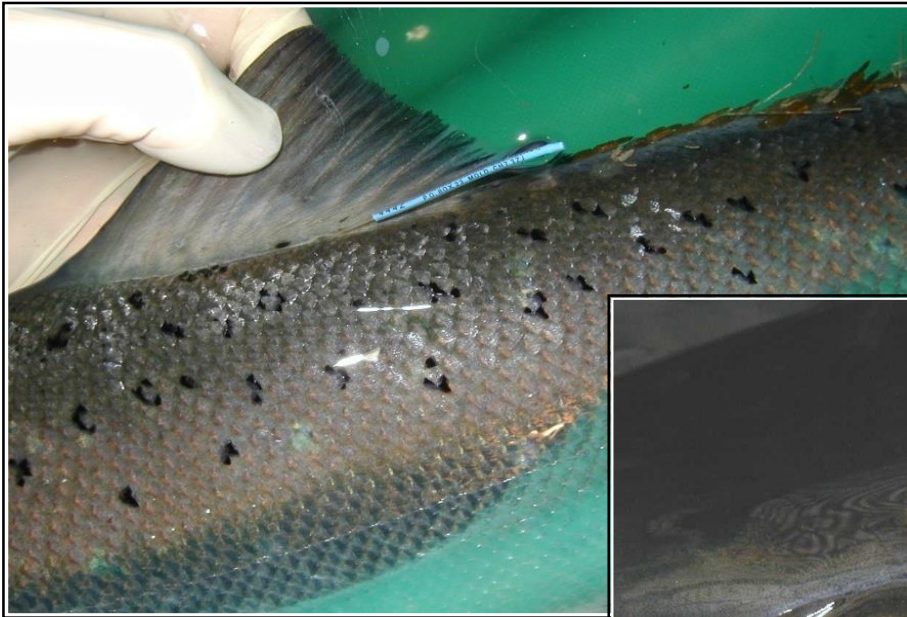


DEE STOCK ASSESSMENT PROGRAMME
ANGLER REPORT 2014



Cyfoeth Naturiol Cymru
Natural Resources Wales

Front cover: Trout parr and smolt.



Photos: Floy tagged salmon and VI (Visible Implant) tagged sea trout.

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1. Introduction

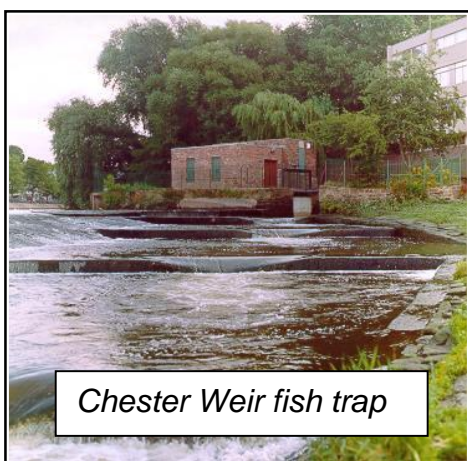
This report summarises provisional findings of the Dee Stock Assessment Programme (DSAP) and related work for 2014.

It is the second of these reports produced by Natural Resources Wales (NRW) – the organisation which, since the 1st April 2013, has taken on the duties of the Environment Agency in Wales (along with the Countryside Council for Wales; the Forestry Commission Wales and some functions of Welsh Government).

2. Trapping and tagging at Chester Weir

Trapping and tagging of adult salmon and sea trout at Chester Weir have been carried out since 1991 to (i) estimate the total run of fish returning each year and (ii) collect information on their biology (e.g. age, size, sex, general condition). Combining this information allows individual generations of fish to be followed through time and is used to help improve our understanding of the factors affecting survival and abundance and inform our management in the widest sense (local, national and international).

Very few rivers have facilities (counters or traps) to estimate the numbers of salmon or sea trout returning each year. Out of more than 60 principal salmon and sea trout rivers in England and Wales (E&W), only 10 provide run estimates for salmon of which just 6 produce the same estimates for sea trout. Among these rivers, only four - (the so called 'Index Rivers': Tyne, Tamar, Dee and Lune) also collect biological information via trapping or fishery based sampling programmes. The Dee is the only river in Wales in the group of 10 counted rivers and has the longest running programme among the Index Rivers.



