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Fisheries Survey Report

River Crane 2016

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Why, what and how we monitor

Accurate, adequate and up-to-date information on the status of fish stocks, their habitats and fishing is essential for sound fisheries management. Whether considering the introduction of new fishery regulations or options for habitat enhancement, fishery managers are reliant on monitoring results to inform and justify their decisions.

Contents

Introduction

National Fisheries Monitoring Programme

A number of agencies and organisations across England and Wales monitor fisheries. Their work ranges from individual still-water surveys for fishery owners, through catchment wide assessments undertaken by Rivers Trusts, to long-term monitoring programmes managed by the Environment Agency.

Work on the Environment Agency's National Fisheries Monitoring Programme began in 2001. Prior to this, monitoring was undertaken primarily to meet local needs such as post-pollution impact assessments and regional strategic surveys. The new programme is aimed at providing information, at a local and national level, about the status of fish stocks and trends in fishery performance. Further information on this and other monitoring programs can be found on the Environment Agencies Website, the details of which can be found on the back page of this report.

Capture Techniques

Electric fishing Electric fishing is the most common method of monitoring fish in small and medium-sized rivers. It works by immersing into the river one or more electrodes connected to a power source and control box. The electric field created stuns the fish within the field and, by interfering with the fishes' swimming muscles, draws the fish towards the centre of the electrode. They are then removed from the water to be counted, measured, and in some cases weighed. A scale sample may be taken so that the age and growth history of the fish can be determined. To estimate the number, density and biomass of fish in a river, a reach is isolated using two nets strung across the river. This prevents fish moving into or out of the survey section.

Fishing the whole width of the river, working from the lower net to the upper net, fish are caught, counted, measured and then retained in suitable holding facilities until the survey is completed. The reach is fished once or twice more, and on each fishing 'run' the catch is removed, processed and retained. From these results it is possible to

calculate an estimate for the total number of fish within the section. After the survey is complete, all captured fish are returned alive to the survey site.

Although electric fishing is very effective in many water bodies and for sampling certain fish populations, it does have limitations. It is relatively ineffective in larger, deeper rivers, canals and still waters. Although new equipment has been developed for sampling deeper water it remains difficult to obtain accurate estimates of fish numbers from larger water bodies by electric fishing alone.

At the Environment Agency recognised best practice for electric fishing is followed during survey work and fish welfare is priority. Electric fishing remains the most effective means of monitoring many fisheries and is vital for providing evidence and information for management decisions.

Catchment overview

The River Crane rises, initially under the guise of the Yeading Brook, to the north of Harrow, flowing south through Ruislip, Hillingdon, Hayes, Hounslow, Feltham and Twickenham before joining the River Thames at Isleworth. The main tributaries are the West and East arms of the Yeading Brook, and the Duke of Northumberland's artificial river which enters the Crane at North Feltham. The river flows for approximately 40km, draining a catchment of 104km^2.

Much of the river corridor passes through urban and suburban developments and industrial sites, most notable amongst which is Heathrow airport. In places the river also flows through significant areas of green land, such as Yeading Meadows, Hounslow Heath and Crane Park, all of which provide important conservational habitat.

Water Framework Directive classifications

Waterbody	Fish	Invertebrates	Macrophytes and Phytobenthos	Ammonia	Dissolved Oxygen	Phosphate
Crane	Moderate	Moderate	Poor	Good	Moderate	Poor

Table 1: Water Framework Directive 2016 classifications for fish and other key elements affecting fish within the Crane WFD waterbody.

Main pressures affecting fish populations

Physical modifications: Flood defence and impounding structures significantly alter the hydrological regime of the River Crane and create significant barriers to fish migration.

Water quality: The River Crane is affected by elevated phosphate levels. Misconnected sewers are also a major source of pollution into the river. Major pollution events in both 2011 and 2013 severely impacted upon both the invertebrate and fish communities present.

