Fisheries investigation report of the Counter Drain (Mepal to Salter's Lode)

Cambridgeshire and Bedfordshire – Fisheries Monitoring Programme

2014

SUMMARY

The 2011 fisheries survey report for the Counter Drain caused considerable concern amongst the local angling community; it reported a large decline in fish density which led to the perception that silver fish populations within the channel had collapsed. Although highlighting decreased numbers of fish captured the 2011 report stated that the result should only be viewed as a snapshot in time and may not have represented the true status of fish stocks and further surveys would be required to investigate this poor result. The 2014 survey was scheduled as an additional investigative survey cycle in an attempt to answer the question posed by the prior survey; had silver fish populations collapsed, or were the poor catches a result of fish migration from the areas routinely surveyed?

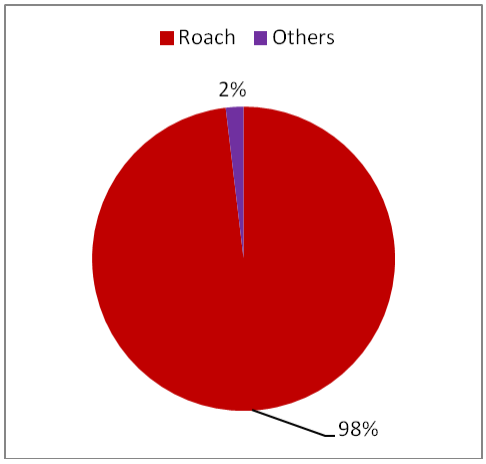
The 2014 investigation found a total of 14 species and one type of hybrid present with roach heavily dominant by both density and standing crop.

List of species caught:

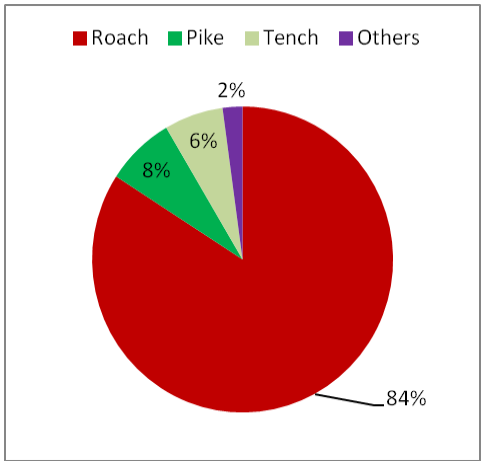
10-spined stickleback [*Pungitius pungitius*]
3-spined stickleback [*Gasterosteus aculeatus*]
Bleak [*Alburnus alburnus*]
Common bream [*Abramis brama*]
Dace [*Leuciscus leuciscus*]
Flounder [*Platichthys flesus*]
Perch [*Perca fluviatilis*]
Pike [*Esox lucius*]
Roach [*Rutilus rutilus*]
Rudd [*Scardinius erythrophthalmus*]
Ruffe [*Gymnocephalus cernuus*]
Silver bream [*Abramis bjoerkna*]
Spined loach [*Cobitis taenia*]
Tench [*Tinca tinca*]

Also recorded: Roach x common bream hybrid

Density and standing crop pie charts with % values and colour key



Species composition by density of fish >99mm



Species composition by standing crop of fish >99mm

The mean density estimate (number of fish in a given area) of fish >99mm equates to 91.7 Ind./100m^2 increasing from 4.56 Ind.100m^2 in 2011.

Mean standing crop estimate (weight of fish in a given area) of fish >99mm equates to 3373.7 g/100m^2 increasing from 1920.2 g/100m^2 in 2011.

The largest fish recorded during the survey included a perch of 430 mm (4lb 7oz) from Welney and a Tench of 533 mm from Salter's Lode.

Population estimates varied considerably at site level and mean population estimates have been heavily influenced by a large catch made at Welney.

The largest individual (mm) and number of fish captured are recorded for Roach, common bream, perch, pike and tench are given at site level below in Table 1.

Table 1: Numbers recorded (all fish) and largest length (mm) for selected species.

	Roach		Common Bream		Perch		Pike		Tench	
Species	No.	Max Length (mm)	No.	Max Length (mm)	No.	Max Length (mm)	No.	Max Length (mm)	No.	Max Length (mm)
D/s Mepal	272	198	4	72	18	112	5	525	0	-
Welches	179	185	0	-	36	184	13	485	2	466
Vandervells Lake	306	92	2	56	28	116	0	-	0	-
U/s Welney	21831	245	1386	196	11	430	1	656	1	172
Salters Lode	2437	195	1022	109	53	260	11	776	10	533

