Appendix (5) Site specific case study.

Risks posed to migratory salmonid fish species by sea fish netting In the Taw and Torridge estuary.

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Table of Contents

List of Figures 3
List of Tables 3
1.0 Introduction. 4
1.1 Background. 4
2.0 Summary of Environment Agency managed migratory salmonid fisheries 5
3.0 Bass nursery areas and gear restrictions. 9
3.1 Taw bass nursery area. 9
3.2 Torridge bass nursery area. 9
3.3 Gear restrictions in the bass nursery areas 10
3.4 Taw and Torridge Estuary Sea fish drift net fishery. 10
4.0 Status of salmon and sea trout in the Rivers Taw and Torridge. 11
4.1 Timing of salmon and sea trout migration in the Taw and Torridge. 16
5.0 Water Framework Directive. 18
6.0 Dartmoor Special Area of Conservation (SAC) consideration. 20
7.0 Interaction between drift nets and migratory salmonids in the estuary. 21
7.1 Key issues for sea fish drift netting and salmonid fisheries management. 25
8.0 Effects of accidental capture in gill nets 26
9.0 Other migratory fish species in need of protection. 28
10. Conclusions 29
11. References 30

List of Figures

Figure (1) - Map of the Taw and Torridge estuary. 4
Figure (20 - Declared salmon net catch and licences issued 1951-2014. 6
Figure (3) - Declared salmon net catch and licences issued 1951-2014 6
Figure (4) - Extent of the Taw and Torridge Bass Nurser Areas 9
Figure (5) – River Taw historic declared salmon rod catches. 11
Figure (6) – River Torridge historic declared salmon rod catches. 11
Figure (7) – River Taw historic declared sea trout rod catches. 12
Figure (8) – River Torridge historic declared sea trout rod catches. 12
Figure (9) - River Torridge salmon conservation Limit compliance. 14
Figure (10) River Taw salmon Conservation Limit compliance. 15
Figure (11) – Salmon and sea trout run timing in 4 salmonid “index” rivers. 16
Figure (12) - The components of overall status for surface water bodies 18
Figure (13) - Observed low water drift netting locations within the estuary. 22
Figure (14) – A typical drift net set in the Taw and Torridge estuary. 22
Figure (15) - Net set perpendicular to the shoreline. 23
Figure (16) A badly enmeshed salmon caught in the net shown in Figures 14 and 15 23

List of Tables

Table (1) – Taw and Torridge rod fishery bag limits per angler. 7
Table (2) - Conservation limit compliance for salmon in the Rivers Taw and Torridge 14
Table (3) - WFD waterbodies in the Rivers Taw and Torridge currently failing for ‘Fish’ 19

1.0 Introduction.

1.1 Background.

- The Rivers Taw and Torridge converge at Instow sands to form a combined estuary. This drains north into the Bristol Channel through a single narrow channel off the North Devon coast (**Figure 1**).

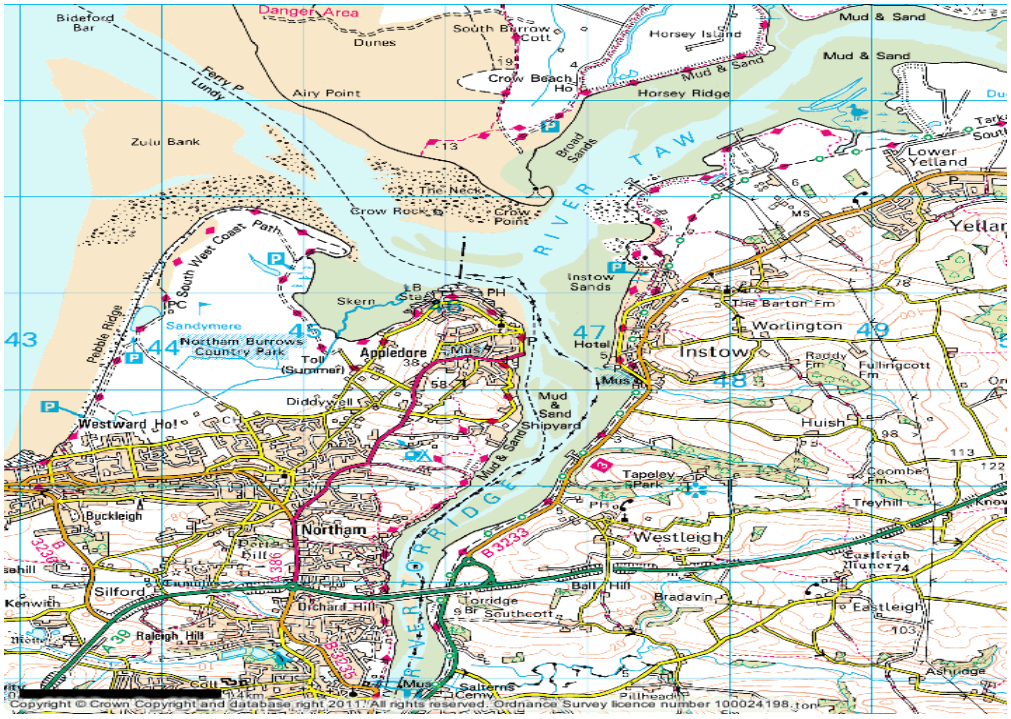

Figure (1) - Map of the Taw and Torridge estuary.

- The Taw/Torridge estuary supports a number of fish species of commercial importance, primarily Bass (*Dicentrarchus labrax*), Mullet *spp*. (*Chelon labrosus, Liza ramada, Liza aurata*) Atlantic salmon (*Salmo salar*) and Sea trout (*Salmo trutta*).

