Fish Populations of the River Tyne Catchment 2009 - 2013

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Cover Photograph: Birns Water

The River Forth Fisheries Trust is a registered Scottish charity with a remit to conserve and enhance all species of freshwater fish and their habitats in the inland and coastal waters of the Firth of Forth, and to promote environmental education throughout the catchment

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INTRODUCTION

The East Lothian Angling Association (ELAA) has instigated regular electrofishing surveys of the River Tyne over the last nine years. In 2005 and 2007, the Clyde River Foundation carried out surveys of the lower main channel (Yeomans *et al*., 2005; 2008), and then in 2009 was commissioned by ELAA to carry out a comprehensive survey of thirty sites throughout the main channel and tributaries (McColl *et al*., 2009). This work was funded by an 'Awards for All' grant secured by ELAA.

In 2011 and 2013, the River Forth Fisheries Trust (RFFT) worked with the ELAA to continue with the electrofishing survey work and to build up the picture of the fish communities across the catchment. Eight sites were surveyed in 2011 and 21 sites in 2013. This report details the survey work carried out by the RFFT and ELAA in 2011 and 2013. Reference is also made to the 2009 survey carried out by CRF for the purposes of interpretation of the medium term patterns of distribution.

The years of electrofishing work have provided a baseline spatial survey of the fishery resource across the River Tyne catchment.

Electrofishing the Bearford Burn at Morham

METHODS

Electrofishing was carried out using an Electracatch WFC11 backpack unit powered by 2 twelve volt lead acid batteries and typically generating at 200v. Smoothed DC was used for fishing for salmonids and all other species except lamprey. Pulsed DC was used for lamprey ammocoete survey. Fishing was carried out to current best practise and following Scottish Fisheries Coordination Centre (SFCC) protocols (SFCC, 2001). Water temperature and conductivity were measured before each survey using a Hanna hand held conductivity meter.

Timed electrofishing surveys were carried out in all cases. While timed surveys do not provide the salmonid density estimates that result from fully quantitative surveys, they have the advantage of being completed quickly, and without the use of stop nets, so that more sites can be included than would otherwise be the case. The data generated from timed surveys allows presence/absence to be reliably determined, and relative abundance can also be derived using the measure of catch per unit effort (CPUE), in this case, number of fish caught per minute.

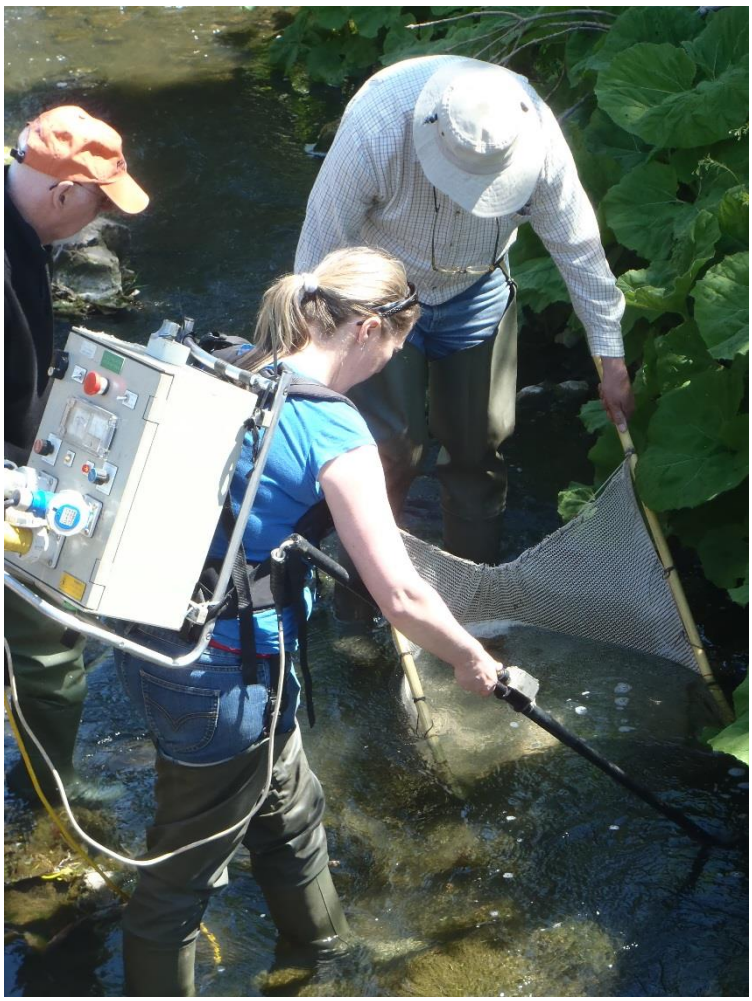
When deposits of organic silts were encountered, the power supply was switched to pulsed DC and a short lamprey ammocoete survey carried out. This involved hovering the activated anode over the deposit for 30 seconds followed by 30 seconds off. The process was repeated two or three times to draw the lamprey out of the sediments. Where possible, lamprey were caught in a small hand net, or if this was not possible, they were counted and recorded as visual sightings. Presence/absence was the only measure determined for lamprey ammocoetes.