Fisheries survey results 2016

In response to the major pollution event of 2013 which severely impacted the fish population throughout much of the River Crane, a programme of investigative surveys has been carried out at three sites to assess the recovery and current status of fish populations. This recovery has been aided by the stocking of approximately 15,000 fish from the Environment Agency's Calverton fish farm in 2014 & 2015.

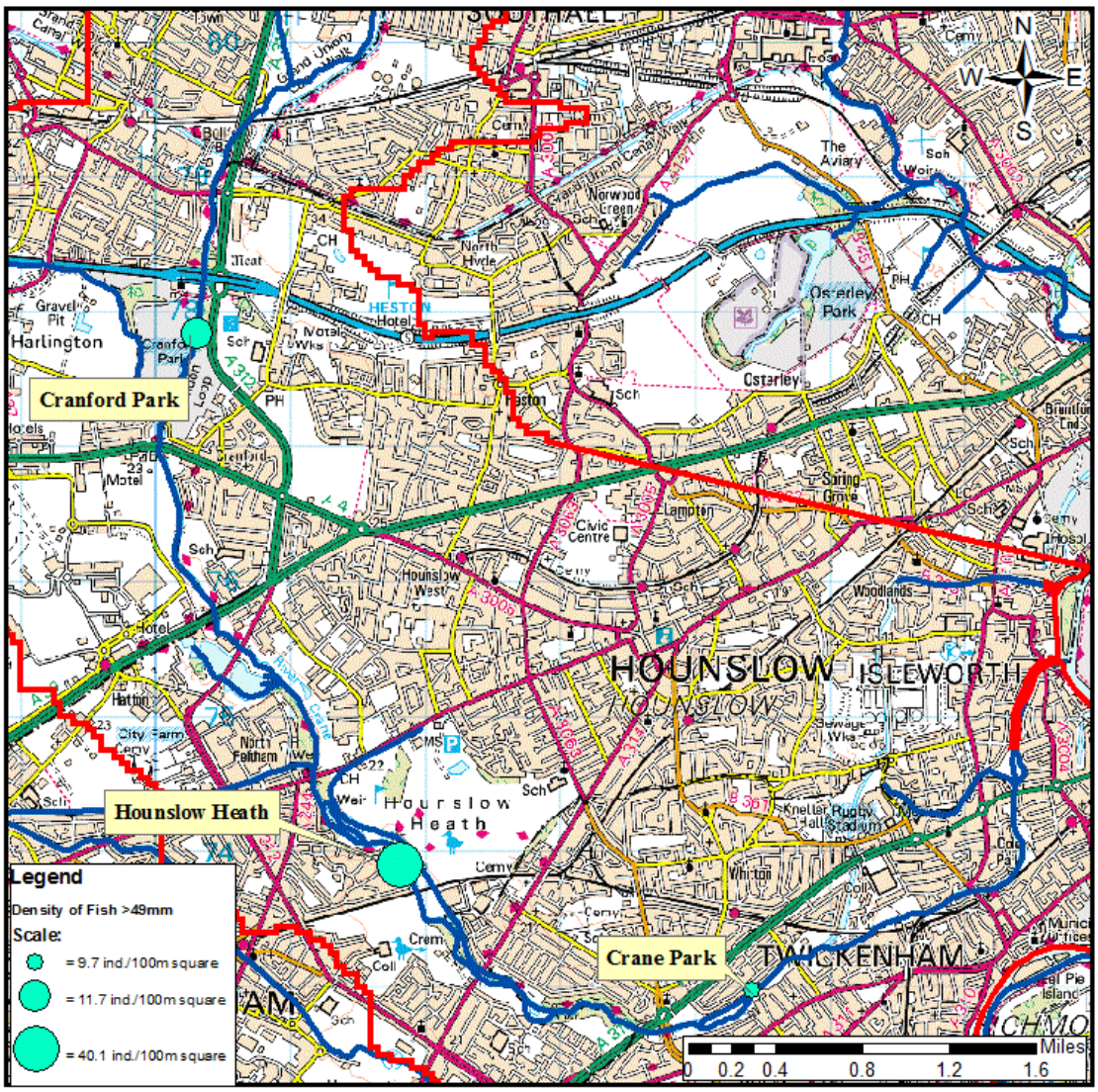


Figure 1: River Crane catchment showing location and comparative density of fish species >49mm at fisheries monitoring sites 2016.