- The estuary is also popular for recreational angling with bass, mullet and flounder (*Platichthys flesus)* being the main target species.

- Commercial and recreational fishing activity in the Taw and Torridge estuary is regulated jointly between the Environment Agency (EA), Devon and Severn Inshore Fisheries and Conservation Authority (DS IFCA) and Marine Management Organisation (MMO).

2.0 Summary of Environment Agency managed migratory salmonid fisheries

- The EA regulate a commercial draft (seine) net fishery for salmon and sea trout which operates from 1st June to 31st July. Currently, 3 licences are issued to fish in the combined estuary and tidal waters of the Taw and Torridge.

- The area permitted for draft net fishing, set by byelaw, is as follows:

    - Taw/Torridge Estuary – upstream of the line drawn across the combined estuary from Saunton Sands Hotel to a point at latitude 051 degrees 04.97 minutes North, longitude 004 degrees 14.65 minutes West, thence to the site of the former Coastguard station at Westward Ho!

    - The upper limits of the netting areas in the estuary of the Taw and Torridge will be:

    - In the River Taw below an imaginary line drawn across the river due south west from Strand Hard Perch SS528 345 TO 523 348.

    - In that part of the River Torridge which lies below Bideford Bridge, before 1st day of July and in that part of the Torridge which lies below the railway bridge at Landcross after 30th day of June.

- Migratory salmonid net licences are issued annually, but numbers are subject to periodic review through Net Limitation Orders (NLOs). The NLO process restricts the public right to fish and sets a specific number of net licences available to fish based upon a detailed evaluation of migratory salmonid stock status and sustainability.

- Successive NLOs and associated net “buy-outs” have resulted in a gradual reduction in the number of licences issued each year within the Taw and Torridge estuary. For instance, between 2002 and 2011 the number of commercial salmonid nets was reduced from 14 to 3. The current 10 year NLO, made in 2012, limits the number of licences to 1 whilst still enabling the existing 3 netsmen to continue until they retire from the fishery.

- The net fishery within the Taw / Torridge estuary is currently licensed to fish in June and July using draft or seine nets only. The use of monofilament nets are prohibited for catching salmonids owing to the increased efficiency and damage inflicted on fish. Close times apply with salmonid nets restricted from fishing between 18:00 on Friday to 06:00 on Monday within the season. National spring salmon byelaws, first introduced in 1999, removed the March to 1 June netting period to protect early running Multi Sea Winter (MSW) salmon.

- The implementation of the 2002 NLO and associated buy-out arrangement resulted in a significant reduction in salmon and sea trout catches (**Figure 2 and 3**). The total average annual catch between 2002 and 2005 was approximately 100 fish. This declined further to an average of less than 20 fish between 2005-2009.

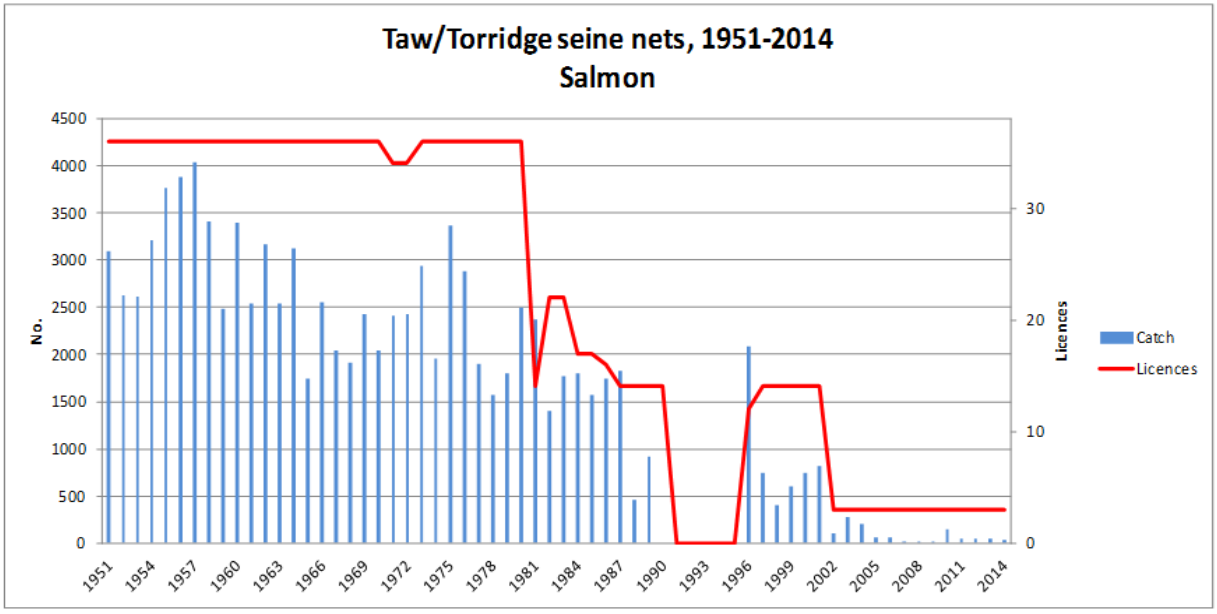

Figure (20 - Declared salmon net catch and licences issued 1951-2014.