Captured fish were anaesthetised using a weak solution of Benzocaine dissolved in ethanol. They were then identified and fork length measured to the nearest mm.

Eel from the Kinchie Burn

The RFFT provided the required electrofishing equipment, and the biologist managed the survey work. Without assistance from ELAA volunteers, none of this work could have been possible.

The 2011 survey was carried out on the 21st, 22nd and 23rd August, with the help of four volunteers from the ELAA. The 2013 survey was carried out over eight days between 22nd May and 21st June, with the assistance of no fewer than ten volunteers from the ELAA.



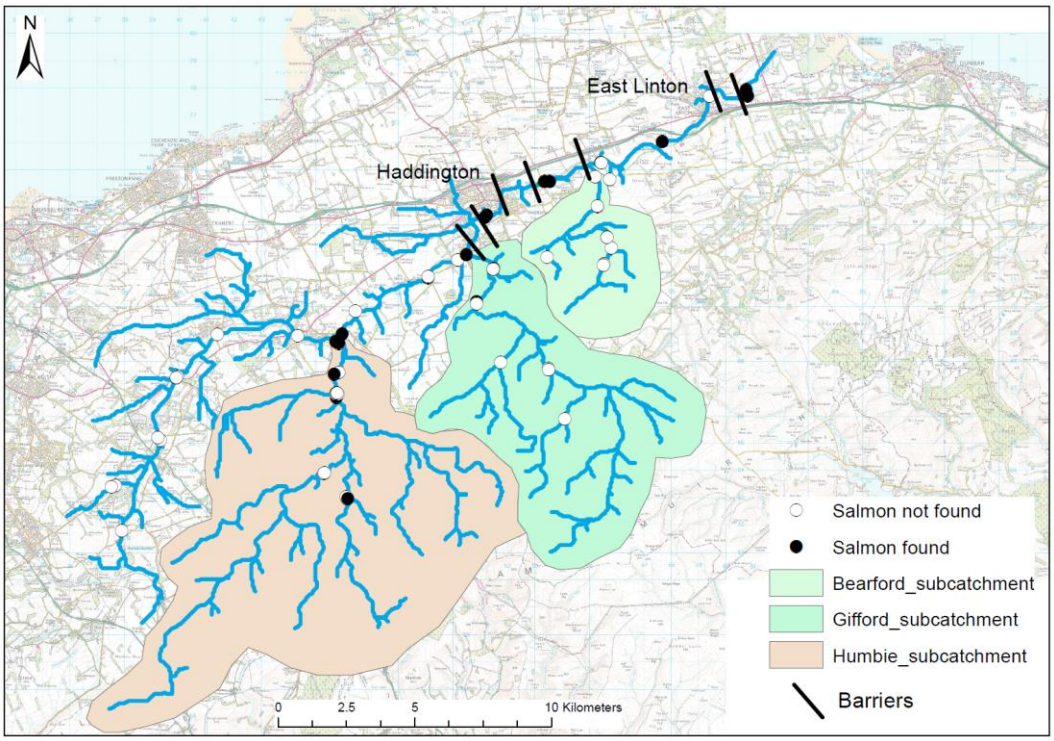
Electrofishing in the Kinchie Burn

RESULTS

Salmon distribution 2009 - 2013

Map 1 shows the distribution of juvenile salmon found during the three surveys of 2009, 2011 and 2013. The data has been amalgamated across the three years to give a broad, medium term picture of salmon distribution across the catchment. In the following pages, further maps show the results broken down by year and population status so that temporal comparisons can be made.