Fish Biomass and Density

We accurately measure and record the length of each fish caught, although large numbers of minor species such as minnows will often be estimated. Using length – weight relationships we can estimate the weight of individual fish and therefore get an estimate for the fish biomass of the river. **Biomass** is a measure of weight of fish over a given area, figures quoted here are in grams per 100 metres squared, and this is kept constant for ease of comparison between sites and years.

Density is a measure of the number of individual fish per area, again in 100 metres squared. It is useful to look at both Biomass and Density together as they show the same results in slightly different ways. Biomass data for a species can be hugely increased by a small number of very large fish. As an example a large number of small dace may not have a large biomass but due to the numbers present will have a large density. The following two graphs (figures 2 and 3) are a way of presenting multiple years Biomass and Density data to allow easy comparison between years.

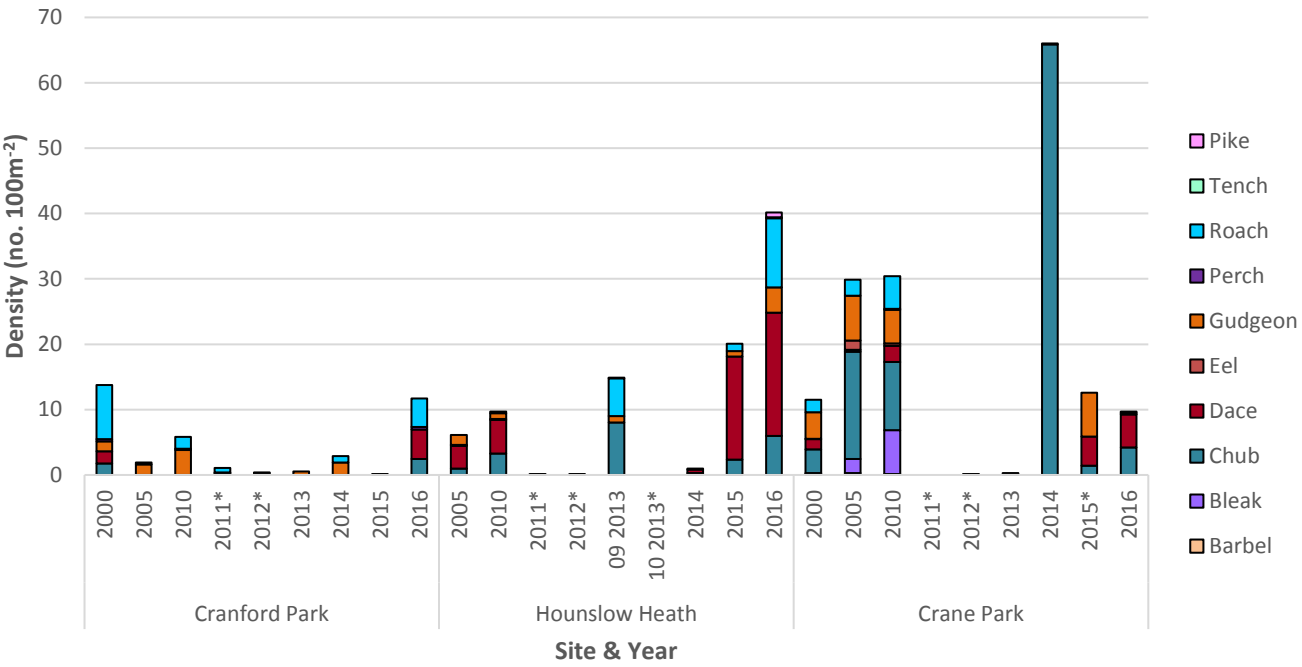


Figure 2: Density of fish species >49mm at monitoring sites on the River Crane 2000 – 2016 (*denotes results based on a single catch and not a quantitative estimate)

