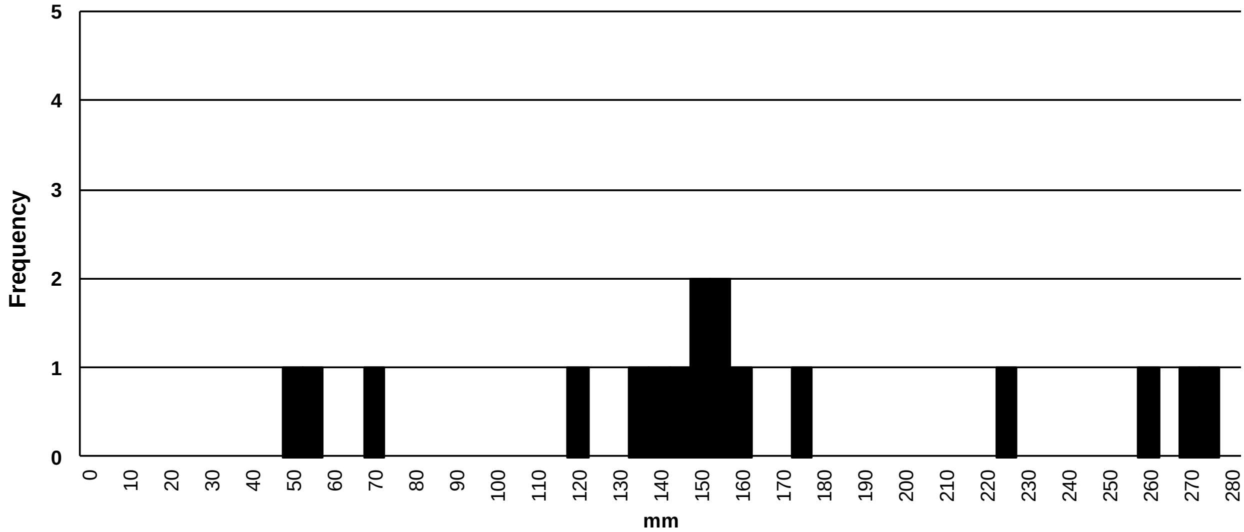
There is a strong positive correlation between the number of degree days > 12°C (four year mean) and the abundance of dace, roach and chub at all sites combined, with an average correlation coefficient of 0.74. The four year mean figure is used as this conveys the temperature over a longer timeframe than a single year and illustrates the cumulative effects of weather over time. As the fish we catch are not just young of the year, in this instance a four year average is more appropriate to correlate with the population as a whole.

Ouse Wild Brown Trout

Graphs Ouse 5 & 6 are length frequency histograms for brown trout at Buxted Bridge and Highbridge Lane respectively. Trout are grouped into 5mm size categories.

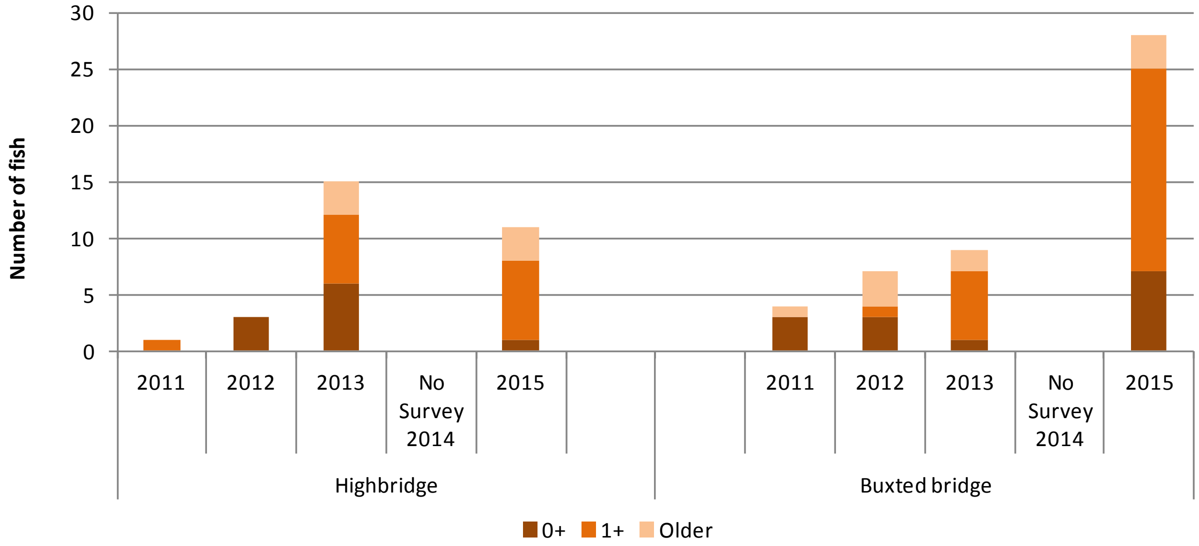


Graph Ouse 5: Brown trout length frequency histogram, Buxted Bridge, 2015



Graph Ouse 6: Brown trout length frequency histogram, Highbridge Lane, 2015

Graph Ouse 7 illustrates the total catch of brown trout at the two Principal Brown Trout (PBT) sites on the Ouse between 2011 and 2015. The catch is split into 0+ (young of the year), 1+ and older fish.



Graph Ouse 7: Brown trout age class, Ouse PBT, 2011-2015

Discussion

In 2015 we carried out biennial Wild Brown Trout surveys at two sites on the Ouse; Highbridge Lane and Buxted Bridge. Graph Ouse 7 illustrates the total catch and year classes present at each site. At Highbridge, overall abundance was lower in 2015 than in 2013, but still higher than in all other survey years. This catch was dominated by 1+ brown trout. These are fish in the second year of life and the result of a strong 2014 year class. We caught fewer 0+ fish in 2015 than in the two previous surveys.

At Buxted Bridge we recorded the highest abundance of brown trout previously observed at this site, with more than three times the number of fish that were caught in 2013. The trout population consisted of more than 50% 1+ fish, highlighting that 2014 was probably a successful year for brown trout reproduction on the Ouse.

Brown trout of different age classes caught during the 2015 survey at Buxted Bridge

WFD

Figure Ouse 8 is a list of the WFD only surveys carried out on the Ouse in 2015. Each site is listed along with its grid reference, number of fish of each species caught, overall number of species and the total density of fish excluding minor species (minnow, stoneloach, bullhead, three spined stickleback and brook lamprey). Total density is measured in number of fish per 100m²

Site	NGR	Brown / sea trout	Chub	Dace	Roach	Rudd	Silver bream	Gudgeon	European eel	Minnow	Stoneloach	Bullhead	3 spined stickleback	Brook lamprey	Number of species	Total density (excl minor species)
Honey Green Caravan Park	TQ5028517205				50		16	24			3	6	3		6	53.9
Tickerage Castle	TQ5105520996	35								28	28			3	4	14.0
Uckfield	TQ4700520851	11	8	8				1	4	62	14	10			8	12.9
Framfield Stream, Arches Farm	TQ5045819254				22	2				1	10				4	8.0
Bradfords Bridge	TQ4794416961											58	5		2	0.0

Figure Ouse 8: WFD summary table, Ouse WFD only sites, 2015

Discussion

Fish populations varied across the five WFD only sites in the Ouse catchment, all of which were situated along the River Uck.

Brown trout were present at two of the sites, mostly 0+ fish at Tickerage Castle and inclusive of a sea trout at Uckfield. In addition seven other species were caught at Uckfield and this was the only site on the Uck where we caught eels.

The highest density of fish was recorded at Honey Green Caravan Park, with 50 roach caught in a channel less than 2.5m wide.

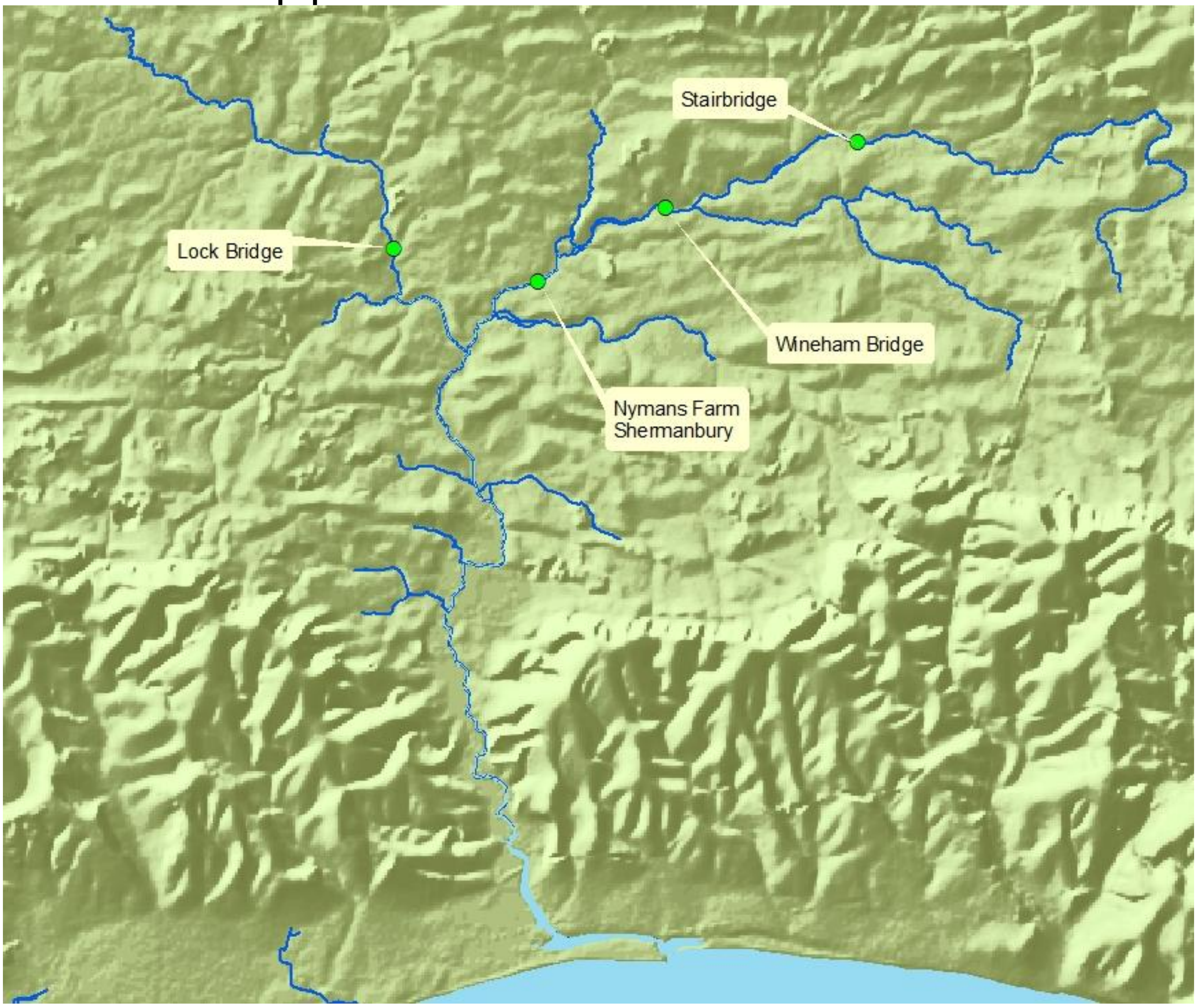
A sea trout from Uckfield

Juvenile brown trout caught from Tickeridge Castle

2. West Sussex

2.1. Adur

In 2015, four Principal Coarse Fishery (PCF) surveys were carried out on the River Adur to monitor coarse fish populations.



Map Adur 1: Site locations where surveys were carried out in 2015

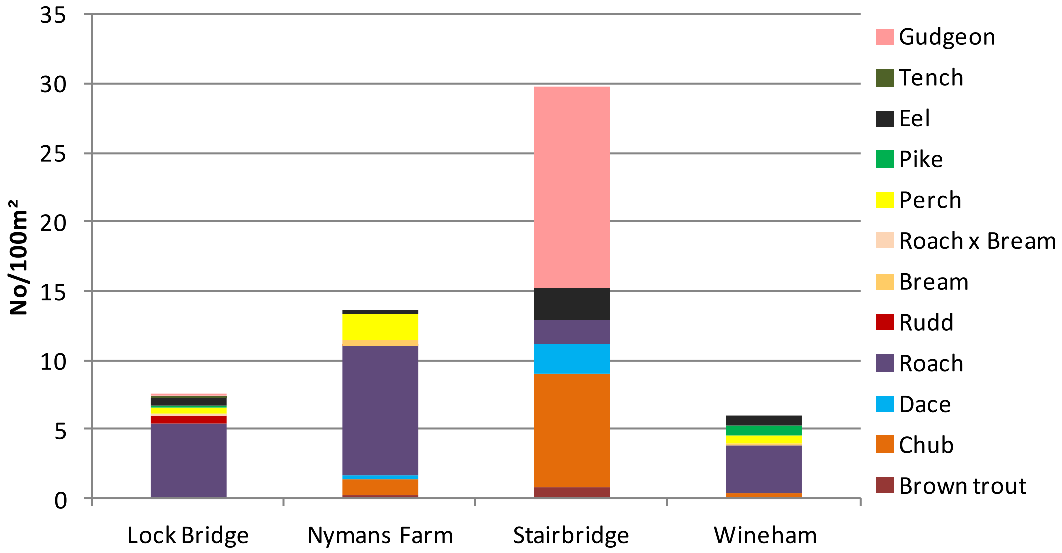
- There were two changes to the Adur PCF survey programme in 2015; we dropped D/S Kings Barn Farm, and moved the site at Shermanbury 100m upstream.

- Catches at all three sites we have monitored previously were lower than in 2012, when the surveys were last carried out.

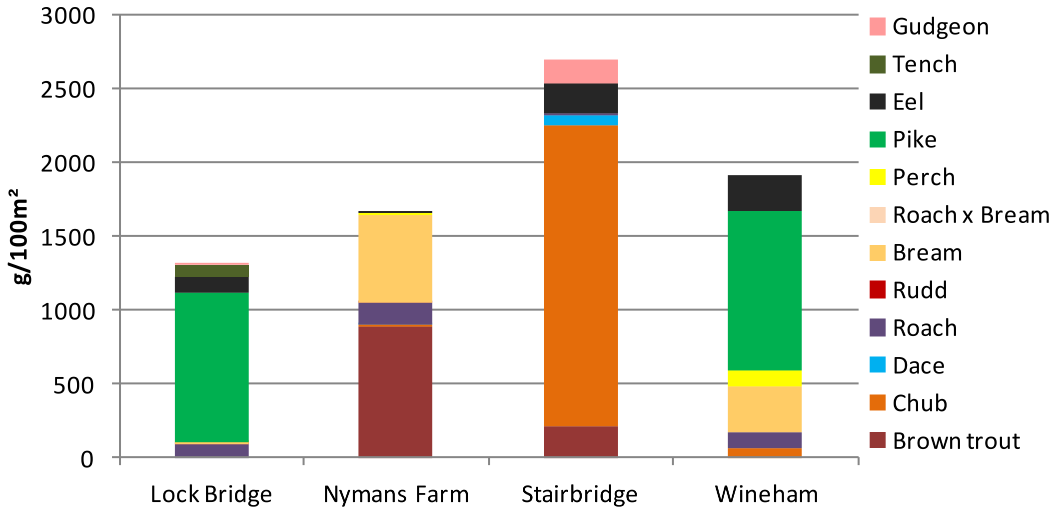
- We caught large numbers of roach and a large sea trout at Nymans Farm, the new Shermanbury site.

- Brown trout and dace abundance was the highest recorded at Stairbridge.

Graphs Adur 1 & 2 show fish density (number of fish per 100m²) and biomass (grams per 100m²) at the four PCF sites on the River Adur where surveys were carried out in 2015.

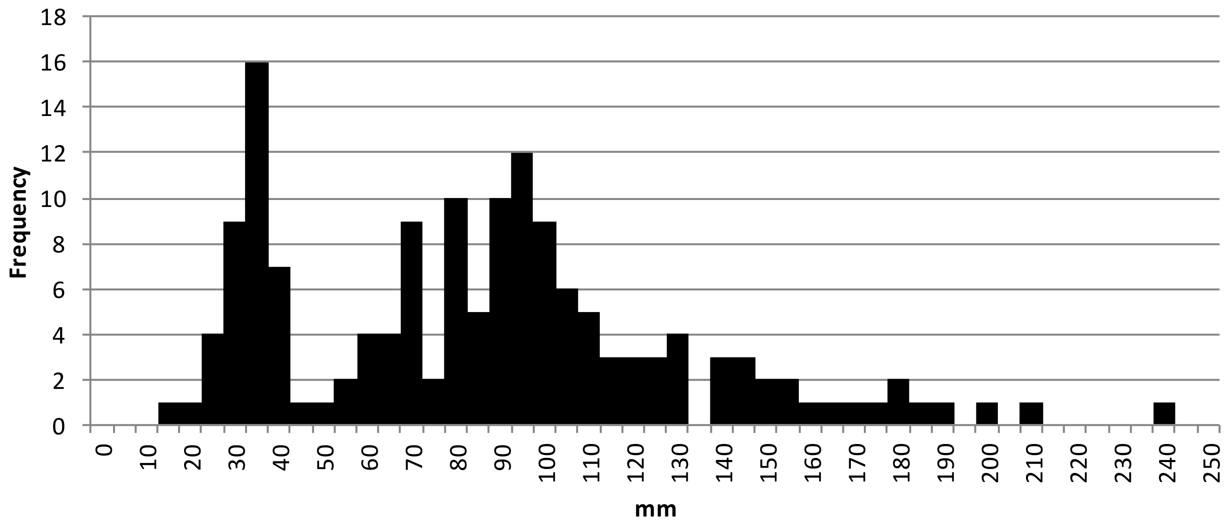


Graph Adur 1: Total estimated density, Adur PCF, 2015



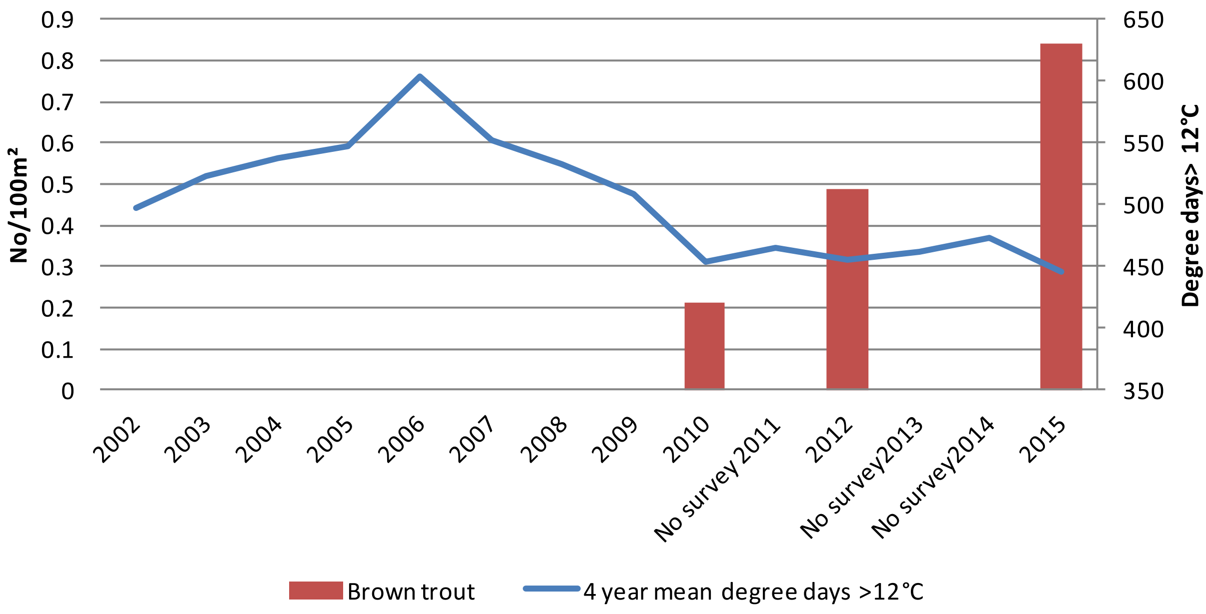
Graph Adur 2: Estimated biomass, Adur PCF, 2015

Graph Adur 3 is a length frequency histogram describing roach from all Adur survey sites combined in 2015. Roach are grouped into 5mm length categories.



Graph Adur 3: Roach length frequency histogram, Adur, 2015

Graph Adur 4 shows the relationship between brown trout density and the 4 yr mean of degree days >12°C at the Stairbridge survey site from 2002 to present.



Graph Adur 4: Brown trout estimated density against four year mean degree days >12°C, Stairbridge, Adur, 2002-2015.

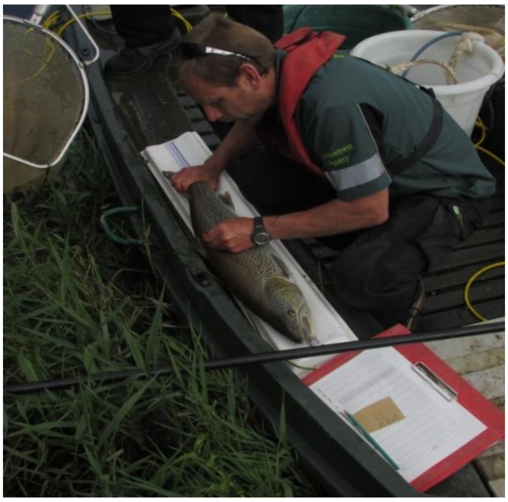
Discussion

In 2015, our survey sites changed slightly from those surveyed in previous years. We dropped one site from the programme (D/S Kings Barn Farm), due to it being unrepresentative of the river, and we moved another site (Shermanbury) to just upstream of the road bridge (Nymans Farm), due to access issues.