Map 1 – Presence / absence of salmon at each survey site in 2009, 2011 and 2013 (amalgamated data), locations of major barriers and the three main subcatchments of the system



Map 1 shows that juvenile salmon have been found on the main channel as far upstream as the confluence with the Humbie Water (near Pencaitland). To reach this point, seven man-made structures must be ascended. This indicates that at least some adult salmon are able to penetrate this far up the system, and that the barriers do not cumulatively form a complete obstruction to migration. However, it should be noted that juvenile salmon distribution in the tributaries and the main channel upstream of the barriers is very limited, indicating potential limits to productivity such as lack of favourable habitat or very limited access (so that only a small number of fish access the areas).

No juvenile salmon were found anywhere in the Bearford Burn subcatchment during any of the surveys. This is despite the subcatchment lying quite far downstream on the River Tyne, at a location that we know to be accessible to salmon (with only two of the partially passable barriers located downstream).

On the Gifford Water, salmon were only found at two sites located very near the confluence with the main channel, at Bolton and Lennoxlove. These salmon were found during the 2009 survey only, and subsequent survey of the same sites did not repeat this success. Currently, there is no indication

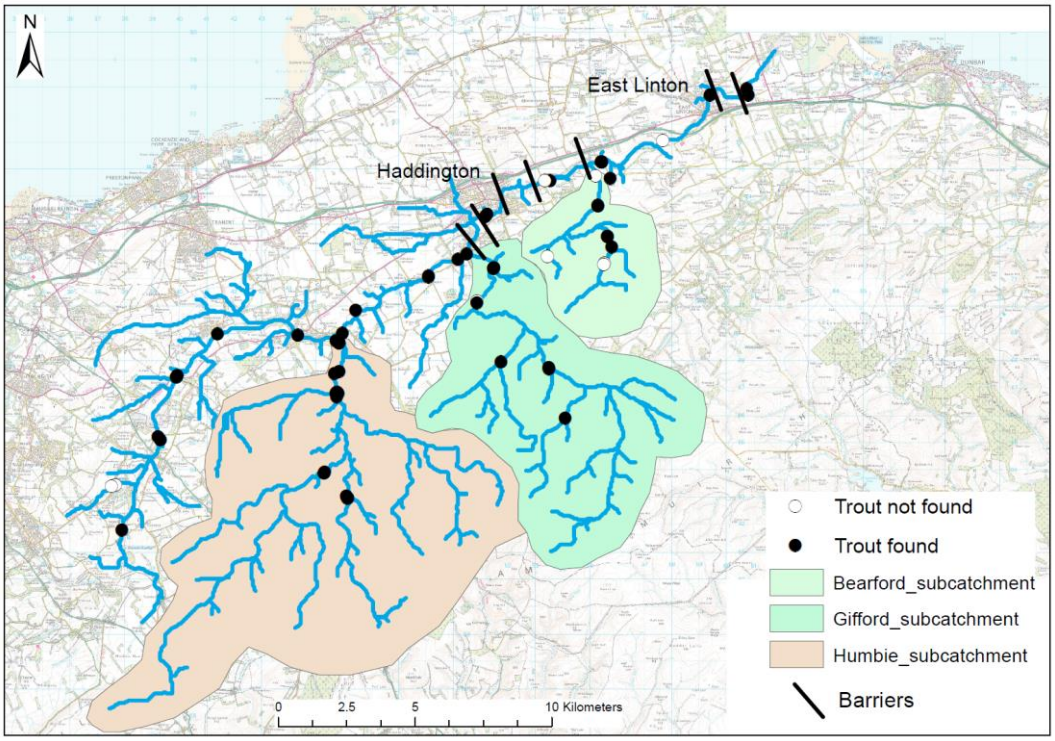
that salmon access the Gifford Water upstream of Bolton. Three sites upstream were surveyed in 2009 and again in 2013, and no salmon were found on either of the two occasions.

On the Humbie Water, the most upstream of the major subcatchments, salmon have been found at three sites in and around Saltoun. In addition, during the 2013, one salmon parr was found as far upstream as Humbie Mill. This site was surveyed in 2009 and 2011, and no salmon were found. It was previously thought that salmon did not penetrate upstream as far as Humbie Mill, but clearly, salmon do occasionally travel this far. Humbie Mill is the most upstream point that electrofishing surveys have shown salmon to access.