Chester Weir fish trap

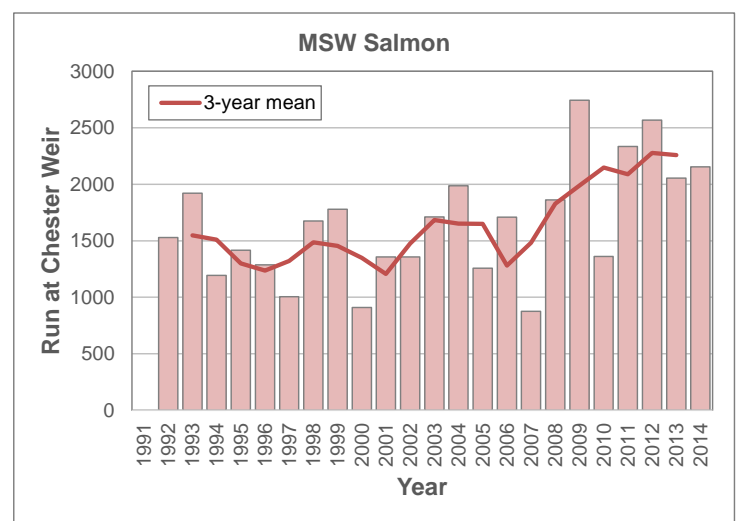
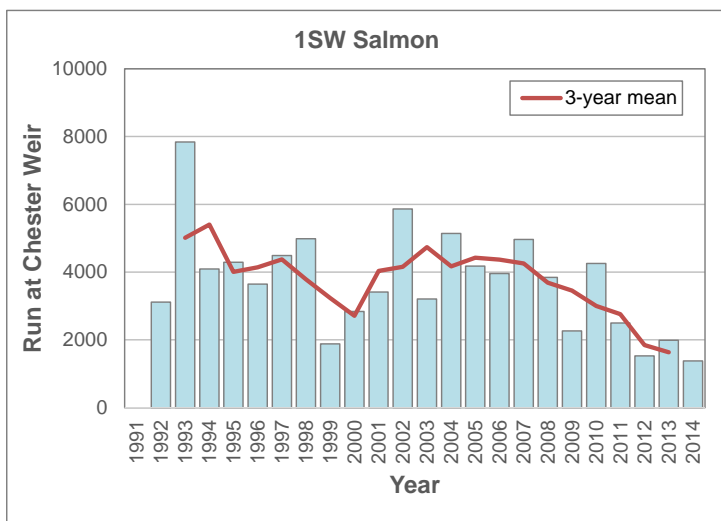
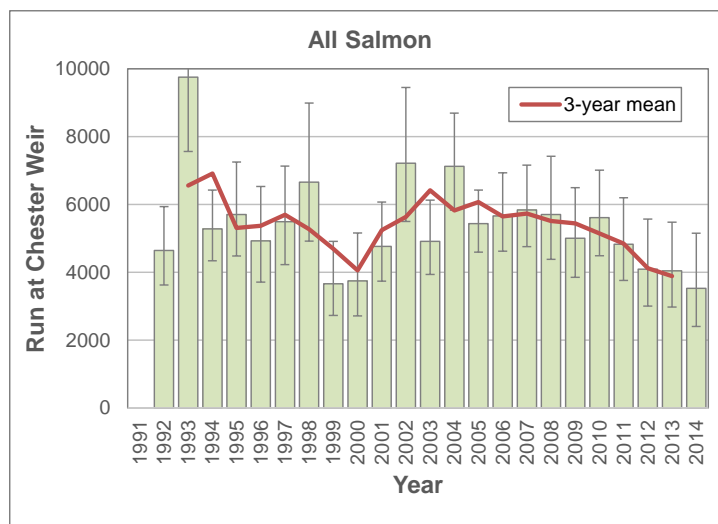
Trapping at Chester Weir is carried out throughout the year (Jan-Dec) but not continuously. When the trap is not being fished (around 40% of the time) it becomes an open channel through which fish can freely pass. For this reason, and because fish are able to cross the weir and bypass the trap in high flows and on big (~9m) tides, the trap is a partial one. Tagging and recapture estimates (below) indicate that, on average, 20-30% of the run is trapped at Chester.

Virtually all salmon and the majority of sea trout captured at Chester Weir are tagged using Floy and VI (Visible Implant) tags, respectively (see photos on inside front cover). In both cases, run estimates require a second catch from which the ratio of tagged to untagged fish can be obtained. For salmon, this relies on anglers reporting the tagged and untagged fish they catch in the same year they were tagged. In the case of sea trout, however, (where, unlike

salmon, multiple spawners are common) the second catch takes place back at Chester Weir trap one year after tagging. In both instances, the ratio of tagged to untagged fish in the second catch is used to raise the total number tagged to obtain a run estimate. For example, if 1,000 salmon were tagged at Chester Trap, and 1 in 5 of the salmon caught by anglers were tagged, then it is assumed that 1/5th of the run has been tagged – producing a run estimate at Chester of 5,000 fish.

A £7 cash reward is offered to encourage anglers to report any tagged salmon they catch. This reward is increased to £14 for anglers who returned a logbook in the previous season. The reason for this is that records of tagged and untagged salmon submitted by logbook anglers are considered the most reliable - simply because of the effort required to maintain a detailed record of each fishing visit. Hence, only the catch and recapture details from logbook anglers are used to generate salmon run estimates.

Fig. 1 Annual run estimates for salmon at Chester Weir, 1992-2014
(error bars indicate 95% confidence intervals)



The run of salmon entering the Dee after the end of the angling season (on average less than 10% of the total) is derived from the trap catch and an estimate of trap efficiency from the in-season period.