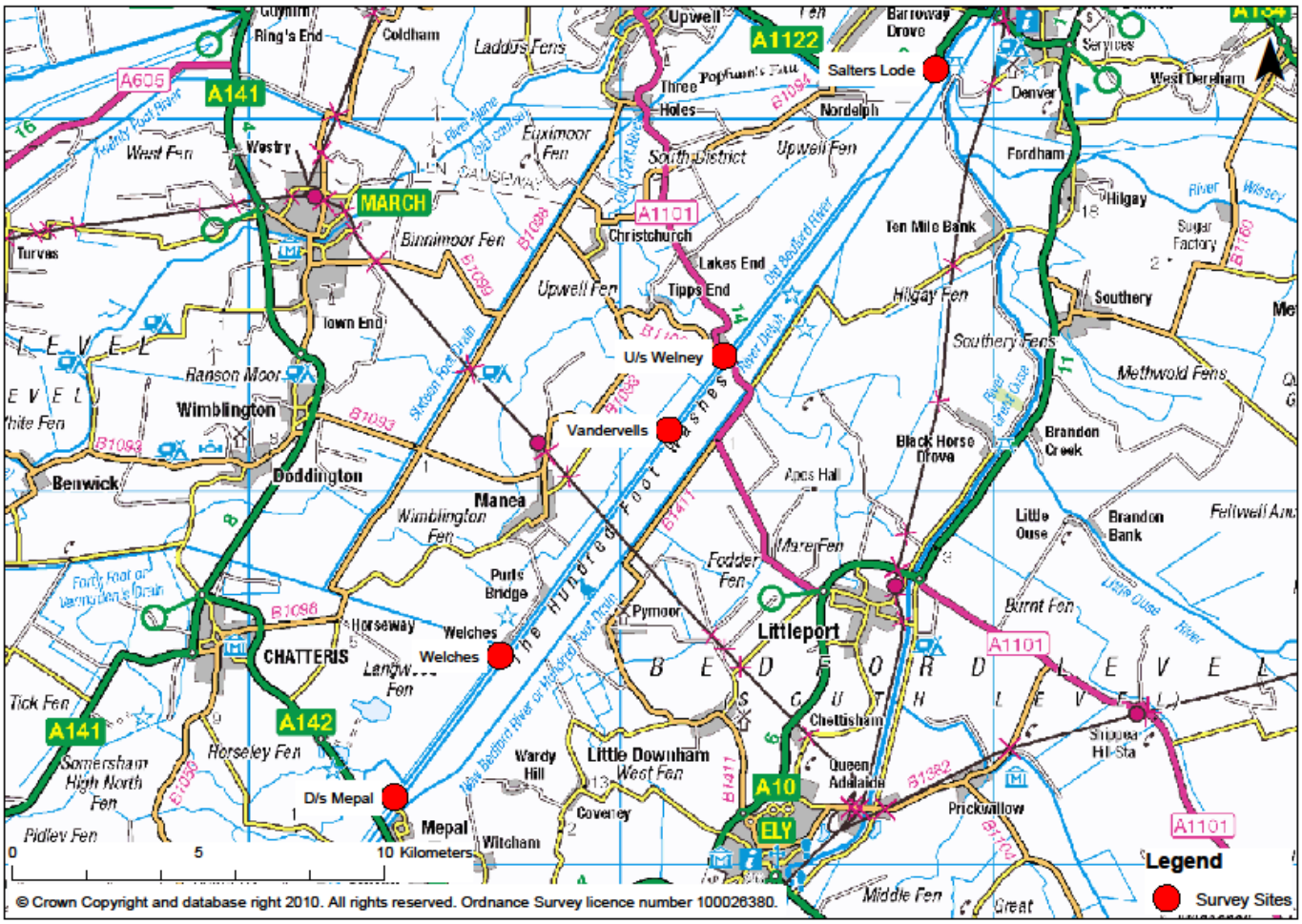


Table 2: Site details

Site Name	Reference	Survey Date	Survey Area M2	Midstream Grid Reference	Survey Methods Catch Strategy	Catch Method
D/s Mepal	CAM148	20/03/2014	1980	TL4392981783	CATCH DEPLETION SAMPLE	WRAP AROUND SEINE NETTING
Welches	CAM149	21/03/2014	2025	TL4677285591	CATCH DEPLETION SAMPLE	WRAP AROUND SEINE NETTING
Vandervells Lake	CAM150	25/03/2014	2025	TL5130191637	CATCH DEPLETION SAMPLE	WRAP AROUND SEINE NETTING
US Welney	CAM151	27/03/2014	2040	TL5226692943	SINGLE CATCH	WRAP AROUND SEINE NETTING
Salters Lode	CAM153	28/03/2014	2250	TF5846001310	CATCH DEPLETION SAMPLE	WRAP AROUND SEINE NETTING

INTRODUCTION TO ENVIRONMENT AGENCY FISHERIES SURVEYS

The Environment Agency has a statutory duty to maintain, improve and develop fisheries. Our policy is to do this in a way that maximises the social, recreational and economic benefits arising from the sustainable exploitation of the fish stocks that underpin fisheries. To help deliver this duty, we have a National Fisheries Monitoring Programme (NFMP) to describe the status of our fish populations and inform our fisheries management to meet international, national and local data needs. Sites are regularly reviewed to maintain a representative sample of fish populations and the water body as a whole in order to retain a comparable dataset. Sites designated for the national fisheries monitoring programme cannot be altered, unless there is a valid health and safety concern or there has been a review of policy during the monitoring period.

METHODOLGY

Five sites were surveyed on the Counter Drain between the 20th and the 28th of March 2014. The sites were sampled using drag down seine netting methodology. Fish were measured to the nearest millimetre and scales were taken for ageing and growth analysis.

Seine netting: Stop nets are positioned across the channel to isolate the survey site and prevent fish from migrating into and out of the survey area (seine 3 & 4 on image 1 below). A catching net is set at the lowermost extent of the survey site (seine 2) and a heavily weighted net is then laid across the channel (seine 1) and is drawn downstream driving fish into the catching net. The catching net is then drawn into the bank to encircle the driving seine which is then removed. Fish are then trapped within the catching net which may be hauled in. The netting operation is repeated until a 50% reduction in the total number of fish caught has been achieved. The nets are constructed from 10mm knotless mesh which is relatively soft and helps to minimize fish damage. Floats are attached along the top edge and a lead-line along the bottom edge so that the net hangs vertically within the water column.

Density and standing crop of individual fish species are calculated using the number / weight of fish in each site and then a mean (average) calculated for the reach, in this case five sites. Density is reported as the number of individuals of that particular species that might be found in $100m^2$ of the river. Similarly, standing crop is the weight, or grams, of that fish species that might be found in the same area. Results are reported primarily utilising fish greater than 99mm in length as the method has been shown to lose efficiency on fish below this. Supporting evidence is also presented using total catch figures i.e. fish of all lengths. These figures are likely to be an underrepresentation of stock and where included should be viewed with caution.