Trout distribution 2009 – 2013

Map 2 shows the distribution of brown/sea trout across the River Tyne catchment during the 2009, 2011 and 2013 surveys (amalgamated data). Of the 61 survey sites visited since 2009, the vast majority had brown trout present. Only eight sites did not result in trout being found. Two of these were on the Vogrie Burn, one in 2009 and one in 2011. The Vogrie Burn has been observed to be almost devoid of fish and invertebrates at the sites surveyed. The factors causing this have yet to be identified. Two survey sites downstream of Haddington on the main channel also turned up no trout, but this is most likely due to the suitability of the habitat and flows within the survey sites. Four survey sites on the Bearford Burn did not find any trout. From observations at the site, it would appear that this is very likely to be due to habitat destruction following excessive siltation.

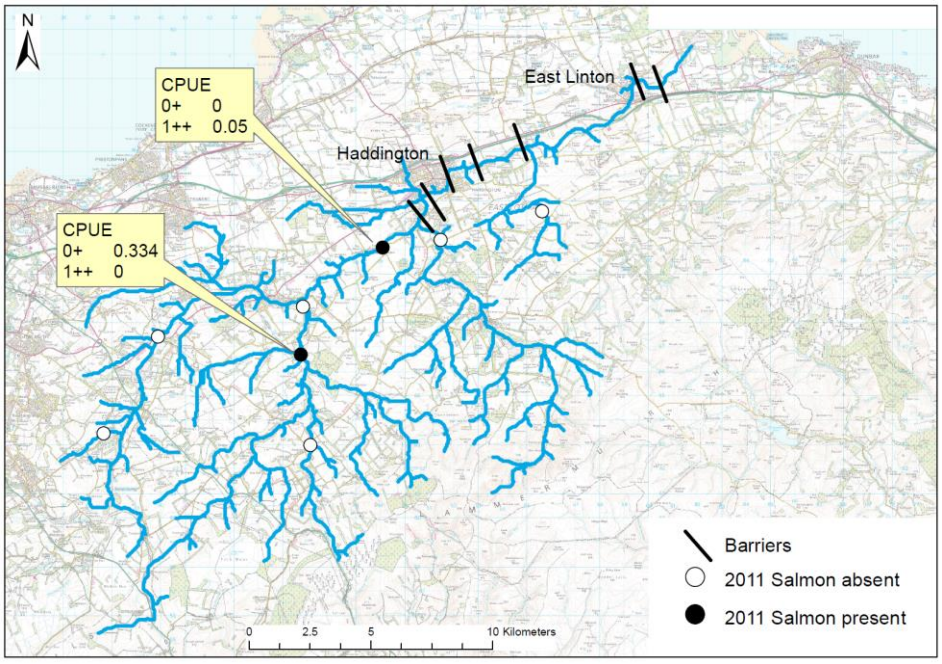
Map 2 – Presence / absence of brown trout at each survey site in 2009, 2011 and 2013 (amalgamated data), locations of major barriers and the three main subcatchments of the system