Overall catches were down on the last surveys we carried out in 2012 at all three repeat sites. At Wineham we had the lowest density of fish we have recorded, although at the other two sites reductions were less, with similar abundance to previous years. This is most likely due to the recent poor climatic conditions for coarse fish, with a series of cool summers and extreme winter flooding in 2014 impacting on coarse fish communities. On a positive note, eel density was the highest we have recorded in nearly fifteen years at all sites.

The new site at Shermanbury (Nymans Farm) was very similar to the old site 100m downstream, and we recorded almost double the density of fish found at the previous site in 2012. This included a large number of roach, and some exceptional sea trout, including one of over 75cm in length, weighing an estimated 13-14lbs.

Despite overall abundances being lower than in previous years, at Stairbridge Lane we caught the highest number of dace and brown trout we have seen at this site. This is likely to be due to lower summer temperatures proving beneficial to brown trout by leading to lower water temperatures and higher dissolved oxygen. This is particularly important at this site, due to a significant proportion of the flow consisting of sewage treatment works effluent. Higher summer rainfall helps to dilute this water and the higher oxygen levels in cooler water are beneficial to fish and trout in particular. Graph Adur 4 demonstrates this relationship; there is a negative correlation (-0.73) between trout density and the four year mean of degree days >12°C.



Taking a scale from a very large sea trout at a new site, Nymans Farm

At some sites, biomass was dominated by one or two very large pike, like this one from Lock Bridge.

Case Study: River Adur, West Sussex

Four weirs on the River Adur have been removed, the aim being to improve riparian habitats, restore natural river and floodplain processes, reduce downstream flooding and enhance biodiversity. This was conducted as part of the Adur Restoration of Physical Habitat Action Plan (ARPHA) which is a project run by the Ouse and Adur Rivers Trust (OART) working in collaboration with various landowners, companies and also the Environment Agency.

The work began in August 2015 and was completed in just over 6 weeks. The weir removal will help contribute towards achieving Good Ecological Status on two water bodies under the Water Framework Directive. This is thanks to the improved river continuity and fewer barriers to fish migration, where 4.8km of river now has unrestricted access.

Before: These images (below) show the three obstructions in place before they were removed and how impassable to certain species of fish they would have been

After: These images (below) show the sites after the obstructions were removed and how fish passage will have greatly improved

The flow dynamics are now far more natural which will change the characteristics and habitat features within the river and the riparian zones. This will benefit a range of biodiversity at various life stages, enhanced further by the work to create new habitats and improve the hydrological state of the river.

After the weir removal, habitat creation work was completed. This provided brilliant habitat for fry and juvenile fish and also refuge for larger specimens during times of high flows.

We hope to see some of results of this great work during the next surveys conducted on the Adur,

2.2. Western Rother & Western Streams

In 2015 we surveyed 14 sites in the Western Rother & Western Streams catchment. Five of these were the annual PCF surveys on the main Western Rother and nine were WFD surveys on smaller streams and tributaries in the area (Map Western Rother 1).

Map Western Rother 1: Site locations in the Western Rother & Western Streams area (green markers are PCF surveys, orange are WFD).

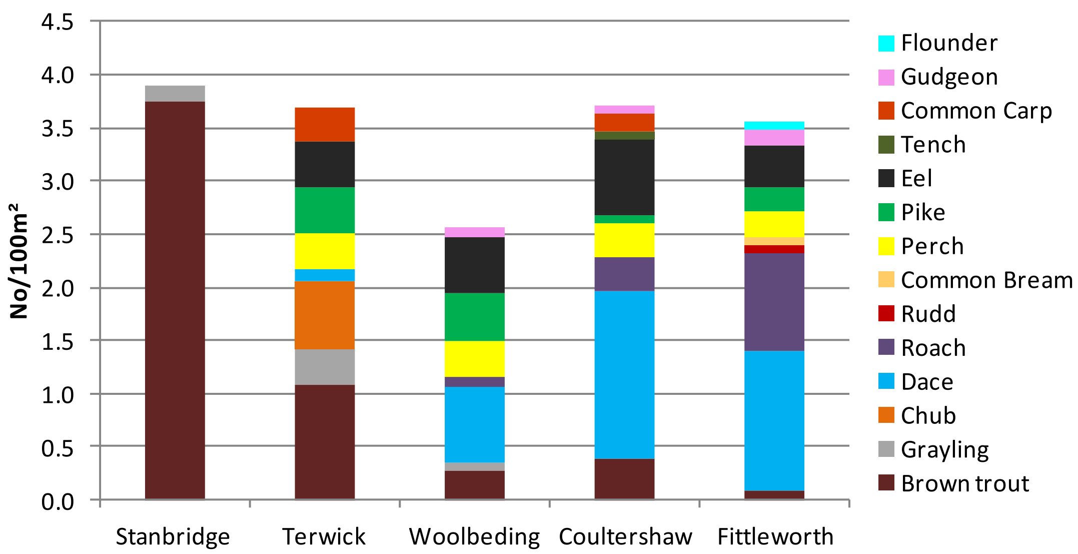
- There were above average catches at the five Western Rother PCF surveys in 2015.
- We caught brown trout or sea trout at each of the five sites.
- Dace and roach numbers were at their highest levels since 2006.
- A WFD survey found a salmon parr in the River Ems for the first time.
- The surveys carried out on small coastal streams recorded high densities of eels.

Table Western Rother 1 is a table showing the results of WFD only surveys in the Western Rother & Western Streams catchment. The species and abundance of fish caught is shown, and sites are listed in order of the total density of fish caught (excluding minor species).

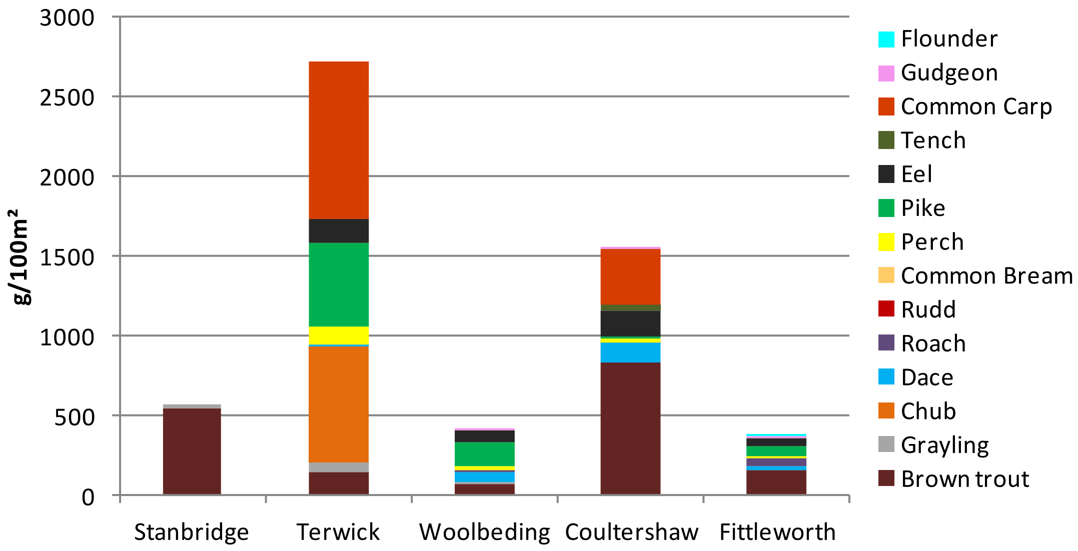
Site	NGR	Atlantic salmon	Brown / sea trout	Perch	Pike	Roach	Rudd	Tench	Common carp	European eel	Minnow	Stoneloach	Bullhead	3 spined stickleback	10 spined stickleback	Brook lamprey	Flounder	Number of species	Total density (excl minor species)
Sefter Farm Footbridge	SU8916600324			1		6		3	1	45								5	16.6
Brook Meadow Footbridge	SU7505506271	1	46							15			50					4	16.5
Apuldrum STW	SU8454003755									49				2			1	3	14.0
Goose Green	SU7704521512		29					1					75			2		4	12.3
Southbrook Farm	SU8087006794									55			33	10				3	10.1
Westbourne	SU7567807789		27							7			500					3	9.4
Heaver Farm Footbridge	SU8128105709		3							40			34	28	1			5	9.0
Pagham Rife	SZ8824598786				2	22	2		1								1	5	3.9
Mizzards Farmhouse	SU8034722630		3					1		1	9	26	25			3		7	1.6

Table Western Rother 1: WFD site details, catch numbers and density.

Graphs Western Rother 1 & Western Rother 2 show the estimated density and estimated biomass across the five Western Rother PCF sites in 2015. Estimated density is given in individuals per 100m² and estimated biomass in grams per 100m².

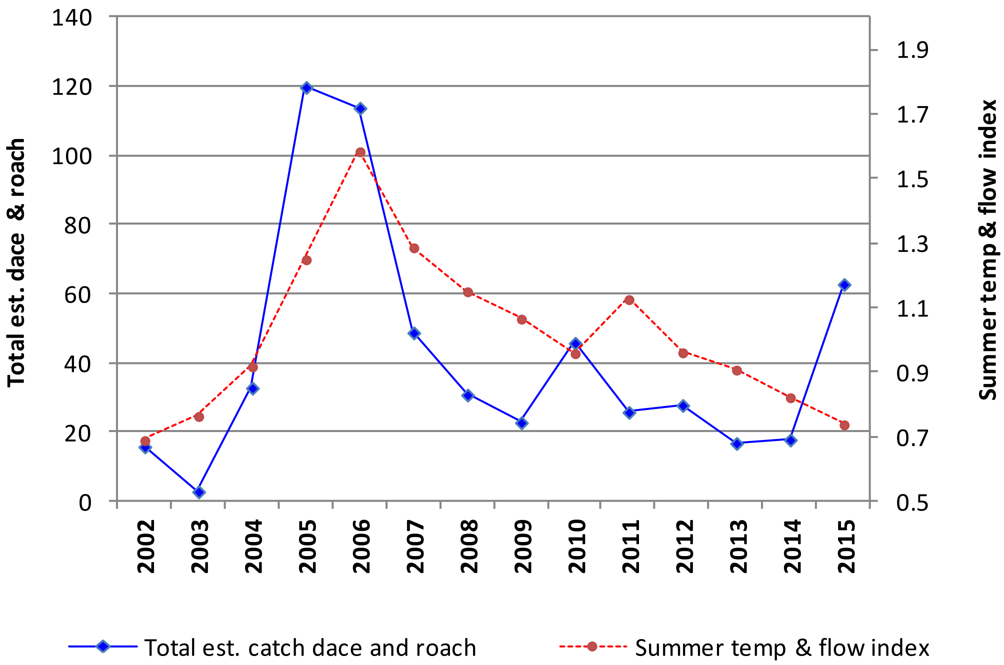


Graph Western Rother 1: Estimated density, Western Rother PCF, 2015.



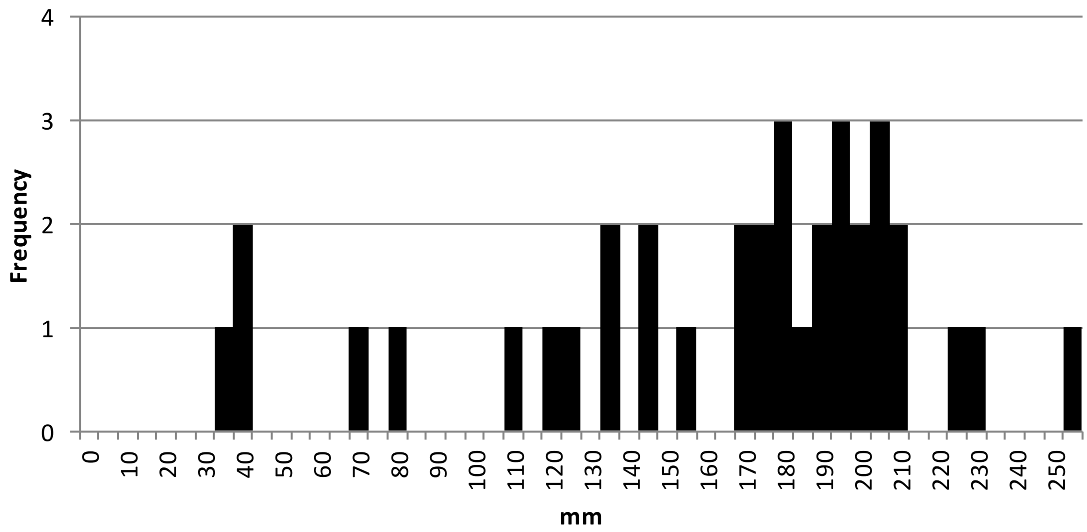
Graph Western Rother 2: Estimated biomass, Western Rother PCF, 2015.

The graph below is an illustration of the impacts of summer temperature and flow over a four year period compared to the total abundance of dace and roach combined at four Western Rother annual sites (not Stanbridge). The summer temperature and flow index is a combined measure of the influence of these two variables, standardised to be shown as one overall influencing factor.

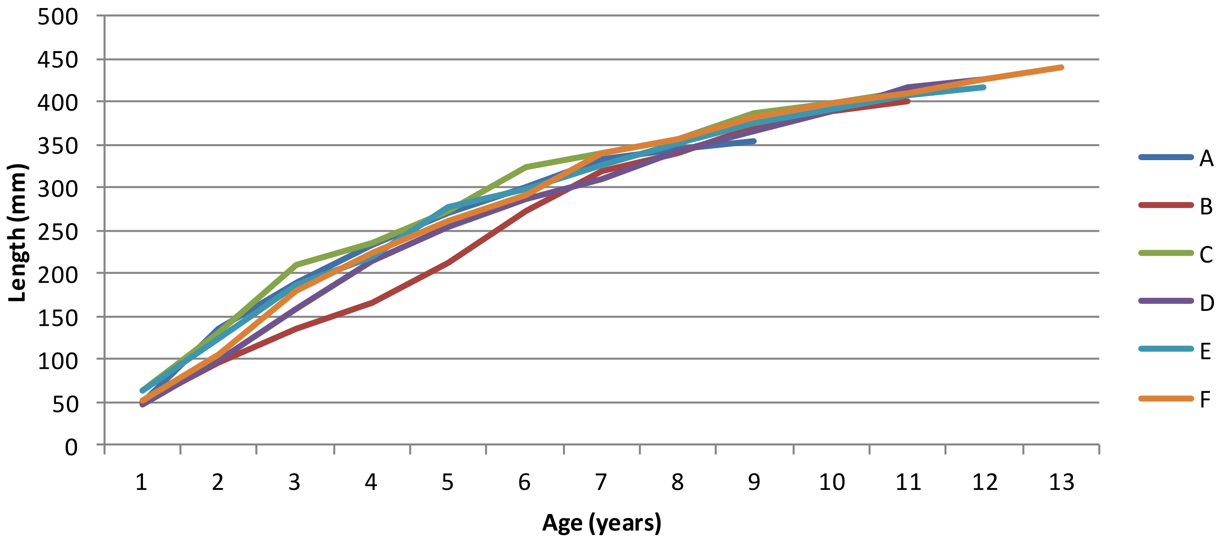


Graph Western Rother 3: Total estimated number of dace and roach compared to a summer temperature and flow index, all Western Rother sites excluding Stanbridge, 2002-2015.

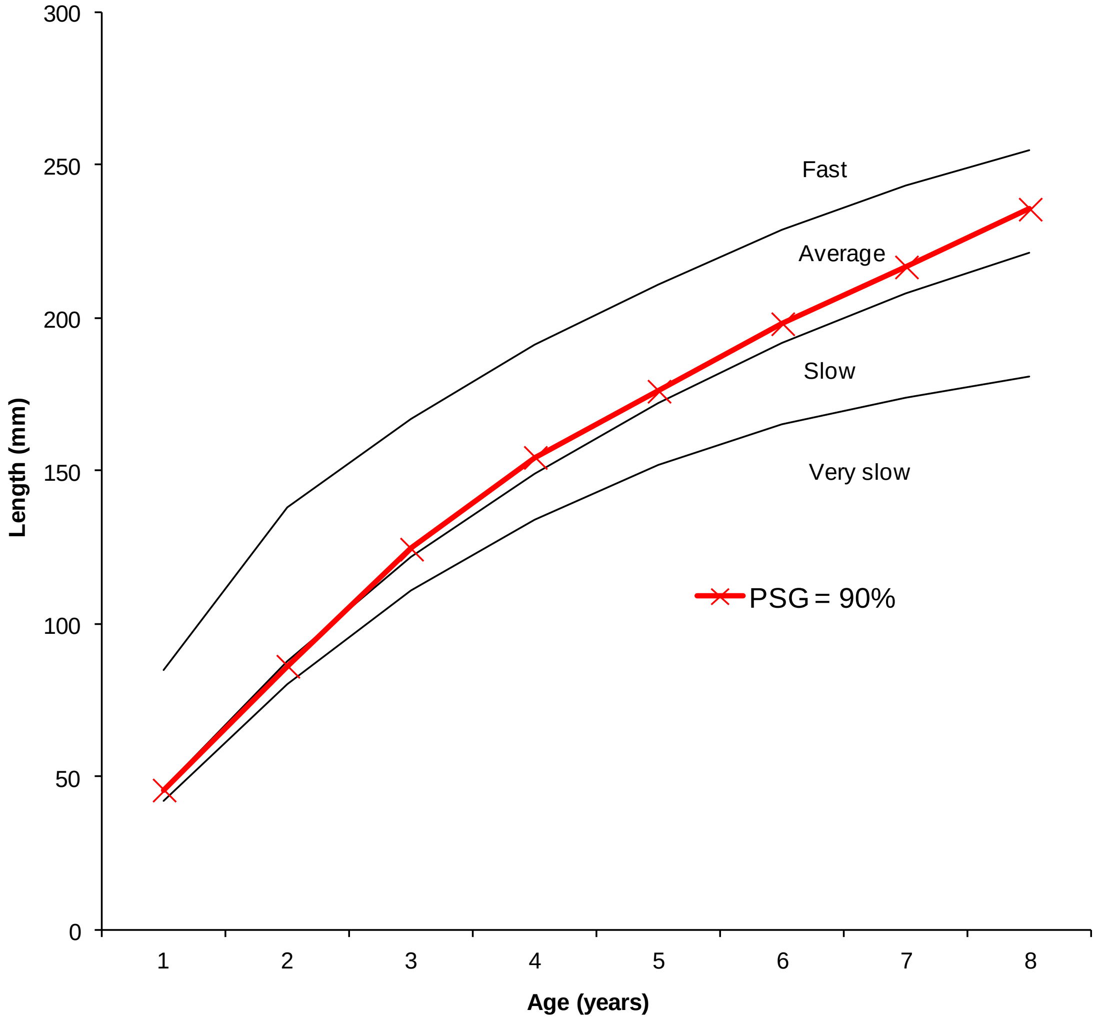
The following four graphs (Graph Western Rother 4, 5, 6 & 7) are based on length and scale data obtained from scale samples taken in 2015. Graph Western Rother 4 is a length frequency histogram for dace at all sites. Graph Western Rother 5 shows chub length at age for six scale readings taken from six fish. Graph Western Rother 6 is a growth curve for dace showing the average length of fish at each year of growth based on scale readings from fish of ages from 1+ to 8+. These lengths are compared to the standard growth rate of dace in Southern rivers and a percentage figure is given to show how Western Rother dace growth compares.



Graph Western Rother 4: Dace length Frequency histogram, Western Rother PCF, 2015.



Graph Western Rother 5: Chub length at age (mm), Western Rother PCF, 2015.



Graph to show the growth of dace in the Western Rother compared to the standard growth of dace in Southern rivers (National Fisheries Services unpublished data)

Graph Western Rother 6: Chub growth rates, Western Rother PCF, 2015.

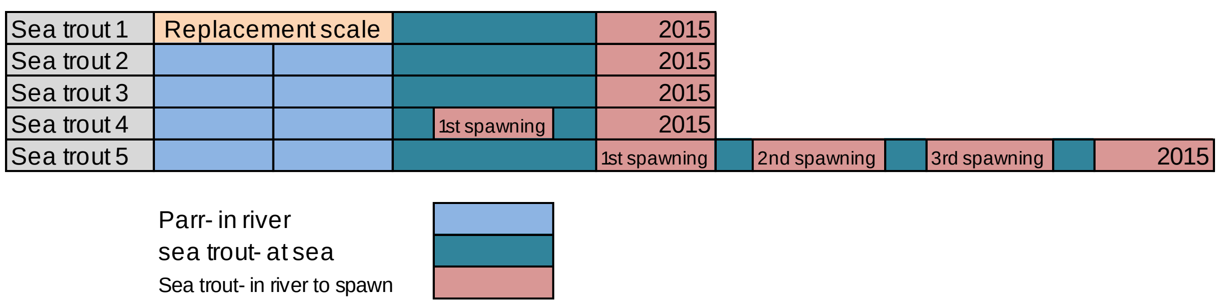


Figure Western Rother 7: A representation of sea trout life histories, Western Rother PCF 2015.

Discussion

The Western Rother is the only reference PCF river we have in our area. This means that it represents its river type in our national dataset and we survey it every year. This in turn means that we can relate the catches to climatic conditions to a much finer degree than other aspects of our programme. 2015 gave us a better than average catch on the Rother, with the highest number of roach and dace that we have recorded since the very warm summers of 2005 & 2006. As well as this we caught brown trout or sea trout at each of our survey sites and eels at the four downstream sites.

The catches of dace and roach appear to defy climatic conditions for the year, with more fish caught despite higher summer flows and cooler summer temperatures. When we look at the length frequency histogram for dace, we can see that, although there are a few young fish, the population appears to be dominated by older fish. We would typically expect a fish population to have more smaller younger individuals, which are then thinned out as they age, leading to a lower number of larger adult fish.