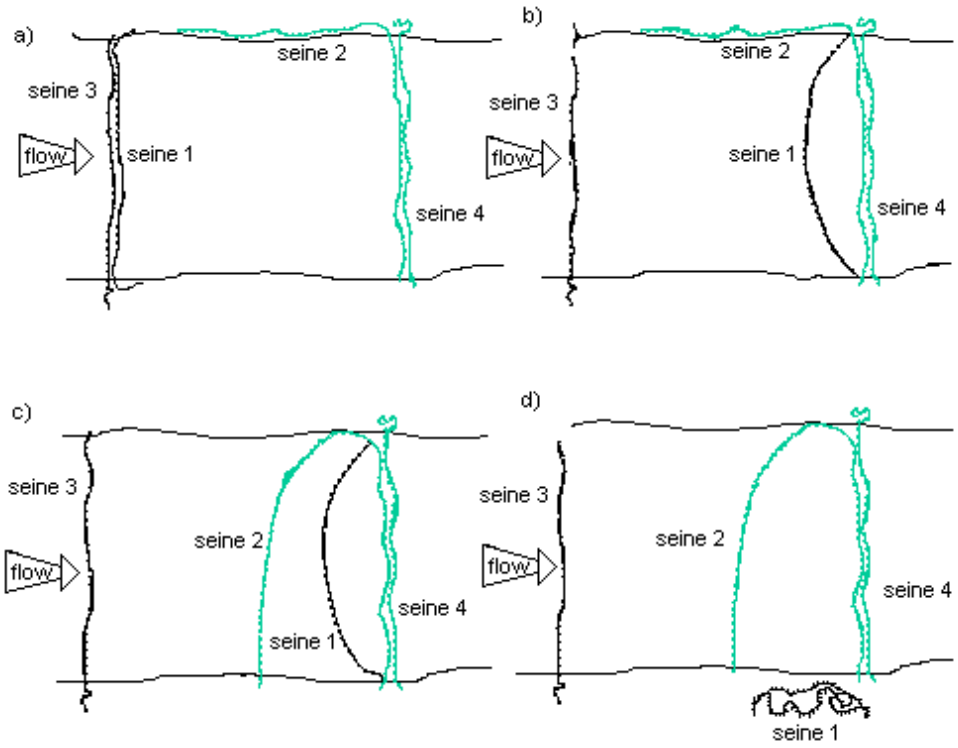


Image 1.

COMBINED RESULTS

A total of 14 species and one type of hybrid were recorded with roach dominant by both density and standing crop. Population estimates varied considerably at site level and mean population estimates have been heavily influenced by a large catch made at Welney. The mean density estimate (number of fish in a given area) of fish >99mm equates to 91.7 Ind./100m^2 increasing from 4.56 Ind.100m^2 in 2011. Mean standing crop estimate (weight of fish in a given area) of fish >99mm equates to 3373.7 g/100m^2 increasing from 1920.2 g/100m^2 in 2011.

Roach were the most common fish (>99mm) over the ten sites with a mean density estimate of 89.9 individuals for every 100m^2 of river surveyed, or a 98 % share of the population. Perch were sub dominant by density with a population estimate of 0.48 Ind./100m^2.

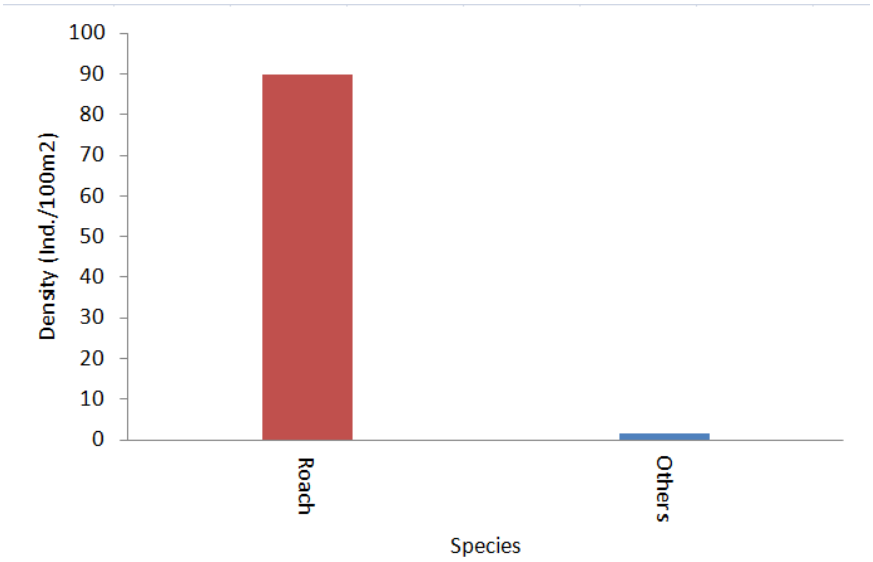


Figure 1. Mean density of fish (>99mm) in the Old Bedford Counter Drain 2014.

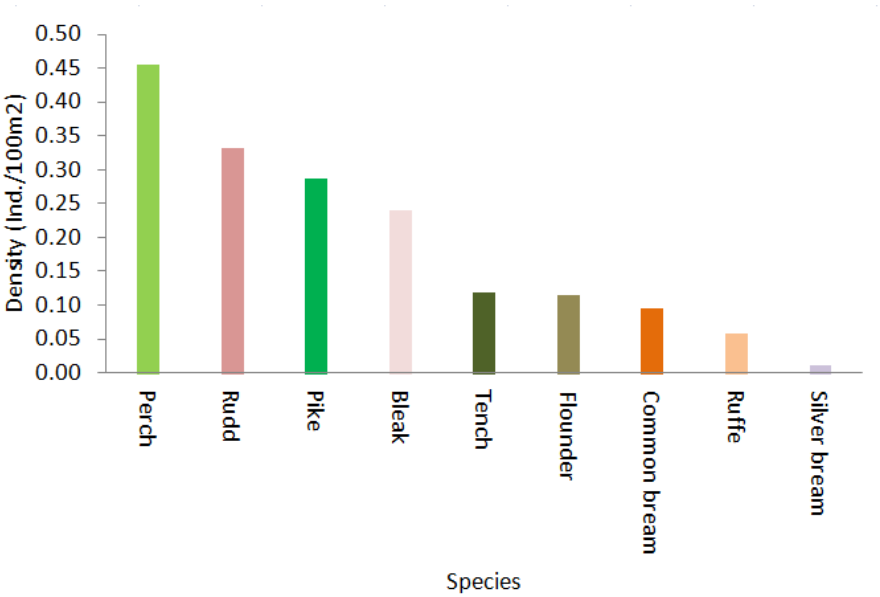


Figure 1b. Mean density of "other" fish species (>99mm) in the Old Bedford Counter Drain 2014.