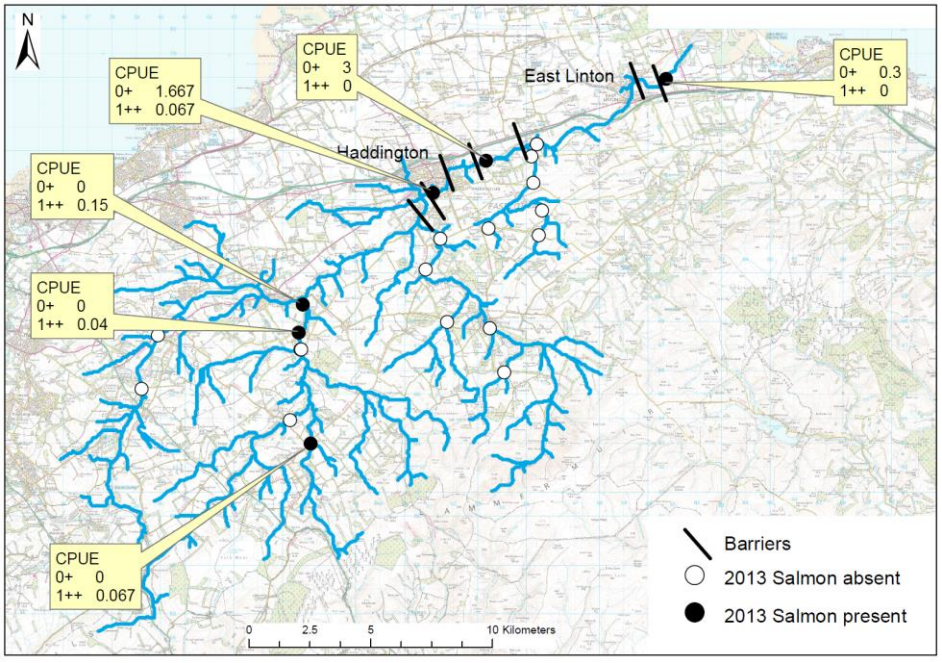
Salmon relative abundance 2011 and 2013

Map 3 and 4 show the CPUE for salmon fry and parr in 2011 and 2013 respectively. The general picture here is one of missing year classes and low numbers of fish being caught. Of the six sites in 2013 at which salmon were found, only one had both fry and parr present. The other five sites were missing one or other year class. This suggests sporadic access to spawning adults or lack of suitable spawning or juvenile habitat. Similarly, of the two sites at which salmon were found in 2011, neither had both fry and parr present in the sample.

Map 3 – Catch per unit effort (CPUE) for juvenile salmon at 2011 survey sites. CPUE is divided into two year classes: 0+ (this year's fry) and 1++ (all parr older than 0+)



Map 4 – Catch per unit effort (CPUE) for juvenile salmon at 2013 survey sites. CPUE is divided into two year classes: 0+ (this year's fry) and 1++ (all parr older than 0+)