Scale data

In 2015 we collected scales from chub, dace and sea trout to send to our national fish health laboratory for analysis. This has given us a fascinating insight into the life histories of some of these fish, even if numbers were too low, with the exception of dace, to infer too much about the population as a whole.

We took scales from six chub, with lengths up to 452mm, and discovered that the oldest of these fish were more than 13 years old. Graph Western Rother 5 shows the growth of the six different chub and their estimated lengths at different ages.

We took scales from a wide range of different sized dace, and were able to plot a growth curve to compare the growth rates of dace in the Western Rother to the average for southern rivers (Graph Western Rother 6). The growth of Western Rother dace is slightly below average, particularly for fish that are younger than 3 years.

Sea trout have fascinating life histories, and the scales we took in 2015 provide a real insight into these fish. All of the scales showed that the fish spent the first two years of life in the river. After this time they undergo changes to allow them to head out to sea as smolts, packing on weight faster than they would be able to in the river. Most fish spent one winter at sea, before returning to the river to spawn. This was the stage at which we caught three fish, as they were back in the river system ready to spawn over the winter of 2015/16. One fish that we caught had been to sea for one year, travelled back to the river to spawn (indicated by a spawning "check" or mark on the scale), then headed back out to sea and returned once again to spawn. It was at this point we caught the trout in our survey.

One final fish, the largest at just over 70cm had a real tale to tell. Having spent two years in the river, it headed out to sea for a year before returning to spawn three times before 2015. The fish was not in the best condition when we sampled, but had contributed to the trout population of the Rother over the course of several years. Figure Western Rother 7 shows this information in a graphical format.

The WFD surveys throughout the wider catchment highlight the importance of smaller coastal streams and rifes to European eel populations. Densities of eels in these sites is often as high or higher than the much higher quality water and habitat of local chalk streams. The surveys also give us an opportunity to sample catchments where we often don't have much previous data on or assess fish populations in that regularly. This occasionally throws up the odd surprise, and in 2015 we caught a salmon parr on the River Ems for the first time. Although adult salmon had been noted in the estuary, and there was anecdotal evidence of fish entering the river, the discovery of a juvenile fish would lead us to the conclusion that adult fish ascended the river, found suitable spawning habitat, spawned successfully and at least one of the progeny survived to parr form.

Taking a scale from a chub, some of which we found to be 13 years old

This sea trout was on its fourth spawning run into the Western Rother

A salmon parr from the River Ems, the first we have ever recorded from this river

A survey in progress at Coultershaw on the Rother

3. Hampshire

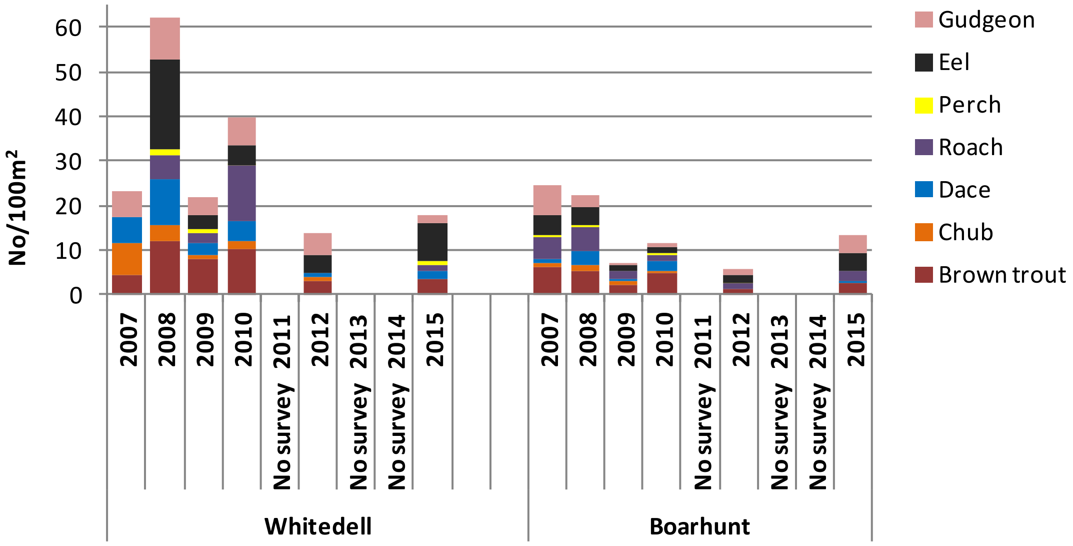
3.1. Wallington

In 2015 we carried out two Principal Coarse Fish (PCF) surveys on the River Wallington, both of which were three run catch depletion surveys. These surveys are now carried out once in every three years at Whitedell Farm and Boarhunt Bridge (see Map Wallington 1).

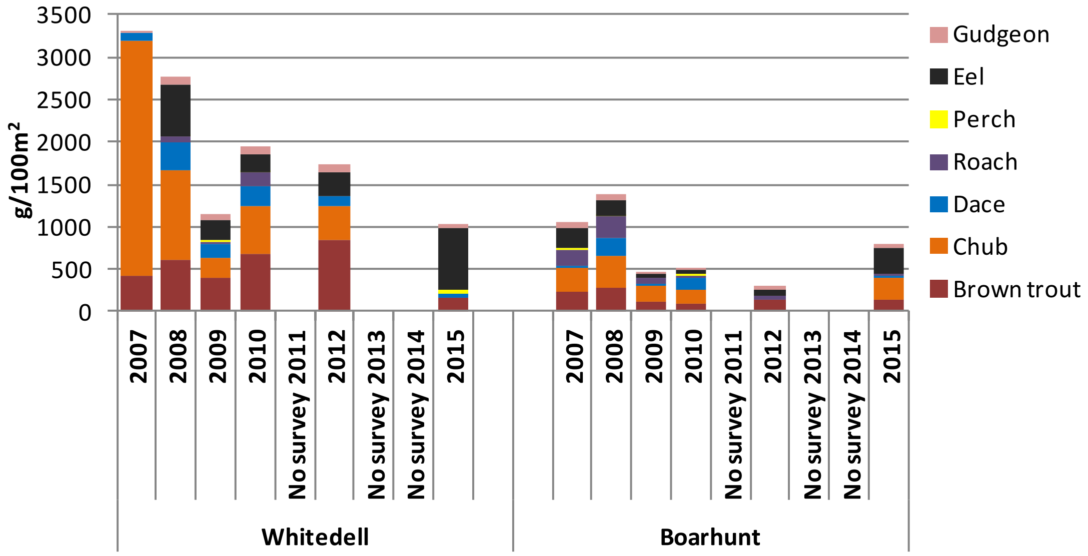
Map Wallington 1: Showing the two PCF survey sites on the River Wallington.

- Overall abundances at both survey sites were around average when compared to previous year's data.
- Eels made up a large proportion of the biomass at each site.
- Brown trout abundance was lower than previous years at each site.

Graphs Wallington 1 & 2 show the estimated density and biomass respectively for the two PCF sites on the River Wallington. The estimates are given for 2007 to 2015 for each site.



Graph Wallington 1: Estimated density, Wallington PCF, 2015.



Graph Wallington 2: Estimated biomass, Wallington PCF, 2015.

Discussion

Graphs Wallington 1 & 2 show that fish abundances at both sites were roughly average in comparison to surveys since 2007 and that species assemblages were similar. The estimated biomass at Whitedell was the lowest in all surveys at this site since 2007. This is due to a lack of large, mature fish captured in the survey. The majority of roach and trout were in their first or second year of life. For both of the sites, eel biomass was the highest we have recorded, despite the density of eels being lower than some previous years. This was due to the capture of a number of large eels up to 60cm in length and around 2lbs in weight.

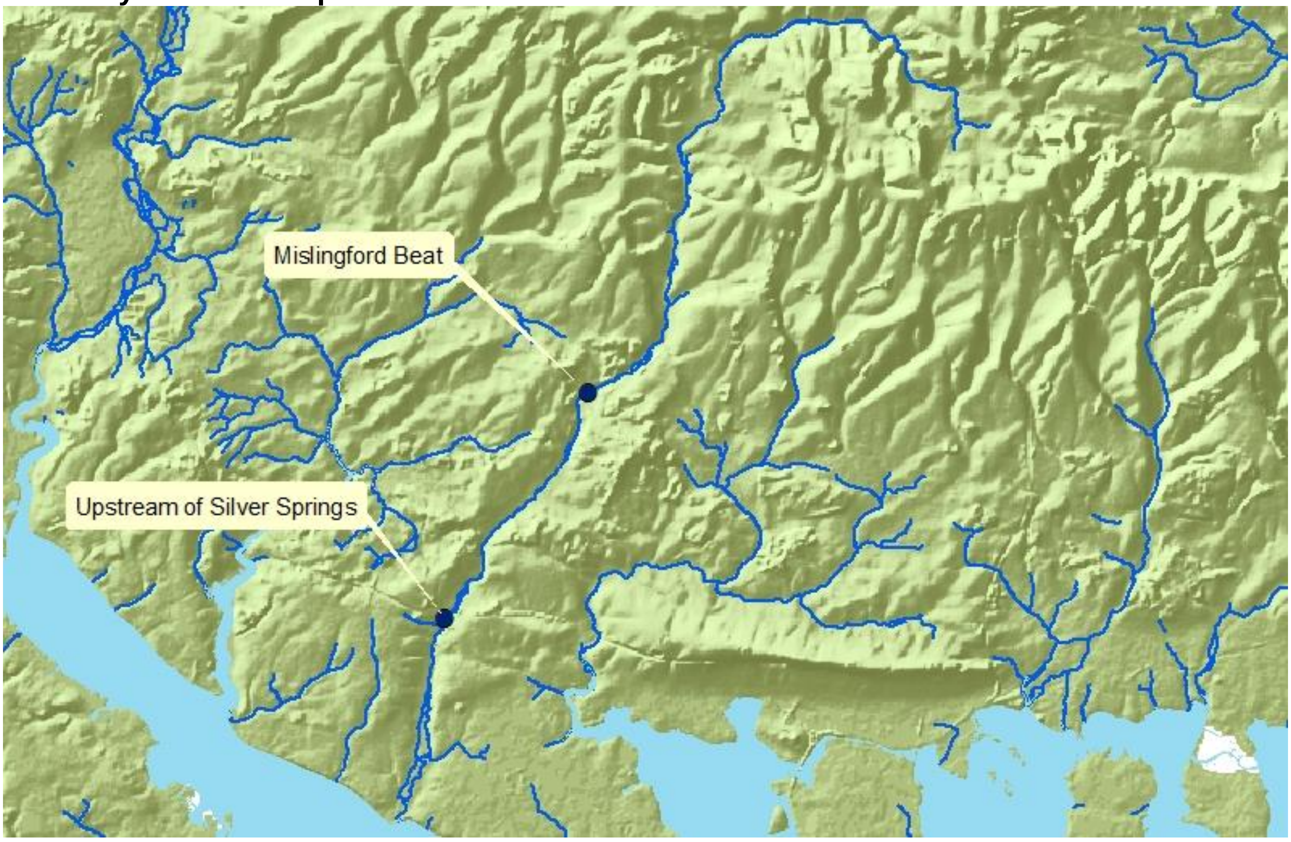
As with most coarse fish dominated rivers in the area, populations were at a high point after the warm summers in the mid 2000's. After the recent cooler summers and high flow events at certain points, fish populations are now generally at lower levels. This does not however, explain the low numbers of brown trout encountered in 2015.

The Wallington contains a number of coarse fish species, like this chub

Brown trout numbers were the lowest we have recorded in our surveys at Whitedell farm in 2015

3.2. Meon

We carried two single run surveys on the River Meon in 2015, one at Mislingford and one at Silver Springs. These surveys have been carried out yearly since 2007 and will be surveyed biennially in future. Map Meon 1 shows the site locations.



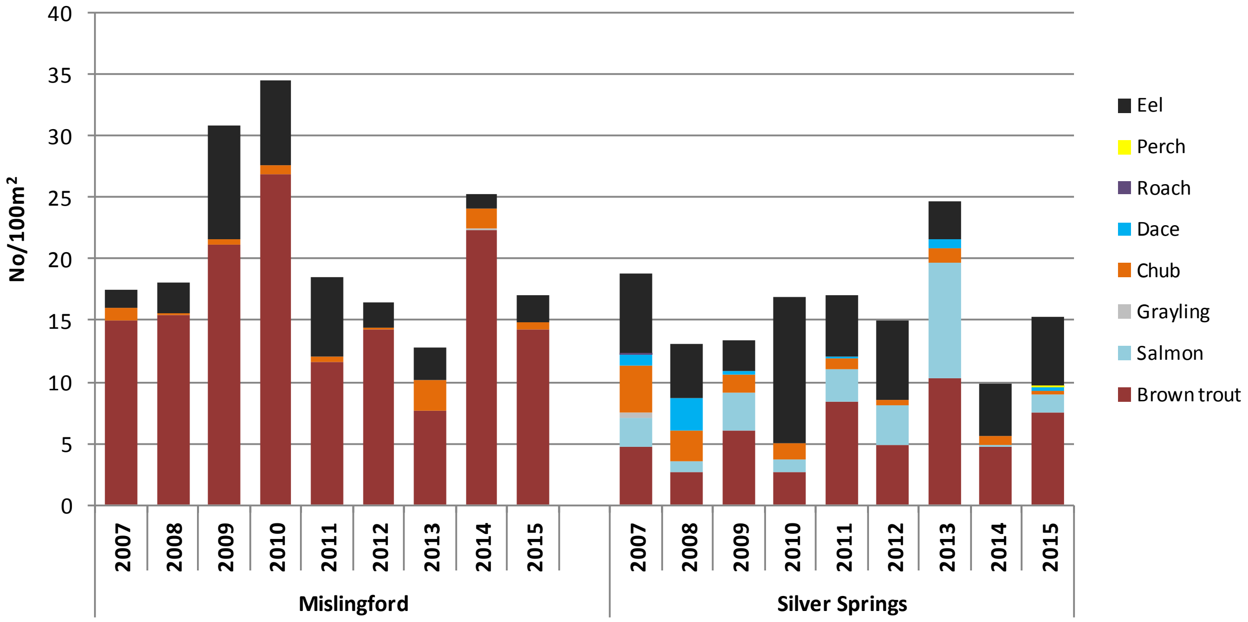
Map Meon 1: 2015 survey locations on the River Meon.

- Catches at both sites were around average when compared to previous year's results, both in terms of numbers and species of fish present.

- Brown trout numbers are down on 2014 at Mislingford Beat, with a less abundant 0+ year class than the previous year.

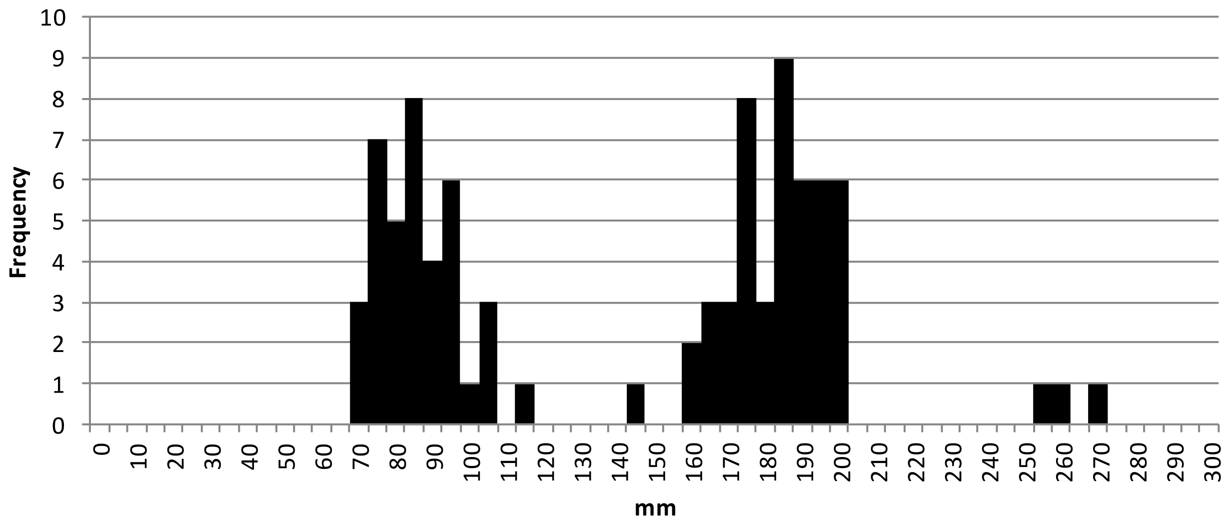
- We caught nine salmon parr and 43 brown trout at Silver springs, an increase on the number we caught in 2014.

The graph below (Meon 1) shows the density of fish caught at the two Principal Brown Trout (PBT) surveys on the River Meon in 2015. Density is recorded in number of fish per 100m².



Graph Meon 1: Density, Meon PBT, 2015

Graph Meon 2 is a length frequency distribution of brown trout at Mislingford in 2015. Fish length is given in mm and the trout are grouped into 5mm length classes.



Graph Meon 2: Brown trout length frequency histogram, Mislingford, Meon, 2015.

Discussion

In 2015 catches were around average at both survey sites on the River Meon, with density at Mislingford down on 2014 and the catch at Silver Springs slightly up on that recorded in 2014. As usual the catch at Mislingford was dominated by brown trout, with the catch almost equally split between 0+ and 1+ fish (Graph Meon 2). The 2014 year class, which was particularly strong, is still well represented in 2015 with these fish now between 150 and 200mm. We only caught three trout above this length. This is most likely due to the fish moving to more suitable adult habitat or smolting after two years and heading out to sea to begin the marine phase of their life cycle. A large component of the brown trout spawning stock for the Meon are sea trout, with only a small number of fish remaining resident in the river as adults.

We caught nine salmon parr at silver springs in 2015, an improvement on the previous year, but less than we have recorded in the years prior to 2014. This catch was split almost equally between 0+ and 1+ fish.

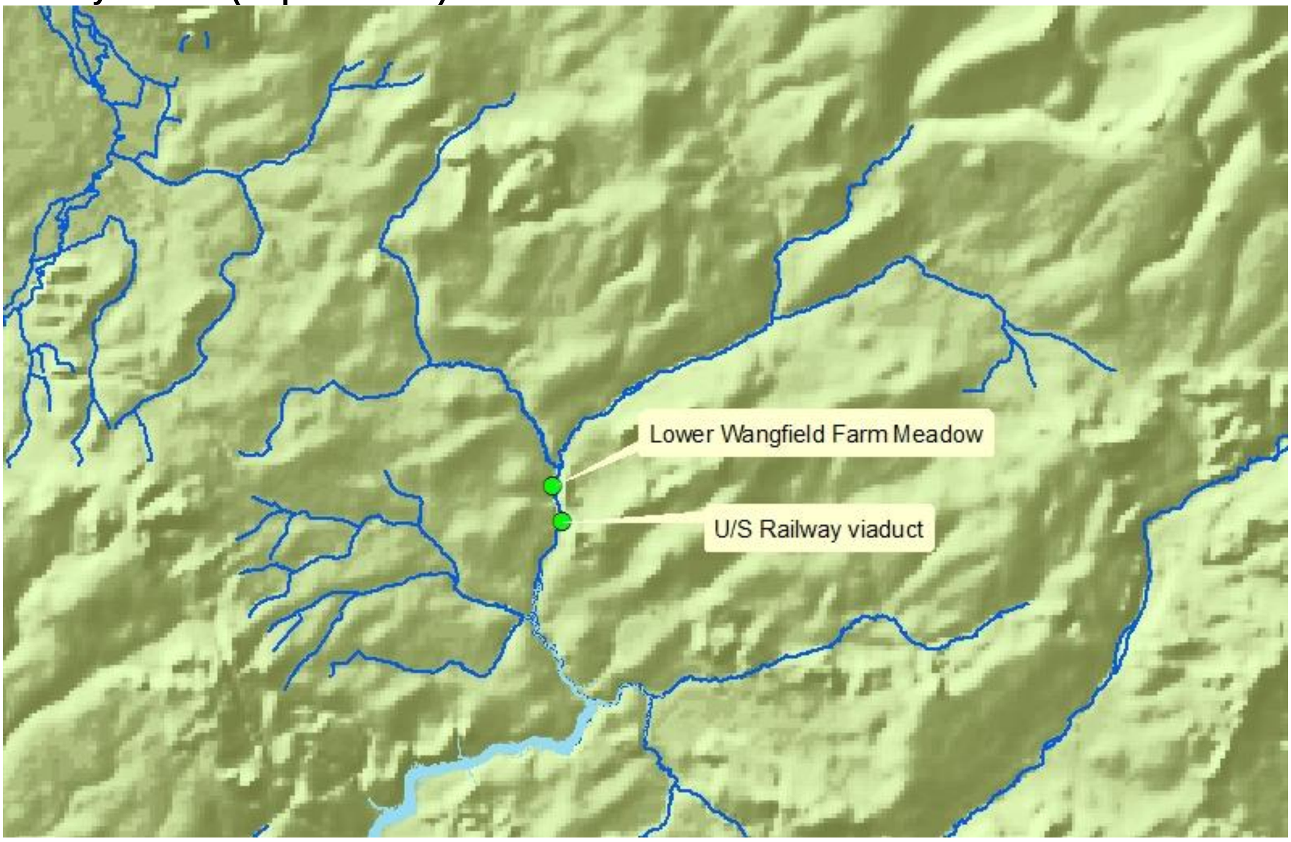
The two photographs below show how ranunculus growth can vary between years on the River Meon. Ranunculus is important to juvenile brown trout for a number of reasons; it provides habitat for invertebrates which the trout feed on and it creates a refuge for the trout, protecting them from predators. Equally importantly, it "pinches" flow into narrow channels, increasing water velocity and keeping gravel clear of silt.