3. Dee Salmon in 2014

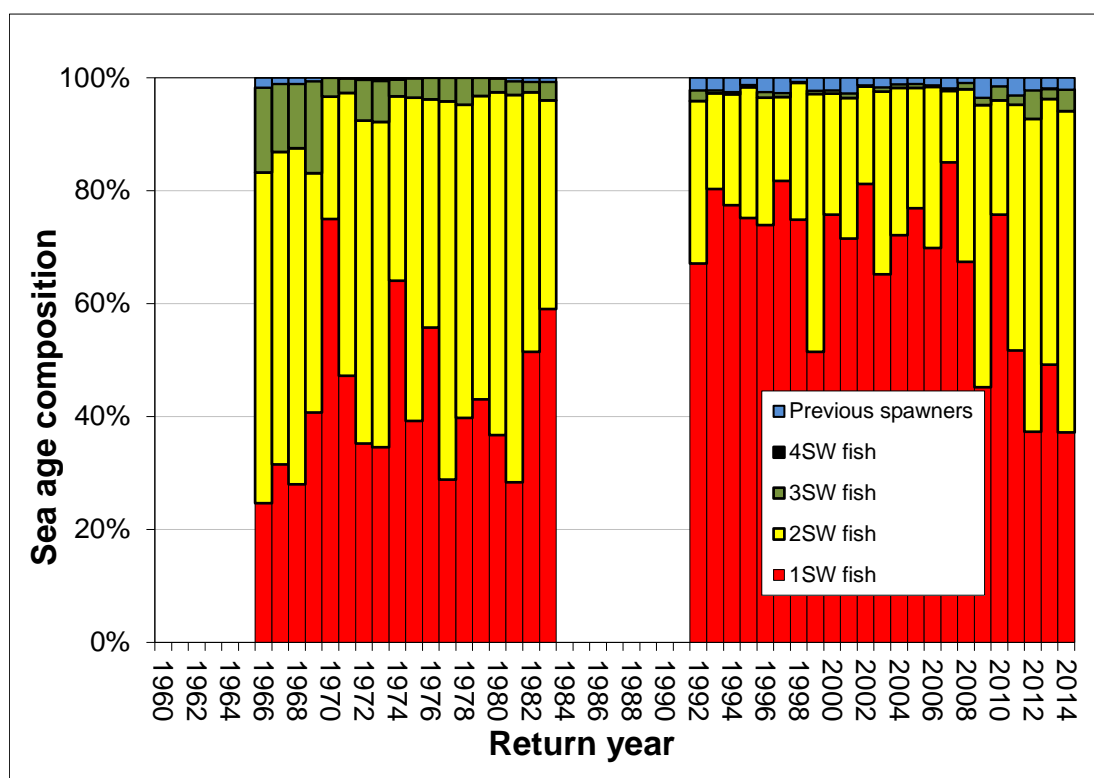
Run size and composition: Provisional results indicate a run of 3,530 salmon (fish of all sea ages) at Chester in 2014; this is the lowest to date and almost 2,000 fish below the long-term average (Fig. 1). The corresponding trap catch in 2014 was 523 fish.

Figures for the Dee run as a whole indicate a worrying decline since the mid-2000s – a pattern evident on many of the counted rivers in E&W (the salmon run estimate on the Lune, for example, at just under 3,500 fish in 2014 was the second lowest in a 26 year time-series and around 50% of the long-term average).

This decline on the Dee (and elsewhere) appears to have been driven by a marked fall in the return of 1-sea winter (1SW) salmon or grilse. Grilse have dominated the Dee run (~75%) for most of the last 20+ years but are now present in near equal proportions to multi-sea winter (MSW) salmon (the latter principally 2SW fish – Fig. 2).

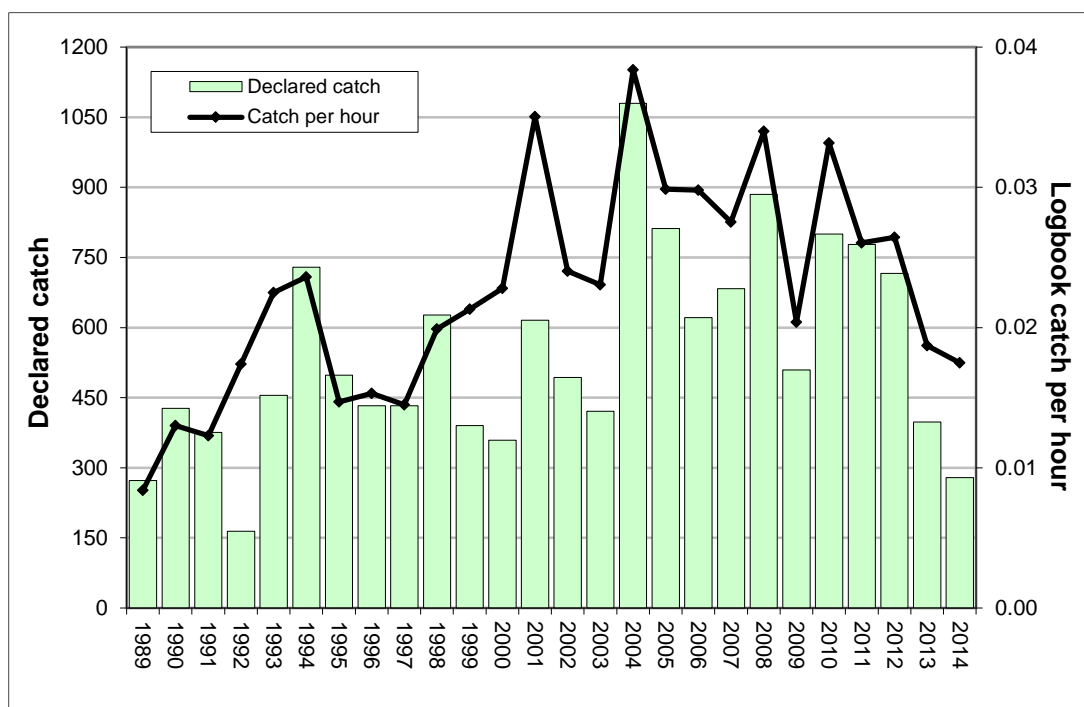
This change corresponds to a grilse return of under 2,000 fish in each of the last 3 years compared to long-term average of close to 4,000 (Fig. 1). In contrast, the estimated return of MSW salmon has been increasing since the mid-2000s – from an average of ~1,500 fish to over 2,200 in the last three years.

