Fish population survey report

The Lower Great Ouse

September/October 2019

This report provides a summary of results from recent fish population surveys on the River Great Ouse between Brampton and Earith. The surveys were carried out to assess the health of the river and enable successful management of our principal fisheries.

Image 1: Our seine netting site at Portholme Meadow

Images 1&1a: An early morning start and a late night working on the River Great Ouse.

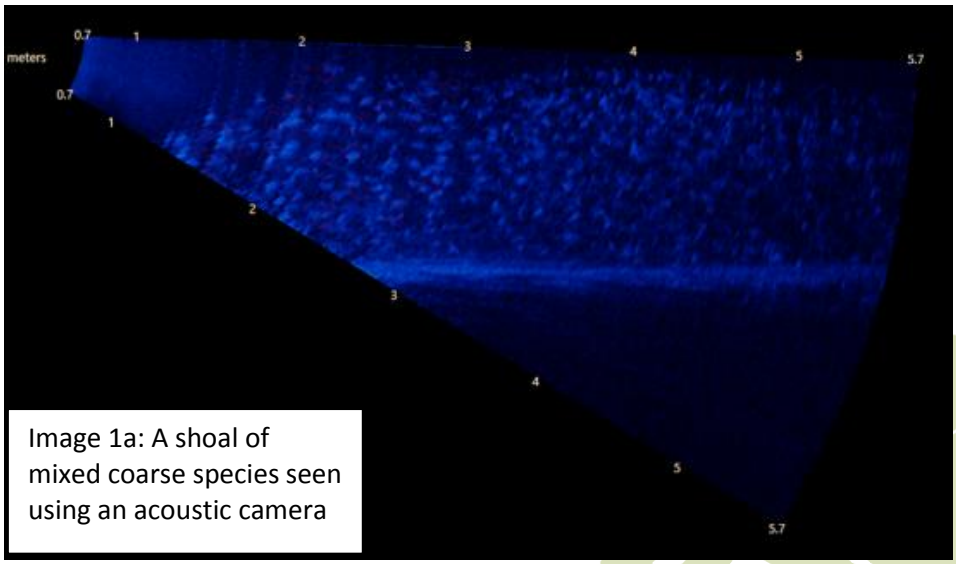


Image 1a: A shoal of mixed coarse species seen using an acoustic camera

Summary

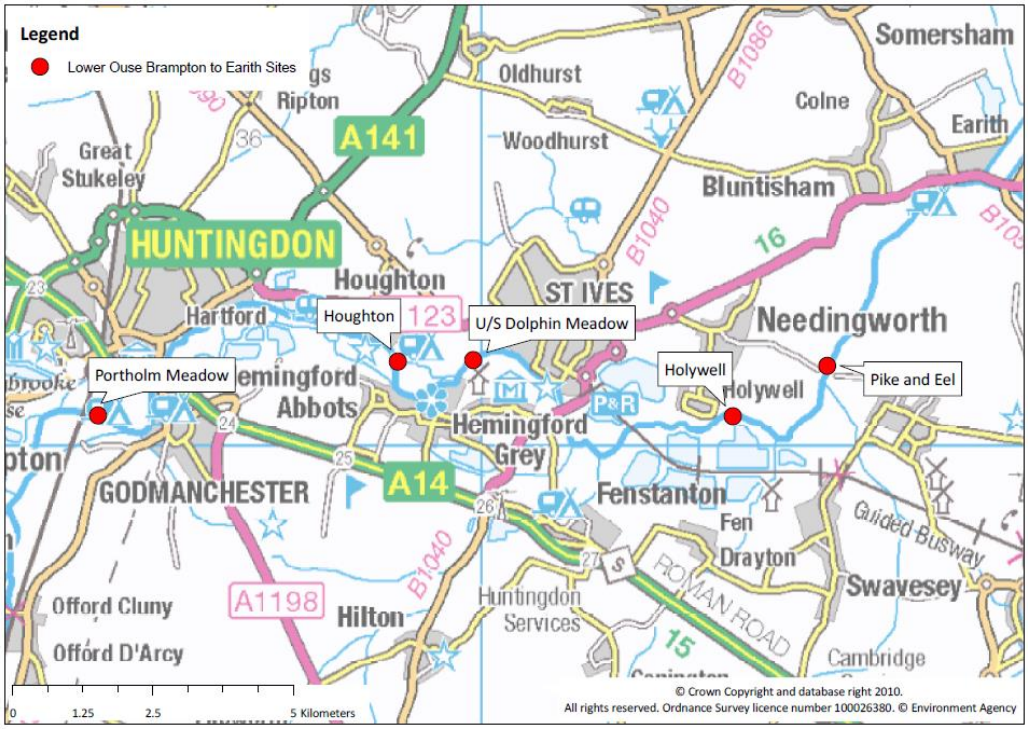
- Five sites on the River Great Ouse were surveyed by Seine netting between the 27th of September and the 11th of October 2019.
- A total of 2052 fish of twelve species, including one non-native species, were recorded.
- Roach were the most numerous species captured (1242 Individuals) followed by perch.
- The average density and standing crop estimate derived from the five sites surveyed equate to 12.3 fish per 100m² and 367.4 grams per 100m² respectively (fish >99mm). Some sites suffered from poor catch depletions and therefore have wide confidence limits. These sites are highlighted in the following data.

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 (WFD, Eel regulations, ICES reporting), 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.

Survey locations



Map 1: Survey sites sampled on the Lower Great Ouse

Table 1: Site Name	Site ID	Date	Length (M)	Width (M)	Area (M2)	NGR	Catch Method
Portholme Meadow	4758		70	35	2450	TL2315770539	Seine netting
Houghton	4764		65	30	1950	TL2850071500	Seine netting
U/s Dolphin Meadow	4768		70	24	1680	TL2984671527	Seine netting
Holywell	4781		60	35	2100	TL3447470525	Seine netting
Pike & Eel	4783		50	40	2000	TL3615871423	Seine netting

Survey methodology

Five sites on the River Great Ouse were sampled by Seine netting. Seine netting is our primary survey technique utilised on lowland watercourses where depth and width of the river channel precludes the use of electric fishing.

The netting process starts with staff positioning stop-nets across the river channel to isolate the survey area and prevent fish from migrating into and out of the site. A 100-meter long seine net is then laid by boat to encircle the entire survey area. 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 to ensure that the net hangs vertically within the water column.

The catching net is hand hauled into the bank and fish are removed and retained in floating keep- cages. The netting operation is then repeated and will hopefully achieve a 50% reduction in the total number of fish caught in the first catch. If the second catch fails to deplete, then a third catch should be undertaken, however; this is not always possible due to pleasure boat traffic and fish welfare, the team preferring to minimise the duration that a catch is retained for processing. **Where data is subject to wide confidence limits, this has been demarked by use of red font and by dashed colour in figures or charts.**

Captured fish are measured to the nearest millimetre (to the fork of the tail) and scales are taken from a sub sample of these fish for age, growth and other statistical analyses, which occurs at the National Fish Laboratory in Brampton.

Density and standing crop results are derived using Carle and Strub depletion methodology and will principally be reported utilising fish with a fork length greater than 99mm, our survey methods loosing efficiency on fish below this size. **Numbers and population estimates of juvenile fish and small species (such as minnow) should therefore be viewed as a minimum estimate only.**

Results

- Five sites on the River Great Ouse were surveyed by Seine netting between the 27th of September and the 11th of October 2019.
- A total of 2052 fish of twelve species, including one non-native species, were recorded.
- Roach were the most numerous species captured (1242 Individuals) followed by perch.
- The average density and standing crop estimate derived from the five sites surveyed equate to 12.3 fish per 100m² and 367.4 grams per 100m² respectively (fish >99mm).

Table 2: Total number and largest (mm) fish captured for key species during the 2016 survey.

Site	Roach		Perch		Dace		Bleak	
	Number	Largest	Number	Largest	Number	Largest	Number	Largest
Portholme Meadow	121	217	13	115	50	214	10	125
Houghton	434	227	97	190	33	195	1	96
Upstream Dolphin Meadow	433	149	11	102	17	194	43	115
Holywell	22	141	2	146	9	170	-	-
Pike and Eel	232	189	48	214	3	152	-	-

Table 3: Density estimate (Ind./100m2) for fish >99mm											>99 mm
Species	Survey Site Reference Number										
	Portholme Meadow		Houghton		U/s Dolphin Meadow		Holywell		Pike & Eel		Mean
	27/09/2019	+/-CI	01/10/2019	+/-CI	02/10/2019	+/-CI	08/10/2019	+/-CI	11/10/2019	+/-CI	
Roach [Rutilus rutilus]	2.98	0	9.39	0.33	11.91	0.09	0.52	0.46	1.8	0.03	5.32
Gudgeon [Gobio gobio]	0.16	0	2.67	0.17	11.67	39.19	0		0.05	0.17	2.91
Perch [Perca fluviatilis]	0.08	0	8.41	40.95	4.82	0.40	0.05	0	0.3	0.05	2.73
Dace [Leuciscus leuciscus]	1.18	0	1.85	0.69	0.60	0.09	0.33	0.09	0.1	0	0.81
Bleak [Alburnus alburnus]	0.33	0	0	0	1.07	0.03	0		0		0.28
Common bream [Abramis brama]	0.33	0	0.26	0.05	0.36	0	0		0		0.19
Pike [Esox lucius]	0.12	0	0.10	0.10	0		0		0		0.05
Rudd [Scardinius erythrophthalmus]	0		0.05	0	0.06	0	0		0		0.02
Ruffe [Gymnocephalus cernuus]	0		0.05	0	0		0		0		0.01
Tench [Tinca tinca]	0		0.05	0.17	0		0		0	0	0.01
Total	**5.18**	**0.00**	**22.82**	**40.96**	**30.48**	**39.19**	**0.91**	**0.47**	**2.25**	**0.18**	**12.33**

Table 4: Standing crop estimate (g./100m2) for fish >99mm											>99 mm
Species	Survey Site Reference Number										
	Portholme Meadow		Houghton		U/s Dolphin Meadow		Holywell		Pike & Eel		Mean
	27/09/2019	**+/-CI**	**01/10/2019**	**+/-CI**	**02/10/2019**	**+/-CI**	**08/10/2019**	**+/-CI**	**11/10/2019**	**+/-CI**	
Roach [Rutilus rutilus]	164.4	0	354.2	12.3	266.8	1.9	14.1	12.3	59.1	1.1	171.7
Perch [Perca fluviatilis]	1.6	0	355.1	1729.0	127.5	10.5	2.5	0	27.9	4.3	102.9
Gudgeon [Gobio gobio]	2.6	0	43.0	2.7	189.5	636.4	0		0.8	2.8	47.2
Dace [Leuciscus leuciscus]	48.3	0	78.4	29.5	20.0	2.9	8.7	2.3	2.8	0	31.6
Pike [Esox lucius]	30.7	0	22.2	21.7	0		0		0		10.6
Common bream [Abramis brama]	17.2	0	14.9	3.1	5.9	0	0		0		7.6
Bleak [Alburnus alburnus]	4.6	0	0.0	0	12.4	0.3	0		0		3.4
Rudd [Scardinius erythrophthalmus]	0		3.1	0	1.0	0	0		0		0.8
Tench [Tinca tinca]	0		1.6	5.4	0		0		0	0	0.3
Ruffe [Gymnocephalus cernuus]	0		0.9	0	0		0		0		0.2
Total	**269.5**	**0**	**873.5**	**1729.4**	**623.1**	**636.5**	**25.2**	**12.6**	**90.6**	**5.2**	**376.4**