This Photo, taken in 2007 shows the Mislingford survey site with excellent weed growth and clean gravel.

In 2015, there was a lot of brown algal (diatom) growth and less ranunculus. Despite this, very similar numbers of trout were caught

3.3. Hamble

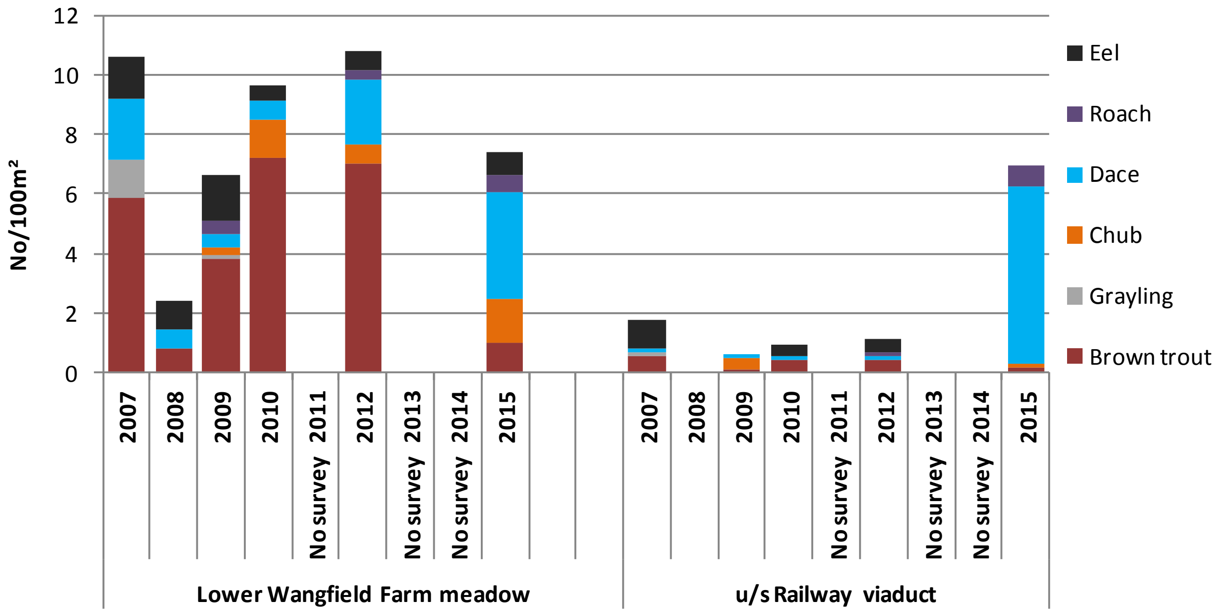
The River Hamble is a Principal Coarse Fishery where we survey two sites every three years. In 2015 we surveyed the two routine sites at Lower Wangfield Farm Meadow and U/S Railway Viaduct (Map Hamble 1)



Map Hamble 1: Location of 2015 survey sites on the River Hamble

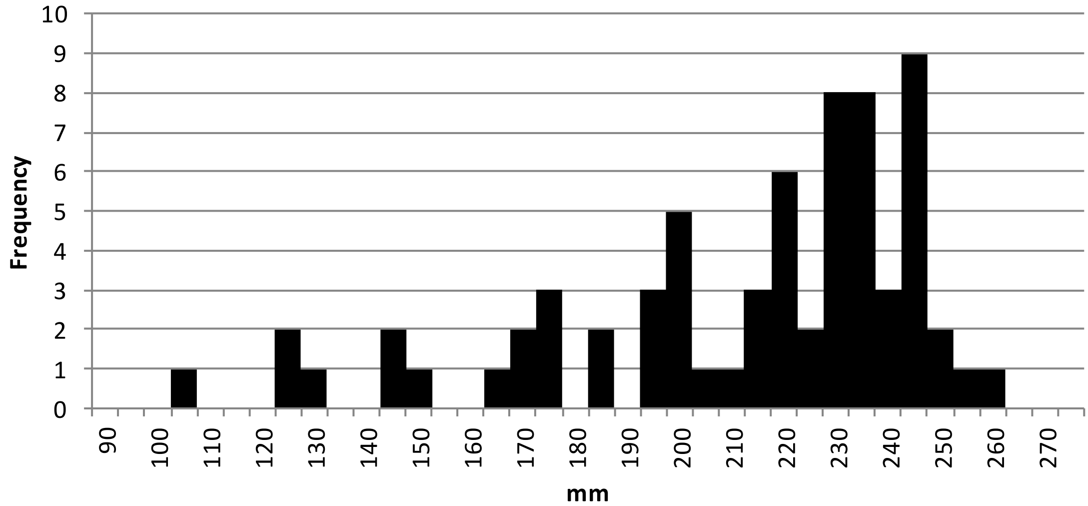
- Fish density was around average at Lower Wangfield Farm Meadow, but the highest we have recorded at U/S Railway viaduct.
- At both sites, fish numbers were dominated by dace, with a number of large individuals caught.
- Trout numbers were lower than in 2012 at both sites.

Graph Hamble 1 presents the estimated density at the two Hamble PCF sites for all survey years (2007-2015).



Graph Hamble 1: Estimated density, Hamble PCF, 2015

The Graph below, Graph Hamble 2, is a length frequency histogram for dace on the River Hamble in 2015. Dace are grouped into 5mm sizes.



Graph Hamble 2: Length frequency histogram, dace, Hamble PCF, 2015

Discussion

Graph Hamble 1 shows that dace abundance at both sites was higher than in any other survey year, with the increased catch at Upstream Railway viaduct particularly notable. Graph Hamble 2 shows that older fish greatly outnumbered younger fish in the 2015 catch - the length frequency category containing the most dace was 240-245mm; dace of this length may be as much as seven years old. Half of the dace caught exceeded 220mm and are likely to be five years old.

A high proportion of dace caught in 2015 were alive during the 2012 (and possibly 2010) surveys but were not captured, probably because they were not within the survey reaches but were occupying a different habitat type more suited to juveniles (for whom predator avoidance is crucial). A fish population survey conducted in October 2006 on the lower Ford Lake stream

(Horton Heath stream), which joins the Hamble downstream of Wangfield Lane, indicated an estimated population of 251 dace within the 100m survey reach, with an average length of 68mm. This reflects the preference that dace have for different types of habitat at different life stages and clarifies the spatial separation of juveniles and adults. It also suggests that the lower reaches of this tributary may be a key spawning and nursery area for dace in the lower Hamble (NB no dace have been recorded in several surveys conducted in the middle and upper reaches of this tributary).Therefore, abundance of large dace in the 2015 may be due to this being the first time that strong year classes from 5-7 years ago have been present within our survey reaches in a survey year. Regardless of the ecological basis for this, this is excellent news for coarse anglers.

A suspected pressure on the Hamble fish population is the impounding effect of Botley Mill. However, water level management in the impounded reach is reported to have stabilised in recent years and the construction of the Botley fish pass has linked the reach with approximately 500m of good quality stream habitat. As such, the 2015 survey results may indicate a genuine improvement in fish habitat conditions in the lower Hamble.

In early 2016, a fish refuge has been created at Lower Wangfield Farm Meadow (pictured below). This will provide off channel habitat vital to the survival of juvenile coarse fish. This type of habitat creates warm, sheltered conditions to allow young fish to maximise growth during the summer, and provide a refuge from high velocity flows in flood events throughout the year.

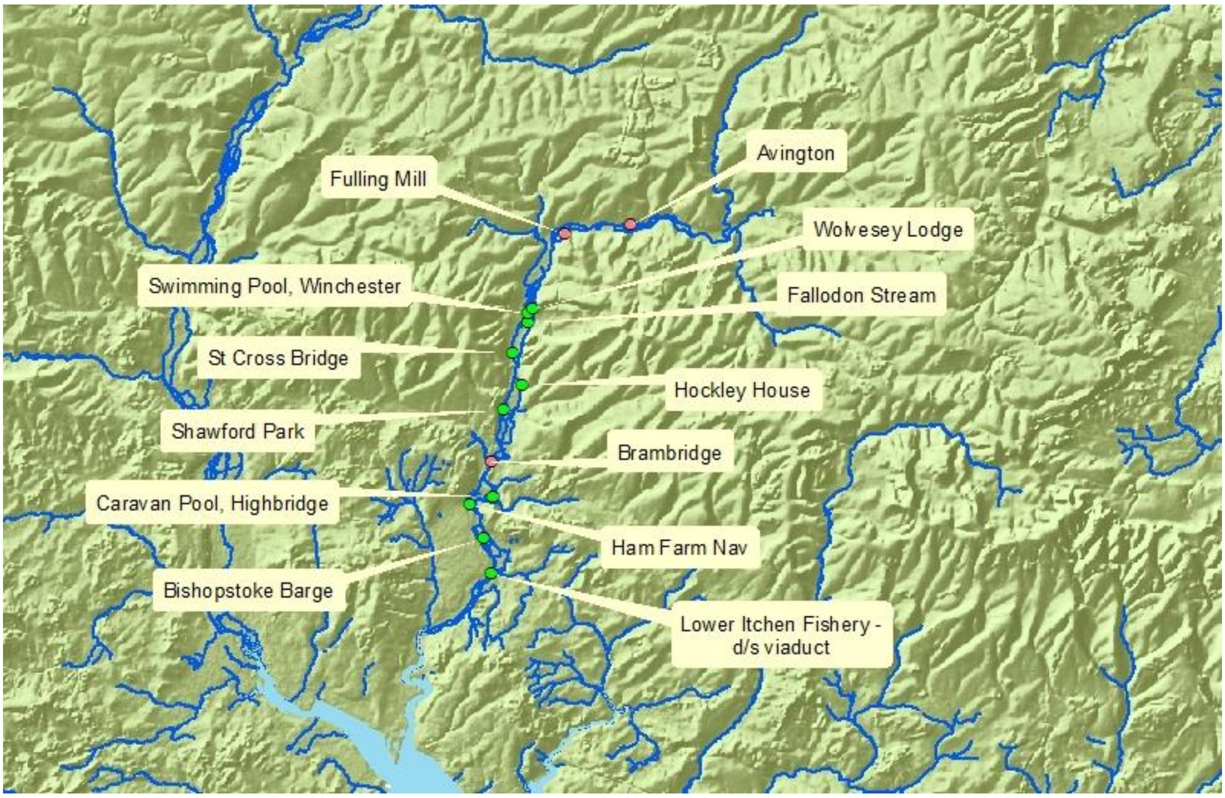
A roach in excellent condition from the Hamble

The number of adult dace in 2015 was higher than in any other year we have surveyed

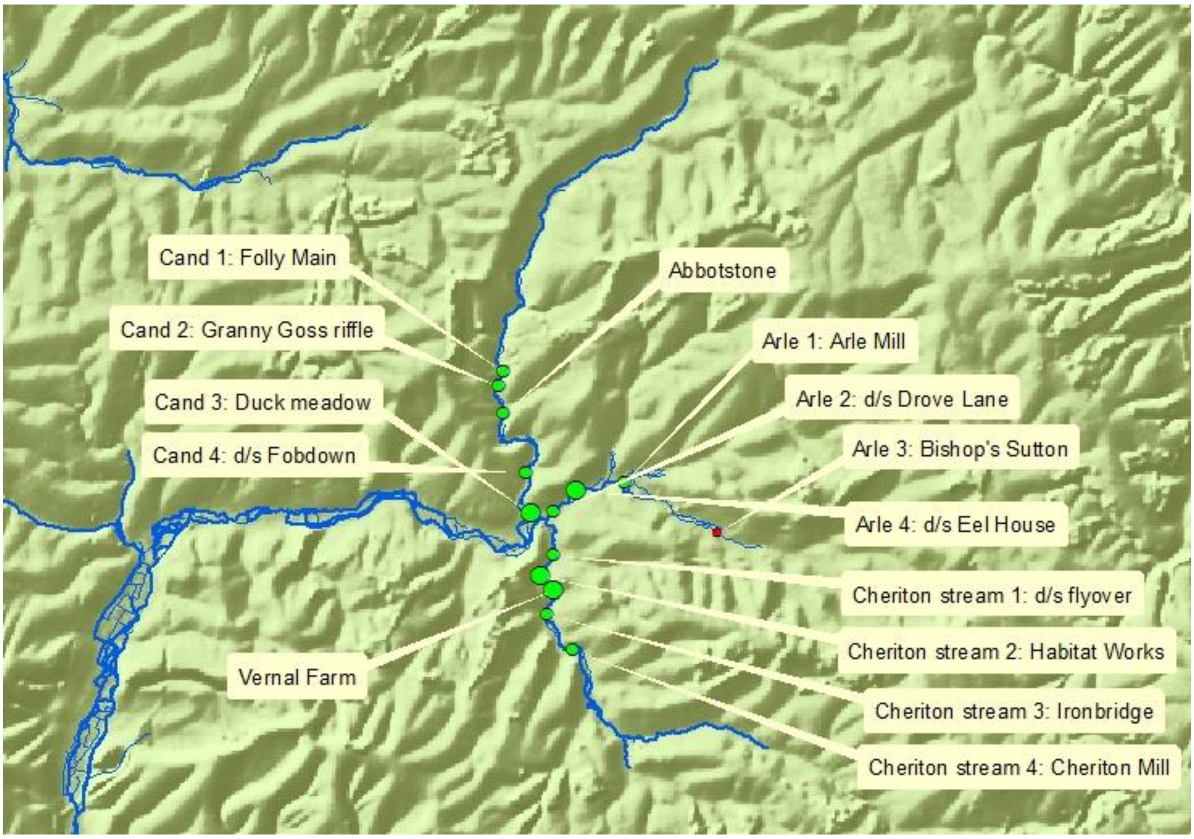
A recently created fish refuge on the River Hamble

3.4. Itchen

The River Itchen was the focus of a large number of surveys in 2015. We carried out 27 surveys in total; 13 were Salmon Action Plan (SAP) surveys and 14 were Principal Brown Trout (PBT) surveys (Fig. Itchen 1). Eel Index surveys were carried out at ten of these sites. The two maps below show the locations of these sites, with map Itchen 1 showing SAP survey sites and map Itchen 2 showing PBT sites. Sites in red highlight where no target fish were caught.



Map Itchen 1: Itchen SAP survey sites 2015 (red denotes absence of salmon parr).



Map Itchen 2: Itchen PBT survey sites 2015 (small green marker = <100 brown trout caught, large green marker = >100 brown trout caught, red denotes absence of brown trout).

	LIF- d/s railway viaduct	Bishopstoke barge	Ham Farm Nav	Caravan Pool	Brambridge	Hockley House	Shawford Park	St. Cross Bridge	Fallodon Stream	Swimming Pool, Winchester	Wolvesey Lodge	Fulling Mill, Abbott's Worthy	Avington	Arle 1: Arle Mill	Arle 2: d/s Drove Lane	Arle 3: Bishop's Sutton	Arle 4: d/s Eel House	Abbotstone	Cand 1: Folly Main	Cand 2: Granny Goss riffle	Cand 3: Duck meadow	Cand 4: d/s Fobdown	Cheriton stream 1: downstream of flyover	Cheriton stream 2: Habitat Works	Cheriton stream 3: Ironbridge	Cheriton stream 4: Cheriton Mill	Vernal Farm
SAP	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓														
WBT														✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eel - Index		✓	✓				✓				✓	✓		✓				✓			✓					✓	✓

Figure Itchen 1: Site list and purposes, River Itchen, 2015.

- Salmon parr were found at 10 out of 13 sites on the River Itchen, in broadly similar locations to 2009.
- As in 2009, no salmon parr were found above Winchester.
- At Shawford park we found the highest first run abundance of salmon parr recorded since surveys began here in 2008.

- We found brown trout at 13 of the 14 sites surveyed, with none present in the very highest reaches of the Arle.
- When compared to 2009, brown trout abundance had increased at 11 of the 14 sites.
- A restoration scheme on the Candover Brook has resulted in improved brown trout habitat.
- Eel numbers show a continued decline across the catchment. The catch in 2015 was just 34% of the number caught in 2009.

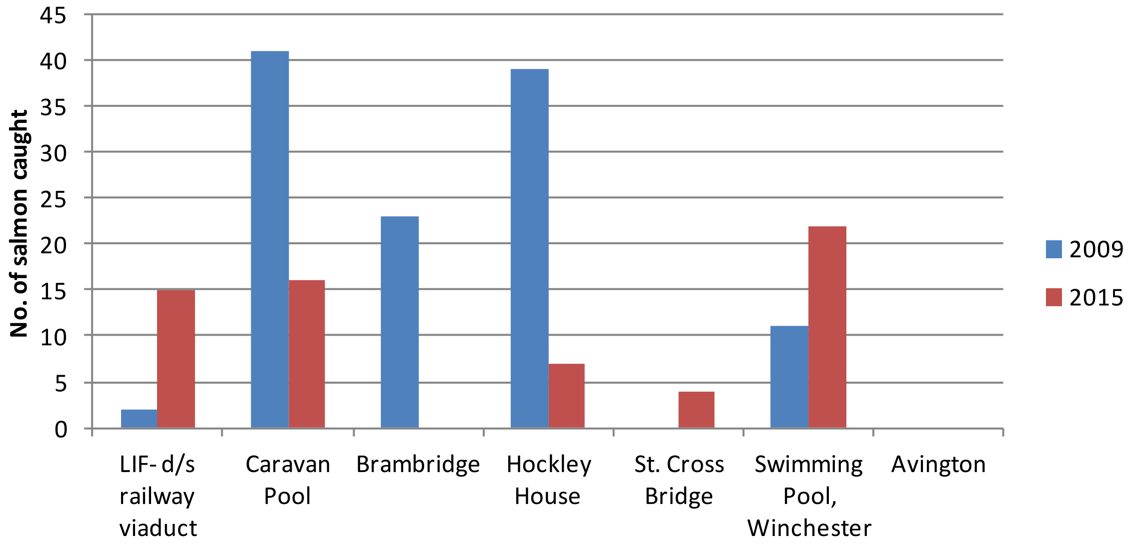
Railway viaduct survey site at the Lower Itchen Fishery in 2009 and 2015, a small island has developed and flows have altered. More salmon parr were caught in 2015 than 2009.

Hockley house in 2009...

...and in 2015, with slightly more weed growth

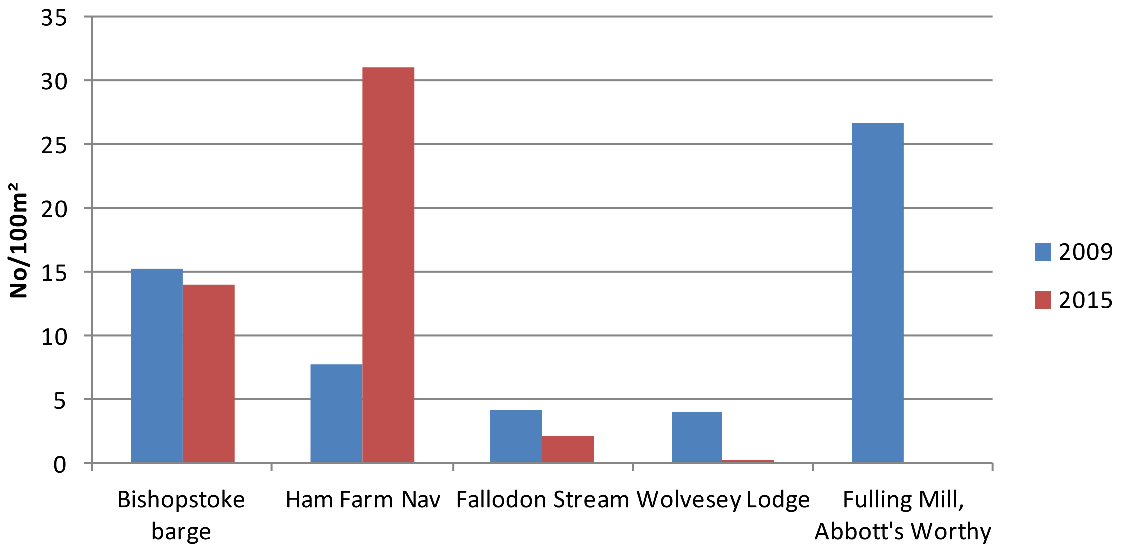
Itchen SAP

Graph Itchen 1 shows the number of salmon parr caught in five minute Catch Per Unit Effort (CPUE) surveys in 2009 & 2015. St Cross Bridge was not surveyed in 2009 and the Avington site was in a slightly different location in 2009 and 2015 with no salmon parr present at either location.



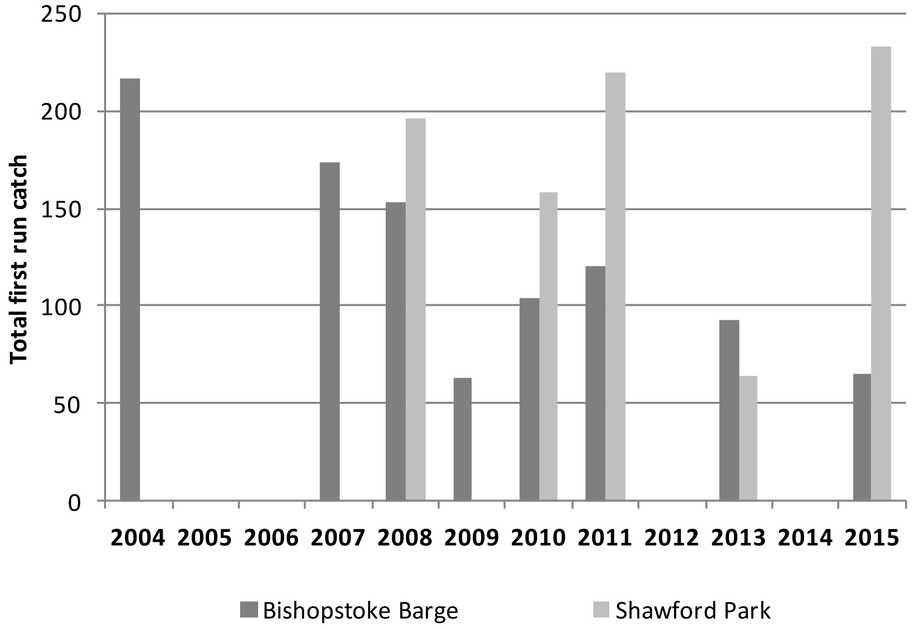
Graph Itchen 1: Salmon parr total catch, CPUE surveys, Itchen SAP, 2009 & 2015.