Common bream play a minor role in the overall density estimate; ranking 8th and preceded in importance by flounder, however it should be noted that in terms of total catch the species was actually the second most populous recorded but almost all of the fish were of less than 99mm in length and are not reported due to the poor efficiency catching fish of this size. The large catches of juvenile common bream made at Welney (1386 ind.) and Salters Lode (1022 ind.) indicate a recruiting population remains present, the mature fish being outside the confines of the survey areas during this sampling cycle. The largest common bream recorded in 2014 was a 196 mm fish caught at Welney.

Perhaps unsurprisingly, roach were also the dominant species' by weight with a mean standing crop estimate of 2839 g/100m^2 representing 84% of the total weight of fish captured. Pike populations were subdominant by weight at 249.6 g/100m^2 (8% of standing crop) while tench were the third most important species with an estimated 213.4g/100m^2 representing a 6% share of the total weight of fish caught. The largest catch of tench and largest individuals captured during the 2014 were recorded at Salter's Lode, the large shoal of the species found at Welney in 2011 being absent during this survey cycle. The comparatively low numbers of pike recorded does not point to a predator prey imbalance.

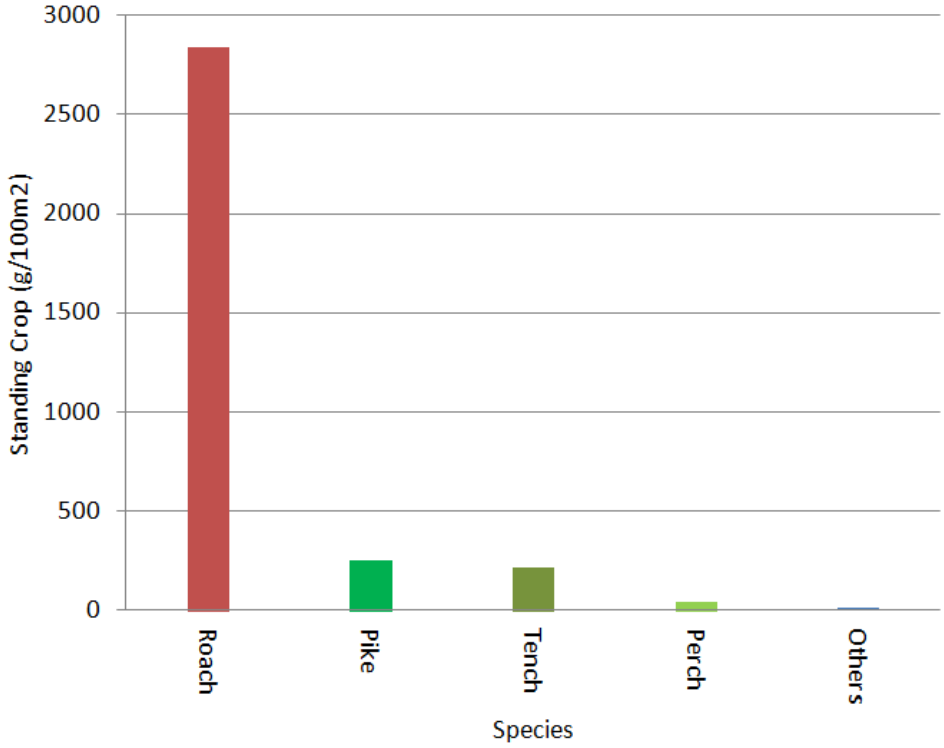


Figure 2. Mean standing crop of fish (>99mm) in the Old Bedford Counter Drain 2014.