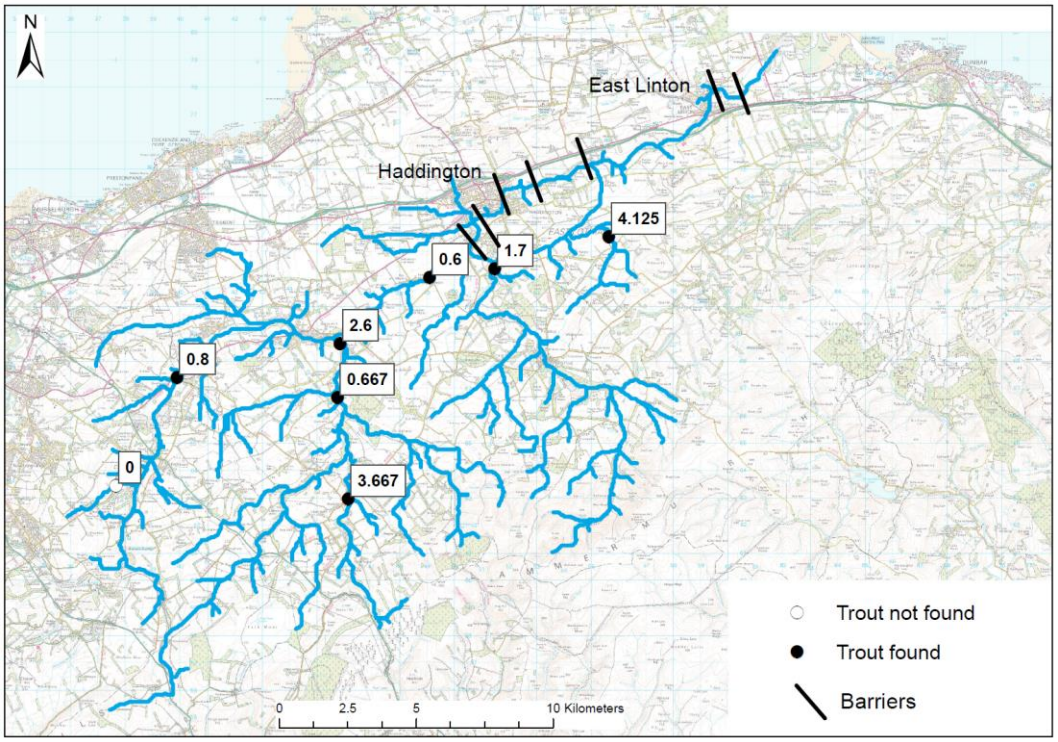


Trout relative abundance 2011 and 2013

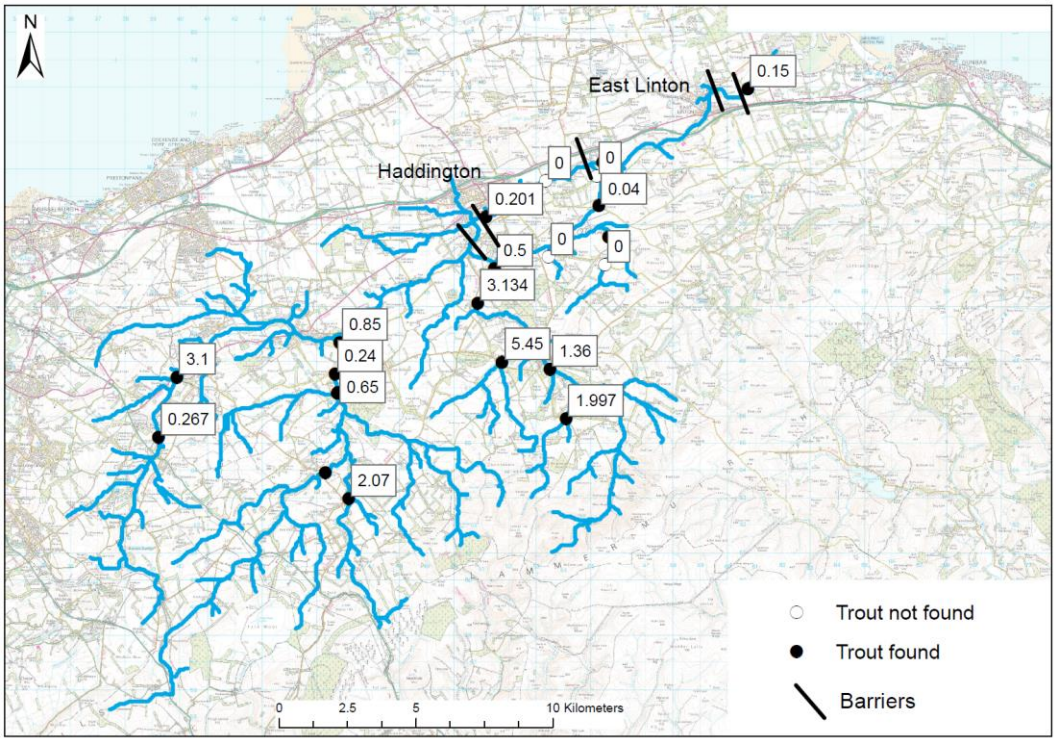
The relative abundances of trout (fry and parr) for the 2011 and 2013 surveys are shown in Maps 5 and 6 respectively. Some of the highest numbers of trout were found (surprisingly) on the Bearford Burn at Morham Church. This is true for both 2011 and 2013. The section of Burn at Morham is of very good quality, with enough gradient to keep the substrate clear of silt. There are several other sites on the Bearford Burn where no trout were found, and the habitat was sub optimal due to excessive siltation.

The Humbie Water and Gifford Water also had several sites with high numbers of trout, indicating reasonably good habitat and water quality. Numbers on the main channel were more variable. This could depend upon the suitability of the site surveyed for juvenile trout as there are areas on the main channel where the river is too deep and / or silty to support juvenile salmonids.

Map 5 - Catch per unit effort (CPUE) for juvenile trout at 2011 survey sites. CPUE is the combined total for fry and parr