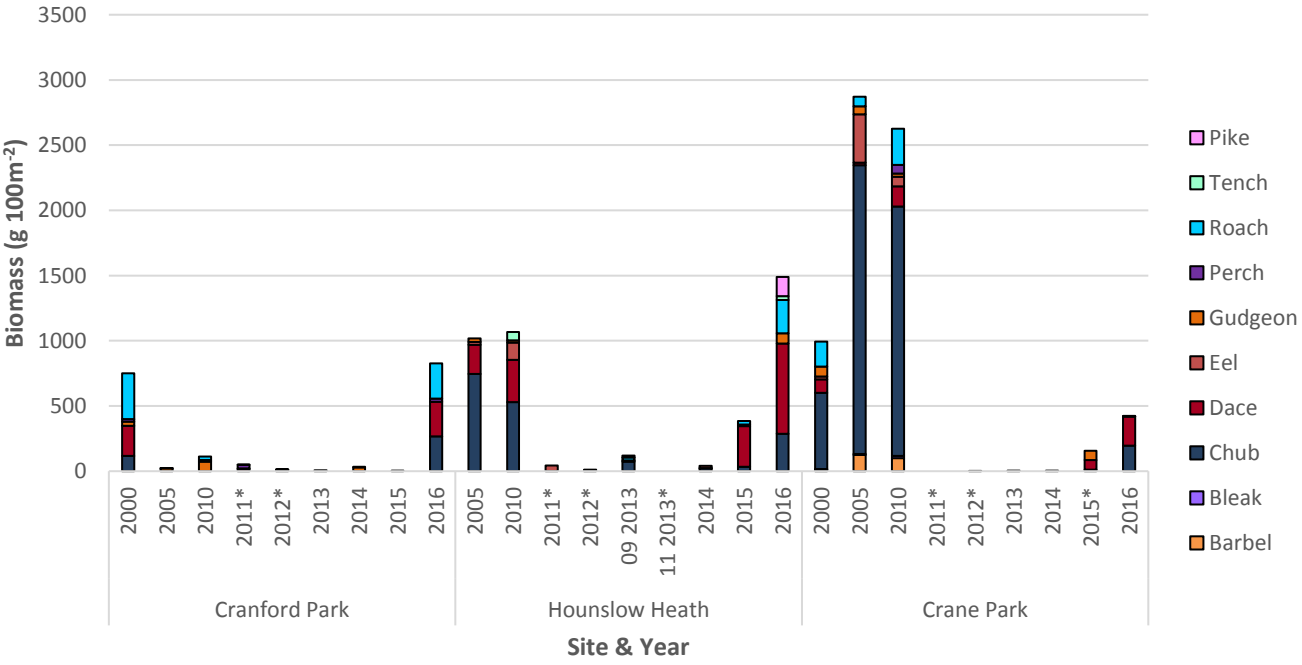


Figure 3: Biomass of fish species >49mm at monitoring sites on the River Crane 2000 – 2016 (*denotes results based on a single catch and not a quantitative estimate)

Cranford Park	2005	2010	2011	2012	2013	2014	2015
Bullhead	0	0	10-99	0	0	0	1-9
Minnow	191	100-999	100-999	100-999	100-999	100-999	100-999
Three-spined Stickleback	64	10-99	10-99	0	10-99	10-99	0
Stone Loach	2	10-99	10-99	0	10-99	10-99	10-99