Table 3a: Density estimate (Ind./100m2) for ALL fish											All Fish
Species	Survey Site Reference Number										
	Portholme Meadow		Houghton		U/s Dolphin Meadow		Holywell		Pike & Eel		Mean
	27/09/2019	+/-CI	01/10/2019	+/-CI	02/10/2019	+/-CI	08/10/2019	+/-CI	11/10/2019	+/-CI	
Roach [Rutilus rutilus]	4.94	0	23.18	0.66	25.83	0.14	1.57	1.54	12	0.42	13.50
Perch [Perca fluviatilis]	0.53	0.05	11.28	11.83	5.83	0.52	0.10	0.09	2.65	0.48	4.08
Gudgeon [Gobio gobio]	1.31	0.05	5.39	0.60	12.86	7.45	0		0.05	0.17	3.92
Dace [Leuciscus leuciscus]	2.04	0	2.05	0.76	1.01	0.10	0.43	0.07	0.15	0	1.14
Bitterling [Rhodeus sericeus]	0		0.10	0	0.60	0.04	0		3.80	0.10	0.90
Bleak [Alburnus alburnus]	0.41	0	0.05	0.17	2.56	0.12	0		0		0.60
Common bream [Abramis brama]	0.33	0	0.31	0.05	0.77	0.03	0		0		0.28
Rudd [Scardinius erythrophthalmus]	0		0.05	0	0.66	0.04	0		0		0.14
Pike [Esox lucius]	0.12	0	0.10	0.10	0		0		0		0.05
Ruffe [Gymnocephalus cernuus]	0		0.21	0	0		0		0		0.04
Tench [Tinca tinca]	0		0.10	0.10	0		0		0.05	0.17	0.03
Bullhead [Cottus gobio]	0		0		0.12	0.12	0		0		0.02
Total	**9.67**	**0.07**	**42.82**	**11.89**	**50.24**	**7.47**	**2.10**	**1.55**	**18.70**	**0.69**	**24.71**

Table 4a: Standing crop estimate (Ind./100m2) for ALL fish											All Fish
	Survey Site Reference Number										
	Portholme Meadow		Houghton		U/s Dolphin Meadow		Holywell		Pike & Eel		
Species	**27/09/2019**	**+/-CI**	**01/10/2019**	**+/-CI**	**02/10/2019**	**+/-CI**	**08/10/2019**	**+/-CI**	**11/10/2019**	**+/-CI**	**Mean**
Roach [Rutilus rutilus]	181.6	0	485.4	13.9	387.4	2.0	25.9	25.5	149.4	5.2	245.9
Perch [Perca fluviatilis]	3.4	0.3	217.3	227.9	137.9	12.4	2.9	2.8	46.6	8.4	81.6
Gudgeon [Gobio gobio]	14.0	0.5	74.9	8.3	163.7	94.8	0		0.8	2.8	50.7
Dace [Leuciscus leuciscus]	57.2	0	81.2	30.2	23.8	2.3	9.7	1.7	3.4	0	35.1
Pike [Esox lucius]	30.7	0	22.2	21.7	0		0		0		10.6
Common bream [Abramis brama]	17.2	0	15.1	2.3	9.2	0.4	0		0		8.3
Bleak [Alburnus alburnus]	5.2	0	0.4	1.4	23.3	1.1	0		0		5.8
Bitterling [Rhodeus sericeus]	0		0.7	0	3.8	0.3	0		23.5	0.6	5.6
Rudd [Scardinius erythrophthalmus]	0		3.1	0	5.4	0.3	0		0		1.7
Ruffe [Gymnocephalus cernuus]	0		2.7	0	0		0		0		0.5
Tench [Tinca tinca]	0		2.1	2.0	0		0		0.7	2.2	0.5
Bullhead [Cottus gobio]	0		0		0.4	0.3	0		0		0.1
Total	**309.3**	**0.6**	**905.0**	**231.5**	**754.9**	**95.7**	**38.6**	**25.7**	**224.4**	**10.5**	**446.4**

Density and Standing Crop estimate by species (>99mm)

Population estimates derived from the 2019 survey cycle show that roach are dominant by density representing 43% of the population estimate (5.32 Ind./100m^2) and is also the principal species by standing crop with 46% of the biomass estimate (171.7g/100m^2).

Gudgeon ranked second by density, but with very wide confidence limits due to a poor depletion at Dolphin Meadow. Perch ranked third by density, but this species was also subject to wide confidence limits due to poor depletion at Houghton (52 Ind. in catch 1 and 45 Ind. in catch 2).

The perch population estimate is further confounded due to a greater number of fish >99mm being present in the second catch. This essentially meant that there was no depletion between the catches at all; in fact, there were more than twice as many fish used to calculate the population estimate in catch 2. This data should therefore be viewed with some caution. Standing crop data for these two species is similarly affected.

Density and Species Composition at site level (>99mm)

Figures 3 & 4 present population estimates at site level broken down to species level.

The majority of fish were captured at the upper three sites; a pattern observed in previous survey cycles, however; in this instance, population density at Portholme is much reduced from that observed in the two preceding survey cycles.

Figure 1: Mean density of fish >99mm by species

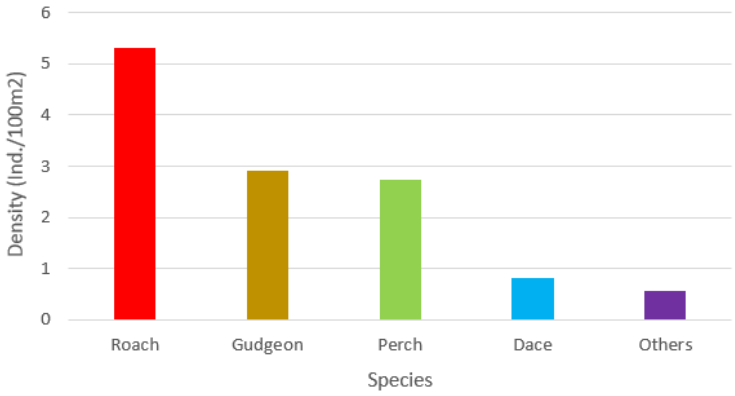


Figure 2: Mean standing crop of fish >99mm by species

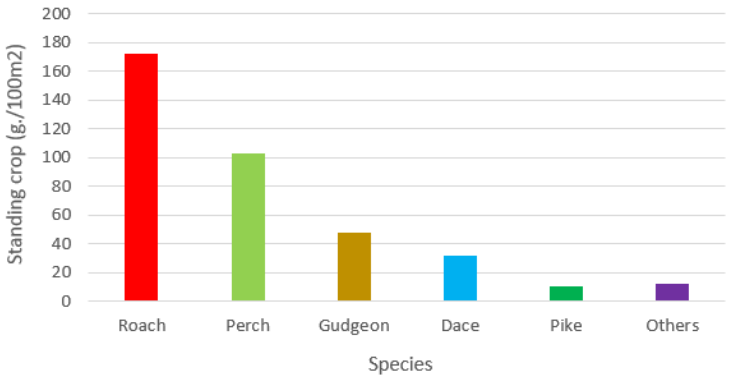


Figure 3: Density at site level by species (>99mm)

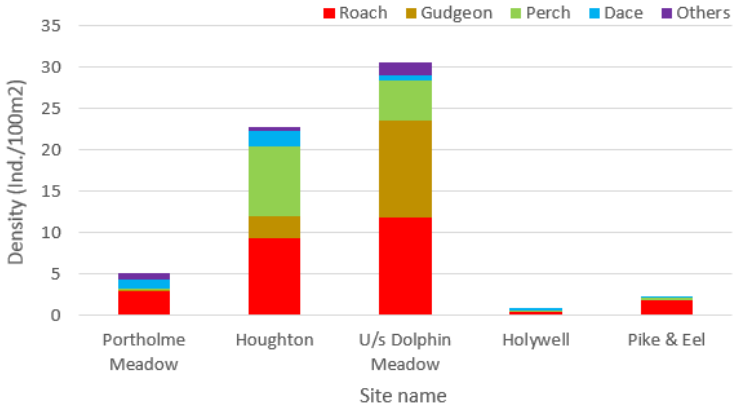
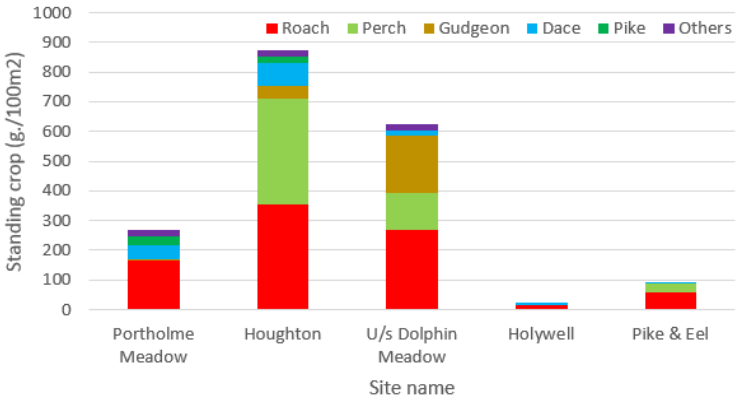


Figure 4: Standing crop at site level by species (>99mm)



Density and Standing crop estimates of the Great Ouse 1996 – 2019

Population estimates derived from successive and comparable survey cycles are given below as **Figure 5**. The current density estimate derived from the 2019 survey cycle is 9 Ind./100m^2, slightly higher than the previous survey, but around one quarter lower than the long term average for the lower river.

Examination of long-term data shows that population density steadily increased between 2003 and 2006 due to favourable environmental conditions for recruitment and low winter flow in both 2004 and 2005, which will have allowed increased survival of young of the year. The majority of the roach captured in 2006 were spawned in 2004 and 2005, but good representation was also noted from the 2002 and 2003 year-classes.