Graph Itchen 2, below, shows the estimated density of salmon parr (number of fish per 100m²) for all single run sites, or, where the site was a three run catch depletion survey, the first run only. Shawford Park was surveyed as a CPUE survey in 2009 and a catch depletion survey in 2015 and is excluded from this graph.



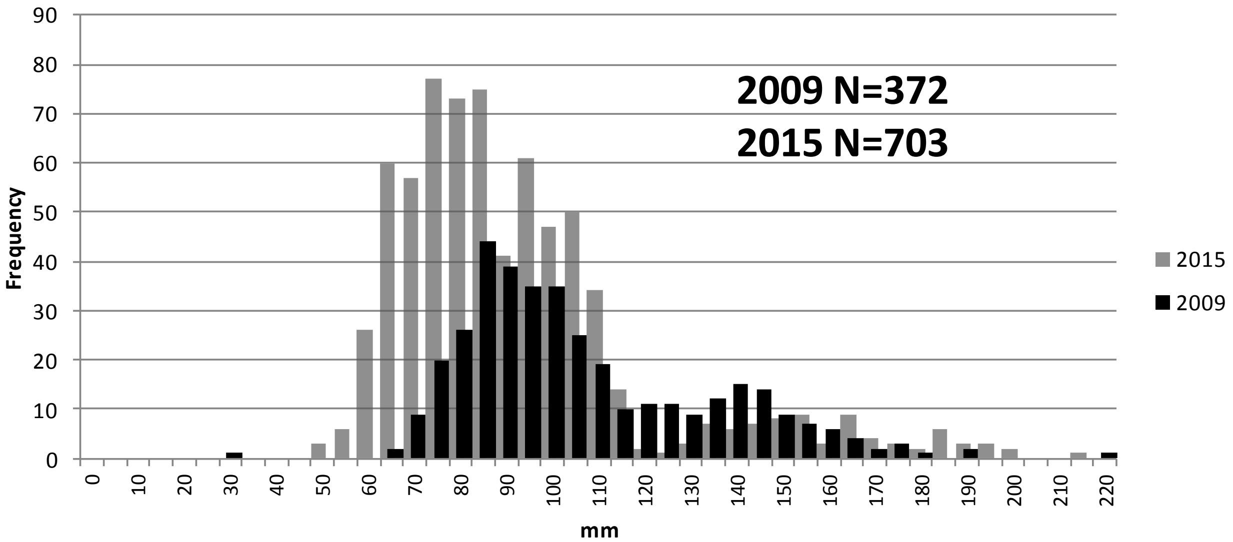
Graph Itchen 2: Salmon parr density, single run (or first run of catch depletion), Itchen SAP, 2009 & 2015.

The graph below (Itchen 3) shows the variation in first run catches at our two temporal SAP survey sites on the Itchen. Data for Bishopstoke Barge extends from 2004 - 2015 and from 2008 - 2015 for Shawford Park.



Graph Itchen 3: First run catch of salmon parr, Bishopstoke Barge & Shawford Park, 2004-2015

Graph Itchen 4 is a length frequency histogram showing salmon parr length for all Itchen SAP surveys in 2009 (black) and 2015 (grey). Salmon are grouped into 5mm size classes.



Graph Itchen 4: Length frequency histogram, salmon parr, Itchen SAP, 2009 & 2015.

Discussion

The 2015 Salmon Action Plan fish surveys carried out on the Itchen were almost an exact repeat of the surveys carried out in 2009. The only changes were the addition of a site at St. Cross Bridge, and the movement of a site from a side channel near Chilland, to the main river. These surveys were a mix of techniques; several were five minute catch per unit effort surveys, following the same prescribed route along the river as 2009, whereas others were constrained by stopnets and a quantitative or semi-quantitative survey was completed. Only one site, Shawford Park, had a change of method. It was done as a five minute CPUE in 2009 and a Catch depletion survey in 2015. CPUE surveys are less accurate than full river width surveys and so we cannot read too much into changes in abundance of salmon parr at these sites. They do however tell us about the distribution of salmon parr within the catchment.

In 2015 we found salmon parr at 10 out of 13 survey sites. We found parr at all sites downstream of Winchester with the exception of Brambridge. This isn't necessarily a cause for concern; there was good spawning habitat just downstream of our survey site, where spawning probably took place. We found salmon parr upstream and downstream of this survey site.

As in 2009 we didn't find salmon parr upstream of Winchester, despite the work that has been carried out on removing barriers to fish migration. It may be that with the number of adult fish we see running up the Itchen, there is a sufficient amount of good quality spawning habitat in the area downstream that fish do not need to venture any further upstream to reach further suitable spawning grounds. With the extra fish that we have recorded returning to the river in 2015, it may be that some fish are pushed further upstream to spawn. We have received reports of salmon being seen in this upstream section which would support this theory.

At the sites where we found salmon parr, some showed increased numbers of parr compared to 2009, whereas other sites showed a reduction. At the two sites where we carry out surveys every two years (Bishopstoke Barge & Shawford Park), we saw the highest ever first run abundance of salmon parr at Shawford, but a continued decline in parr numbers at Bishopstoke.

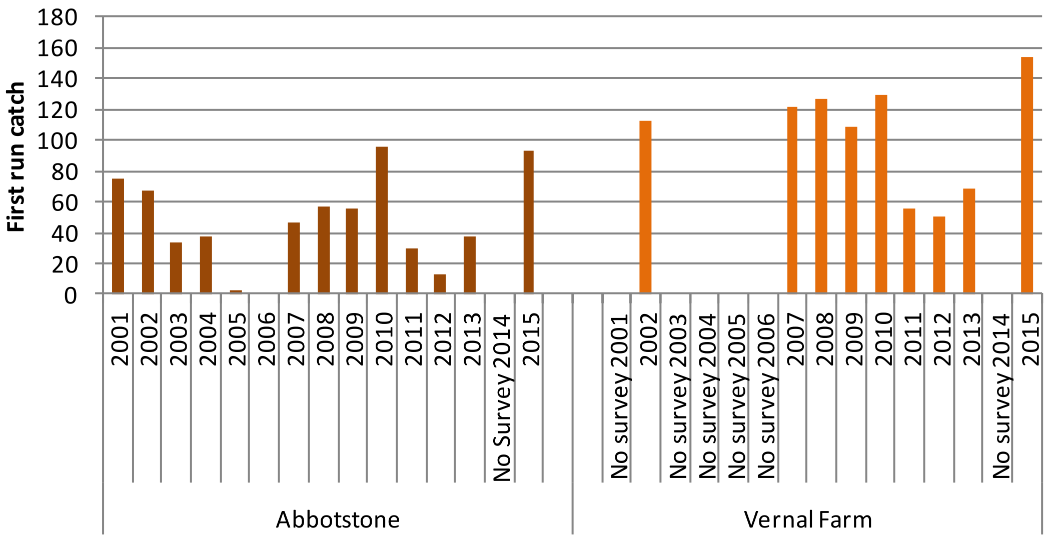
A typical 0+ salmon parr from the Itchen

1+ fish make up a larger proportion of the immature fish than in the neighbouring Test

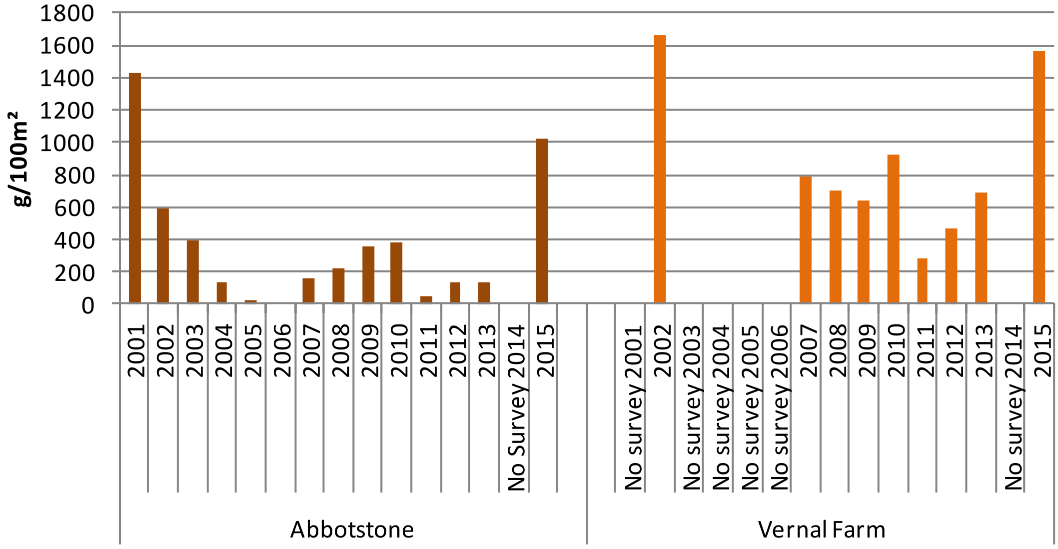
A survey in progress at Ham Farm, where we caught a high abundance of salmon parr, and a number of other species.

Itchen PBT

Graphs Itchen 5 & 6 illustrate the first run catch and biomass respectively at the two PBT temporal sites, Abbotstone and Vernal Farm, on the Candover and Cheriton Stream. Data is shown from 2001 to 2015.

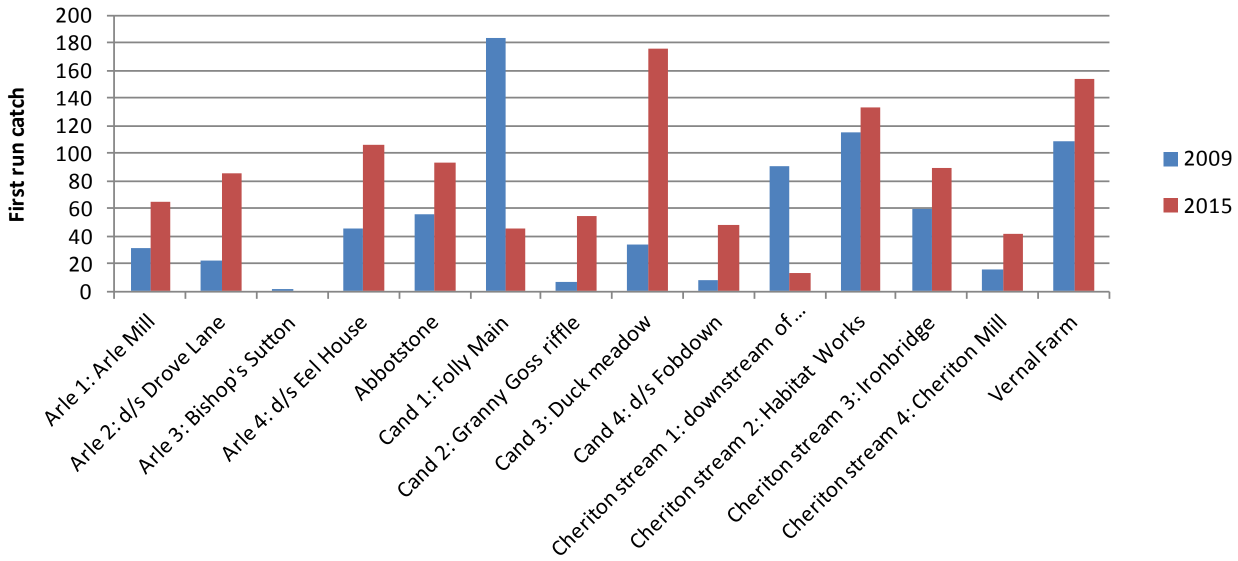


Graph Itchen 5: Brown trout first run catch, upper Itchen PBT, 2001 - 2015



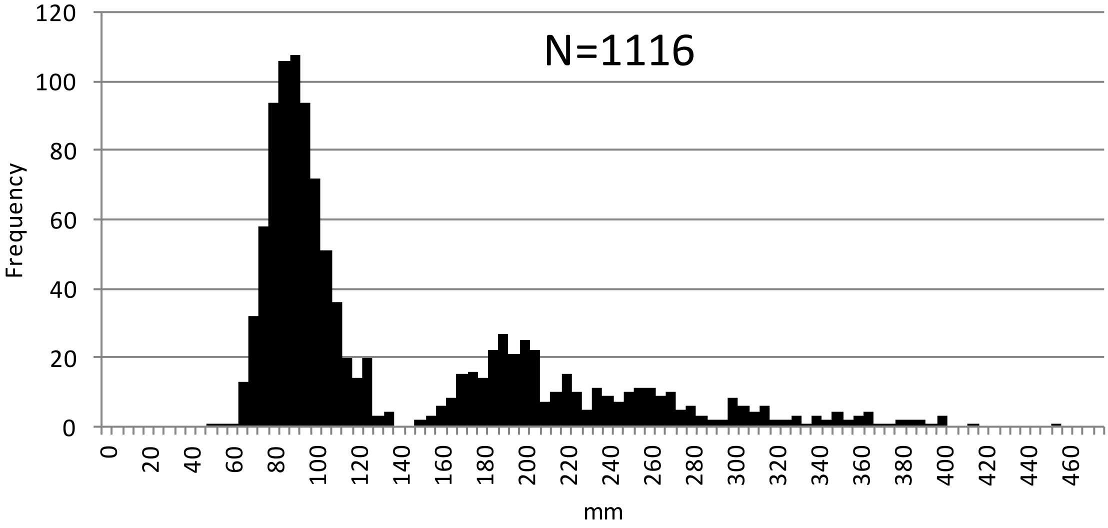
Graph Itchen 6: Brown trout first run biomass, upper Itchen PBT, 2001 - 2015

Graph Itchen 7 shows the first run catch at the Itchen spatial PBT sites in 2015. Five surveys were carried out on the Candover and Cheriton streams and four on the River Arle.

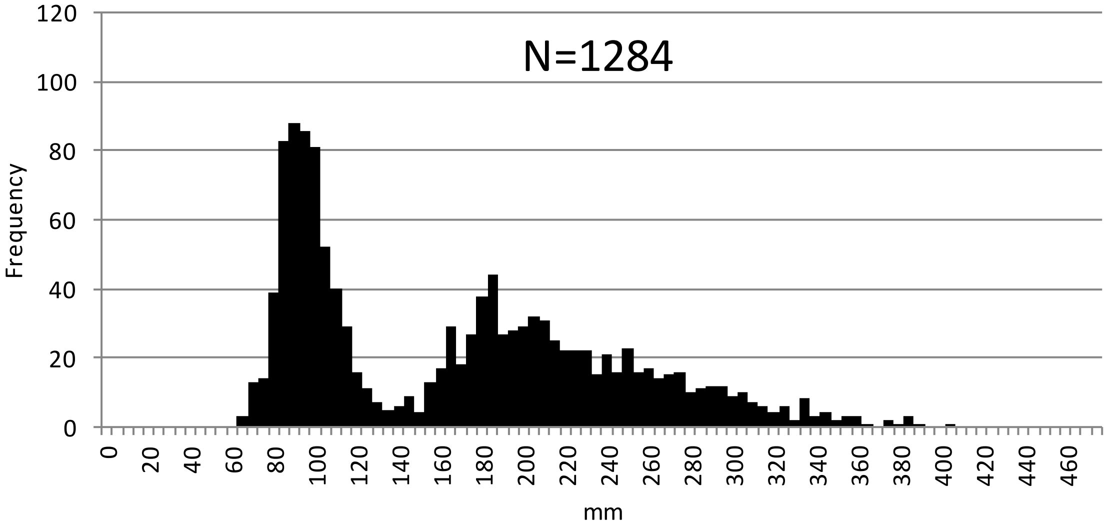


Graph Itchen 7: First run catch, upper Itchen PBT, 2009 & 2015

Graphs Itchen 8 & 9 are length frequency histograms for all brown trout caught in the Itchen PBT surveys in 2009 and 2015.



Graph Itchen 8: Brown trout length frequency histogram, upper Itchen PBT, 2009.



Graph Itchen 9: Brown trout length frequency histogram, upper Itchen PBT, 2015.

Discussion

In 2015 we surveyed 14 sites in the upper Itchen to look at the brown trout population across the Cheriton stream, Candover Brook and River Arle. The Candover and Cheriton stream had five surveys apiece, and the Arle four. These surveys were an exact re-run of the 14 surveys carried out in 2009, with 12 being done for the first time since then, and two sites (Abbotstone and Vernal Farm) being repeated in between; initially every year and now biennially. All of these sites were surveyed using full width surveys.

When comparing the 2015 catch to 2009, brown trout abundance increased in 11 of the 14 sites. For the zero catch, at Bishops Sutton on the River Arle, this site was only 200m from the stream head in summer, and may not have the physical characteristics to support trout in all years. This site only recorded one trout in 2009. All other sites on the Arle showed an increase in brown trout abundance; at Arle mill and Eel house we recorded over double the 2009 catch, and at Drove lane the trout population increased to almost four times the catch we had in 2009.

On the Candover Brook, catches increased at four sites, whilst substantially reducing at Folly main. At the time of the survey this site appeared to be impacted by heavy siltation and sluggish flows. We did however still catch 68 brown trout at this site, with around 1/3 of these 0+ fish. The other sites all showed substantial increases in brown trout abundance, reflecting the positive restoration work that has been carried out in this catchment over the past few years. Much of this restoration has been aimed at improving adult habitat and increasing the abundance of adult fish. The success of this restoration is illustrated in the length frequency histograms Itchen 8 and Itchen 9. Despite the number of fish under 200mm remaining similar (862 in 2009 and 827 in 2015), the number of fish longer than 200mm had increased from 254 in 2009 to 457 in 2015.

It was a similar story on the Cheriton stream; at four of the sites we observed an increase in the number of trout caught, with just one site showing a large decrease in fish. The site which showed a decline in numbers was just downstream of the A31 flyover, situated in a field with a head of cattle. The survey reach was unfenced, allowing cattle to wander freely through the stream, and indeed did so whilst we were on site. This constant disturbance has produced a stretch of river which is over-wide, with a lack of marginal and instream plant growth. We hope to carry out restoration work on this stretch in the near future.

In addition to the spatial sites, we carry out more frequent surveys at Abbotstone on the Candover Brook and Vernal Farm on the Cheriton stream (Graph Itchen 5, Itchen 6). 2015 saw the highest ever catch at Vernal Farm, and the second highest catch at Abbotstone. The previous highest catch at Abbotstone was in the first year we carried out a survey at this site, back in 2001. This long running dataset illustrates the lack of resilience in the brown trout population in this location, with a number of years of poor results, particularly during the warm summers of 2005 & 2006. The case study below demonstrates the work that is being done to increase this resilience and create a more stable population.

Biosecurity is important in all of our fish surveys, but particularly where sensitive native fauna are present. Here, a fisheries officer hoses plant material from the survey boat

A fantastic Itchen wild brown trout

Abbotstone Restoration Case Study

Abbotstone survey site 2007

The same site in 2015, following restoration work in 2014

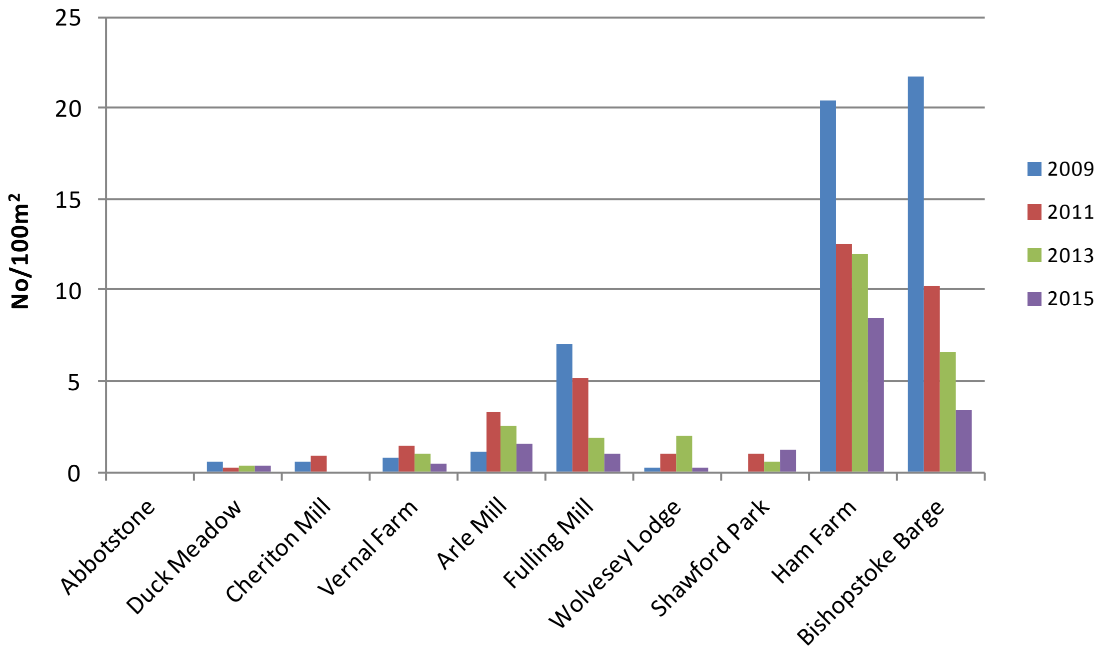
As these two photographs show, the effects of a restoration project can influence both habitat and fish populations in a very short space of time. The section of the Candover that we survey at Abbotstone often shows very variable habitat at the time of our survey. Some years, when flows are strong, there is abundant plant growth and excellent habitat. However, in years of less than ideal flow, levels drop, the flow velocity reduces and sedimentation and algal growth both increase.