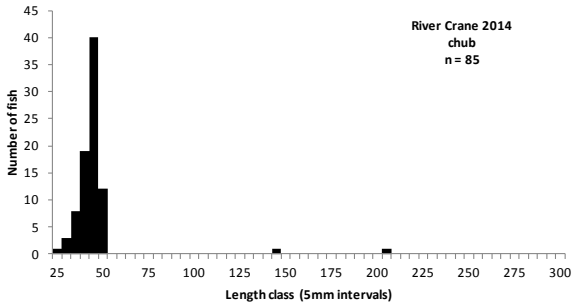
Hounslow Heath	2005	2010	2011	2012	Sep-13	Oct-13	2014	2015
Bullhead	0	10-99	2	10-99	10-99	0	10-99	100-999
Minnow	12	10-99	0	100-999	1000-9999	0	1000-9999	100-999
Three-spined Stickleback	1	0	2	100-999	10-99	1-9	10-99	0
Stone Loach	2	10-99	0	10-99	100-999	1-9	10-99	100-999

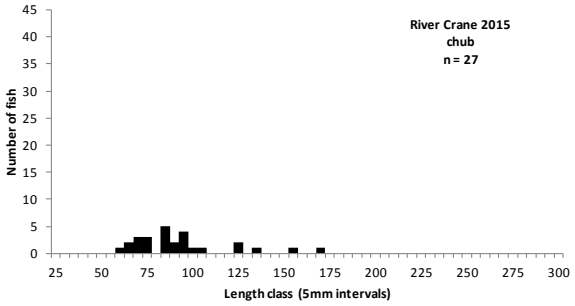
Crane Park	2005	2010	2011	2012	2013	2014	2015	2016
Bullhead	0	1-9	0	10-99	0	0	10-99	100-999
Minnow	10-99	100-999	1-9	100-999	0	100-999	100-999	100-999
Three-spined Stickleback	0	1-9	0	0	10-99	10-99	10-99	100-999
Stone Loach	1-9	10-99	0	10-99	0	10-99	10-99	10-99

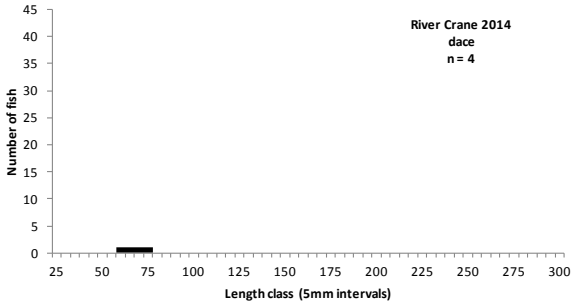
Table 2: Numbers of minor species recorded during surveys of the River Crane 2000 – 2016 (numbers in some survey years given as log abundance estimates)

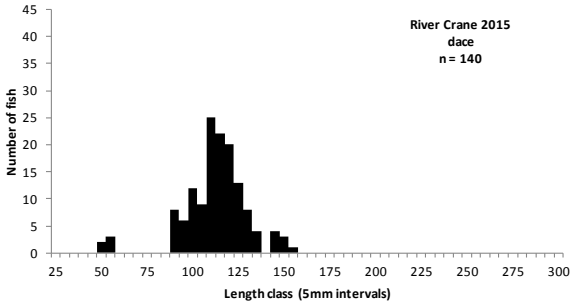
Length Frequency Distributions

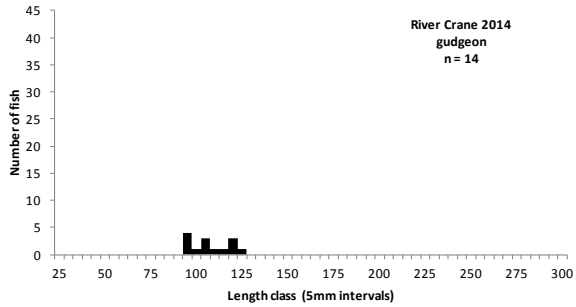
Fish lengths can be interpreted using length frequency diagrams. They show graphically the range of sizes for each species within the population. The horizontal axis of the graph shows the length of fish, and the vertical axis shows the number of fish of that length caught. The particular shape of the length frequency diagram is the result of recruitment, growth, mortality and sampling bias.