Figure 5: Long term density estimate 1992 -2019

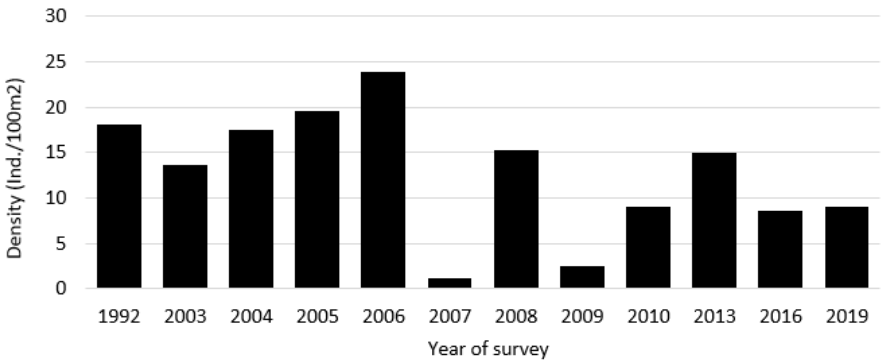
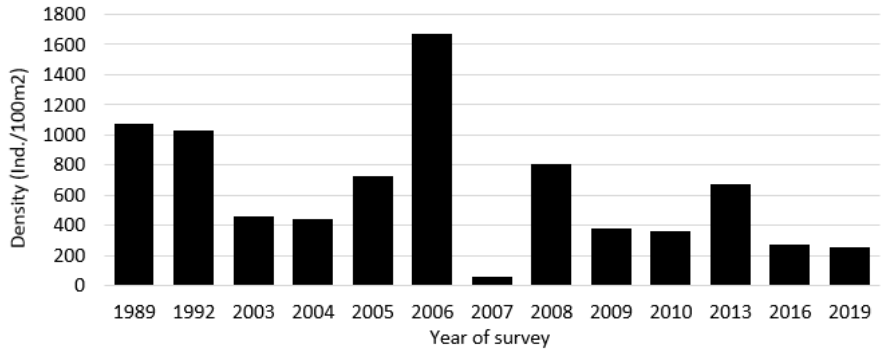


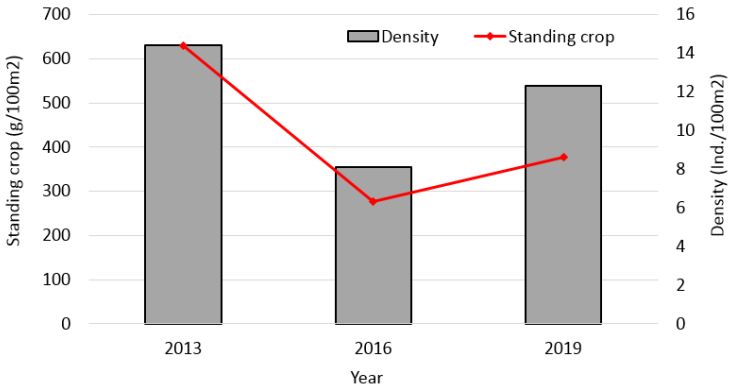
Figure 6: Long term standing crop estimate 1992 -2019



Our 2007 survey cycle followed severe summer flooding within the catchment and produced the lowest density estimate recorded on the lower river. This result may have been due to high flow displacing fish stocks, particularly those younger year classes, but this result may also have been influenced by the survey being postponed until much later in the year (November), increasing the likelihood that stock distribution was influenced winter shoaling. The summer flooding of 2007 was also likely to considerably reduce spawning success during that year.

The 2008 survey produced an above average density estimate, but distribution of stock was much reduced at both Portholme and Dolphin Meadow and was unusually high at the lowermost Pike and Eel site. Initial thoughts were that this bias towards the lower river might suggest downstream displacement of fish had occurred. It is also likely fish at this location would have coped better due to the proximity of the marina where shelter could be sought from high flows. The importance of this marina to fish aggregation will be discussed further later in this report.

Figure 7: Mean density & standing crop at all five sites sampled 2013-2019



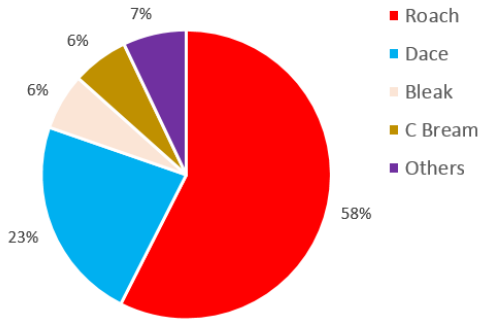
The 2009 population estimate was considerably lower than 2008, but not as poor as 2007, and less than 400 roach were recorded of which only five of these exceeded 99mm in length. The subsequent two surveys saw density increasing, exceeding the LTA in 2013. The last two population estimates are comparable with the 2010 result, but are below the LTA, this section of river not yet returning to pre 2007 population estimate. Examination of historic standing crop data shows that the 2019 result is below the long-term average for this section of river (**Figure 6**). Standing crop is broadly comparable to that observed in 2016, indeed, if all five sites are compared the 2019 result is actually a little higher (See **Figure 7)**. However, it should be noted that some species population estimates might well be overstated in this survey cycle due to poor catch-depletions at Houghton (perch) and Dolphin Meadow (Gudgeon).

Site level discussion

Site No: 4758 **Site name:** Portholme Meadow **Date of survey:** 27.09.2019

Species	Minimum Length (mm)	Maximum Length (mm)	Mean Length (mm)	Numbers Caught
Roach	74	217	119	121
Dace	86	214	122	50
Gudgeon	74	111	91	32
Perch	54	115	73	13
Bleak	94	125	107	10
Common bream	131	190	150	8
Pike	275	371	310	3

Figure 8: Species compostion at site level (>99mm)

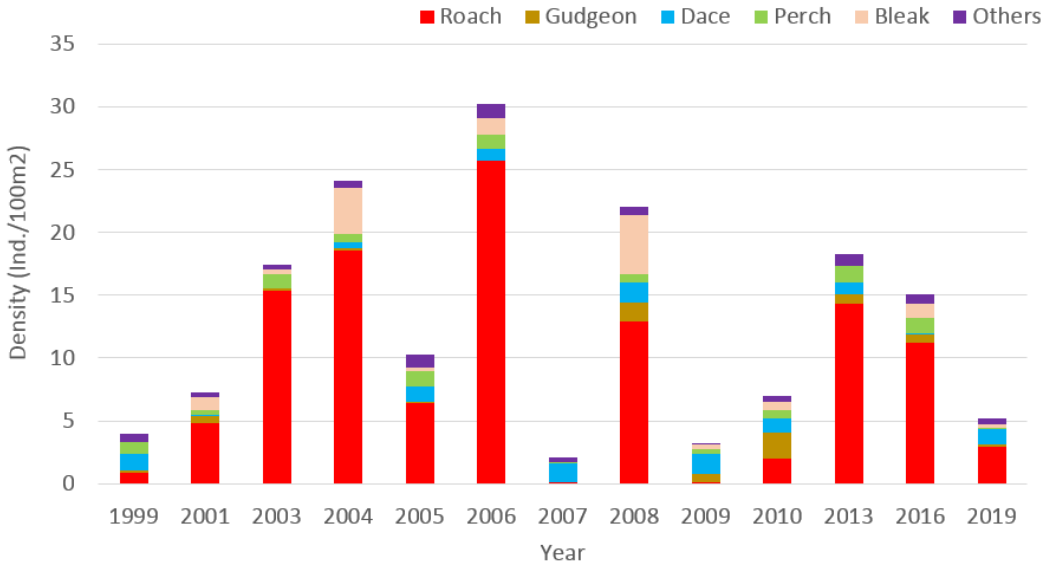


The 2019 survey at Portholme Meadow recorded seven species with roach dominant by density (58%) with dace subdominant (23%) with some good sized individuals to over 200mm observed.

The current population estimate is currently two thirds less than that recorded in the previous survey; a dissapointing result to following the two strong catches made in 2013 and 2016. Examination of historic data (**Figure 9**) shows that the current loss in population density is principally due to a much reduced roach population present at the time of sampling. This is not the lowest catch that has been made at this site, and population density has frequently recovered quite rapidly following previous lows in 2007, 2009 and 2010.

Three days after the survey at Portholme fisheries staff observed a large aggregation of stock composed of several thousand fish predominantly roach, dace and perch. These fish were shoaled tightly in the large mill pool taking advantage of tree cover and moored boats located near**bye** Brampton Mill Public House. This observation shows the need to remem**ber** individual survey results only represent a snapshot of the fish stock present within the survey area *at the time of sampling.* With highly motile species such as common bream, and where fish are tending to aggregate it can make our survey results somewhat hit or miss (more on this later) either way, it is far more valuable to look at a population estimate derived from across the wider river, than a single survey.

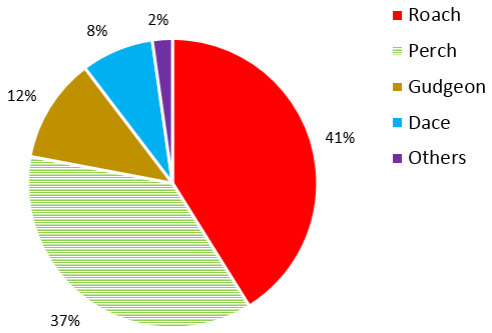
Figure 9: Density at site level by species compostion (>99mm)



Site No: 4764 **Site name:** Houghton **Date of survey:** 01.10.2019

Species	Minimum Length (mm)	Maximum Length (mm)	Mean Length (mm)	Numbers Caught
Roach	40	227	104	434
Perch	61	190	96	97
Gudgeon	80	120	101	96
Dace	92	195	140	33
Common Bream	65	177	140	6
Ruffe	61	102	90	4
Tench	82	122	102	2
Pike	289	315	302	2
Bitterling	65	66	66	2
Bleak	96	96	96	1
Rudd	152	152	152	1

Figure 10: Species composition at site level (>99mm)



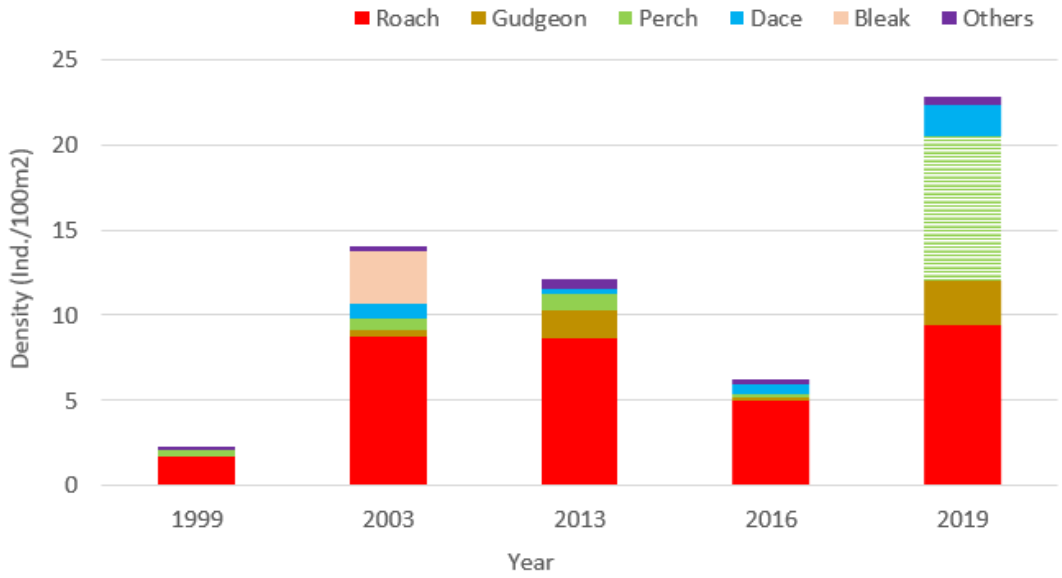
Our 2019 survey at Houghton found a fish population composed of eleven species with roach dominant by density (41%). Roach density at this site was, in fact, quite comparable to previous catches made in 2003 & 2013 and greater than catches from 1999 and 2016.