In late 2014, this section of stream was fenced off, stopping cattle access to this area. This allows marginal vegetation to encroach on the channel. Depth and flow alterations were also created, to improve habitat variability. The marginal vegetation growth not only increases velocity in the main channel, but creates refuge areas in the margins for fry and invertebrates.

The numbers ring true in this instance; in 2007 we caught 47 brown trout in the first run, with a biomass of 155grams/100m² and an average length of 103mm. In 2015, we caught 93 brown trout with a biomass of 1,017grams/100m² and an average length of 136mm. Not only have numbers of trout increased, there was a much higher biomass and the average size of fish has increased. This shows that the habitat is better for both juvenile and adult fish.

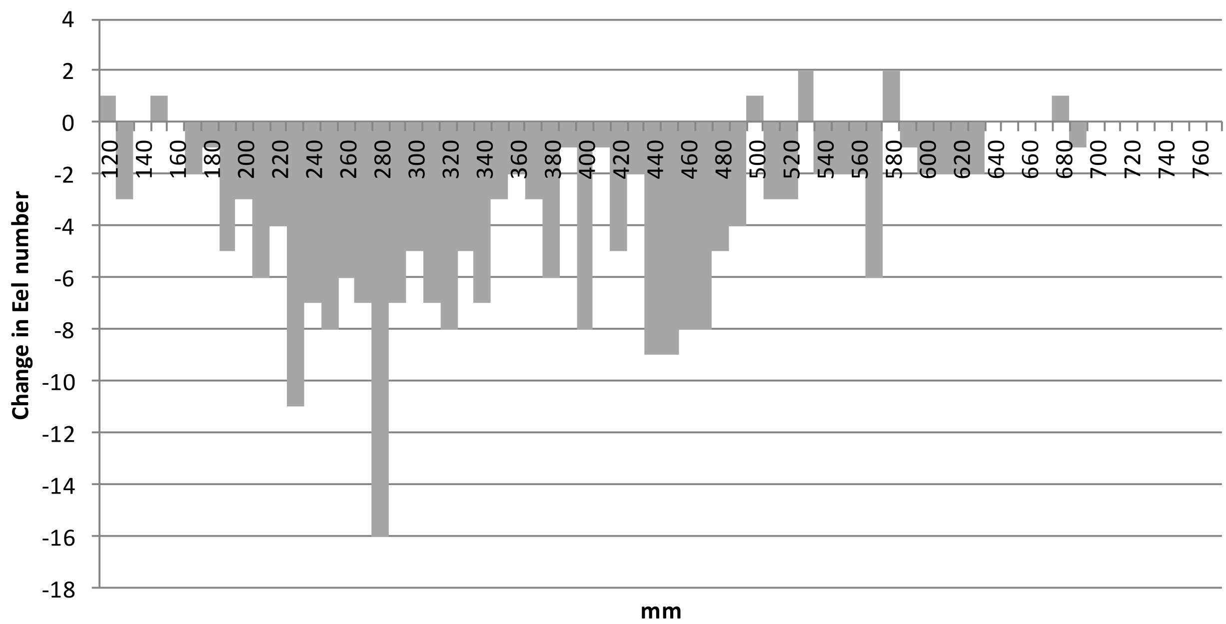
Itchen Eel Index

Graph Itchen 10 shows the estimated density of eels at the ten Eel Index survey sites on the River Itchen for each Eel Index survey year (2009, 2011, 2013 & 2015).



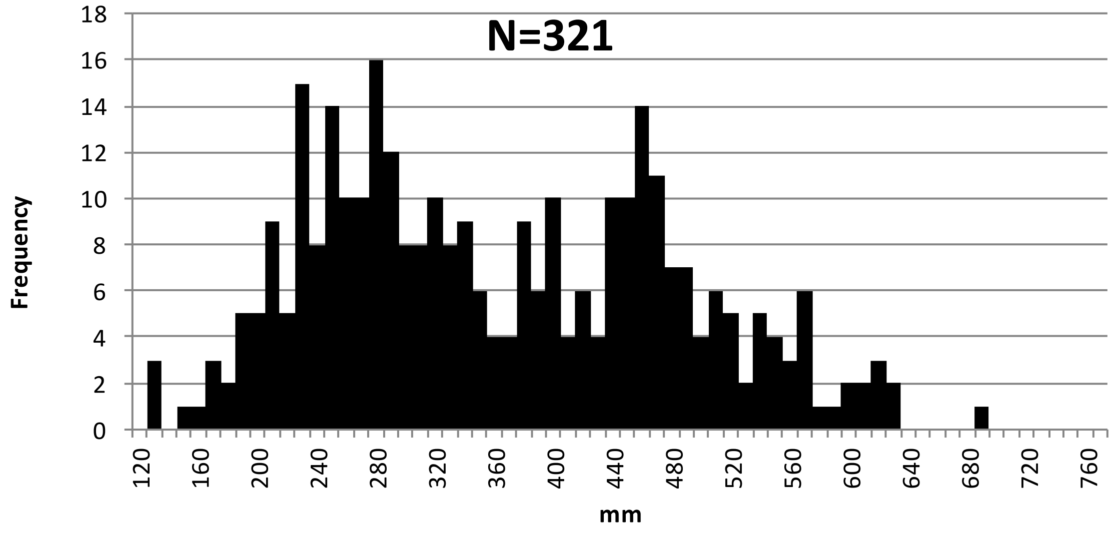
Graph Itchen 10: Estimated density, Itchen Eel Index, 2009-2015

Graph Itchen 11 shows the change in eel abundance between 2009 and 2015 for all ten Eel Index sites combined. A change in number of eels captured is given for each 10mm length category.

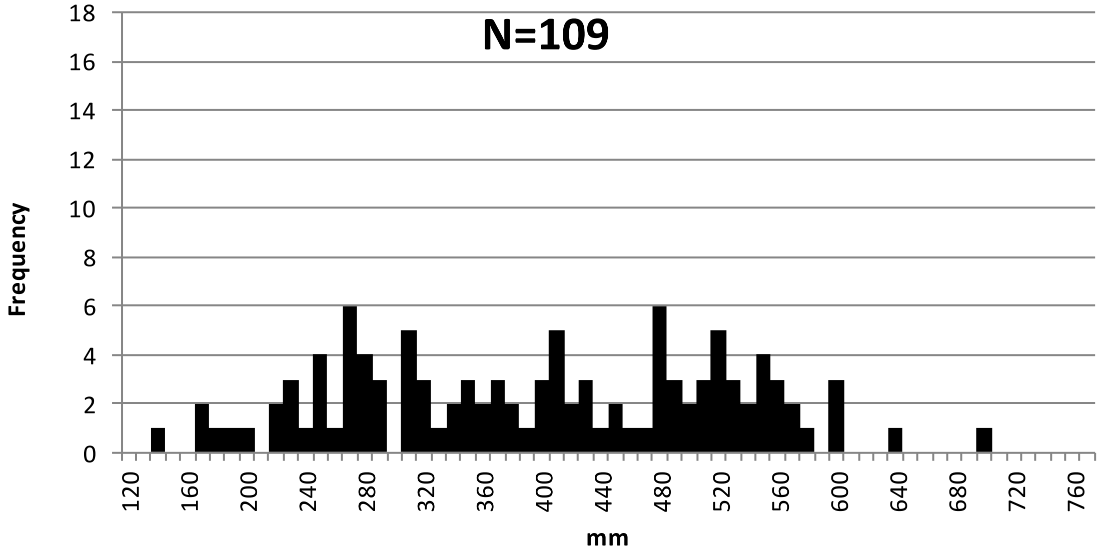


Graph Itchen 11: The change in eel numbers per length category, Itchen Eel Index, 2009 - 2015

The two length frequency histograms below (Graph Itchen 12 & 13) show the lengths of eels caught at all ten Eel Index sites in 2009 and 2015 respectively. Eels are categorised in 10mm size bands.



Graph Itchen 12: Eel length frequency distribution Itchen Eel Index 2009



Graph Itchen 13: Eel length frequency distribution, Itchen Eel Index, 2015

Discussion

2015 was the fourth time we have carried out our biennial Eel Index surveys on the River Itchen, adding to a dataset which extends back to 2009. There has been a steady decline in overall eel numbers caught in our surveys each year over the four survey years. Total catches of eels have dropped from 321 in 2009 to just 109 in 2015. The key losses have been eels in the size ranges 200-350mm and 430-490mm. These are eels between approximately five and ten years old (200-350mm), and larger female eels (430-490mm). This loss could be a sign that as adult fish are lost from the system, either through mortality or outward spawning migration, elvers are not returning to the river in sufficient quantities to replace this stock. In 2015 we only caught six eels smaller than 200mm (less than 5 years old).

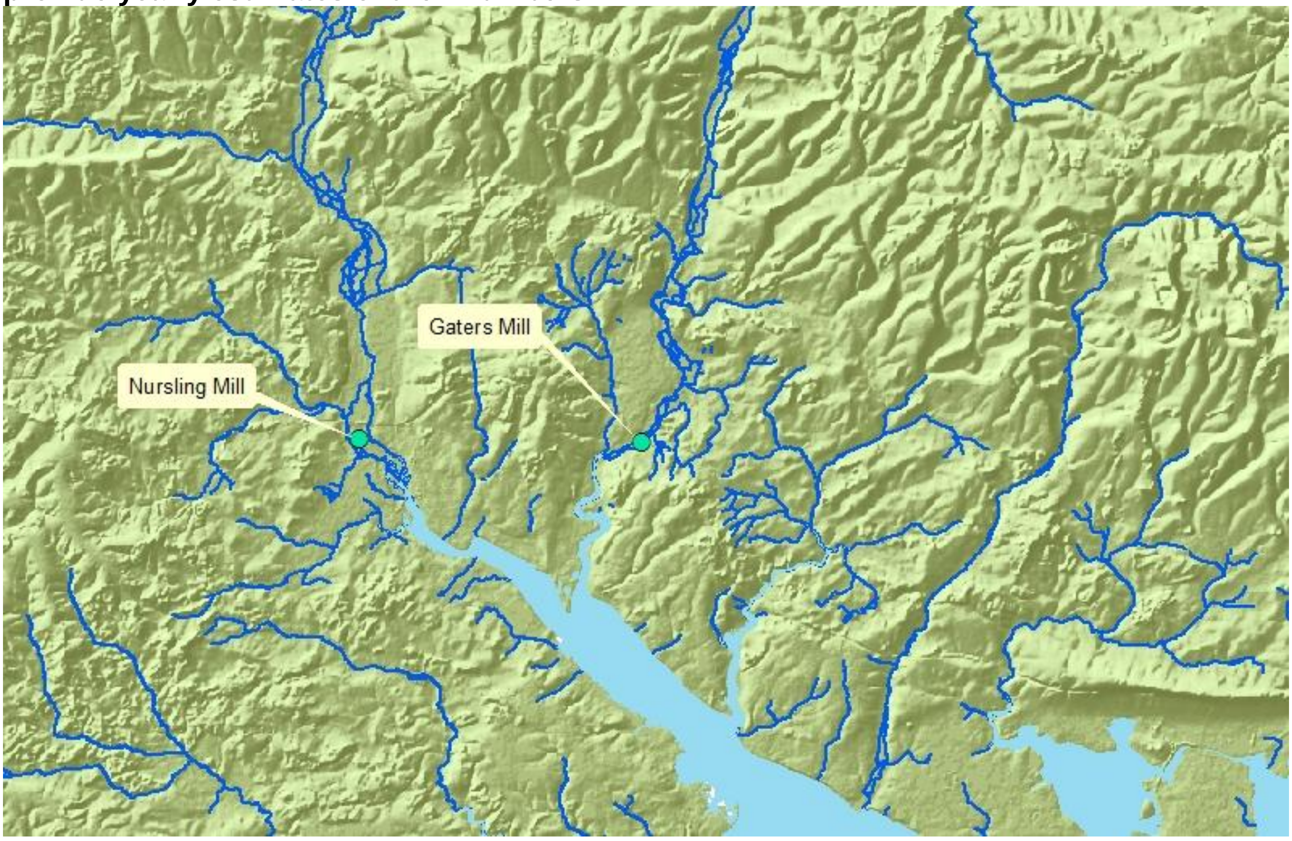
Eel spatial distribution in the Itchen remains similar to previous years, with the highest densities of eels present in the lower reaches of the river. Lower densities of eels are present in the middle reaches of the river and lower still in the Candover and Cheriton streams in the upper catchment.

Eel numbers continue to decline on the Itchen

The highest density of eels was at Ham Farm on the Itchen Navigation, pictured above

3.5. Test & Itchen Fish Counters

We have fish counters on the lower reaches of both the River Itchen and the River Test, which work by detecting the change in resistance when a fish swims over an array of electrical sensors in the channel. These are used to monitor returning adult salmon and provide yearly estimates of their numbers.



Map Test & Itchen 1: The locations of the two fish counters on the River Test and the River Itchen.

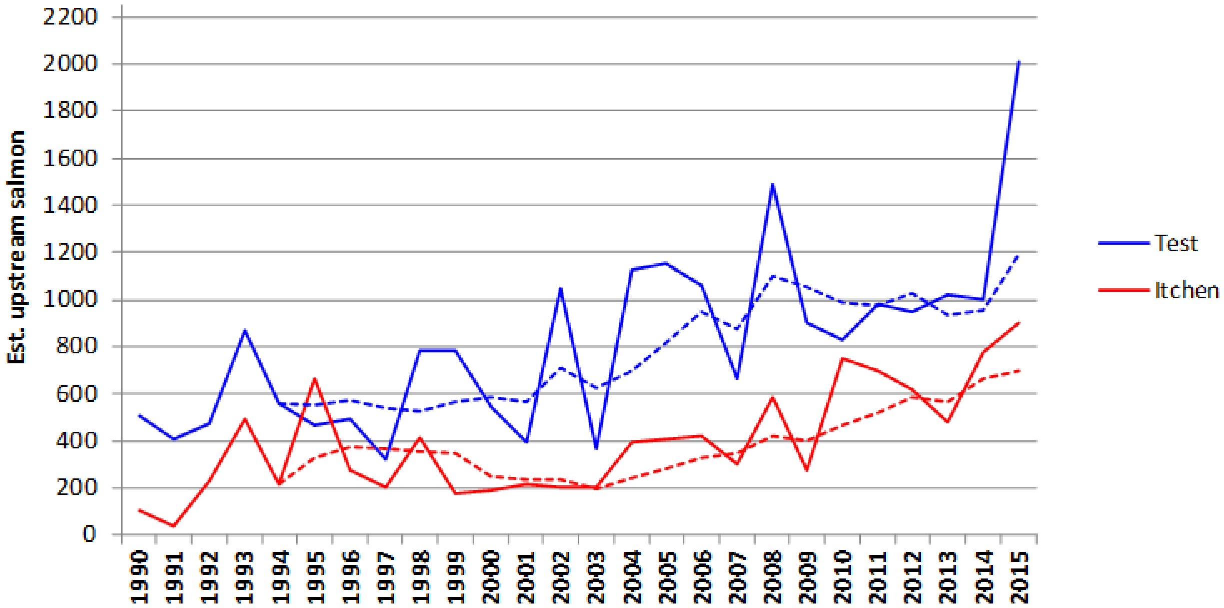
- The estimates for the Test & Itchen for 1st May-31st December 2015 are 2,007 and 903 respectively.

- These estimates suggest that both rivers had the largest runs of returning salmon in 25 years.

- The previous largest run estimates for the Test were: 2008 (1,487); 2005 (1,150) & 2004 (1,129).

- The previous largest run estimates for the Itchen were: 2014 (779); 2010 (749) & 2011 (697).

Graph Test & Itchen 1, below, shows the estimated number of upstream migrating salmon, between the 1st May and 31st December for each year from 1990 to 2015. A smoothed average (three- year) is given to illustrate any data trends.



Graph Test & Itchen 1: Estimated adult salmon returning stock in the Test and Itchen from 1990-present.

The two figures below, Graphs Test & Itchen 2 & 3, are salmon datasheets for the Itchen and Test respectively. For each year, the number of returning salmon, rod catch, catch and release rate, spawning escapement and egg deposition is given. The salmon egg conservation and management targets are also shown, as are any details about specific issues with the data.

River Itchen							
Adult Return Year	**Returning Stock**	**Rod Catch**	**Catch and Release Rate** (%)	**Spawning Escapement**	**Egg Deposition** (millions)	**% egg conservation limit**	**% egg management target**
1990	367	187	-	106	0.26	16	13
1991	152	69	-	37	0.09	6	5
1992	357	95	-	230	0.56	34	28
1993	852	357	-	495	1.21	74	61
1994	378	183	14	219	0.53	33	27
1995	880	241	0	664	1.62	99	82
1996	433	261	13	275	0.67	41	34
1997	246	95	14	204	0.50	31	25
1998	453	161	44	414	1.01	62	51
1999	213	92	46	176	0.43	26	22
2000	208	168	66	189	0.46	28	23
2001	217	190	99	214	0.52	32	27
2002	239	188	99	202	0.49	30	25
2003	222	78	100	204	0.50	31	25
2004	410	149	100	393	0.96	59	49
2005	411	87	100	411	1.00	62	51
2006	419	121	100	419	1.02	63	52
2007	302	224	100	301	0.73	45	37
2008	609	282	100	584	1.42	87	72
2009	276	205	100	276	0.67	41	34
2010	757	361	100	749	1.83	112	93
2011	697	295	100	697	1.7**	104	86
2012	622	373	100	622	1.52	93	77
2013	478	154	100	478	1.17	72	59
2014	779	269	100	779	1.9**	117	96
2015	903	341	100	903	2.20	135	112

Salmon egg conservation limit 1.63 Million
Salmon egg management target 1.97 Million

Notes
** *Likely to be a slight underestimate due to fault in May and June*

Figure Test & Itchen 2: Itchen salmon data sheet showing key figures for the returning salmon stock into the River Itchen

River Test							
Adult Return Year	Returning Stock	Rod Catch	Catch and Release Rate (%)	Spawning Escapement	Egg Deposition (millions)	% egg conservation limit	% egg management target
1990	790	288	-	505	1.23	36	32
1991	538	139	-	405	0.99	29	25
1992	614	151	-	471	1.15	34	30
1993	1155	335	-	870	2.12	62	55
1994	775	247	14	560	1.37	40	35
1995	647	167	0	465	1.13	33	29
1996	623	146	13	496	1.21	36	31
1997	361	49	14	319	0.78	23	20
1998	898	204	44	784	1.91	56	49
1999	867	159	46	781	1.91	56	49
2000	595	147	66	545	1.33	39	34
2001	410	215	99	398	0.97	29	25
2002	1046	342	99	1044	2.55	75	66
2003	367	164	100	367	0.90	26	23
2004	1129	449	100	1129	2.75	81	71
2005	1150	357	100	1150	2.81	83	72
2006	1058	210	100	1058	2.58	76	67
2007	664	258	100	664	1.62	48	42
2008	1487	424	100	1487	3.63	107	94
2009	903	185	100	903	2.20	65	57
2010	833	225	99	831	2.03	60	52
2011	980	312	100	979	2.39*	70	62
2012	949	293	100	949	2.32*	68	60
2013	1020	323	100	1020	2.49	73	64
2014	1001	235	100	1001	2.44	72	63
2015	2007	499	100	2007	4.90	144	126

Salmon egg conservation limit 3.4 Million
Salmon egg management target 3.88 Million

Notes
* *Returning stock estimate based on historic relationship with rod catch due to fish counter faults*

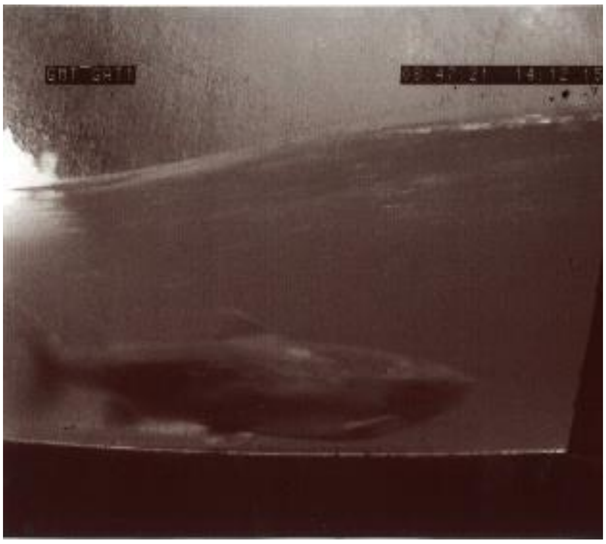
Figure Test & Itchen 3: Test salmon data sheet showing key figures for the returning salmon stock into the River Test

Discussion

In 2015, we recorded the highest numbers of returning salmon we have recorded since 1990 into both the Itchen and the Test, with an estimated 903 fish returning to the Itchen and 2,007 to the Test. The majority of these fish will spawn over the winter of 2015/2016 and we will pick up their young as parr in our salmon parr surveys in late summer 2016. Since 2003 there has been a trend in increasing numbers, with a smoothed average line showing this on graph Test & Itchen 1.

The salmon data sheets for both catchments (figures Test & Itchen 2 & 3) demonstrate that the number of salmon returning to the two rivers in 2015 could provide egg deposition in excess of the management target for each. However, it is not as simple as more returning salmon = more salmon parr -and there are many other factors which will influence the number of smolts produced in the 2014/2015 spawning season and eventually heading to sea.