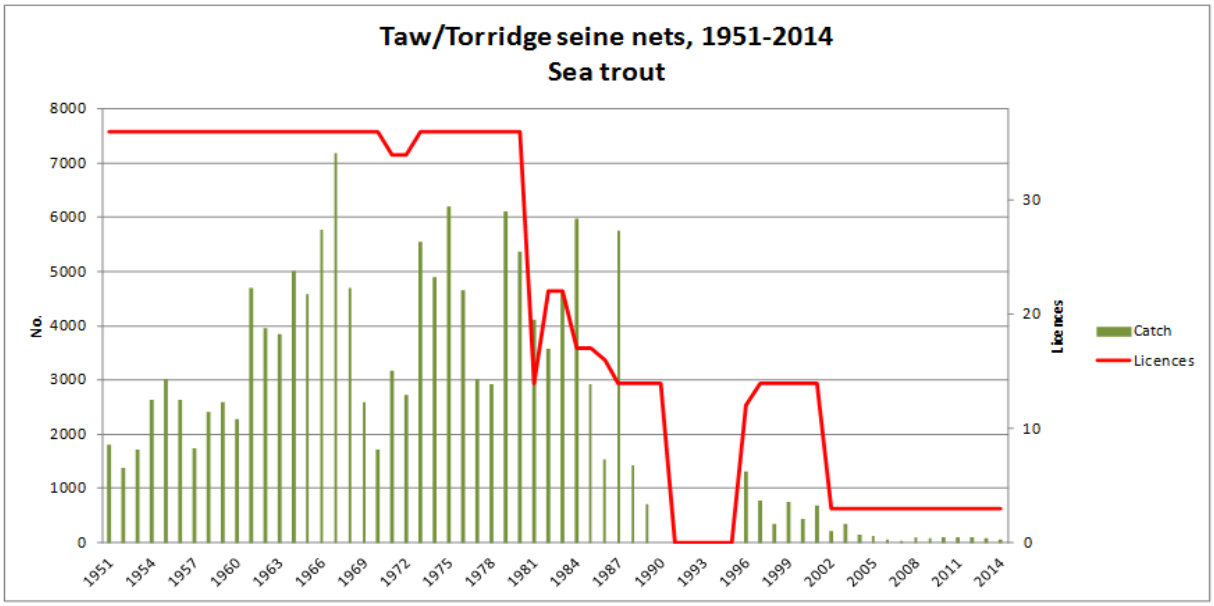

Figure (3) - Declared salmon net catch and licences issued 1951-2014.

Key to figures:

*1981 – NLO, Limited effort

** T/T rehabilitation scheme introduced - netsmen compensated to reduce fishing effort in 1988-89 and to stop fishing completely in 1990.

*** 1990 – 1995, no netting

- The reduction in salmonid netting has been undertaken as part of a wider package of measures applied to both the rod and net fisheries to conserve salmon and sea trout stocks in the Taw and Torridge river catchments. Salmonid net licensees are required to keep detailed records of catches and of fishing effort throughout the season in log books which are submitted as a return to the Environment Agency. A carcass tagging system is also in operation for all salmon/sea trout net fisheries in England and Wales to limit the illegal sale of salmon and sea trout. It is illegal to sell rod caught salmon and sea trout.

- Restrictions on methods and seasons for salmon and sea trout rod and line angling also apply on both the rivers Taw and Torridge. These are applied through a combination of national and regional rod fishing bylaws. These include:

    - Salmon fishing season starts 1st March, ends 30th September.
    - Sea trout fishing season starts 15th March, ends 30th September.
    - Restriction to fly or spinning methods only until 31st March and then fly only from 1st April.
    - Mandatory release of all salmon before 16th June.
    - Release of all salmon greater than 70cm from 1st Aug.
    - Takeable minimum size limit on migratory trout of 25cm.
    - Rod caught salmon and sea trout cannot be offered for sale.
    - Bag limits are as follows:

Bag limits		Period		
River / Area	**Species**	**24 hours**	**7 days**	**Season**
Taw	Salmon	2	3	10
Taw	Migratory trout	5	15	40
Torridge	Salmon	2	2	7
Torridge	Migratory trout	2	5	20

Table (1) – Taw and Torridge rod fishery bag limits per angler.

- Environment Agency Fisheries Officers are warranted with powers of a constable for offences committed under the Salmon and Freshwater Fisheries Act 1975. This includes the illegal taking of salmon or migratory trout in fresh or inshore waters up to a distance of 6 nautical miles. 2 EA fisheries officers based in North Devon are also joint funded by Devon and Severn IFCA to undertake enforcement in relation to their powers under the Marine and Coastal Access Act (2009).

- Salmon Action Plans (SAPs - now called ‘Sea trout and Salmon Catchment Summaries’) for the River Taw and River Torridge have been written and their main focus to date has been associated with;

    - resolving fish migration issues,

    - Improving and maintaining good water quality and quantity

    - mitigating for and reducing the impacts associated with the siltation of spawning gravels through landcare and Catchment Sensitive Farming (CSF) initiatives,

    - Minimising illegal fishing activity.

- The socio-economic value of salmon fisheries on the two rivers have been estimated as part of the SAP process. The combined value of both the Taw and Torridge salmon fisheries were estimated to be worth 8.34 million (capital) with annual revenue benefits to the local economy. The value of the sea trout fisheries have not been valued to date but this is likely to be significant although of a lower value than the salmon fishery valuation.

- The Environment Agency, Wildlife Trusts, West Country Rivers Trust and private riparian interests have invested significant sums of money into improving the quality and habitat of the two rivers for many species in recent years with salmon and sea trout being the focus of these efforts. Salmon and sea trout are particularly iconic and of significant heritage value on these rivers in particular owing to the strong link with Henry Williamson.

- The illegal targeting and exploitation of migratory salmonids is a regular occurrence within the Taw and Torridge estuary and the Environment Agency regularly undertakes enforcement patrols to combat these illegal activities. This work is significantly assisted by good intelligence data received from legitimate fisheries.