Perch were (just) subdominant numerically; however, in terms of population estimate the species represents over a third of the density (37%). This result should be treated with some caution as a poor species level depletion has produced a result subject to great uncertainty. Gudgeon were the third most important species by density and almost one hundred individuals were captured, and unlike at other sites sampled in 2019, the catch at Houghton was an excellent depletion suggesting the species was sampled efficiently.

The number of dace present in 2019 is also of interest, with some large individuals (almost 200mm) captured and represents the largest catch of the species at this site. Dace are likely to fair better in the Houghton Trout stream, a nearby channel which has seen significant habitat enhancement by the EA in recent years. Work to date has included gravel jetting (to improve spawning success of species such as dace, chub and barbel) installation of woody debris features and significant tree planting to increase riparian cover. The intention of this work being to boost natural recruitment.

The dataset for this site remains rather limited; however recent data suggests a dominant and fairly stable roach population of a little under 10 Ind./100m^2 with gudgeon, perch, dace and bleak also present, a species assemblage that seems appropriate to the location.

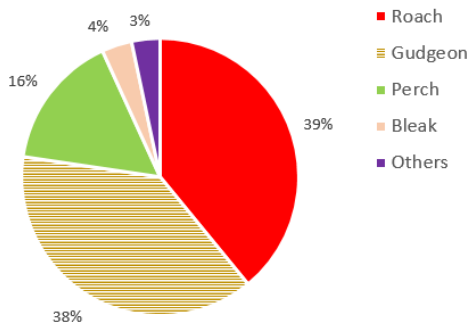
Figure 11: Density at site level by species composition (>99mm)



Site No: 4768 **Site name:** US Dolphin Meadow **Date of survey:** 02/10/2019

Species	Minimum Length (mm)	Maximum Length (mm)	Mean Length (mm)	Numbers Caught
Roach	51	149	97	433
Gudgeon	59	123	96	122
Perch	55	202	111	92
Bleak	80	115	98	43
Dace	85	194	115	17
Common bream	70	120	94	13
Rudd	56	102	79	11
Bitterling	62	70	67	10
Bullhead	60	64	62	2

Figure 12: Species composition at site level (>99mm)

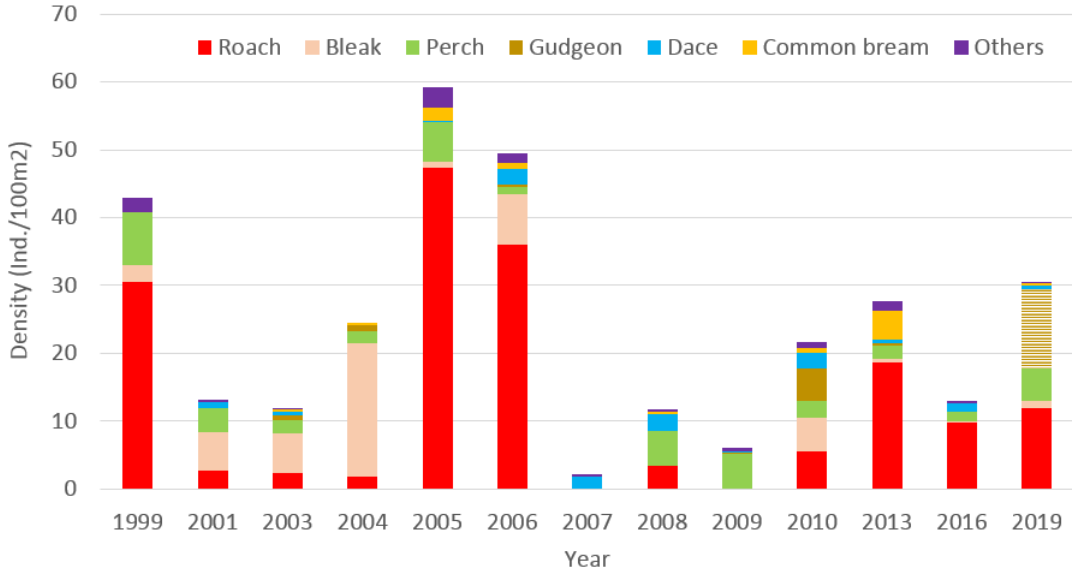


Our survey at Dolphin Meadow found nine species present, including the non-native bitterling, with roach dominant both numerically and representing almost 40% of the density estimate of fish >99mm. The roach population estimate at this site (11.9 Ind./100m^2) was quite comparable to our 2016 result, showing a slight increase of 2 Ind./100m^2. The total roach catch (of all lengths) was around a third less than recorded in 2016, this can be explained by the average fish captured in 2019 being larger meaning more individuals could be utilised in the quantitative population estimate.

The population density at this site has been rather changeable over successive surveys; this might well be expected when 6 years elapse between survey cycles, but large changes to population density have also been observed when the duration between sampling was just one year. Changes to both density and species composition between the 2004 and 2005 survey cycles is particularly apparent, the total catch of roach increasing from 62 to 1200 individuals. Although younger year classes were present, the 2005 catch was not entirely composed recently recruited fish, but many were older fish that had moved into the survey area. Roach numbers remained elevated in the subsequent 2006, however following summer flooding in 2007 (and 2008) these fish dispersed and have not been observed to this extent at Dolphin meadow subsequently.

Gudgeon were subdominant numerically (122 Ind.) and produced a surprisingly high density estimate of 11.6 Ind./100m^2, (representing 38% of the population present) a result that is subject to very wide confidence limits and is principally due to a poor catch depletion of the species. Benthic species can sometimes be difficult to sample efficiently, the preference to reside on the channel bed increasing the possibility of escapement under a seine nets lead line, a particular issue when dense macrophyte growth causes the lead line to ride up and 'lift' over it. The gudgeon population estimate should therefore be viewed with some caution in this instance.

Figure 13: Density at site level by species composition (>99mm)



Site No: 4781 **Site name:** Holywell **Date of survey:** 08/10/2019

Species	Minimum Length (mm)	Maximum Length (mm)	Mean Length (mm)	Numbers Caught
Roach	76	141	99	22
Dace	95	170	116	9
Perch	85	146	116	2

The 2019 catch at Holywell was a very poor result and composed of just 33 fish of three species with small roach most numerous.

Although this result is not the lowest population density to be found at this site, this current result is amongst the bottom three.

It is difficult to draw any further conclusions due to the small sample size of fish captured. A disappointing result.

Figure 12: Species composition at site level (>99mm)

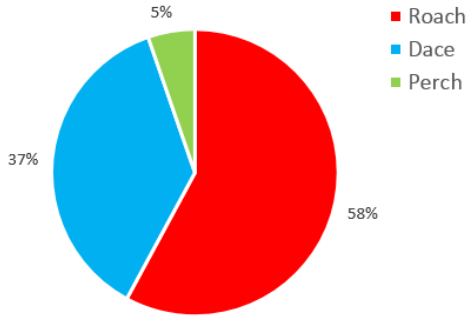
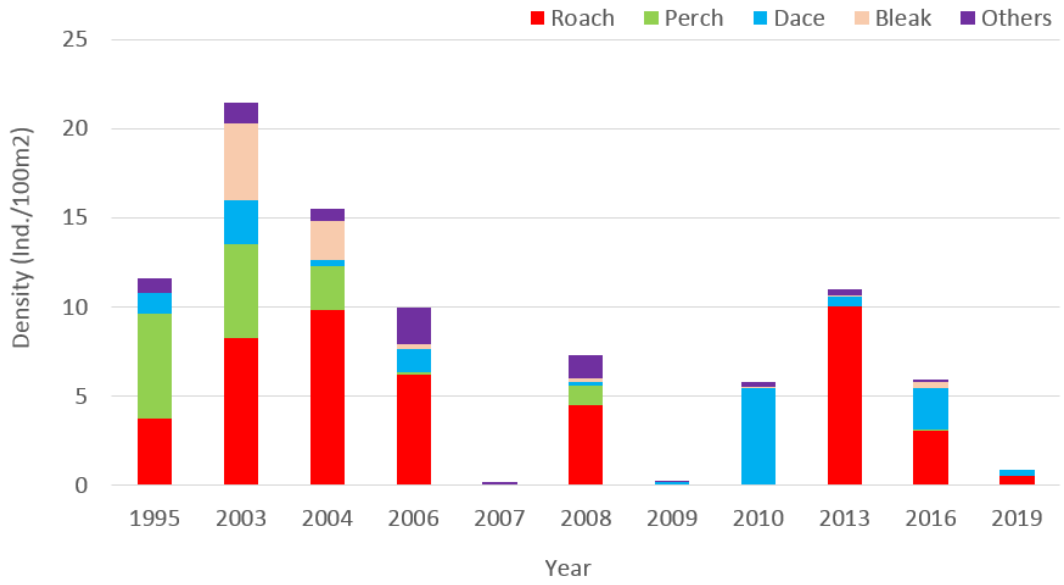


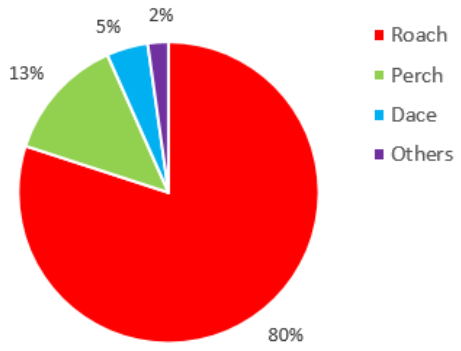
Figure 15: Density at site level by species composition (>99mm)



Site No: 4783 **Site name:** Pike and Eel **Date of survey:** 11/10/2019

Species	Minimum Length (mm)	Maximum Length (mm)	Mean Length (mm)	Numbers Caught
Roach	53	189	91	232
Bitterling	51	75	66	76
Perch	66	214	90	48
Dace	99	152	118	3
Gudgeon	106	106	106	1
Tench	92	92	92	1

Figure 16: Species composition at site level (>99mm)