Fig. 2 Sea age composition of the Dee salmon run, 1966-2014



Rod catch: Licence returns to date indicate a declared rod catch of 279 salmon. Excluding 1992 - when the introduction of a single national licence meant catches were significantly underreported, this was the second lowest catch in records going back to 1951 (catches of 273 fish were declared in 1984 and 1989). Catch per hour figures from logbook returns reflect the poor catch in 2014 (Fig. 3).

Fig. 3 Declared salmon rod catch and logbook catch effort, 1989-2014

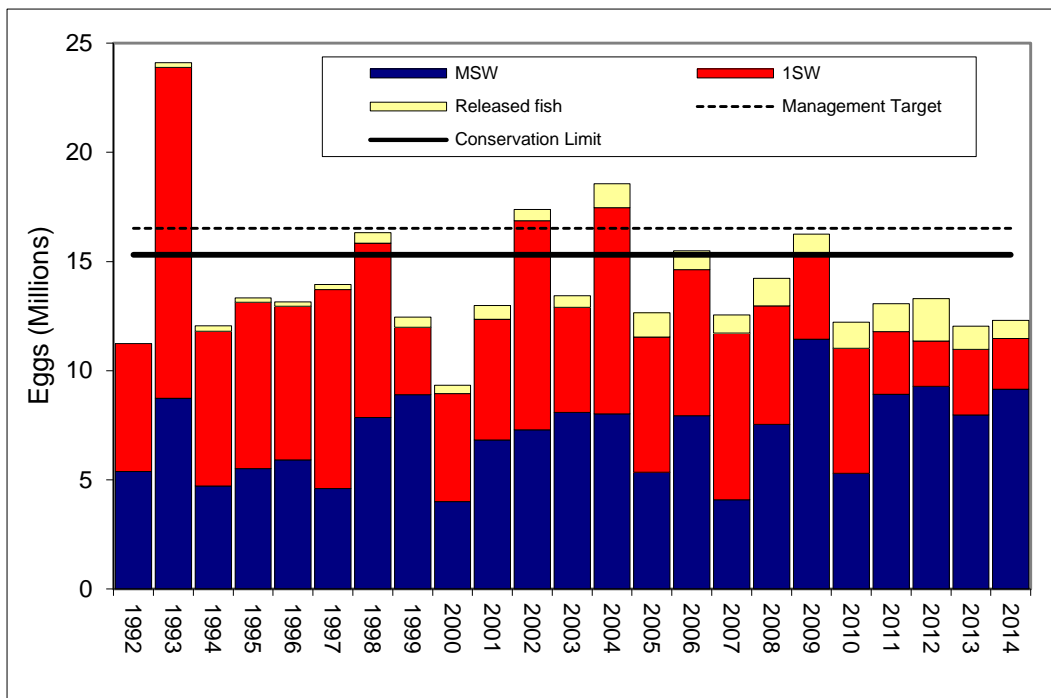


The salmon angling exploitation rate last season (i.e. the proportion of the total run caught) at 8.7% was the third lowest recorded. This was well down on the long-term average rate of 13% and even below the low rate of 10.8% recorded in 2013 when similarly dry conditions (also combined with a poor run of fish) made angling particularly difficult.

Of the 279 fish caught, 244 or 87.5% were released by anglers. This represents further improvement on last year's catch-and-release rate of 81.2% but remains below the 90+% target rate.

Spawning escapement: Estimates of the numbers of spawning salmon and the eggs they deposit are based on the run at Chester Weir minus losses to the rod fishery and other sources of mortality. They also take account of the sex ratio of returning fish sampled at Chester (as judged from external appearance – the ratio is usually close to 1:1) and their average size (which relates to their likely egg contribution).

Fig. 4 Salmon egg deposition, 1992-2014



The latest estimate of egg deposition for 2014 is 12.30 million eggs produced by around 3,200 spawners. More than 200 spawners were estimated to have been rod-released fish contributing around 830,000 eggs. For the fourth year running, egg deposition is below the Conservation Limit for the Dee of 15.3 million eggs and well short of the associated Management Target of ~17 million eggs (Fig. 4).

Compliance failure against the Conservation Limit clearly remains a concern on the Dee – and particularly as the river is a ‘Special Area of Conservation’ (SAC) for salmon (one of only 6 SAC rivers in Wales with salmon as a feature). However, salmon stocks on most rivers in Wales and many in England are in a similar position to the Dee with respect to Conservation Limit compliance - leading to more widespread concerns about the status of salmon stocks generally (concerns also expressed by neighbouring countries in the southern Atlantic sector).