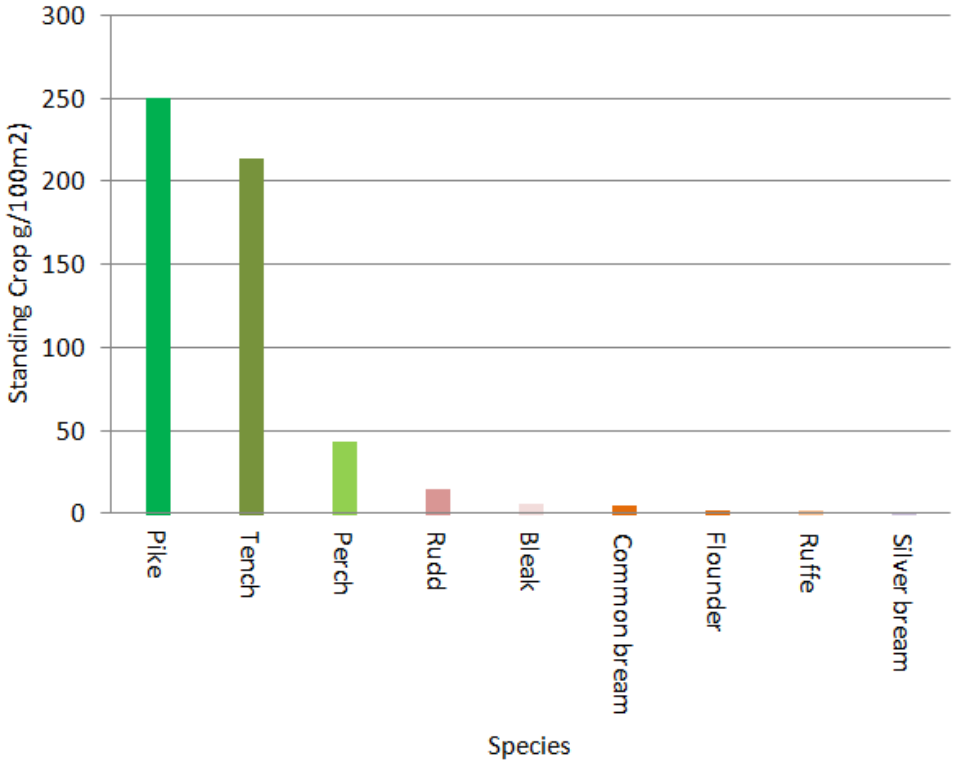


Figure 2b. Mean standing crop of "other" fish species (>99mm) in the Old Bedford Counter Drain 2014.

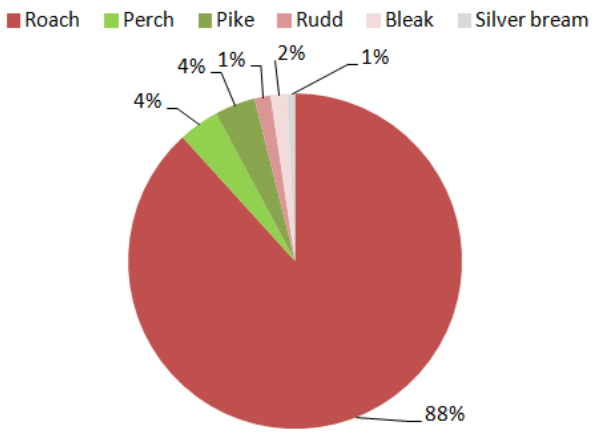
SITE LEVEL DATA

Site No. 4543: Mepal
20/03/2014

Species present (All lengths)

Species	Number	Species	Number
Roach [*Rutilus rutilus*]	272	Rudd [*Scardinius erythrophthalmus*]	3
Perch [*Perca fluviatilis*]	18	Bleak [*Alburnus alburnus*]	2
Pike [*Esox lucius*]	5	Silver bream [*Abramis bjoerkna*]	1
Common bream [*Abramis brama*]	4	Ruffe [*Gymnocephalus cernuus*]	1

Population Composition by Density (Lengths >99mm)



In 2014 the fish population at Mepal was dominated by roach stocks. Fish densities have increased since the previous survey in 2011 and were more numerous than recorded in the four preceding historic surveys at this location conducted between 2011 and 2003. Higher populations were recorded in the late 1980's and 1990's due to some large catches of roach made at this location.

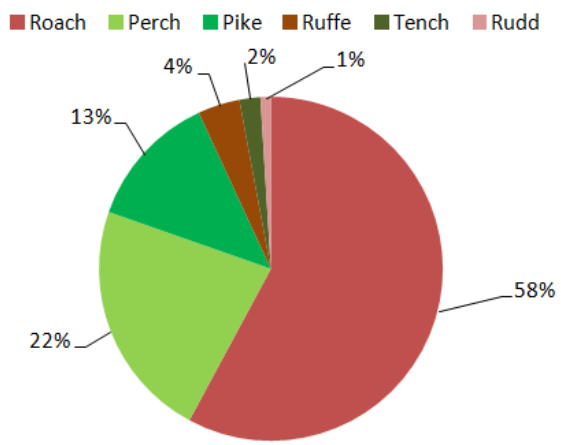
The mean long term density estimate for this site equates to 16.37 Ind./100m^2 which is heavily influenced by the two large catches of roach made in 1988 and 1993.

Site No. 4544: Welches
21/03/2014

Species present (All lengths)

Species	Number	Species	Number
Roach [*Rutilus rutilus*]	179	Pike [*Esox lucius*]	13
Perch [*Perca fluviatilis]*	36	Rudd [*Scardinius erythrophthalmus*]	2
Ruffe [*Gymnocephalus cernuus*]	19	Tench [*Tinca tinca*]	2

Population Composition by Density (Lengths >99mm)



Fish populations at Welches are numerically dominated by roach and perch. The density estimate of fish >99mm at this location currently equates to 5.04 Ind./100m^2 which is the second highest recorded over all historic surveys since 1988, this result was only bettered during the 1997 survey cycle when 7.62 Ind./100m^2 was recorded. The mean long term density estimate for this site equates to 2.92 Ind./100m^2.

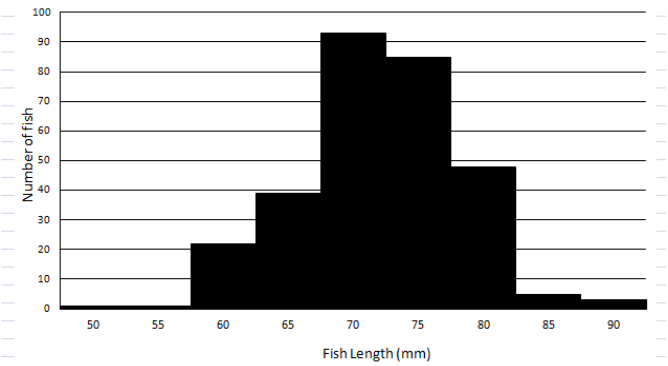
Site No. 4545: Vandervells Lake
25/03/2014

Species present (All lengths)

Species	Number	Species	Number
Roach [*Rutilus rutilus*]	306	Rudd [*Scardinius erythrophthalmus*]	3
Perch [*Perca fluviatilis*]	28	Common bream [*Abramis brama*]	2
Spined loach [*Cobitis taenia*]	5	10-sp stickleback [*Pungitius pungitius*]	1

Population Composition Density
(Lengths >99mm)

Only perch exceeded 99mm in length at this site during 2014.