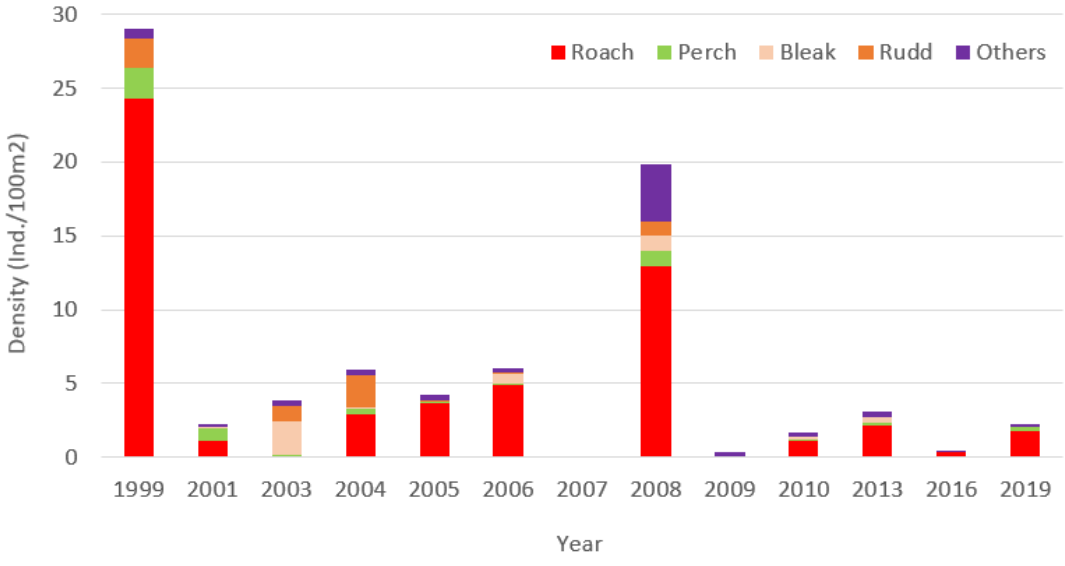


Our most recent survey at the Pike and Eel produced a considerably better result than the meagre catch made in 2016, finding a species composition chiefly composed of roach (80%) and perch (13%) The non-native bitterling was the second most numerous species captured, but the low average size of this species means it is not counted in our population estimate. The inclusion of a juvenile tench was a welcome by-catch and only the second inclusion of this species within the 2019 survey cycle.

Historic survey data from the Pike and Eel site has shown some unusual trends and it is, perhaps, interesting to note that the two largest catches on record at this site follow periods of high spring/summer flow (the 1998 'Easter floods' and 2007 summer flooding) perhaps implying that these unusually high catches are composed of fish displaced from further upstream by high river flow?

A potential explanation for the occasional larger catches made at this site is the close proximity to the Pike and Eel marina. In times of high flow, fish would seem likely to use such an area, for respite and it also seems likely that the cover provided by the moored boat is also likely to attract and hold fish stocks. Electric-fishing conducted in the marina has previously observed large numbers of silver fish present, and more recent acoustic sampling using an ARIS explorer, a management option first suggested in the conclusions of the 2016 report, found that this was still the case with silver fish, large common bream and occasional predatory fish observed. This will be discussed further in the conclusion of this report.

Figure 17: Density at site level by species composition (>99mm)



Species level discussion

Figure 18: Roach density and standing crop from four sites with a long term data set.

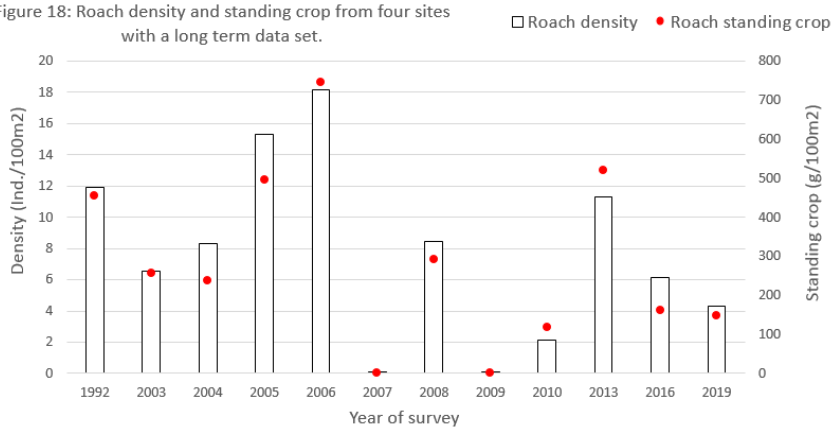
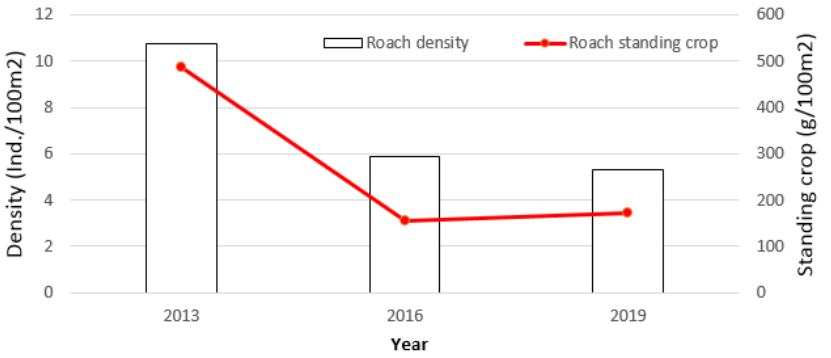


Figure 18a: Roach density and standing crop from all five sites sampled 2013-2019.



Roach: The 2016 report noted that, "Roach are the most numerous species which are likely to be encountered by anglers on the lower Great Ouse and are therefore an important indicator of fishery performance" and nothing has changed in this, the subsequent 2019 report where the species remains dominant by density representing 43% of the population estimate. Roach constitute a lesser share of the population than recorded in 2016, partly due to the larger (possibly overstated) population estimates of perch and gudgeon.

Examination of data available on this section of the lower river gives two slightly differing views of the current roach status dependent on the dataset used. Data from the four sites possessing long-term datasets suggest a roach density approximately one third smaller than observed in 2016; and this is predominantly due to the reduced catches at both Portholme and Holywell. Should data from *all five* sites be compared with the same from 2016 (see **Figure 18a**) then this indicates a much closer result with density reduced by less than 1/6th and standing crop showing a slight increase due to the much-improved catch that was made at the Houghton site.

During 2019 fisheries staff assisting in the clearance of floating pennywort from the Great Ouse by boat (more on this later) during these clearance operations staff were surprised at the number and indeed the size of some of the roach that were observed utilising backwater habitat around St Ives. Given the high water clarity within the main channel, it is perhaps understandable that fish would naturally seek out such areas that offer cover. These fish will likely disperse into the main river during the hours of darkness to feed, a behaviour observed amongst aggregated stocks especially around structures such as pumping stations and marinas.

Age analysis

Scale samples were collected from a subsample of fish species captured to allow age and growth analysis and the National Fisheries Laboratory at Brampton. Because these surveys were conducted across the September/October growth seasons, this resulted in some fish being assigned 'plus' growth and others aged to the scale edge.

Of the 82 scale samples submitted, 78 were aged with one sample being replacement and the remainder (n = 3) being sub-sampled.

Roach were present to 7 years old, and when the species growth was compared to the species standard (National Fisheries Services, unpublished data), it was apparent that roach exhibited average growth, attaining a Percentage Standard Growth (PSG) value of 91%. It is interesting to note that roach exhibited their slowest growth during the first 3 years, but growth rate increases in later life and the oldest fish hat achieved 'fast' growth in their latter 2 years. **Table 10** (below) shows growth rates and maximum age of roach over the last eleven survey cycles.

Table: 10	2003	2004	2005	2006	2007	2008	2009	2010	2013	2016	2019
P.S.G	87	82	89	92	101	86	90	91	90	84	91
Maximum roach age	8	4	6	7	6	7	3	6	8	6	7

Dace also displayed an average growth rate (PSG = 90%) and were aged to 6 years old. The common bream had a slow growth rate (PSG = 77%) when compared to their standard growth data (Hickley & Dexter, 1979) and growth was consistent across the age groups examined. The common bream sample was fairly limited in sample size (n = 15), so caution must be used when extrapolating this data.

Management Options

The 2016 survey report recommended that we should attempt larger scale survey technique, to assess whether a greater fish population is resident in the lower river than was generally indicated by our routine surveys. A previous attempt at using our standard hydro acoustic survey method, a very successful technique when used on the Ely Ouse and Relief Channel, was not effective on the Great Ouse as the channel depth and width were frequently insufficient for optimum survey efficiency, whilst the extensive macrophyte growth present further reduced the effective survey range. This meant that we needed to use an alternative survey apparatus and the most appropriate appeared to be the use of an ARIS 'Explorer' acoustic camera which would be used in conjunction with a side scanning fish-finder. The ARIS Explorer is an imaging sonar which allows detailed underwater views by using high frequency pulses of sound. When these acoustic 'pings' hit a solid object such as underwater structure or fish, they are reflected back to the sounder/receiver unit and are converted into a digital image which is recorded and can be viewed in real time on a laptop. Although we do not use this apparatus to create a population density estimate, this technology, when used in combination, does allow the fish population of significant river lengths to be assessed, the side scan unit being useful to locate aggregated fish stocks and the ARIS sonar allowing more detailed viewing of behaviour and, in some cases, identifying species present. Further details follow later in this report.

The first ARIS survey to be conducted on the lower Great Ouse and the Pike and Eel Marina was conducted during daylight in January 2019. Fish appeared sparsely distributed within the main river itself, however roach and large common bream were observed within the marina itself and we suspected that these fish would likely disperse out of the marina and into the river to feed at night, or during periods of increased channel turbidity, where fish would feel more secure from predation.

As the ARIS sonar may be used in completed darkness (or during turbid conditions) we decided that we should return to the marina and evaluate changes to stock behaviour and distribution in response to changing light intensity and also investigate the marinas use as off-channel habitat during periods of high flow. Unfortunately, the ongoing drought conditions in 2019 meant that we had to wait until February 2020 before we had the opportunity to conduct a further survey (thus the late completion of this report).

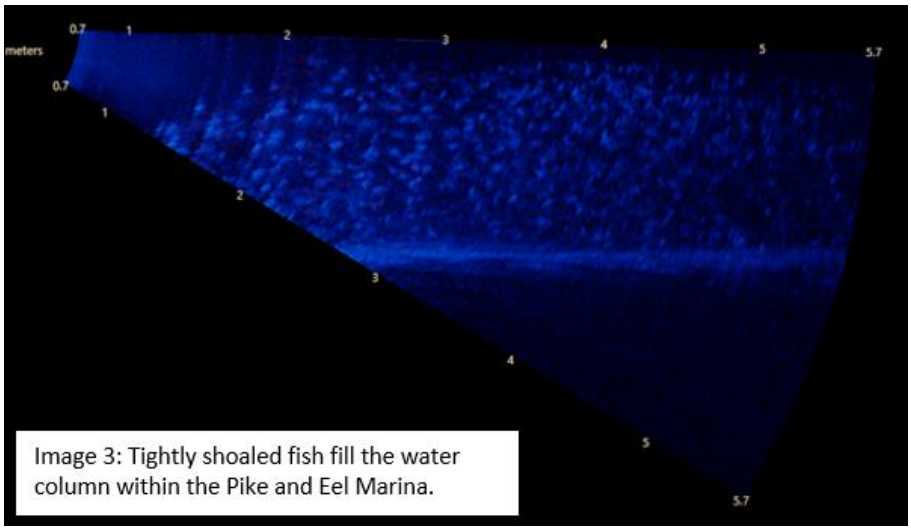


Image 3: Tightly shoaled fish fill the water column within the Pike and Eel Marina.