3.0 Bass nursery areas and gear restrictions.

- Bass Nursery Areas (BNA's) are specific zones within inshore waters where fishing for bass from vessels is restricted for all or part of the year. These areas are established under The Bass (Specified Areas) (Prohibition of Fishing) Order 1990 (S.I. 1990/1156), amended by The Bass (Specified Areas) (Prohibition of Fishing) (Variation) Order 1999 (S.I. 1999/75). Restrictions extend to commercial fishing and angling alike and include restricted use of sand-eels (*Ammodytidae*) as bait.

- The individual estuaries of the Taw and Torridge are designated as separate BNA's. (**Figure 4**).

3.1 Taw bass nursery area.

- All tidal waters enclosed by a line drawn 190º true from the western end of Braunton pill to the site of the former power station at Yelland.

- Between 30th April – 1st November.

3.2 Torridge bass nursery area.

- All tidal waters enclosed by a line drawn 290º true from Zeta berth to the opposite shore

- Between 30th April – 1st November.

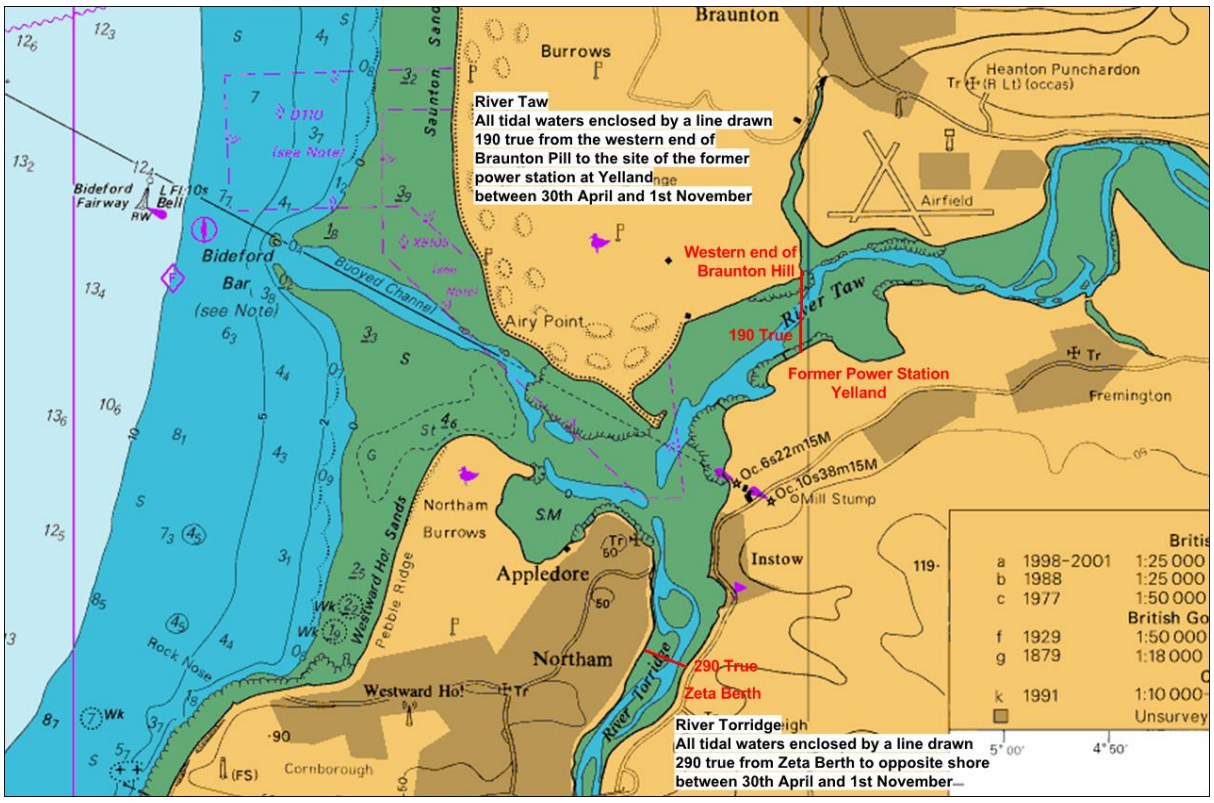

Figure (4) - Extent of the Taw and Torridge Bass Nursery Areas

- The shared section of the estuary is not designated a BNA. A substantial amount of this area was included under the original MAFF BNA proposals in 1988, with the original

seaward boundary drawn between Crow Point Beacon and Skern Point. This was subsequently omitted from the extent of the BNA's by MAFF due to concerns that this restriction would concentrate net and angling effort to particularly unsafe areas of the lower estuary. The possibility of introducing additional supplementary restrictions to prohibit fishing for sea fish from vessels (except by permit) in the lower estuary was suggested at the time but never came into being. This situation clearly presents an ongoing risk to migratory salmonids.

3.3 Gear restrictions in the bass nursery areas

- Under The Sea Fish (Specified Sea Area) (Regulation of Nets and Prohibition of Fishing Methods) Order 1989 (S.I 1989/1284), amended by, The Sea Fish (Specified Sea Area) (Regulation of Nets and Prohibition of Fishing Methods) (Variation) Order 1999 (S.I. 1999/74), use of nets with a mesh size between 71 and 89mm is prohibited within most British fishery limits, including those around the North Devon coast.

3.4 Taw and Torridge Estuary Sea fish drift net fishery.

- The fishery principally targets bass and mullet. Bass in particular have been a commercially targeted species within the Taw and Torridge estuary for many years. A drift net (gill net) fishery for bass currently operates within the shared estuary and the non-restricted areas of the two rivers. This consists of 6-7 MMO licensed vessels and 4-6 'un-powered vessels' (un-powered vessels do not currently require an MMO licence to sell fish).