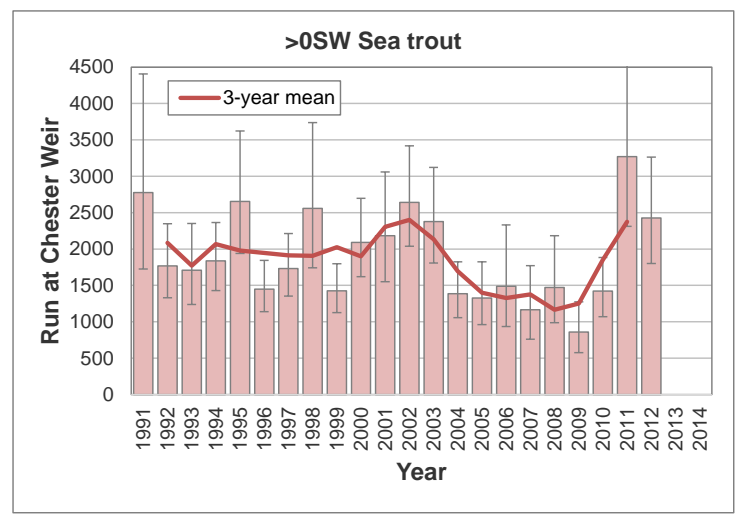
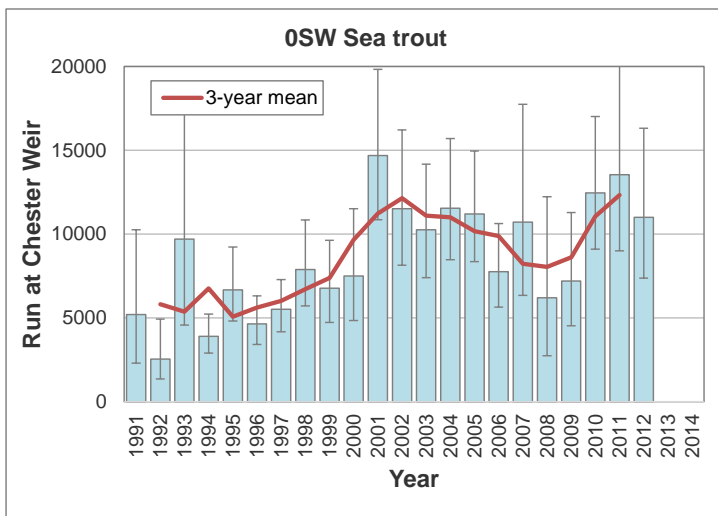
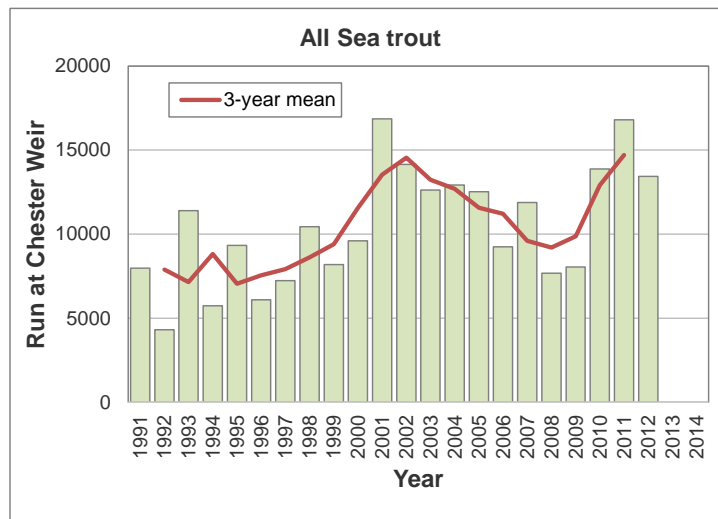
The situation has become particularly acute in recent years as marine survival rates appear to have fallen further and some of the biological characteristics of returning fish have been less than favourable (e.g. fish which are smaller and in poorer condition than in former times).

As a consequence, both Natural Resources Wales and the Environment Agency are considering options to further protect salmon stocks at what appears to be a critical time. For now, anglers on the Dee (as well as across Wales) are asked to continue improving C&R rates. In practice, on the Dee and many other rivers, this means aiming to release all salmon caught.

4. Dee sea trout in 2014

Run size: As described in Section 2, run estimates for sea trout on the Dee rely on the recapture of tagged fish back at Chester trap in the year after tagging - and so are 12 months behind those of salmon.

Fig. 5 Annual run estimates for sea trout at Chester Weir, 1991-2012
(error bars indicate 95% confidence intervals)



Separate run estimates are obtained for whiting (OSW) sea trout (i.e. fish which spend only a few months at sea and weigh around 1lb on their return) and older (>OSW) fish. Provisional estimates for 2012 are above the long-term average for both these groups at 11,002 for whiting and 2,427 for older fish (Fig. 5).

Whiting abundance has varied markedly over the years, reaching a peak of ~15,000 fish in 2001, followed by a general decline to just over 6,000 in 2008 (although numbers still remained above those recorded in most years in the 1990s). Since then, numbers appear to have been building again with an estimated return in 2010 of close to 12,500 fish – the second highest to date.