A second ARIS survey was organised on the 27th of February 2020 and this would coincide with a flooded River Ouse, high river turbidity and low water temperature (5°C). We considered that, should fish show obvious migration during such a low water temperature, then it may reasonably be expected that migration could be likely throughout the year. We were initially concerned that the turbidity of the river may have influenced the results, however the behaviour observed made us conclude that this was perhaps not as significant a stimulus as first suspected.

The survey of the Pike and Eel Marina began just after midday, but we decided that we should continue into the evening until darkness had fallen.

Our observations during daylight determined that, despite the turbidity within the marina, the large majority of fish were very tightly shoaled within a mooring bay in the North West corner of the marina. In this area, flanked on either side by two moored narrow boats, a huge aggregation of fish filled the water column from surface to substrate. **Image 3** shows a side-on (rolled) image of part of this aggregation**.** Conversation with an owner of the moored boats revealed that these fish were regularly resident at this location.

Elsewhere in the marina, only infrequent small shoals were observed, generally around other moored boats, sunken structure and riparian cover such as small bushes. Our use of ARIS had effectively demonstrated that the large majority of fish were tightly shoaled at the most distant point from the river. As the water temperature was low (and still falling), we wondered whether the fish might be torpid, remaining aggregated with no major dispersal of stock, however; we moved the survey boat to the mouth of the marina and moored up with the ARIS camera viewing across the full width of the marinas entry cut.

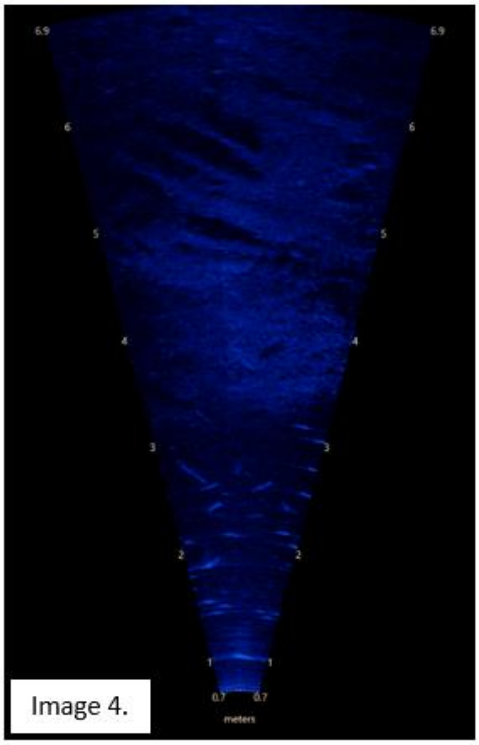


Image 4.

As the light level decreased, first single fish, then occasional small shoals could be seen moving around at the mouth of the marina. As full darkness approached large numbers of fish began dispersing into the river. The majority of these fish stayed very tightly to the margin meaning that the imaging of some individuals was sub optimal. **Image 4** shows our view across the mouth of the marina. Note the 'empty' water in the middle of the image, but the large number of individuals moving at extremes of range, particularly close to the moored boat (where the image narrows).

When fish dispersal had slowed and individuals appeared to be milling around rather than moving with purpose, we took one final slow pass through the marina. Unsurprisingly, distribution of fish within the marina was quite different from that observed within the daylight hours and fish were now widespread throughout areas previously devoid of stock earlier in the evening. The tight aggregation of fish in the North West corner was much reduced, although a good number of fish remained present. As many of the fish were holding quite shallow in the water column they could be identified with a powerful torch as roach, rudd, bleak and perch. Indeed, so many fish were present that a number of individuals managed to beach themselves in the slipway whilst we were retrieving the boat, allowing definitive identification of the species present as we returned them to the water.

The behaviour observed during this survey was very interesting, demonstrating that large-scale stock migration would occur despite the low water temperature and high flow in the destination river. The fact that both the river and marina were already turbid due to floodwater suggests that, in this instance at least, falling darkness was a much stronger influence on stock migration than reduced light levels from the turbid water present.

Some sample footage from our first acoustic investigation at the Pike and Eel Marina can be found on our OuseFishEA Facebook page via the following link: https://www.facebook.com/OuseFishEA/posts/319868321967208 This footage is well worth viewing as static images alone do not adequately demonstrate the number of fish observed utilising this off-river habitat.

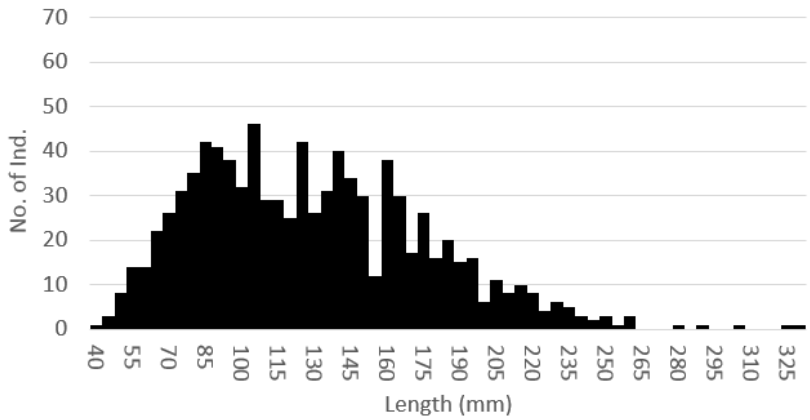
Analysis of ARIS acoustic data

To analyse the ARIS data we firstly create an echogram file, which is a visual representation of the ARIS image displaying tracks that represent the range and location of the fish as they swim across the sonar beam. Once an echogram has been produced, individual fish can be marked and length may be measured. We can also collect data such on fish thickness, observe swimming behaviour and often identify fish species if sufficiently large; for example, we cannot distinguish between a silver bream, roach or small skimmer bream however tench, common bream and pike are obvious, particularly when the sounder is rolled and the fish are viewed side on, rather than top down.

The individual lengths of the fish measured have been combined to create three length frequency distribution graphs, one for the fish recorded leaving the marina (**Figure 19**) and one for those fish that remained in the marina (**Figure 20**) and one showing all these fish combined (**Figure 21**).

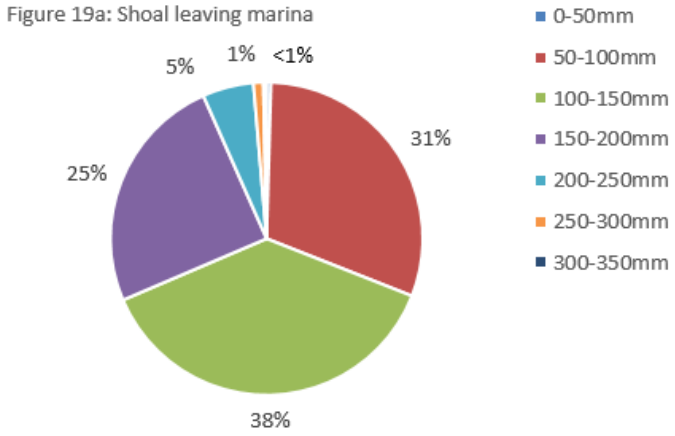
It should be remembered that length frequency is derived from a small sub-sample of the fish observed, the sheer number of fish present making a total count infeasible. The sub-sample was chosen by selecting a sufficiently clear echogram that would allow all fish to be measured and was not biased by the size/number of fish present.

Figure 19: Fish recorded leaving the Marina No= 904



A subsample of fish (Ind.= 904) was measured from those fish imaged whilst leaving the marina. This data is expressed as straight length/frequency (**Figure 19**) and divided into 50mm groupings (**Figure 19a**). From this data we may determine that 31% of the fish lay within the 50 – 100mm length band, 38% were between 100-150mm, 25% were composed of the 150-200mm subgroup and a little over 6% of those measured exceeded 200mm.

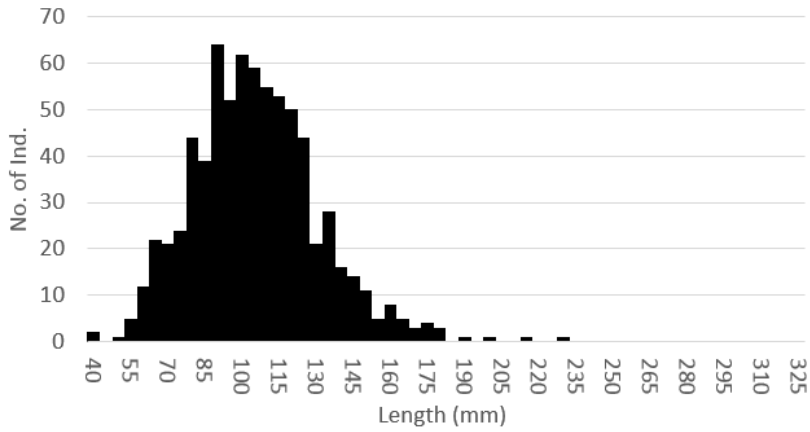
Figure 19a: Shoal leaving marina



Those fish which had remained in the marina, but had dispersed away from the area of daylight aggregation, appeared, on average, to be a little smaller than those which ventured out into the main river with most measuring between 80mm - 125mm. **Figure 20 & 20a** display data for these fish.

Of the 731 fish measured that remained within the marina, 39% of the fish fell in the 50-100 mm bracket, over half of the fish (55%) were in the 100-150mm size range and the reminder of the fish constituted a little over 6% of the sub-sample.

Figure: 20 Fish that remained in the Marina after dark No=731



Data from both subsamples is combined as **Figure 21** and this perhaps give a more representative image of the length frequency of those shoaling 'silver fish' species residing within the Pike and Eel Marina.

It was interesting to observe that larger fish appeared more likely to leave than stay and over 30% of the fish leaving the marina exceeded 150mm, whilst only a little over 6% of those fish remaining exceeded this length. This observation may of course be skewed by the small sample size and environmental conditions at the time of survey (particularly the flooded main river) perhaps encouraging larger fish, better equipped for conditions in the main river to leave. It should also be noted that a large area of slack flow habitat is present along the frontage of the Pike and Eel Marina, so it is possible that during periods of higher flow this is where the fish will tend to congregate, feeding on passing food items along the crease formed where the main current meets slack flow, without needing to expend significant energy swimming.