Roach length at Vandervells Lake

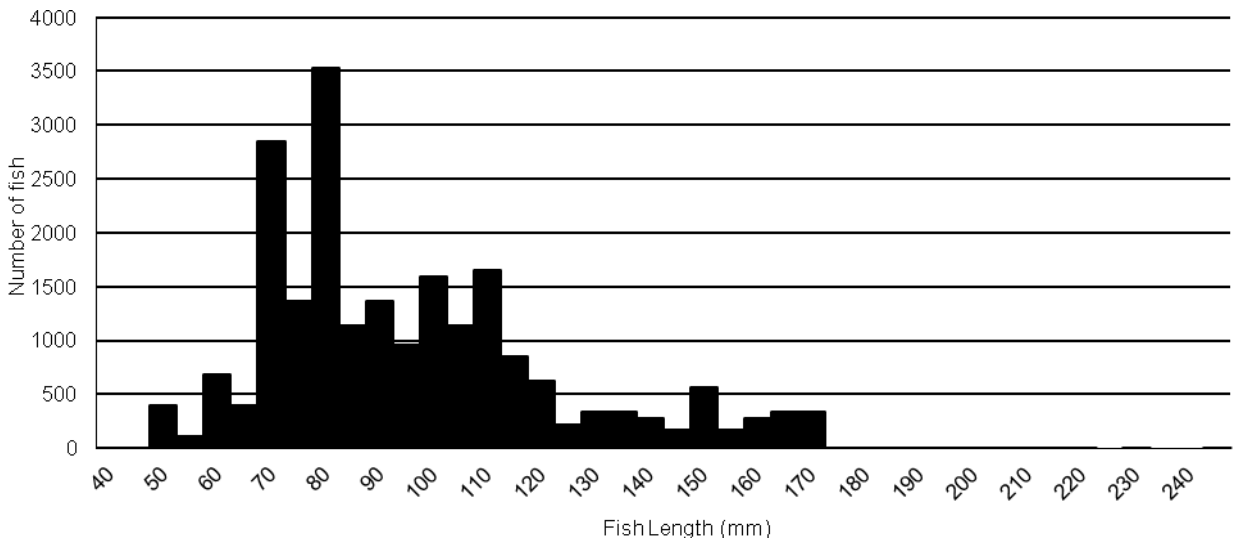
Fish populations at Vandervells lake were dominated by roach and perch, however all of the roach were <99mm in length as were all but two perch. While the inclusion of these juvenile fish is encouraging for future years and is evidence of recent recruitment to the population they are not used in the population calculation meaning that population estimate for this location equates to 0.1 Ind./100m^2, well below the long term mean of 2.32 Ind./100m^2. Common bream were present at this location in 2014 but were also only represented by a small number of juvenile fish. In terms of total population, of all lengths, this catch is numerically the highest made at this location over the last 10 years.

Site No. 4546: Upstream of Welney
27/03/2014

Species present (All lengths)

Species	Number	Species	Number
Roach [*Rutilus rutilus*]	21831	Silver bream [*Abramis bjoerkna*]	14
Common bream [Abramis brama]	1386	Perch [*Perca fluviatilis*]	11
Rudd [*Scardinius erythrophthalmus*]	30	Pike [*Esox lucius*]	1
Bleak [*Alburnus alburnus*]	22	Tench [*Tinca tinca*]	1

There is little to be gained by creating a species composition pie chart for this location, the dominance of roach stocks being immediately apparent in the table above. The 2014 catch produced a mean population density estimate of 434.7 Ind./100m^2 with almost 9000 fish >99mm in length and with roach to almost 250mm long present. This catch is not actually the highest on record at this site with a total catch of over 38000 fish made at Welney in 2004. For fish welfare reasons a catch as large as this must be processed quickly with fish being counted back or bulk weighed rather than individually measured. In this respect data from these exceptional catches are essentially estimates of the total population and there will be some degree of error with the proportion of population composition attributed to each species. Larger fish such as pike and tench will still be measured individually. The 2014 catch should also be viewed as a minimum estimate of fish present as only one haul of the net was conducted, following which the survey team reported that they could still see numerous fish swirling in the margins suggesting that significant stocks remained uncaught. Length frequency estimates suggest the majority of roach recorded were between 70mm and 120mm in length, a length frequency graph follows overleaf. The 2014 standing crop estimate is the second highest recorded on this channel despite the absence of the large shoal of tench which has been recorded occasionally at this location. The current standing crop estimate equates to 14101.5 g/100m^2. One small tench of 172mm was present and an exceptional perch of 4lb 8oz was also recorded. Curiously, pike were only represented by one individual, at 655mm fish, although with such a prevalence of prey fish present it is certainly reasonable to suspect more will be nearby.



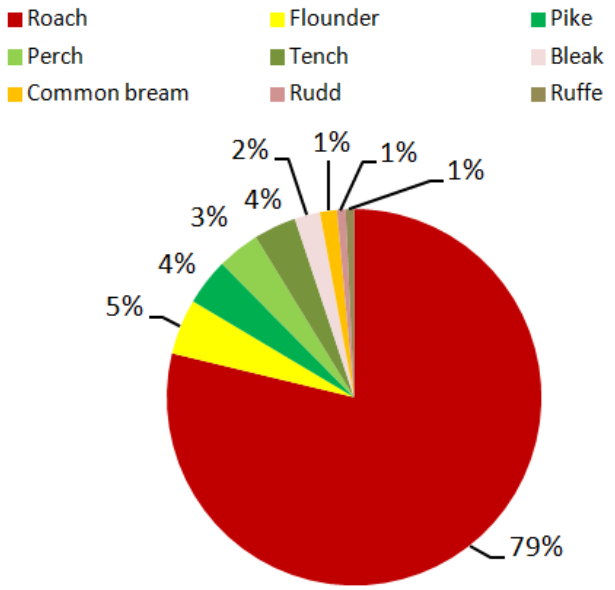
Estimated length frequency for roach at site 4546: Upstream of Welney