- Mullet are also commercially fished for in the tidal rivers and estuary. This has historically been incidental to the larger bass fishery, but recent increases in the first sale market price for mullet has resulted in more effort being applied to the fishery within the estuary. There are currently no restricted areas within the combined or individual estuaries for net fishing targeting other sea species, including mullet. Mullet fishing does currently occur within the BNA's, typically over the intertidal mud-flat areas and with some drift netting in the upper estuaries over high water.

- Drift netting within the Taw and Torridge estuary is currently of major concern to the Environment Agency because of risks posed to migratory salmonids caught as bycatch and interactions with the gear types used.

4.0 Status of salmon and sea trout in the Rivers Taw and Torridge.

- The status of salmon stocks is assessed by the Environment Agency using data obtained from the licensed net fishery, statutory rod and line licence returns from anglers and juvenile monitoring.

- Rod and net statistics from both rivers show a steady reduction of catches of salmon and sea trout over the past 50 years, which is consistent with national and international trends for both species (**Figures 5 and 6 rod catches and Figures 7 and 8 net catches**).

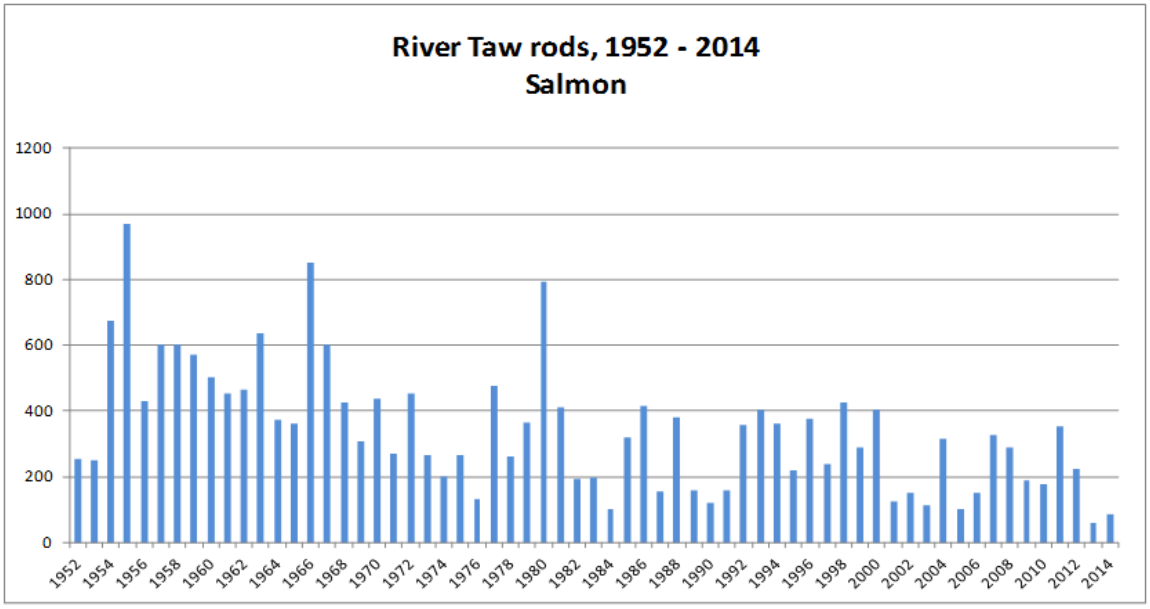

Figure (5) – River Taw historic declared salmon rod catches.

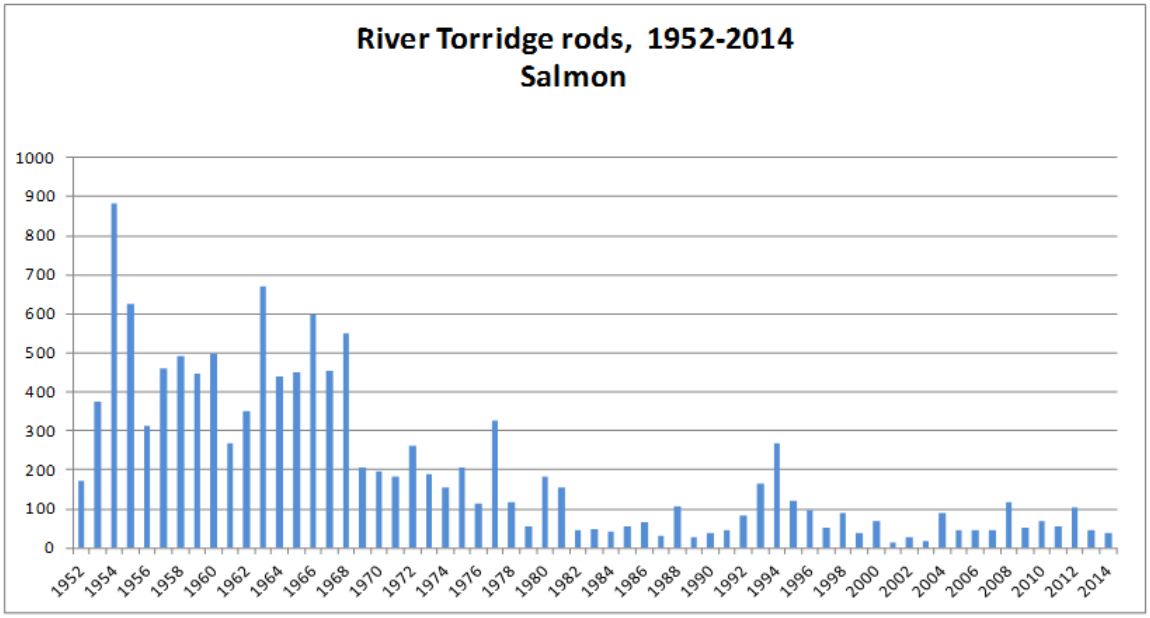

Figure (6) – River Torridge historic declared salmon rod catches.