Figure 20a: Shoal remaining in marina

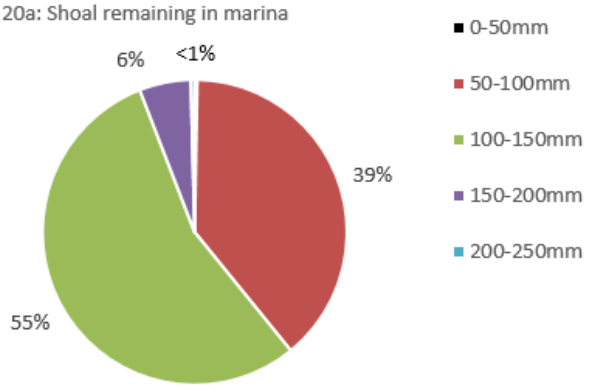
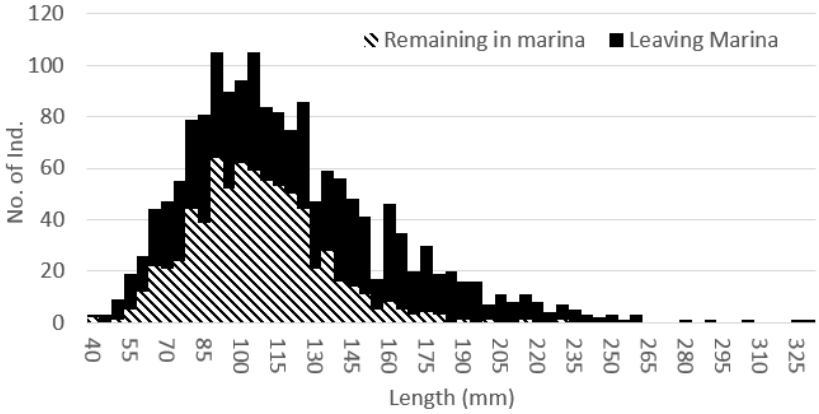


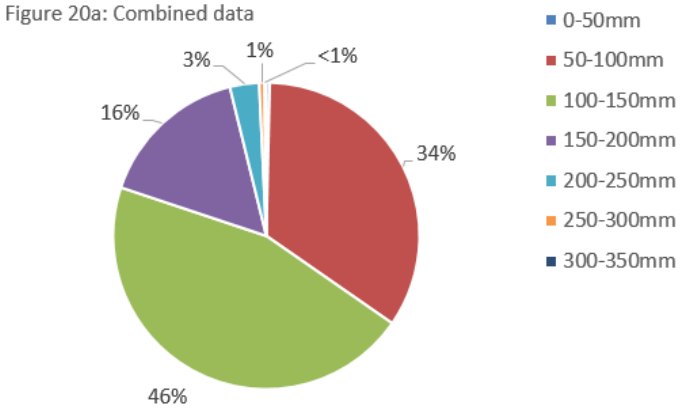
Figure 21: Combined data: No = 1635



Conclusions

The 2016 survey recorded a fish population with a density and standing crop estimate below the long-term average brought about by poor representation from larger fish within the survey cycle. The 2019 result is somewhat similar with a comparable density estimate, although it should be noted that possible overestimation of fish density occurred at two sites due to poor catch depletions.

Figure 20a: Combined data



If we look at roach as a key angling species and principal component of population density, then current population data from long term sites suggest density is one third lower than noted in 2016, however if data from *all* sites sampled is utilised then density is far more comparable to the previous result (1/6th reduction) and standing crop shows a slight increase, a result principally due to large catch being made at Houghton, a historic site that was re-introduced to the survey programme in 2013.

The growth rate of roach has increased a little since 2016, with the species displaying average growth. It is interesting to note that the species is exhibiting slow growth as juveniles, suggesting competition, or insufficient food resource for the younger year classes. The reason for this is uncertain, however as seine netting results indicate a population skewed towards smaller fish, perhaps this competition is from their brethren. Scale reading from the subsample collected in 2016 dataset also noted this phenomenon suggesting pressure on younger year classes is a long term pressure on these fish. It is tempting to hypothesize that those fish which are tending to aggregate tightly, (such as observed in the Pike and Eel marina), may well suffer from competition, particularly those fish do not regularly leave the marina to feed?

Match Catch database

Fish catches by rod and line are a valuable source of information about fishery performance and can be a sound indicator of the status of the exploited stock. The match catch database allows the storage of match results in a way that allows easy analysis of angler catches over time and is a way for anglers to support their fishery and have their say on the quality of sport they are experiencing. The data provided by anglers not only underpins and validates the survey data but in some cases also adds to it by including details of species which have not been caught in surveys. By collecting & providing the EA with match catch data an angling club can also know that if it has worries about the state of its fishery, there will be a record of fishery performance against which these concerns may be compared.

- **If clubs fishing the Great Ouse wish to provide such data for analysis and inclusion in subsequent reports then this is encouraged and will be welcomed.**
- **A blank match return form & instructions for completion are included at the rear of this report.**

An example of the value that such data can add to our understanding of a fisheries status can be seen from the results of a recent match conducted on the 18th June 2020 on the Great Ouse at Dolphin Meadow.

Image 5: EA fisheries Office Kye Jerrom with his 17lb winning catch from Dolphin Meadow. June 2020.

The match was fished by twelve competitors for three hours and was won by EA Fisheries Officer Kye Jerrom who weighed in with a 17lb net of mixed species that included good representation from skimmer bream (and a larger individual of 3lb was lost at the net). Six of the other 12 anglers competing also caught large skimmer bream alongside lots of quality rudd and perch while one angler managed to catch three chub to around 1.5lb.

Our survey conducted during 2019 did not find rudd or chub present and the common bream catch was also somewhat limited, indeed looking at the 2020 survey data, one could easily imagine that there were very few bream present within the Great Ouse, however as already mentioned in this report, this is one of the difficulties in sampling a highly mobile shoaling species.

Our historic data shows that Common bream have been caught sporadically at Dolphin Meadow during our surveys, strongest representation being in 2010 and 2013 with 261 and 199 individuals respectively. If these two large catches are removed from the dataset, the average number of bream observed during the thirteen remaining surveys is just 15 individuals and quite frequently no bream have been recorded at all. Chub have been captured in 7 of the 15 surveys conducted at his location and rudd have been particularly poorly represented across all sampling cycles with just 46 fish in total and an average of a little over 3 fish per survey at this site.

Data from this catch increases our current knowledge on the distribution of fish species locally, and should data be regularly collected from matches at this location then this could quickly provide to be a useful reference site against which to validate our survey results and inform on the quality of sport that anglers are experiencing on this section of the Great Ouse.

- **If match data is supplied to the EA than it will be analysed and presented within the next survey report in 2022.**

Non-native species

Floating Pennywort: In its native range, floating pennywort (*Hydrocotyle ranunculoides*) occurs in slow-flowing warm and nutrient rich water in Argentina, Brazil, Paraguay and southern states of the USA. It is an invasive weed in North Western Europe and was first naturalised in the UK in 1990 as an introduction from garden ponds. Since then it has become widespread in the south and east of England and is spreading rapidly north and westwards. Floating pennywort is found in and around canals, lakes, rivers, streams, ditches and ponds. It roots along waterbody margins, growing up to a rate of 20cm per day, and spreads out onto the water as dense interwoven mats above and beneath the surface. These dense mats can quickly overwhelm a water body and impede water flow. Very large infestations may interfere with navigation, prevent angling access and increase the risk of flooding. Another important consideration is the detrimental effect of floating pennywort on native plant and animal species. The dense growths result in native plants being shaded out and may obstruct native air-breathing insects from reaching the water surface. In addition, the water beneath mats can become deoxygenated resulting in fish mortality and changes to the invertebrate community.

On the River Great Ouse, floating pennywort has been identified from Bedford downstream to Hemingford including some minor tributaries of the main river. The infestation was identified in 2015 and initial herbicide work was undertaken to control growth, this was followed by a mechanical removal programme in 2016 with approximately 100 tonnes of floating pennywort removed from the river. Floating pennywort is usually spread by vegetative propagation, with very small fragments of the plant able to form new colonies. Landowners are responsible for undertaking swift and effective action to control floating pennywort on their land. Under the provisions of the Wildlife and Countryside Act (1981) it is illegal for landowners to allow floating pennywort to spread from their property.