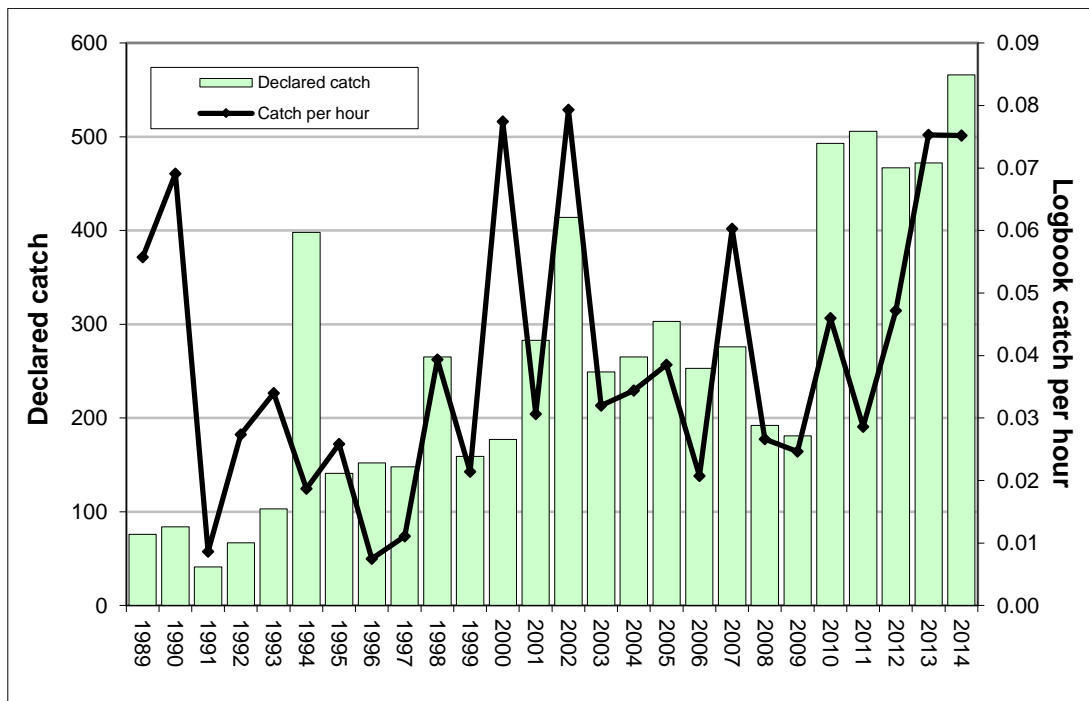
In comparison to whiting, the run of older sea trout has remained relatively stable over the last 20 years. After a period of gradual decline from the early 2000s, numbers have picked up sharply in the last couple of years.

Run estimates for 2013 are not yet available but catches of sea trout at Chester Weir in 2013 and 2014 were exceptionally good at 4,713 and 5,565 fish, respectively, the latter the highest total to date.

Rod catch: Provisional sea trout rod catch figures for the Dee in 2014 stand at 566 fish (with 483 released). This is the best sea trout catch on record (back to 1975) and continues a pattern of improved catch and catch per hour evident in the last few years (Fig. 6).

At present no national assessment method has been developed for sea trout equivalent to the Conservation Limit procedures in place for salmon. However, the performance of rod fisheries on all principal sea trout rivers in E&W is routinely examined using catch-effort data collected from the licence return. On this basis, no concerns have been raised about the status of the Dee sea trout stock.