Site No. 4548: Salters Lode
28/03/2014

Species present (All lengths)

Species	Number	Species	Number
Roach [*Rutilus rutilus*]	2437	Tench [*Tinca tinca*]	10
Common bream [*Abramis brama*]	1022	Ruffe [*Gymnocephalus cernuus*]	6
Bleak [*Alburnus alburnus*]	255	Rudd [*Scardinius erythrophthalmus*]	3
Silver bream [*Abramis bjoerkna*]	60	3-sp stickleback [*Gasterosteus aculeatus*]	3
Perch [*Perca fluviatilis*]	53	Spined loach [*Cobitis taenia*]	1
Flounder [*Platichthys flesus*]	26	Dace [*Leuciscus leuciscus*]	1
Pike [*Esox lucius*]	11	Roach x co bream hybrid	7

Population Composition Density
(Lengths >99mm)



Fish populations at site 4548 Salter's Lode were dominated by roach with flounder subdominant amongst those fish >99mm. In terms of total population including all lengths common bream were subdominant with a large catch of over 1000 small fish made at this site. Ten large tench were also captured with fish to 533mm in length recorded. This site produced the most diverse catch on the Counter Drain with a total of 13 species and one hybrid type recorded. The population estimate for this location equated to 12.27 Ind./100m^2 and 1830.1 g/100m^2 respectively. These figures are the third highest density estimate and the highest standing crop on record for this site. As with other sites sampled in 2014 a large proportion of the fish caught were of younger year classes with just 215 of the roach >99mm in length, although larger individuals to almost 200mm were also recorded. This catch represents a great improvement over the 2011 survey cycle, doubling the density estimate and over seven times the previous standing crop recorded. The total density for this site is slightly higher than the long term mean, the standing crop is significantly so.

Table 3: Habitat data collected from sites sampled in 2014

Site Name	Channel		Margins			Substrate % (approx)					Habitat		
	Av. Width (m)	Av. Depth (cm)	1	2	3	Cobbles	Gravel	Sand	Silt	Clay	1	2	3
D/s Mepal	7	220	Steep	Natural	-	-	-	-	100	-	Glide	Slack	-
Welches	16	200	Steep	Natural	-	-	-	-	100	-	Glide	Slack	-
Vandavells Lake	13	175	Steep	Shallow	-	-	-	-	100	-	Glide	-	-
U/s Welney	13	150	Steep	Shallow	Natural	-	-	-	100	-	Glide	Slack	-
Salters Lode	16	150	Steep	Shallow	Natural	-	-	-	100	-	Glide	Slack	-

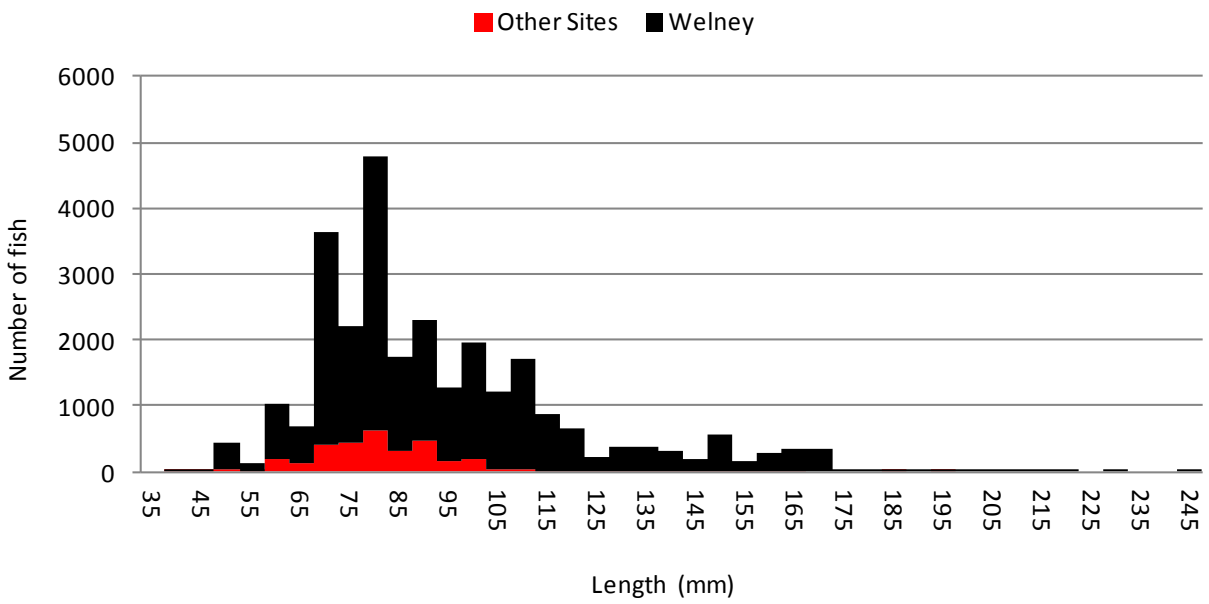
Site Name	Overhead cover	Tree Roots	Woody Debris	Emergent Macrophytes	Submerged Macrophytes	Algae		Turbidity	Land use
						Filamentous	Non Filamentous		
D/s Mepal	None	None	None	Sparse	Sparse	None	None	High	Floodbank
Welches	None	None	None	Sparse	Occasional	None	None	High	Floodbank, Agriculture
Vandavells Lake	None	None	None	Abundant	Occasional	Occasional	None	Slight	Floodbank Agriculture
U/s Welney	Sparse	None	None	Occasional	Sparse	Sparse	None	Slight	Floodbank, Urban, Agriculure
Salters Lode	None	None	None	Occasional	None	None	None	Moderate	Floodbank, Agriculture