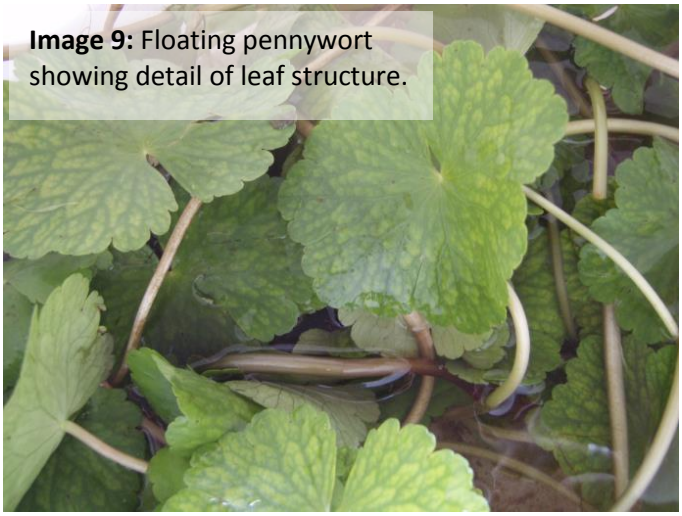


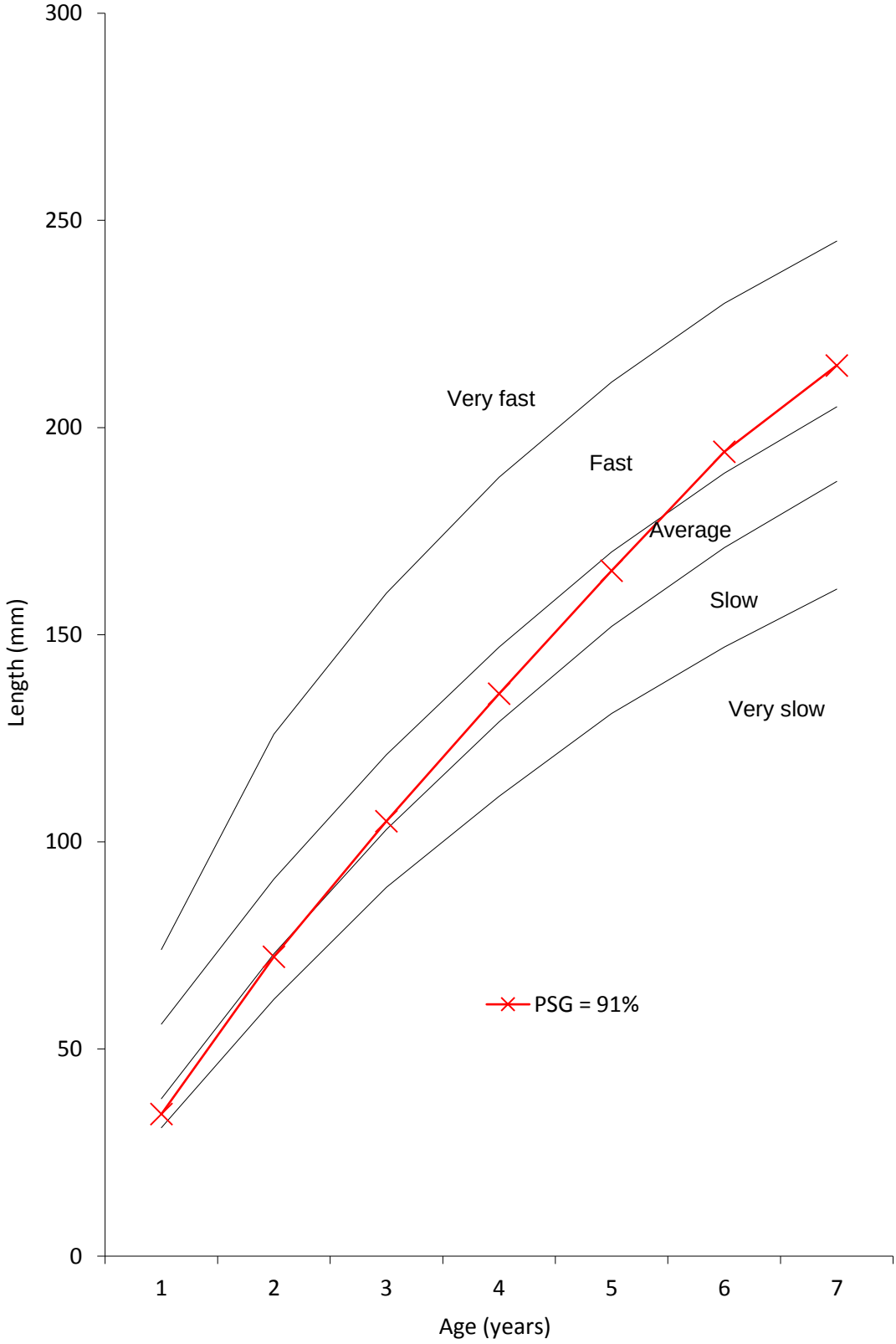
Image 9: Floating pennywort showing detail of leaf structure.

Anglers should adhere to the check, clean, dry protocol to help avoid spreading this plant on their equipment such as landing nets and keep-nets. Anglers using weed rakes should be particularly careful not to disturb or break up clumps of pennywort as this could cause the spread of fragments, which may then root elsewhere.

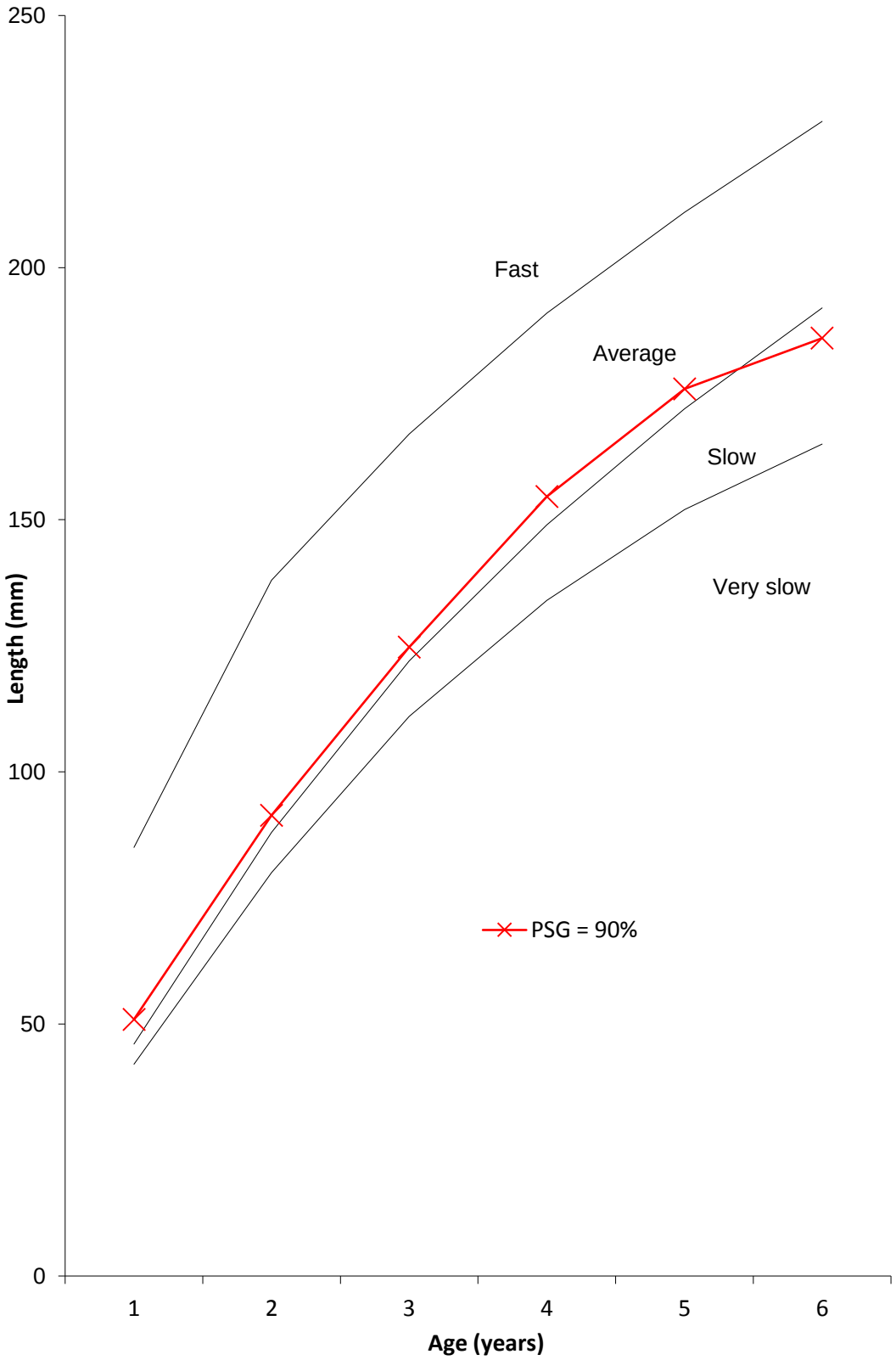
If you think you have found floating pennywort please report it to anglian-invasive@environment-agency.gov.uk providing a photograph and detail of the location, preferably including a grid reference.

Owners of smartphones could also help track the location of non-native species by using either the Plant Tracker or Aqua Invader Apps available for both Android and IPhone. For more information, please see: http://www.nonnativespecies.org/checkcleandry/biosecurity-for-anglers.cfm

Graphs showing growth rates for key species



Graph to show the growth of roach in the Gt Ouse compared to the standard growth of roach in Southern rivers (National Fisheries Services unpublished data)



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

Additional information

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 Biodiversity and Geomorphology (FBG) Officer Chris Middleton. chris.middleton@environment-agency.gov.uk

Anglers can keep up to date with the Great Ouse & Fenland Fisheries Team by liking and following our social media pages @OuseFishEA:

Facebook: please click here.

Twitter: please click here.

Anglers can also keep up to date with the Lower Ouse & Fenland Fisheries Consultative Association (LOFFCA) and local Angling Trust Eastern Region by liking the following Facebook pages:

Lower Ouse & Fenland Fisheries Consultative Association (LOFFCA): please click here.

Angling Trust East of England: please click here.

For information regarding the Fisheries Improvement Programme, please follow the link below:
https://www.gov.uk/government/news/fisheries-projects-needed-to-improve-the-environment

For information regarding the Angling Improvement Fund (AIF) administered by the Angling Trust, please follow the link below:
http://www.anglingtrust.net/landing.asp?section=1094&sectionTitle=Angling+Improvement+Fund

Before you go fishing don't forget:

You must have a valid Environment Agency rod licence and permission from the fishery owner;

You must comply with the fisheries byelaws;

The coarse fish close season (15th March to 15th June inclusive) applies to all rivers, streams and drains in England and Wales but not most stillwaters. Stillwater fishery owners can still have their own close season and rules, so please check with them before setting out.

Report illegal fishing:

If you see any fishing, netting or trapping you think may be illegal, please do not tackle it yourself. Call us immediately on 0800 80 70 60 and tell us: Exactly where the alleged offence is taking place; What is happening; How many people are involved and their descriptions & The registration numbers of any vehicles involved.

If you prefer to remain report an environmental crime anonymously call Crimestoppers on 0800 555 111 or https://crimestoppers-uk.org/give-information/give-information-online/.

Justin Mould - **Fisheries Analysis and Reporting Officer**

23.01.2017

Carle, F. L. & Strub, M. R. (1978) A New Method for Estimating Population Size from Removal Data.

Next survey due

Summer 2022

Environment Agency Match Record

(Please complete after each match and return by email to chris.middleton@environment-agency.gov.uk)

Name of angling club:		Date of match:	
River:		Venue:	
Section / peg fished:		Number of competitors:	
Match start time:		Match duration (hrs):	

Number of anglers weighing-in:		
Total weight caught:		(lbs/oz) or (g) *delete as appropriate*
Winning weight:		(lbs/oz) or (g) *delete as appropriate*
2nd weight:		(lbs/oz) or (g) *delete as appropriate*
3rd weight:		(lbs/oz) or (g) *delete as appropriate*

Species Caught In:

Greatest number:	
Second greatest number:	
Other species present:	

River Conditions:

Level		Colour		Condition		River Temp	
Low		Clear		Falling		Cold	
Normal		Coloured		Steady		Normal	
High		Green		Rising		Warm	

Weather Conditions:

Brightness		Wind		Rain	
Dull		Still		Dry	
Changeable		Light		Drizzle	
Bright		Moderate		Light	
		Strong		Heavy	
				Hail	
				Sleet	
				Snow	

Any other comments:

STOP THE SPREAD

STOP THE SPREAD
INVASIVE AQUATIC SPECIES
CHECK-CLEAN-DRY

Are you unknowingly spreading invasive species on your water sports equipment and clothing?

Invasive species can affect fish and other wildlife, restrict navigation, clog up propellers and be costly to manage. You can help protect the water sports you love by following three simple steps when you leave the water.

CHECK

Check your equipment and clothing for live organisms - particular in areas that are damp or hard to inspect.

CLEAN

Clean and wash all equipment, footwear and clothes thoroughly. Use hot water where possible.

If you do come across any organisms, leave them at the water body where you found them.

DRY

Dry all equipment and clothing - some species can live for many days in moist conditions.

Make sure you don't transfer water elsewhere.

For more information go to www.nonnativespecies.org/checkcleandry

Department for Environment Food & Rural Affairs
natural scotland SCOTTISH GOVERNMENT
Llywodraeth Cymru Wales Government
NNSS
RYA
BRITISH ROWING
BRITISH CANOE UNION
ANGLING TRUST THE VOICE OF ANGLING
SFCA
angling cymru