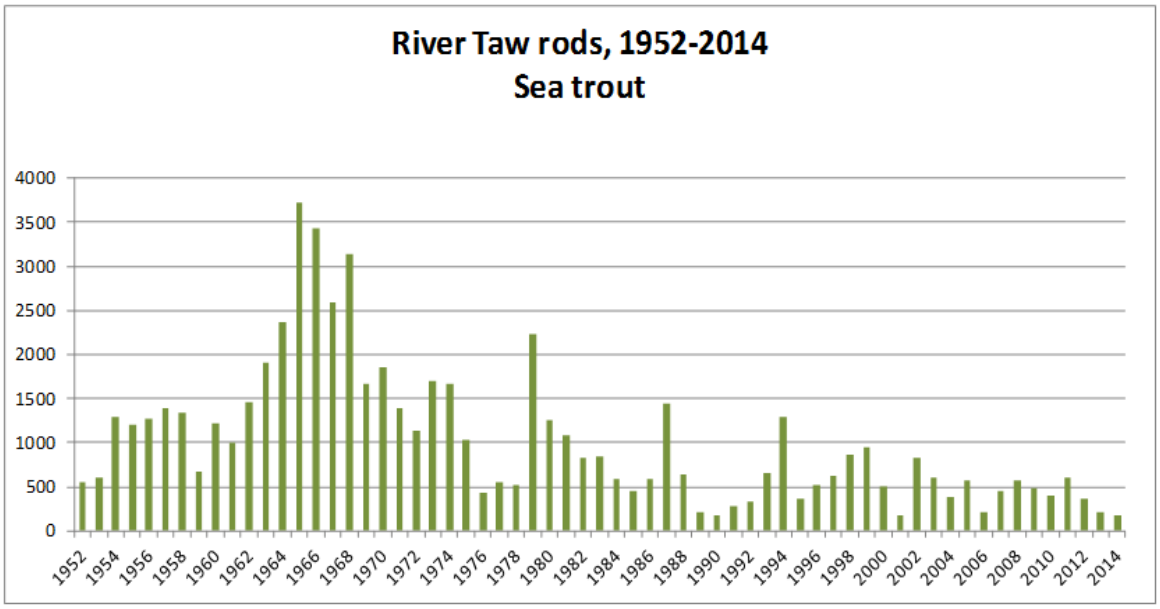

Figure (7) – River Taw historic declared sea trout rod catches.

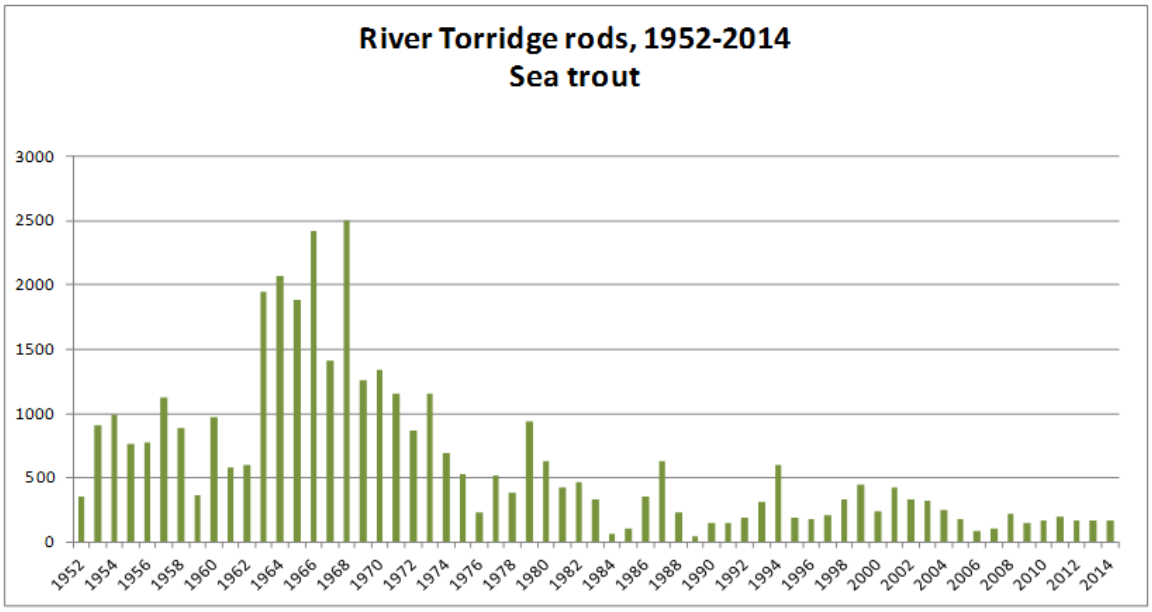

Figure (8) – River Torridge historic declared sea trout rod catches.

- The introduction of compulsory catch and release of salmon before 16th June and the prohibition of spinning for the majority of the season introduced in the 1980's are thought to have had a reducing effect on rod fishing effort on both rivers, which may account for some of the reduction in rod catches over this time. Rates of catch and release on both rivers show a steady upward trend and regularly now exceed 70%. This may be in part due to the previously mentioned reduction of effort by anglers who want to take fish since the introduction of a greater number of restrictions on methods and killing fish (summarised above). This is also a reflection on the fact that attitudes towards catch and release fishing are generally becoming more positive amongst game anglers and increased awareness around sensitive fish handling has led to more satisfactory rates of post-release survival of rod-caught fish. Radio tracking studies conducted by the Environment Agency and other bodies responsible for salmon management in the UK have observed very high levels of survival (90%) following rod and line capture and release.