DISCUSSION

Conclusions from 2011 survey report: *"Since the previous spatial survey in 2008, both standing crop and density have declined, with standing crop falling by 18% from 2347.6g to 1920.2 g/100m² and density by 92% from 56.72 individuals to 4.56 individuals for every 100m² of channel, the lowest recorded density estimate to date. These declines are primarily due to a reduction in the number of silver fish caught from U/s Welney and Salters Lode. It should be noted that this is only one year's data and as such, may not represent the true status of the current fish population within the Counter Drain. Further spatial surveys should reveal whether the 2011 result is due to a general downturn in fish stocks, or, as is possible simply the result of a poor survey year brought about by environmental factors such as clear water conditions and stock aggregation."*

The 2011 report caused considerable concern amongst the local angling community; the large decline in fish density reported leading to the perception that silver fish populations within the Counter Drain had collapsed. The 2011 report did indicate that the poor survey result should only be viewed as a snapshot in time and may not have represented an accurate picture of fish stocks within the channel. The 2014 survey was scheduled in an attempt to answer the question posed by the prior survey; had silver fish populations collapsed?, or were the poor catches a result of fish migration from the areas routinely surveyed as was suggested in the 2011 survey report. It is reasonable to say that the 2014 survey cycle has successfully answered this question; finding roach populations present which heavily dominate the current fish population (both numerically and by biomass) and representation by common bream noted at all but one site.

The 2014 survey found fish of smaller sizes to be prevalent with large numbers recorded which would fit the 1+ and 2+ year old size bracket if these fish are following a reasonably standard growth curve. Age data derived from scale samples taken will allow further more definitive examination of the age structure of these species; however it is reasonable to say that there is good evidence of recent recruitment to the population.



Uneven distribution of fish stock was recorded across the sites sampled with a very high aggregation of stock of many year classes at Welney whilst at Vandervells the much smaller population was almost entirely composed of younger fish; however all sites returned much improved catches over the 2011 result with total populations ranging from several hundred to many thousand fish present.

A potential explanation for stock distribution seen during the 2014 cycle was also touched upon in the 2011 report, namely habitat availability and turbidity. During 2011 the highest roach density was found at Salter's Lode and habitat data collected concurrently with these surveys indicate that this was the only site which exhibited turbidity in the water column (classed as high turbidity) the remaining sites being described as clear. The clarity experienced in 2011 was most likely due to the winter drought in 2010 which led into a drought summer in 2011. Throughout the 2014 survey cycle the Counter Drain exhibited more widespread turbidity and two of the five

sites were described as being highly turbid, one was moderately turbid and two were slightly turbid. Welney and Vandervells were the least (slightly) turbid sites; however Welney possesses riparian tree growth and a bridge structure providing overhead cover and only Vandervells Lake had neither significant turbidity or overhead cover present, habitat being provided by extensive emergent and occasional pockets of submerged macrophyte growth which may help explain the prevalence of smaller fish present using the more limited habitat available at this site.

It is accepted that there will be correlation between habitat quality and stock density, particularly with a species such as roach which has a close affinity for the presence of cover and it is probable that areas with more complex habitat, particularly overhead cover, will hold consistently higher fish stocks than areas of lower quality. On a comparatively uniform channel such as the Counter Drain this behaviour may help explain the large aggregations of stock found at Welney, of course there are other potential explanations such as overwintering and pre spawning aggregations which must be considered as well.

Tench had formed the major component of standing crop at Welney in 2011 with a total of 64 individuals present to specimen size; however in 2014 this species was represented at Welney by a single juvenile individual. In contrast – the lowermost site at Salter's Lode produced the largest catch of tench made at that location with 10 large individuals present, further evidence of stock movement within the channel and the occasionally hit or miss nature of fixed point monitoring.

In terms of mean standing crop and density estimates the 2014 results are the second highest recorded with only the 2004 result surpassing this. The historic data-set shows evidence of shoaling behaviour in many of the seven survey cycles. In the late 1980's and early 1990's the highest proportion of fish were recorded at Mepal, in 2004 the stock was heavily concentrated at Welney, behaviour which has been observed in the 2008 and 2014. A large fish kill occurred at Welney in 2002 and the mortality figures from this incident suggest that this location was heavily populated during this period also.

The 2014 result does seem to indicate a widespread improvement across the channel compared to that seen in the previous survey and while a population of old fish with little juvenile representation would be of cause for concern; the strong representation by younger year classes found suggests populations should be maintained. It is possible that the general improvement seen is also in part due to the increased turbidity noted during 2014; populations being more widely dispersed when there is sufficient turbidity to give fish the confidence to move away from areas of shelter without being exposed to predation. Is it also plausible that during turbid conditions fish will be less likely to vacate a site when disturbed by arrival of staff, unloading of survey equipment and launching boats etc prior to a survey? If the poor 2011 survey result was at least partly due to clear water conditions and shoaling outside of survey areas and the good 2014 catches were a result of the turbid water and shoaling within survey areas then which is the correct result? Perhaps the true image of fish stocks within the channel is somewhere between the two extremes with a cyclic fish population present determined by successful recruitment and strong year classes with distribution dictated by shoaling behaviour, habitat availability and water clarity.

If any angling matches are held throughout this river length then angling clubs are encouraged to provide match results to feed into the Environment Agencies Match Catch Database which analyses angler catches to assess fishery performance. The output of this database can also be used as supporting evidence to assist analysis of routine survey results. Match return cards and more information on the Match Catch Database can be obtained from Fisheries Analysis and Reporting Officer Chris Middleton chris.middleton@environment-agency.gov.uk

The Old Bedford Counter Drain will next be surveyed in 2017.

Part of the roach catch from Welney

4lb 8oz perch from Welney

Tench from Salters Lode