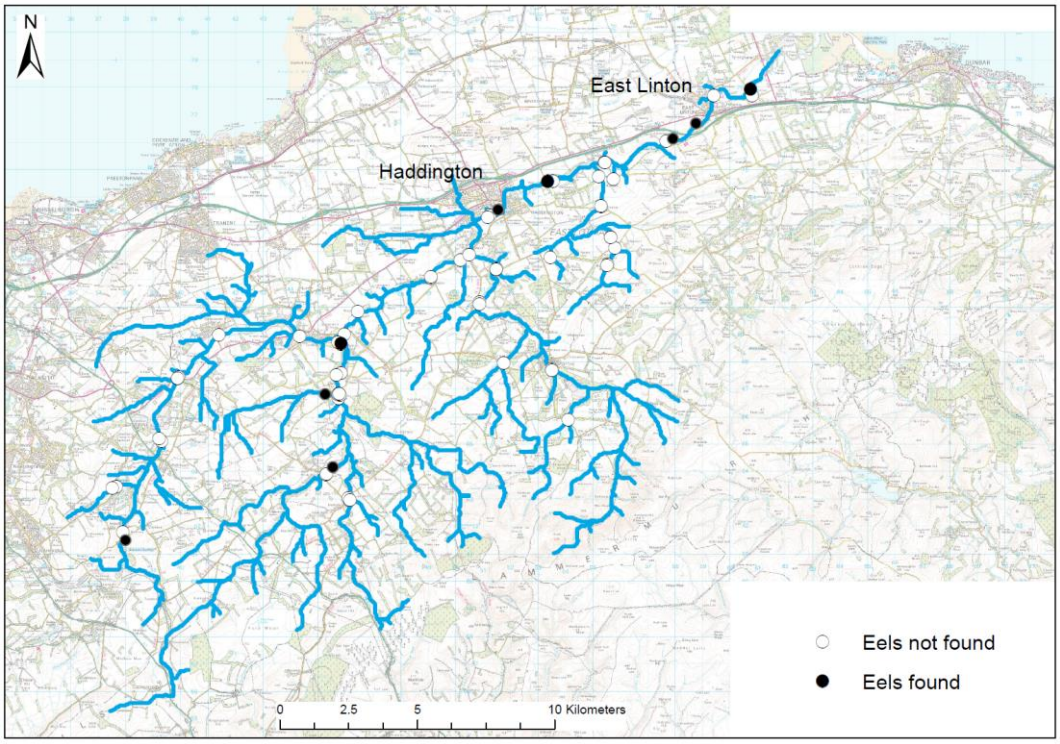
Map 6 - Catch per unit effort (CPUE) for juvenile trout at 2013 survey sites. CPUE is the combined total for fry and parr



Eel distribution 2009 – 2013

Eels were found at seven sites during the 2009 survey and three sites in 2013. No eels were found at any of the 8 sites surveyed in 2011. The distribution of eels is shown in Map7. Eels were found at sites on the main channel and the Humbie Water, but absent from the Gifford Water and Bearford Burn.

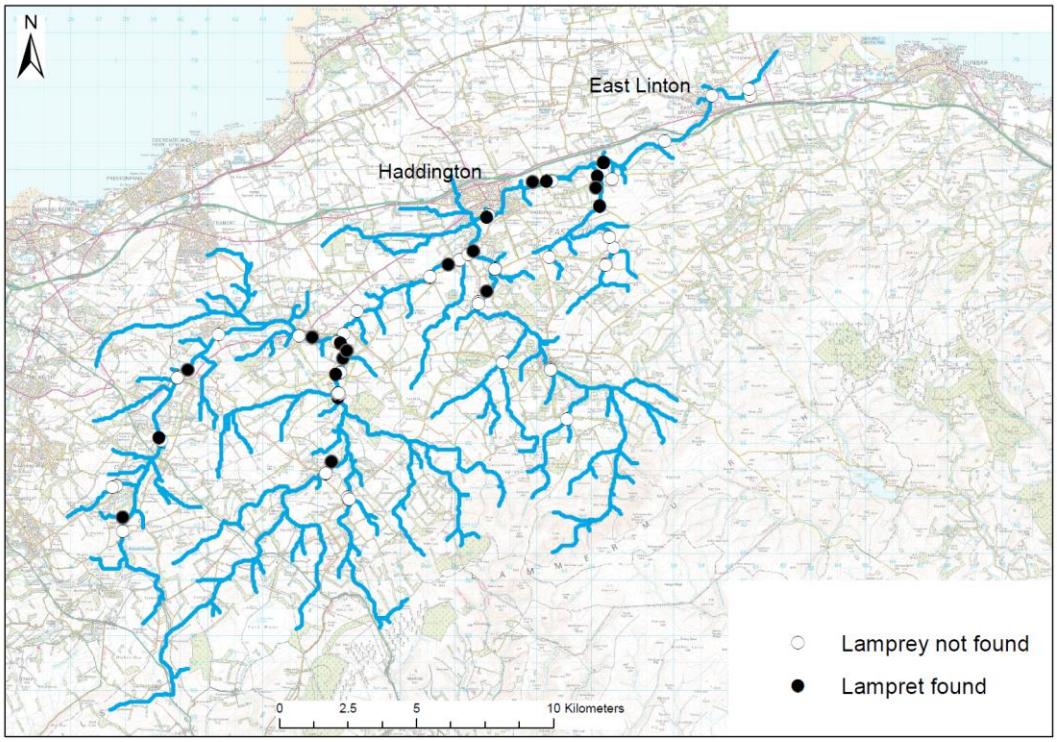
Map 7 – Distribution of eels in the River Tyne catchment, 2009 – 2013 (amalgamated data)