- The reduction in yield from the salmonid net fishery again is a reflection of both declining stock size and consequently reduced fishing effort since the 1980's. This was achieved through the following:-
    - NLO introduced in 1981,
    - the implementation of the 1988 Taw/Torridge rehabilitation scheme where licensed netsmen were compensated to reduce effort ahead of a complete fishery closure between 1990 and 1995;
    - The 2002 NLO which reduced the fishery from 14 to 3 licensed netsmen.
    - The 2012 NLO set the number of licensed nets to just 1 net licence by 2022 (enabling retirement of 2 of the existing 3 nets).

- The requirement for these increasing restrictions over the past 30 years has stemmed from concern around the resilience of the stocks and the sustainability of the fishery, exemplified by the steadily reducing declared catches and non compliance with salmon conservation limits.

- Whilst netting for salmonids has been managed down over time to reflect declining runs of fish, a number of the ex- Salmonid netsmen have subsequently taken up drift netting for bass and mullet in the lower estuary. As there is no equivalent NLO for sea fish netting, the fishery is potentially open to anyone with a suitable net and rowing boat.

- Salmon conservation limits have been established on all major rivers in England and Wales. These define a figure for spawning stock for each river, below which stocks should not be allowed to fall. The conservation limits (expressed as number of eggs deposited) outline the minimum required stock level of adult fish to avoid a significant reduction in numbers of juvenile fish produced in the next generation. Stock levels are measured from catch return and fish counter data (where in use). **Table (2)** displays the current (2014) compliance status of the Rivers Taw and Torridge.

	Current (2014) compliance status	Predicted (2019) status	Trend status
Taw	**Probably at risk**	**Probably at risk**	**Declining (Uncertain)**
Torridge	**Probably at risk**	**Probably at risk**	**Declining (Uncertain)**

Table (2) - Conservation limit compliance for salmon in the Rivers Taw and Torridge

- The Torridge has failed to reach its conservation limit in 8 of the last 10 years, meaning that it is currently rated as 'Probably at risk' and 'Probably at risk' in 2019 .**Figure (9)**.

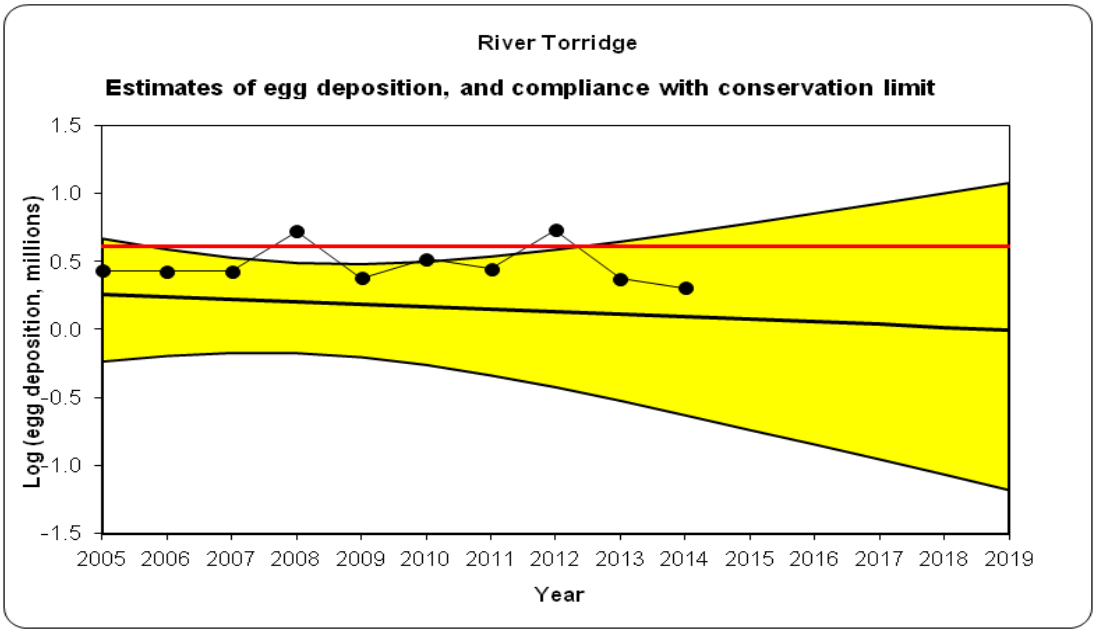

Figure (9) - River Torridge salmon conservation Limit compliance.

- The River Taw salmon stock has performed only slightly better in the same period having failed to reach its limit in 2 of the last 10 years and was assessed to be 'probably at risk' in 2014 and "probably at risk" in 2019 (**Figure 10**).

- The overall trend for both rivers is "declining" although this is uncertain owing to the high degree of variability within the data set. The uncertainty of either river reaching its Conservation Limit within the next 5 year period indicates that both populations remain unstable. Although quantitative data from catch returns is subjective to conditions year on year (i.e. exceptionally wet or dry years can result in reduced angling effort, reflected in catch numbers), the long term trends in rod catches of salmon show a marked general depression in numbers of returning adults, despite the reduced effort of the draft net fishery.