Fig. 6 Declared sea trout rod catch and logbook catch effort, 1989-2014

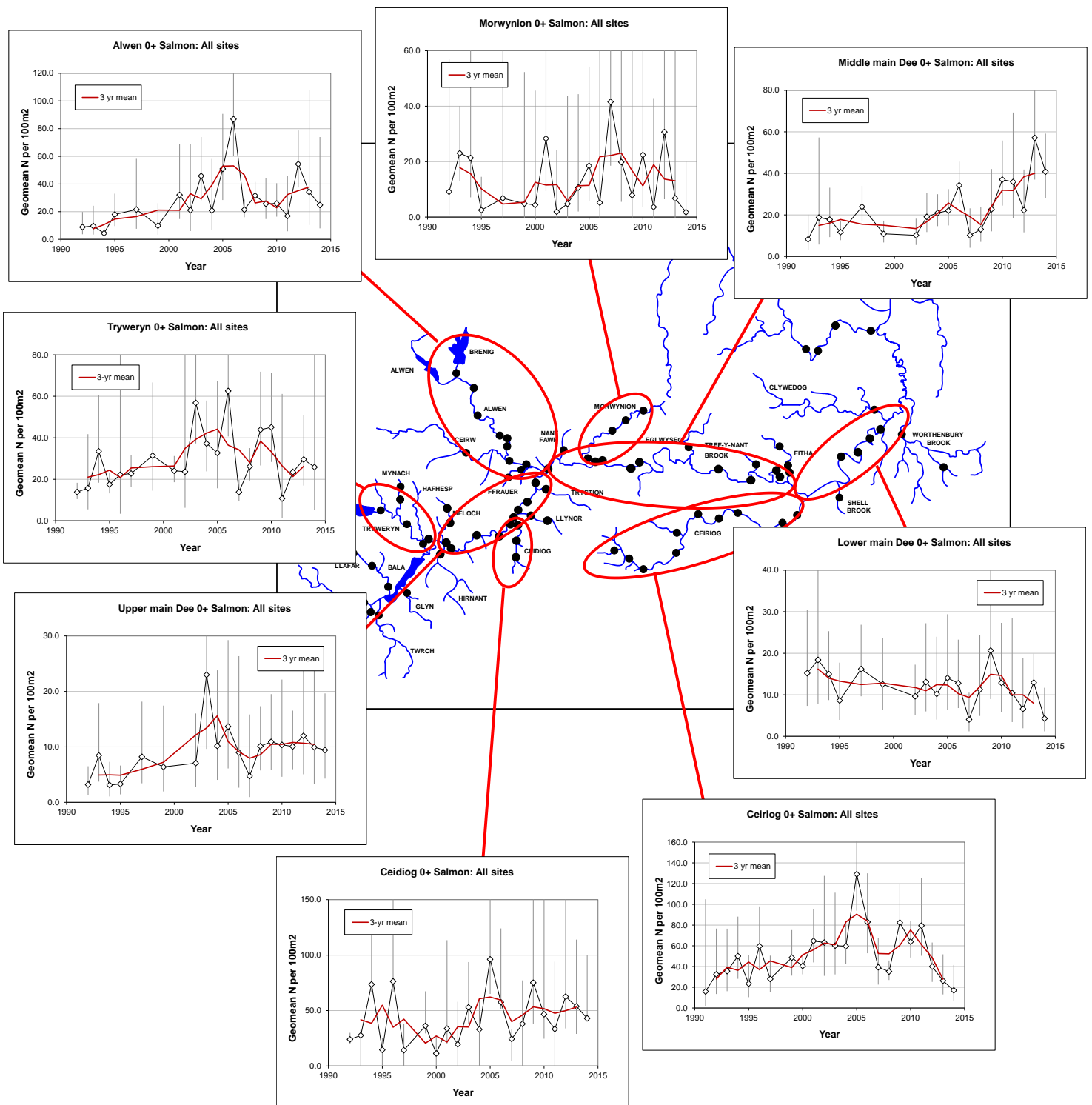


5. Juvenile salmon and trout

Timed (5-minute) electrofishing surveys targeting shallow riffle/run habitats are carried out at the same 80+ sites on the Dee each year to monitor the distribution and abundance of juvenile salmon and trout (Figs. 7 and 8).

Results from these surveys can be related to measures of adult spawner abundance or smolt output; help identify reaches where poor environmental quality or access may be the cause of under-performance; and provide information on the age and growth of juvenile fish.

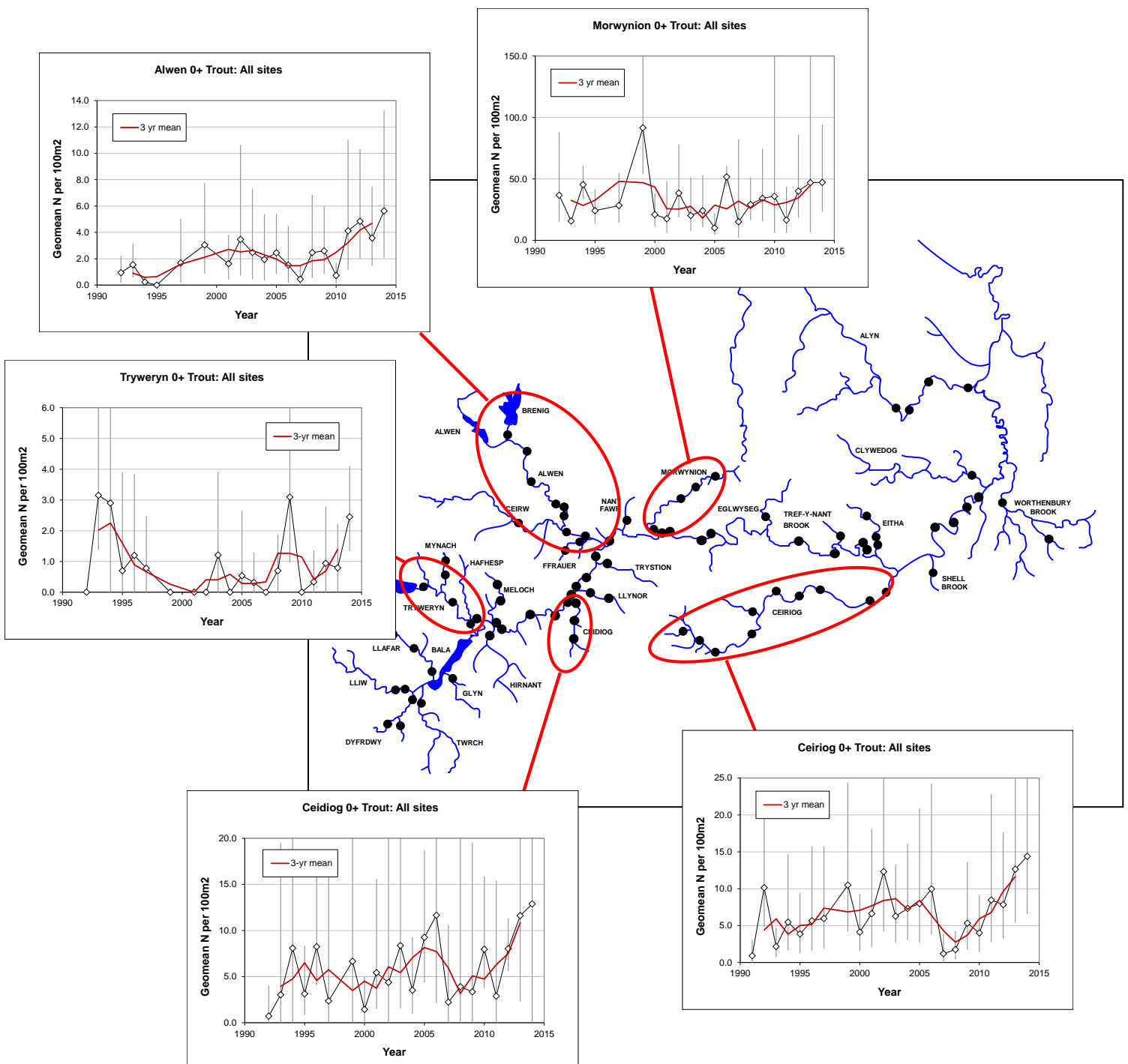
Fig. 7 Salmon fry abundance on the main Dee and tributaries, 1992-2014



For salmon fry (Fig. 7), the general pattern is one of peak abundances around mid-2000 followed by decline since, although on most river sections this has not been to the lowest levels seen in the earlier part of the time-series. The middle section of the main Dee – where fry abundance appears to be increasing – is a notable exception to this pattern.