Water temperature and flow can influence salmon throughout the time they spend in freshwater; during the summer when most adult fish return to the river, when they are migrating to spawning gravels upstream and during spawning. Once eggs have been deposited, water temperature and flow influence the survival of the eggs and how long they take to develop. Temperatures throughout the year dictate parr growth rates and influence survival. Flow dictates the amount of physical habitat available for spawning and how accessible it is. It can clean gravels prior to spawning and influence the amount of weed growth during the summer months. These environmental conditions coupled with human impacts mean that there is a very complex, indirect relationship between the number of returning adults one year, and the number of smolts eventually produced from that spawning. The range of factors determining survival of smolts at sea is even less well understood.

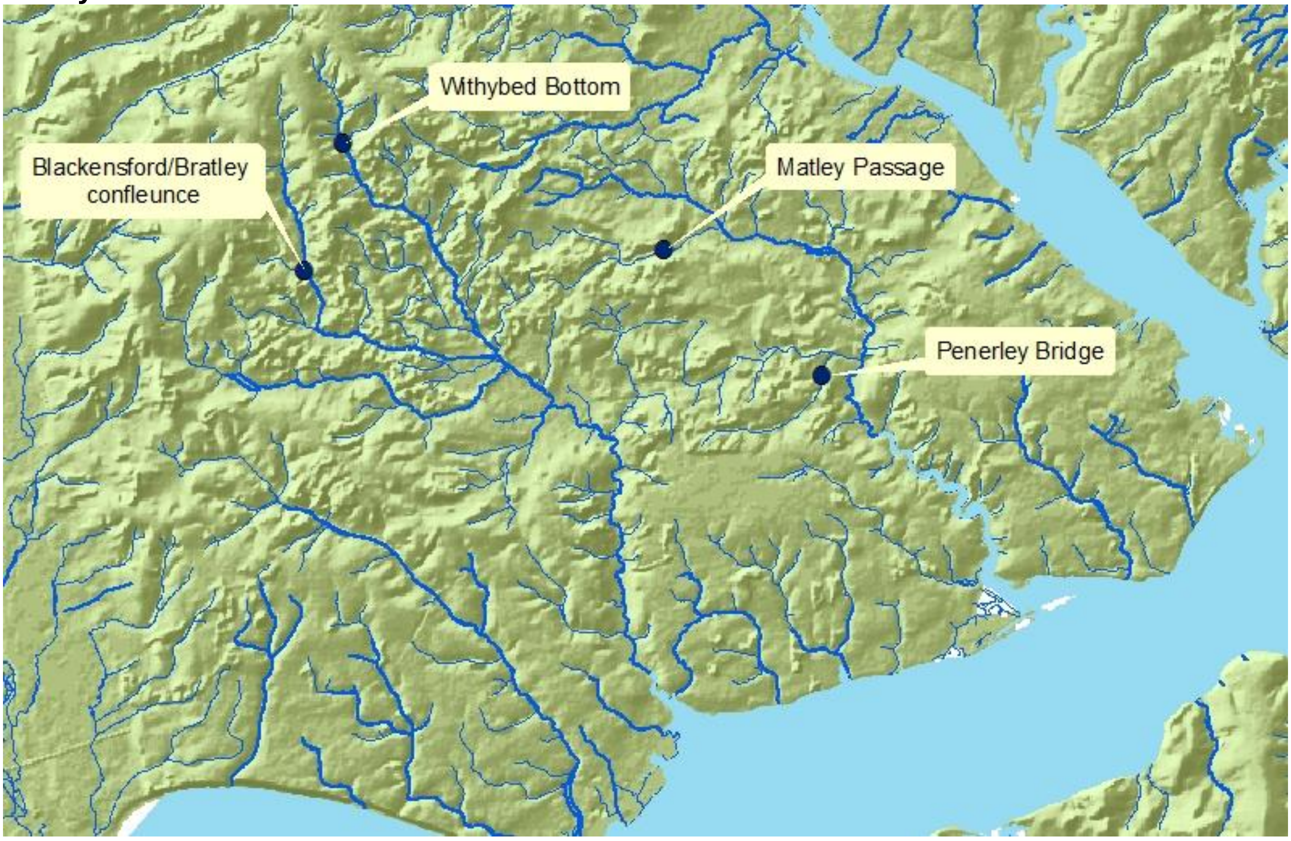


A salmon approximately 75cm long (around 10lb) passing through the Gaters Mill counter at 18:47 on the 14th December, 2015.

The building that houses the fish counter on the River Test.

3.6. New Forest

We carried out four surveys in the New Forest in 2015; two on the Lymington River and two on the Beaulieu River (Map New Forest 1). All four surveys were Principal Brown Trout surveys.



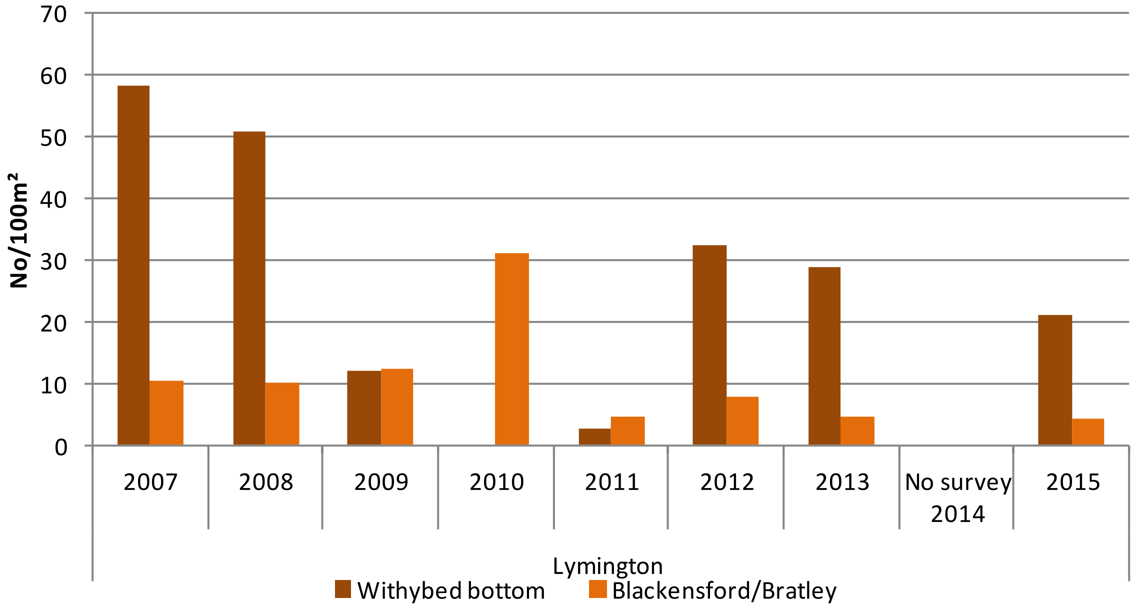
Map New Forest 1: Locations of survey sites in the New Forest catchment

- Only three of the survey sites in the New Forest had water in them, the site at Penerley was dry. This is still important data so we record the dry site as a zero catch survey to reflect the relationship between flow and fish abundance.

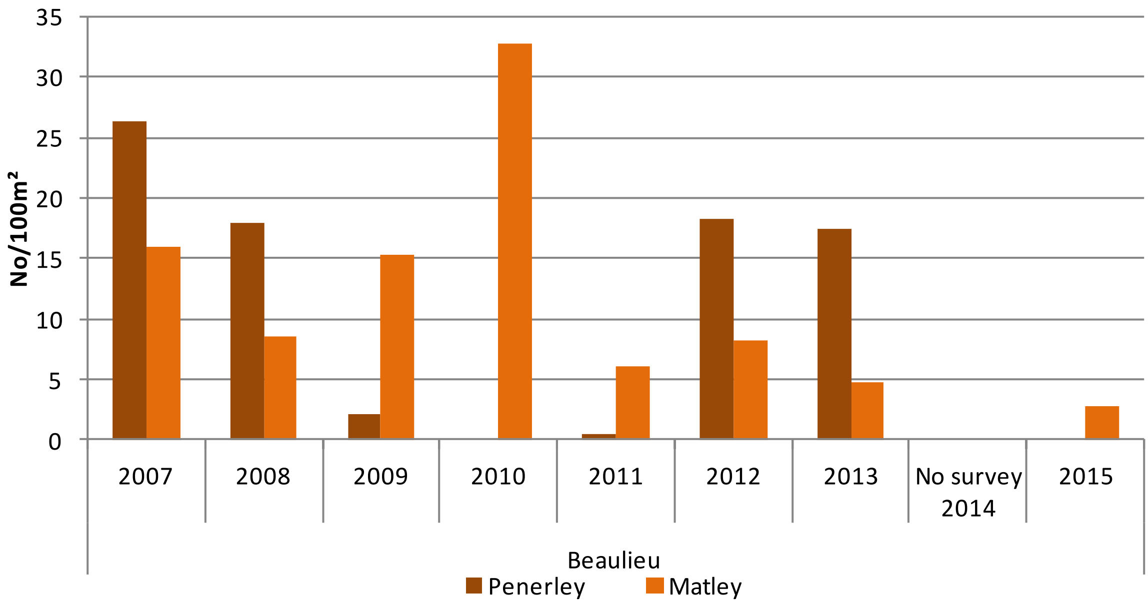
- Brown trout numbers were the lowest we have recorded at Blackensford/Bratley and Matley Passage.

- Brown trout abundance at Withybed Bottom on the Lymington River was around average compared to previous years.

Graphs New Forest 1 & New Forest 2 below, show the density of brown trout caught at sites on the Lymington and Beaulieu Rivers respectively. In 2010, a zero catch was recorded at Withybed bottom and Penerley due to the sites being dry. This is also the case at Penerley in 2015.

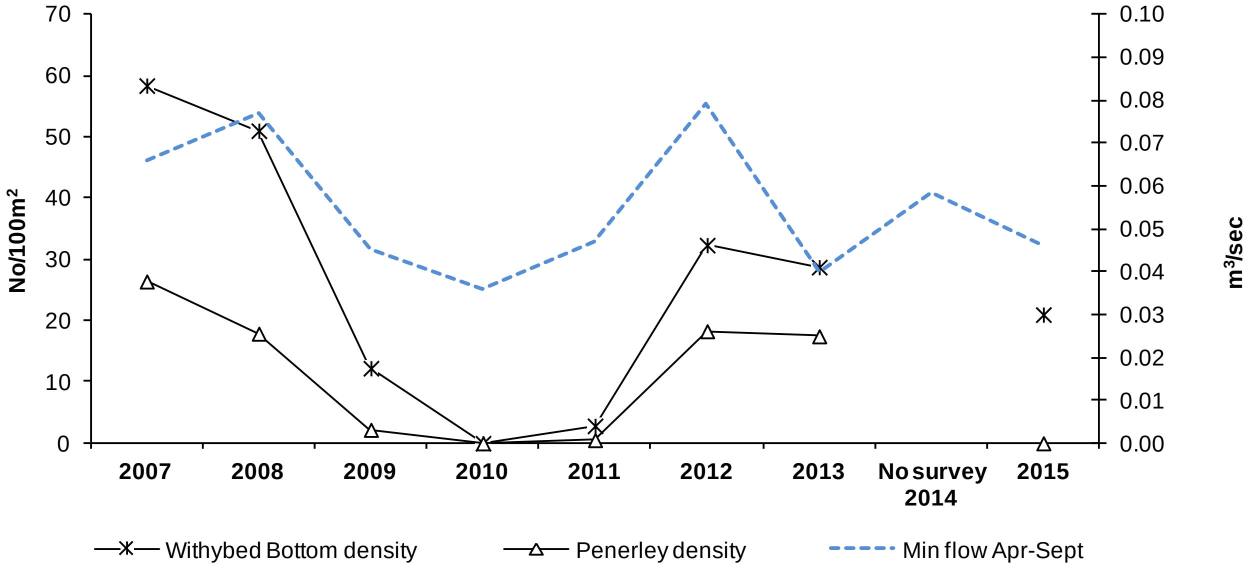


Graph New Forest 1: Brown trout density, Lymington River 2007-2015



Graph New Forest 2: Brown trout density, Beaulieu river 2007-2015

Graph New Forest 3 shows brown trout density compared to minimum monthly flow (in cubic meters per second) during April to September for Withybed Bottom on the Lymington River and Penerley on the Beaulieu River.



Graph New Forest 3: Brown trout density & minimum monthly flow, Withybed Bottom & Penerley, 2007-2015

Discussion

This season, the abundance of trout caught in our surveys in the New Forest were the lowest we have seen across all sites since 2011. We had the lowest recorded catches since our surveys began in 2007 at Blackensford/Bratley on the Lymington and Matley on the Beaulieu. At Penerley we could not electrofish due to the river being dry at this point, however we still collected data and reported the survey as a zero catch sample. The only survey where we had an average catch was at Withybed bottom on the Lymington River. The reasons for this are likely to be climatic conditions in the build up to our survey period. Below average monthly rainfall totals from November 2014 until our surveys in July in every month except May, resulted in unfavourable flow conditions throughout the catchment. Graph New Forest 3 highlights the impact flow conditions have on brown trout parr abundance, with correlations of 0.84 and 0.68 between minimum monthly flow and brown trout density at Withybed Bottom & Penerley. Low flow conditions limit the available habitat for brown trout and the associated high water temperatures and low dissolved oxygen content in the river can lead to mortality. There's little doubt that New Forest trout are adapted to tolerating periods of very low flow by retreating to deep, shady pools (a feature of the natural New Forest stream habitat) but the length of time they can endure such tough conditions is limited.

The Penerley site was dry in 2015, although heavy rain immediately after our survey would see it flowing once again

A young of the year trout from the Beaulieu River

A fish survey in typical New Forest surroundings

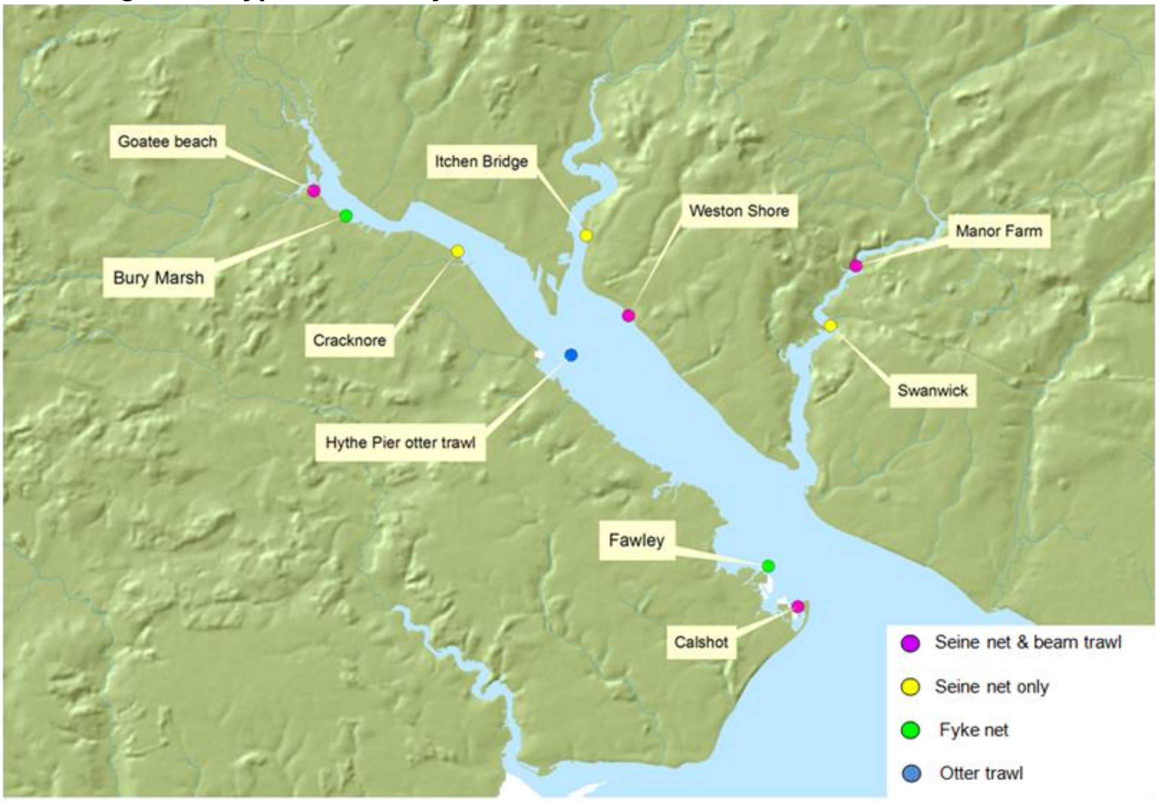
4. Estuarine Fish Monitoring

4.1. Southampton Water

In 2015 the Southampton Water Transitional and Coastal (TrAC) fish monitoring programme included the routine spring and autumn beach seine and beam trawl surveys at four sites, beach seine only surveys at three sites (where beam trawling would be hazardous) and fyke net surveys at a further two sites. Seine net surveys consist of two semi-circular samples in the same location, with a 45m net set from a boat. The beam trawl is 1.5m wide and is towed for exactly 200m, parallel to the shore, at the seine net site. Each fyke survey consists of two double ended fykes, set close to shore in one metre of water at low tide and left for 24 hours.

All the sampling described above is carried out by the local area team. The programme also includes an autumn otter trawl survey which in 2015 comprised of two 15 minute trawls, carried out by the Coastal Survey Vessel (CSV) "Solent Guardian" near to the edge of the maintained shipping channel, around 600m east of Hythe.

Map Soton Water 1 shows the TrAC monitoring sites in Southampton Water, coloured according to the types of survey carried out at each location.

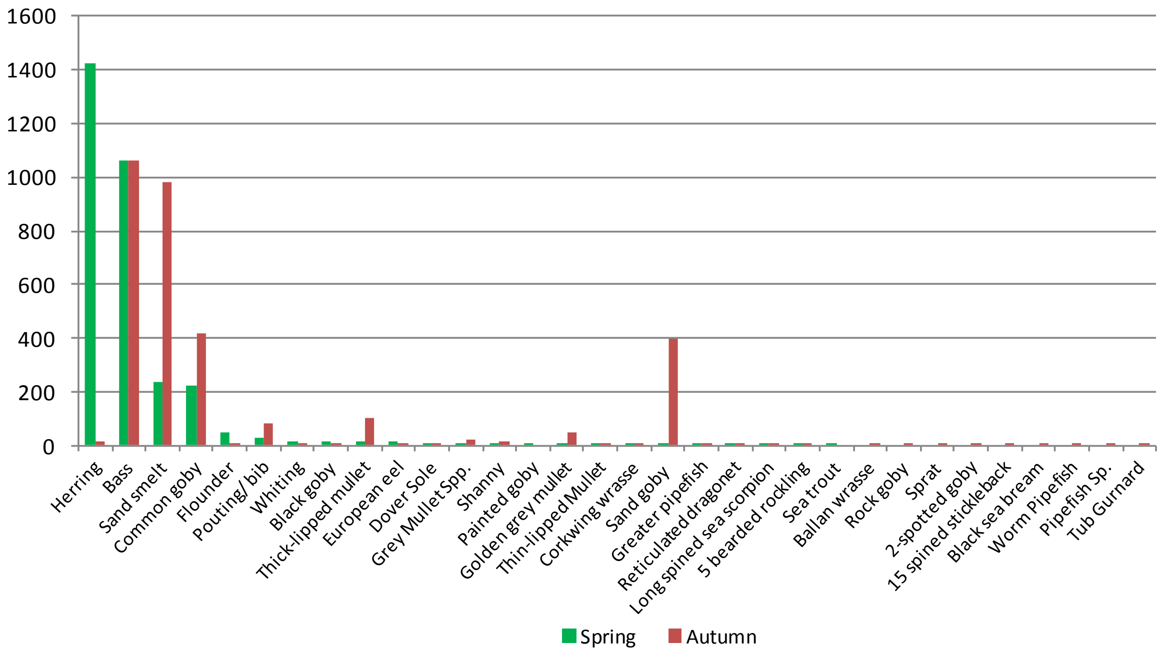


Map Soton Water 1: Fish monitoring sites in Southampton Water in 2015

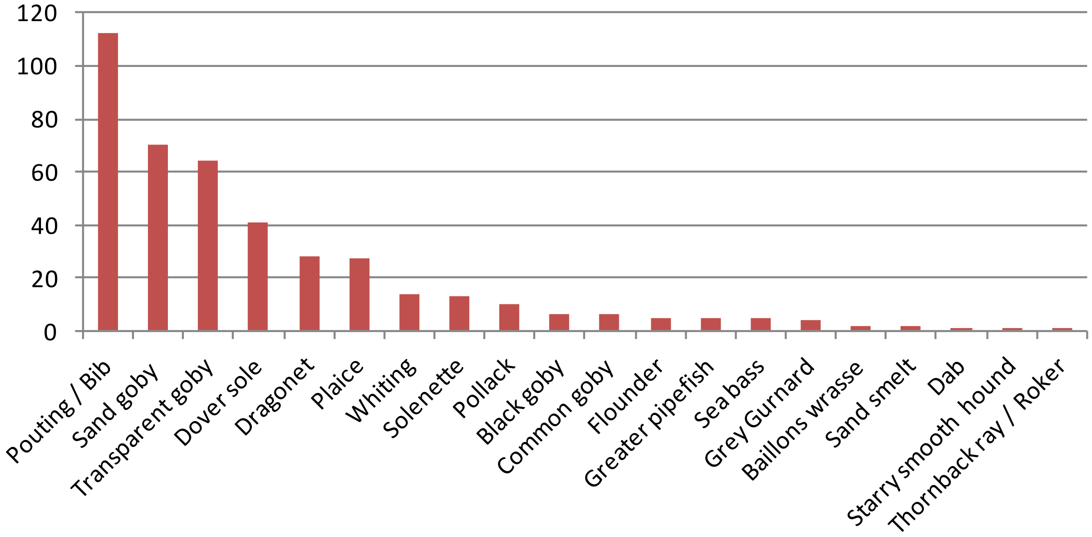
- 40 species of fish were caught in Southampton Water in 2015.
- A total of over 6,500 individual fish were caught.
- The total catch in spring was around average but autumn numbers were the second lowest we have recorded.
- Spring juvenile bass numbers were the highest we have recorded, but the autumn figure was a reduction on the last two years.