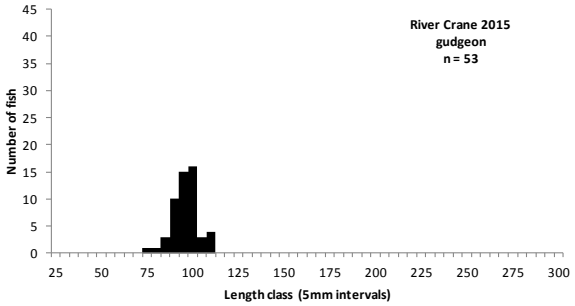

River Crane 2014
chub
n = 85
Number of fish
Length class (5mm intervals)

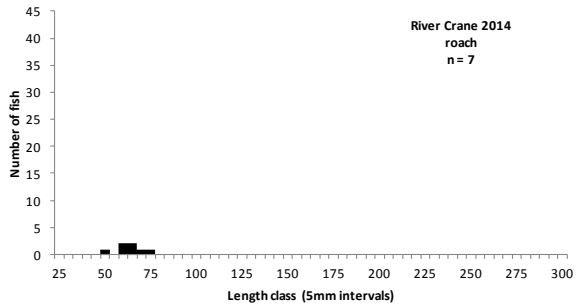

River Crane 2015
chub
n = 27
Number of fish
Length class (5mm intervals)

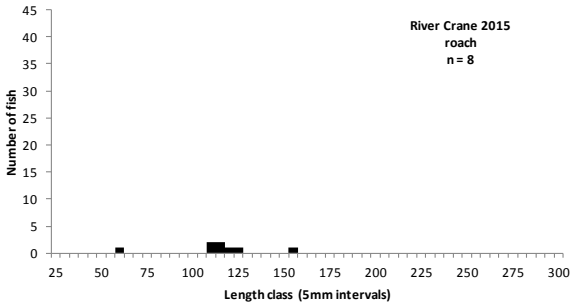

River Crane 2014
dace
n = 4
Number of fish
Length class (5mm intervals)

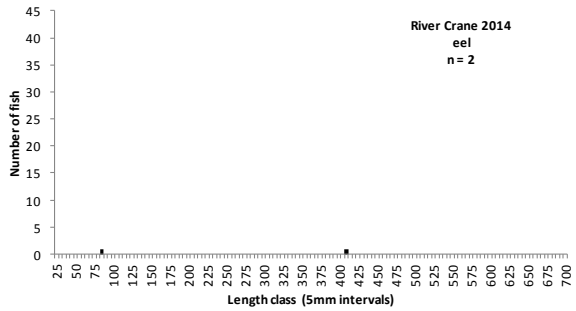

River Crane 2015
dace
n = 140
Number of fish
Length class (5mm intervals)

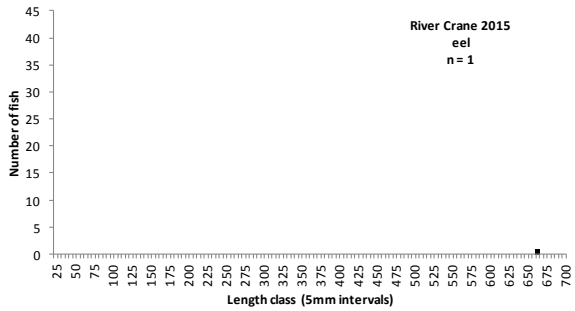

River Crane 2014
gudgeon
n = 14
Number of fish
Length class (5mm intervals)


River Crane 2015
gudgeon
n = 53
Number of fish
Length class (5mm intervals)


River Crane 2014
roach
n = 7
Number of fish
Length class (5mm intervals)


River Crane 2015
roach
n = 8
Number of fish
Length class (5mm intervals)


River Crane 2014
eel
n = 2
Number of fish
Length class (5mm intervals)


River Crane 2015
eel
n = 1
Number of fish
Length class (5mm intervals)