For trout fry (Fig. 8), there are indications that densities on many tributaries have been increasing in recent years – similar to the pattern observed in adult returns at Chester. (No results are shown for trout fry on the main Dee as so few fish are caught in this wide river environment)

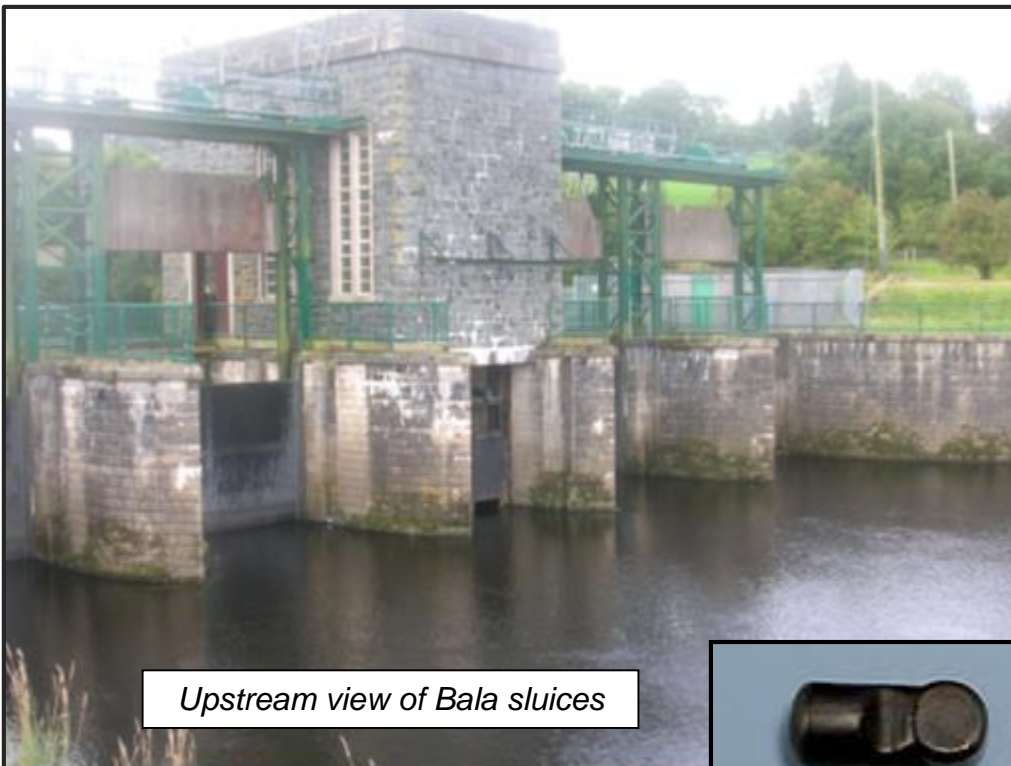
Fig. 8 Trout fry abundance on the Dee tributaries, 1992-2014



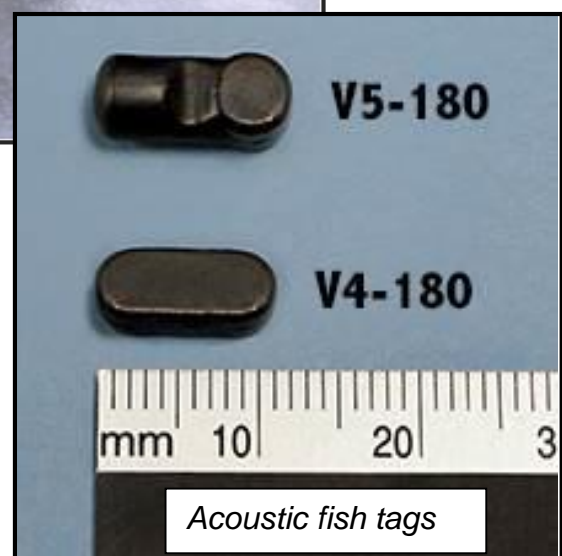
6. Developments: Upper Dee investigations

Work will begin this spring on a salmon smolt tagging and tracking project to investigate the migratory behaviour of fish around the Bala sluices. This work is being carried out in conjunction with Ahern Ecology who will be undertaking the tagging and analysis.

NRW fisheries staff will trap downstream migrating salmon smolts over a 6-8 week period starting early April to provide up to 100 fish suitable for acoustic tagging by Ahern. The movement of tagged smolts in the area from the Llyn Tegid outflow down to the Bala sluices will then be tracked, with the aim of improving our understanding of smolt behaviour in this reach under a range of different river and flow conditions.



Upstream view of Bala sluices



Acoustic fish tags