Setting the seine net at Weston Shore

Graph Soton Water 1 & 2 show the abundance of each species of fish caught in all surveys in Southampton Water in 2015, and in the CSV trawl in autumn 2015 separately. Spring is shown in green and autumn in red. Where the bar appears absent for both survey periods, this is where only very few or single individuals were caught.

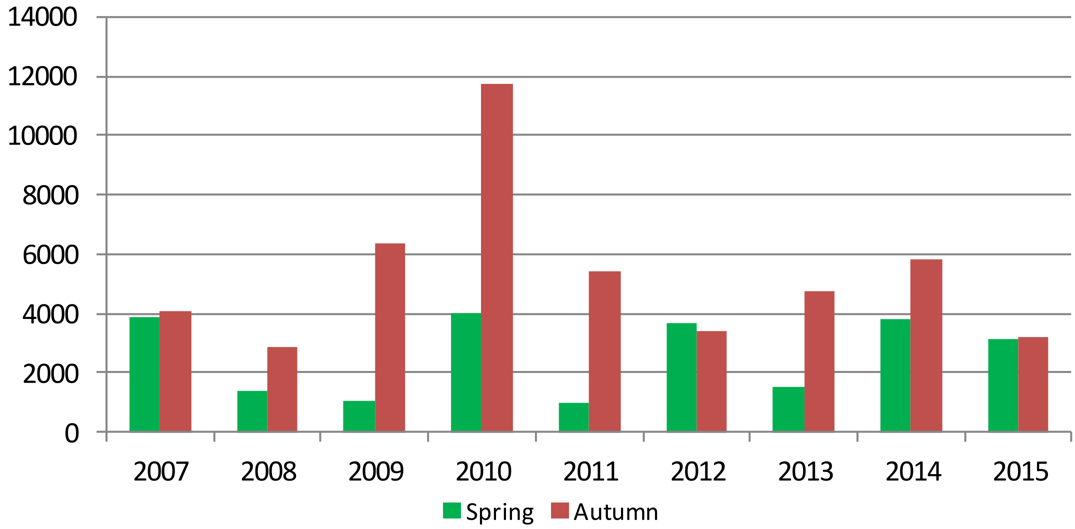


Graph Soton Water 1: Numbers of fish caught in all surveys in spring and autumn 2015. (N.b where the bar appears absent for both survey periods, this is where only very few or single individuals were caught.)



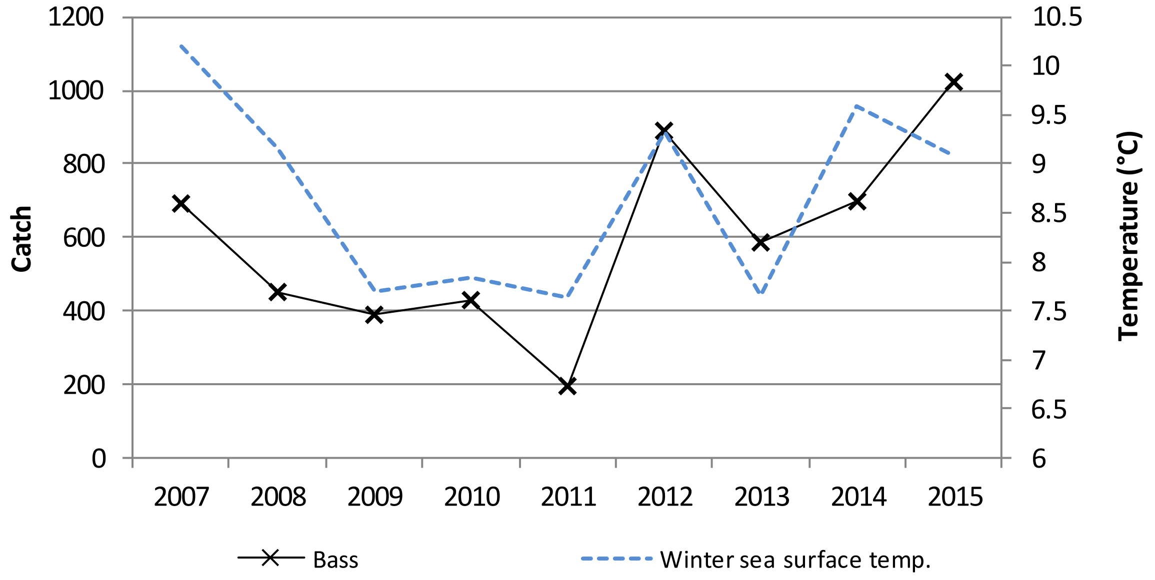
Graph Soton Water 2: Fish Abundance, CSV Trawl, Southampton Water, autumn 2015

Graph Soton Water 3 is a graph showing the total spring and autumn catch for seine net, beam trawl and fyke net surveys for each year from 2007 to 2015.

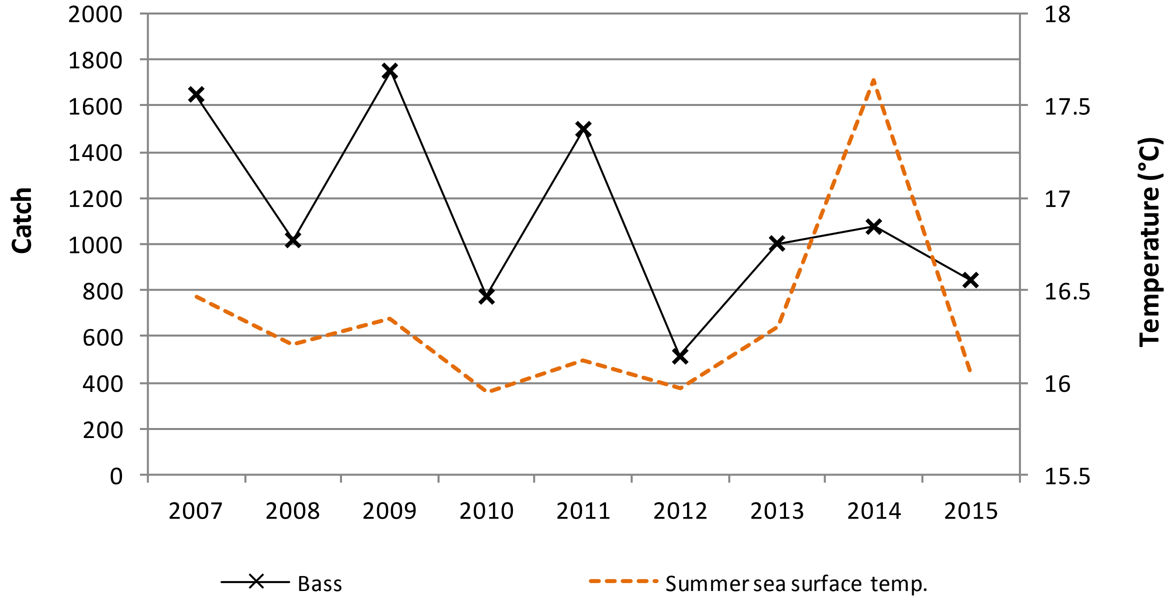


Graph Soton Water 3: Total catch for seine, fyke & beam trawls, Southampton Water, spring & autumn 2007-2015

Graphs Soton Water 4 & 5 below compare spring and autumn juvenile bass catches to average winter and summer sea surface temperature respectively. Average sea surface temperature is gained by taking an average of the mean monthly sea surface temperature for the summer or winter months as recorded at the Hayling Island data buoy.



Graph Soton Water 4: Juvenile bass abundance in spring compared to winter sea surface temperature, Southampton Water, 2007-2015.



Graph Soton Water 5: Juvenile bass abundance in autumn compared to summer sea surface temperature, Southampton Water, 2007-2015.

Discussion

In 2015 we caught a total of 6,758 fish from Southampton water; 3,105 in our spring surveys, 3,206 in the autumn and an additional 417 in the annual CSV otter trawl. We caught 40 species of fish in total during the year, including two species that we encountered for the first time in our WFD estuarine monitoring- the grey gurnard and sea trout (graph Soton Water 1 & 2). Although we know sea trout are present in the estuary at certain times throughout the year, it is not a species we expect to catch during our surveys due to timings and also the fact that sea trout should be able to easily out swim our netting techniques, which are predominantly aimed at juvenile fish.

The spring survey season yielded average catches, in the eight previous survey years we have caught more on four occasions and less on four occasions (graph Soton Water 2). Juvenile bass numbers, however, were the highest we have recorded over the nine years; this is likely due to the predominantly mild, settled conditions over the previous winter period.

The autumn catch was less positive, only in 2008 have we caught fewer fish. Again, climatic conditions are likely to be the main driver behind this; our data from the beginning of this report showing that we had the coolest summer in 15 years, with May through to October all being colder than average (Graphs TR1 & 2). It was a similar story for juvenile bass numbers in the autumn. This is when we first see the 2015 year class juveniles in our surveys, with numbers down on the past two years (Graph Soton Water 3 & 4).

The Itchen Bridge survey site

This sea trout smolt is the first we have caught in our TrAC surveys.

Southampton Water is home to an array of interesting fish species such as this corkwing wrasse...

...and this tub gurnard.

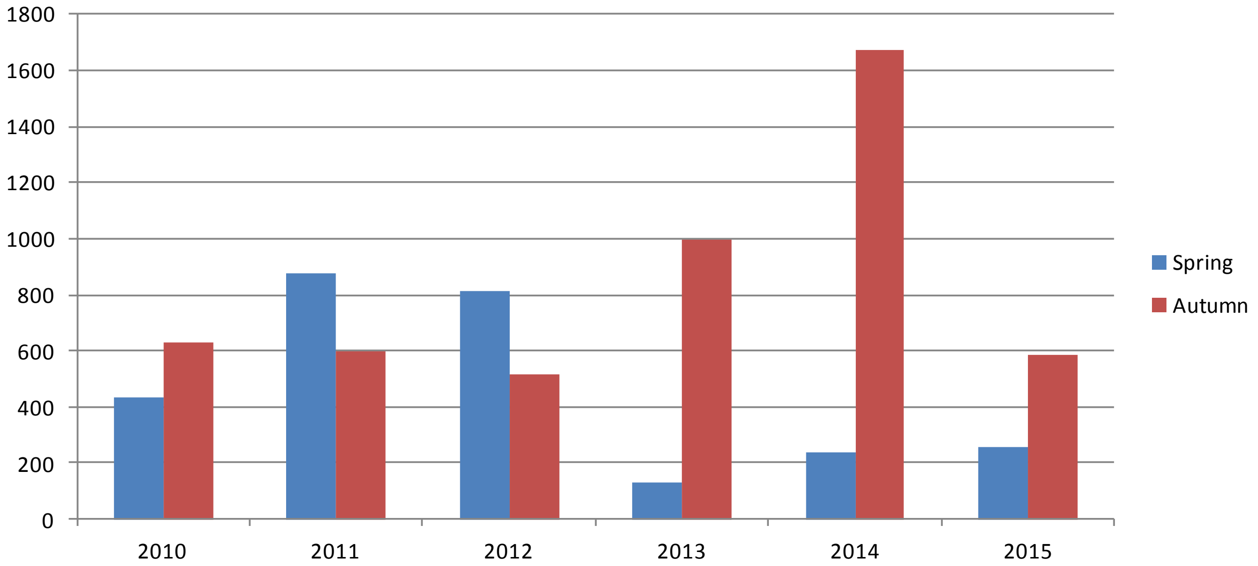
4.2. Adur Estuary

In 2015 we carried out the three routine surveys on the Adur estuary at Ladywell Stream, Old Toll Bridge and Kingston Beach. These locations are shown on the map below. At each site we completed a seine net survey followed by a beam trawl.

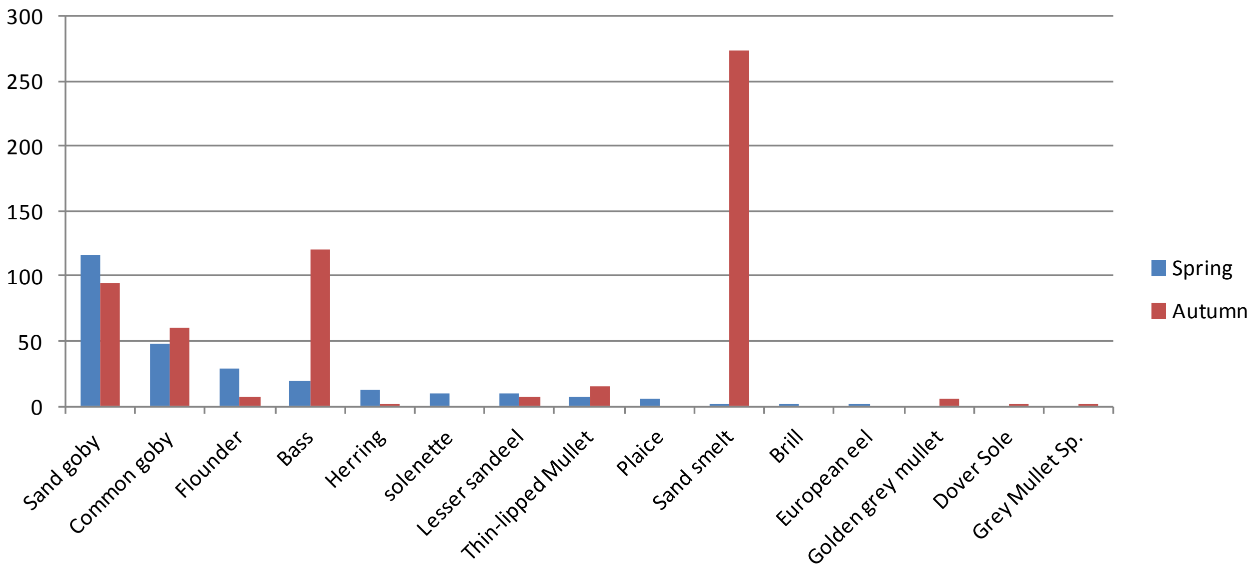
Map Adur TrAC 1: Survey sites on the River Adur estuary. All sites are both beam trawl and seine net surveys.

- We caught 15 species of fish in the Adur estuary in 2015, including eel, plaice and brill.
- Overall numbers of fish caught were slightly below average in spring and autumn.
- Bass numbers are strongly correlated to sea surface temperature, with a return to very low numbers in autumn 2015 following the cool summer.
- Mullet and pelagic fish numbers have not recovered since falling sharply in spring 2013.

The two graphs below show both the size of the catch and the numbers of each species we caught in 2015, and how this relates to the total catch in previous years.

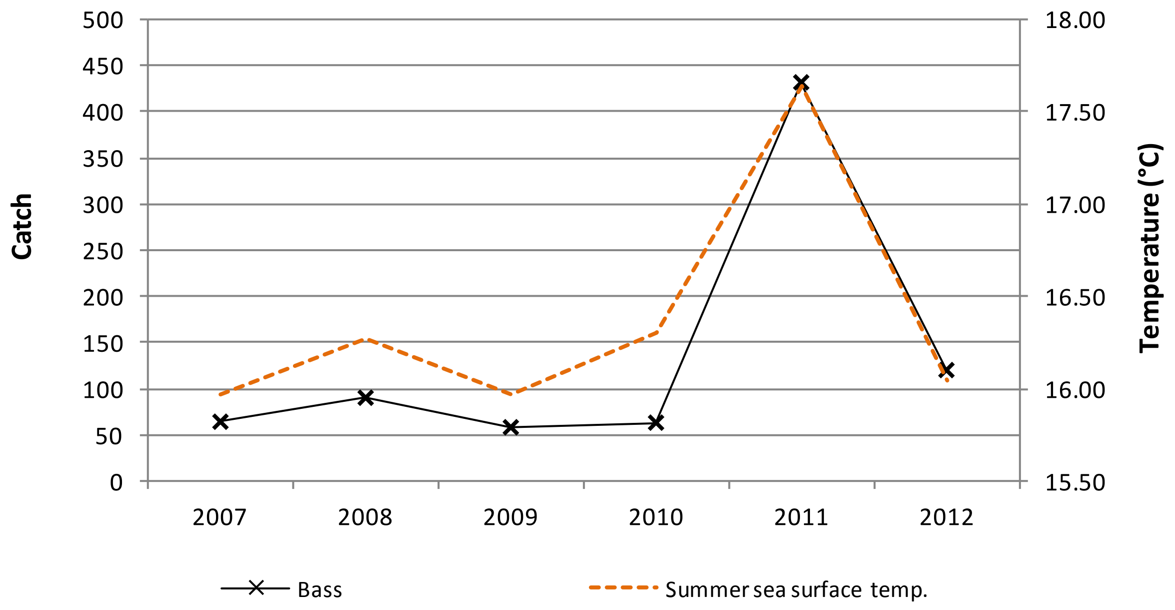


Graph Adur TrAC 1: Total number of fish caught, spring and autumn, 2010-2015



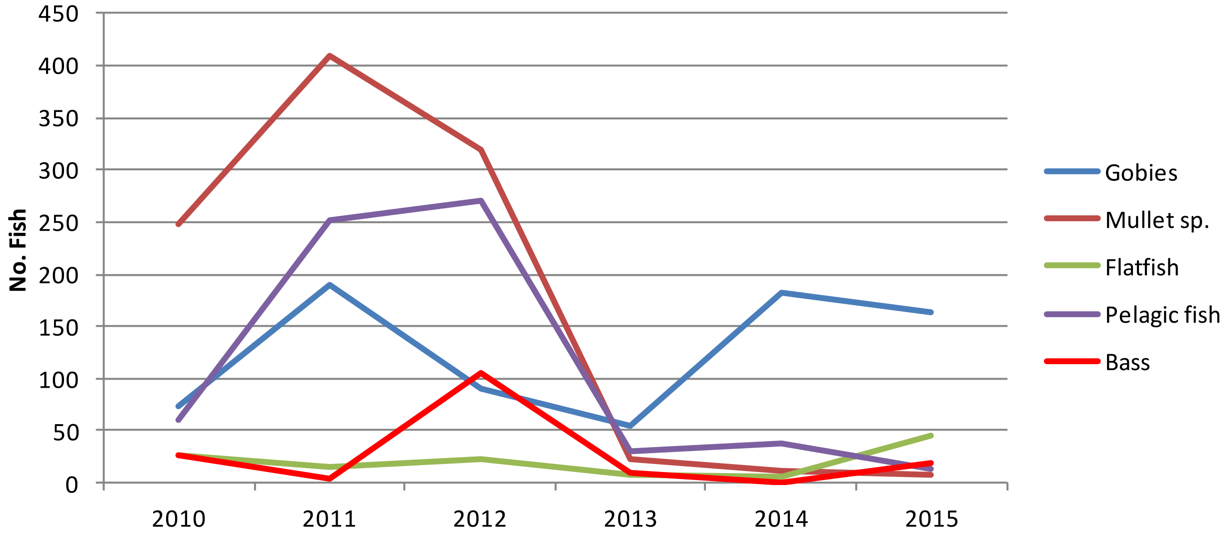
Graph Adur TrAC 2: The number of fish caught of different species in spring and autumn 2015

Graph Adur TrAC 3 illustrates the correlation between total catches of juvenile bass in autumn and the mean summer sea surface temperature. Average sea surface temperature is gained by taking an average of the mean monthly sea surface temperature for the summer or winter months as recorded at the Hayling Island data buoy.



Graph Adur TrAC 3: Juvenile bass numbers compared to mean summer sea surface temperature, 2010-2015.

The graph below describes the total catch of different fish types in spring surveys from 2010 to 2015.



Graph Adur TrAC 4: Abundance of different fish types, spring surveys, 2010-2015.

Discussion

In total we caught 15 different species of fish over the spring and autumn surveys. The most prevalent was the sand smelt, which dominated the autumn catch in terms of numbers caught. Sand gobies were the most abundant fish species recorded in spring, with over twice as many being caught as any other species (graph Adur TrAC 2). The surveys in the spring did produce a few slightly unexpected fish with plaice, brill and a European eel forming part of the catch at Ladywell Stream. Despite eels being present throughout the River Adur catchment, this is the first time we have caught one in our surveys at these sites - seine netting is not a very effective method for capturing eels, which are much more susceptible to fyke netting.

The number of fish caught in spring was marginally higher than 2014 (graph Adur TrAC 1), although it would appear that after a large decline in spring catches after winter 2012/2013, numbers are yet to recover fully. This change has mostly been due to a reduction in the number of juvenile mullet and pelagic fish such as herring & sand smelt caught in the spring surveys (graph Adur TrAC 4).

The autumn catch was the second lowest we have recorded in the past five years and this is almost certainly due to the low summer temperatures and occasional high rainfall event over the summer period (river flow is a strong influence on salinity in the Adur estuary). We observed a large reduction in the number of 0+ bass caught, which again is very strongly correlated to mean summer sea surface temperatures (graph Adur TrAC 3).

The Adur TrAC survey site at the Old Toll Bridge

One of a number of large flounder caught at the Old Toll Bridge site

Looking Forward

In 2016 we have a varied and interesting programme, with particular emphasis on salmon parr in the River Test. Overall the programme consists of:

- River Test salmon surveys- six biennial temporal salmon parr surveys and 23 6-yearly spatial salmon parr surveys.
- Western Rother Principal Coarse Fishery surveys
- River Arun Principal Coarse Fishery surveys
- Pevensey Levels Principal Coarse Fishery surveys
- Various WFD surveys in several catchments
- TrAC surveys in the autumn in Southampton Water & the Adur estuary

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