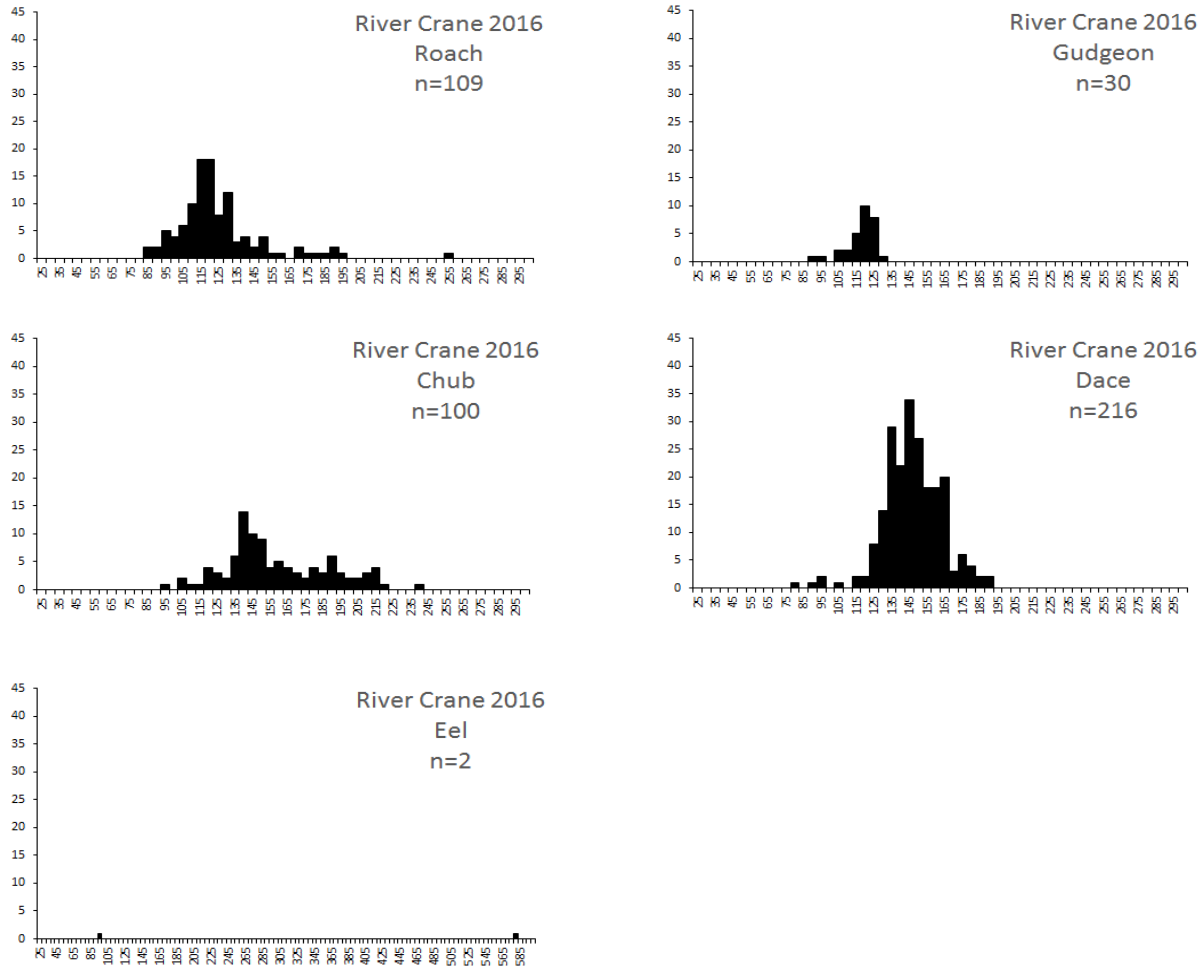


Figure 4: Length frequency histograms for fish species captured during the 2016 survey of the River Crane and comparative length frequencies from 2015 & 2014.

Discussion

Results of the 2016 survey of the River Crane suggest that fish populations have almost recovered from the pollution events. The effects of two successive stockings of chub, dace, roach and barbel in December 2014 and December 2015, consisting cumulatively of in excess of 15,000 fish has no doubt assisted in this recovery.