Lamprey distribution 2009 – 2013

Lamprey were found at 11 sites in 2009, one site in 2011 and seven sites in 2013. As with eels, lamprey are well distributed in the main channel and the lower Humbie Water, but absent from most of the Gifford Water. Aside from the very lowest sections, lamprey are poorly distributed on the Bearford Burn.

Map 8 – Distribution of lamprey in the River Tyne catchment, 2009 – 2013 (amalgamated data)



DISCUSSION

Salmon

During the 2009 survey, of the 30 sites studied, salmon parr (1++) were found at only one place (West Mill, Haddington). Salmon fry, however, were found at ten sites, primarily on the main stem from East Linton to Pencaitland. The subsequent surveys in 2011 and 2013 found a broadly similar distribution of salmon fry on the main stem. Salmon were generally absent from the Bearford Burn and the Gifford Water, but present in the lower reaches of the Humbie Water, as far upstream as Humbie Mill. The results of all of the surveys show that salmon would appear to be absent from the main River Tyne channel upstream of Pencaitland.

The results show that the seven barriers on the main stem are not cumulatively completely impassable to migratory salmonids, but they do appear to be severely restricting salmon distribution within the upper catchment. It is not clear why salmon should be absent from the main channel upstream of Pencaitland (and this has consistently remained the case across the survey years). There is suitable habitat, and there is no evidence that water quality is an issue. The suggestion is therefore that the barriers are partially impassable to the extent that they do not allow enough adults to reach the upper channel and make use of all the available habitat. If the barriers were to be eased and made more passable, therefore, it may reasonably be expected that there would be a substantial improvement in habitat utilisation and hence productivity within the salmon population.

Salmon do not seem to do very well in the tributaries of the River Tyne. Juveniles were found only in the lower reaches of the Humbie Water, and were absent from the Gifford Water and Bearford Burn. It is not clear why this should be the case in the Gifford Water, where there is access, suitable habitat and reasonable water quality. The Bearford Burn suffers from excessive siltation, and so there has been much habitat destruction in the subcatchment, making it unsuitable for salmonids to spawn in.

Excessive siltation in the Bearford Burn following rain

Trout

Brown trout are distributed ubiquitously throughout the catchment, and were present at the vast majority of survey sites over the years (53 of 61 sites had trout present). Many of the negative sites were located in the Bearford Burn which has already been identified as subject to severe habitat loss due to siltation, and the Vogrie Burn in the upper catchment which, for reasons as yet unknown, seems to struggle to support fish and invertebrate life.

Some of the highest catches of trout were obtained in the Gifford Water, supporting the suggestion that habitat and water quality within the subcatchment are suitable for supporting salmonids. Perhaps the absence of salmon contributes to higher numbers of trout being able to survive here, in which case it would be of interest to examine further why salmon should be absent from this river.

Eels and lamprey

Both of these species are reasonably well distributed in the River Tyne catchment, although not always in particularly large numbers. The distribution of both seems to follow that of salmon i.e. present in the main channel and the lower Humbie Water, but absent from the Gifford Water and Bearford Burn. In addition, there is one telling difference in their distribution compared to that of salmon. Eels and lamprey are present at several sites in the upper main channel (particularly lamprey) where salmon were not found. This suggests that the upper river is of good quality and can support sensitive fish species, and points to restriction of access as a plausible reason for the lack of juvenile salmon in this area.

Conclusions

- Salmon productivity appears to be negatively impacted and restricted by the presence of the seven barriers on the main channel of the River Tyne. Salmon have consistently been absent from the main channel upstream of Pencaitland.
- The Bearford Burn has experienced habitat loss due to excessive siltation with the result that the salmonid population has been decimated. The subcatchment would benefit from a silt management plan.
- The Gifford Water does not support salmon, lamprey or eels, but has a strong trout community. It is not clear why this should be the case.
- The lower catchment of the Humbie Water supports salmon, trout, eels and lamprey. Less is known of the upper reaches of the river, and would benefit from survey work in the future.

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