Cranford Park is located upstream of the area affected by either the pollution event of 2011 or 2013. The site had been surveyed prior to this time, and its inclusion in our post-pollution monitoring was aimed at providing a continuum of the baseline data already collected, as well as an unaffected site against which the recovery of affected sites could be gauged. Fish populations when first surveyed in 2000 were far healthier than previous years, however 2016 results are now the highest recorded for biomass and density is very similar to the 2000 results. In recent years habitat quality for fish has deteriorated with the site now overgrown and heavily shaded limiting photosynthetic productivity. Better habitat for fish is to be found a short distance upstream of our site. In 2016 the catch consisted of 18 chub ranging in size from 128-240mm, 33 dace ranging in size from 126-193mm, 32 roach ranging in size from 99-258mm and 3 perch.

Density of fish >49mm was the highest to date at **Hounslow Heath**, and is in fact higher than prior to the first major pollution event of 2011. Dace were the most abundant species at the site with 135 captured during the course of the survey. The shallow, briskly flowing water over a clean gravel substrate found throughout the site provides habitat well suited to the species. The size of dace captured, averaging 145mm, suggests they are from previously stocked fish. In addition 42 chub, and 76 roach were captured, as well as naturally re-colonising gudgeon, pike, tench and eel. The site is open with limited cover, and this may limit its utilisation by other stocked species such as barbel.

At **Crane Park** results of surveys carried out between 2000 and 2010 suggest that the site previously supported the highest density, biomass and species diversity of the three sites surveyed. In 2010, the year preceding the first major pollution event, a total of 12 fish species including minor species were captured. The 2016 results suggest that density of fish >49mm has declined slightly from the previous year and is about a third of the levels prior to the pollution events. Species diversity has increased compared to the previous year with the additional presence of roach and eels, but is still lower than pre- pollution levels. The 2014 survey also revealed evidence of natural recruitment of chub occurring in the vicinity of the site with 83 juvenile chub with a mean length of 45mm captured. Due to the inefficiency of electric fishing as a capture method for fish of this size and the related difficulty in obtaining accurate population estimates, they are not represented within the results shown in Figures 2 and 3.

Although density results suggest signs of recovery at Crane Park, biomass still falls some way short of pre-pollution levels, and is indicative of the fact that those fish present are predominantly young stock fish. Biomass at Crane Park and Hounslow Heath was heavily influenced by the presence of large individuals of species such as chub. The recovery of fish stocks to include larger individuals will occur naturally over time as stocked fish grow on. However the biomass results for the other two sites is the highest ever recorded, which would suggest that these sites have fully recovered from the pollution events.

Table 2 details the abundance of minor species at each of our sites on the River Crane. The fact that these species are both small and can be incredibly abundant, means that obtaining accurate quantitative population estimates can be extremely difficult. As such log abundance estimates of numbers are instead recorded. The ability of these species to rapidly re-colonise is clear. At both Hounslow Heath and Crane Park estimated abundance of minor species had returned to, or exceeded, pre-pollution event levels within a year. Booming populations of minor species may occur in response to a reduction in populations of larger cohabiting species, and the pressures from predation and competition that they may exert.

Figure 4 details length frequency histograms for fish species captured in 2016, and comparative length frequency histograms from the surveys in 2015 & 2014. The increase in gudgeon which have not been stocked is particularly encouraging, whilst numbers of dace captured has increased significantly. For chub the large numbers of juveniles captured in 2014 were not replicated in 2015, however the total numbers caught significantly increased this year showing a healthy range of sizes. Roach numbers have increased from 8 to 109 individuals ranging in size from juveniles to large individuals of 258mm.

Barbel which have been stocked over the last two winters have not featured in any of our surveys. The habitat found within our survey sites is likely to be the main reason for this, with Hounslow Heath and Crane Park offering little in the way of cover, with areas of river providing greater depth of water and increased cover from submerged macrophyte beds and riparian vegetation likely to be sought out by the species during its juvenile life stage.

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