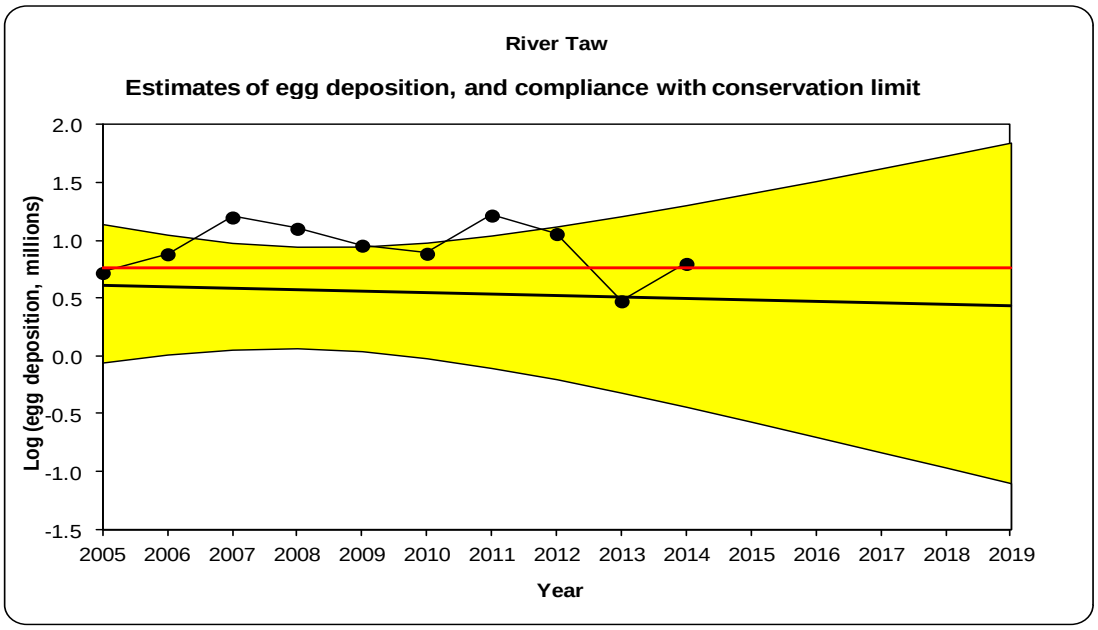

Figure (10) River Taw salmon Conservation Limit compliance.

Key to graphs:

- 20th percentile trend line (in a 10 year period around 2 annual egg deposition values would be expected to fall below this line)
- Annual egg deposition estimates
- Conservation Limit (CL)
- Upper and lower boundaries of the Confidence Interval.

4.1 Timing of salmon and sea trout migration in the Taw and Torridge.

- The timing of adult salmon and sea trout runs on the River Taw and Torridge conform to the pattern observed on many other rivers in Devon and Cornwall and in other rivers nationally (**Figure 11**).

- Fresh run salmon typically begin to enter the river from early March with the run building through April, May and early June. These fish comprise the MSW "spring" stock component which are typically larger fish averaging 7 to 10lb in weight but can be in excess of 20lb. These fish have been protected since 1999 through the implementation of national spring salmon byelaws.

- Towards the end of June, grilse (one sea winter salmon), typically ranging between 4 and 7lb in weight, arrive and the runs of these fish increase through July, August and September. Throughout this period some MSW fish are also present. The salmon run slowly declines through to November when most of the salmon run will be present in freshwater prior to spawning which typically take place between late November and January. A small number (~5%) of salmon that have survived spawning will take advantage of high winter flows to migrate back downstream to the sea.

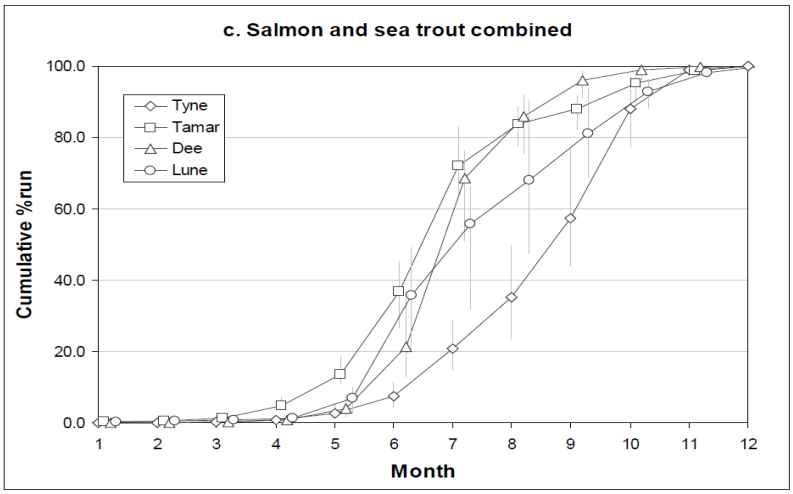

Figure (11) – Salmon and sea trout run timing in 4 salmonid "index" rivers.

- Sea trout have a similar life cycle to salmon but differ in that many more adults survive to spawn on multiple occasions. Sea trout, like salmon, arrive in early March with the run increasing through to May. These early running fish tend to be relatively large and are either maiden fish (fish returning from the sea for the first time to spawn) or repeat spawning sea trout ranging from 2 to 7 years of age. These fish range in weights from 2 to 10lbs or larger.

- From late June, the run of school sea trout (locally referred to as peal) begins to arrive in large schools. These are typically fish that have smolted earlier in the year (March/ April), spent time feeding inshore coastal areas and then returned to freshwater to spawn. These fish typically range in size between 1 to 2lb. The main run period for these fish occurs in July and August. After this time, smaller numbers of maiden fish and repeat spawners tend to arrive with spawning taking place in late October/

November. Following spawning, many sea trout migrate back to sea and will resume active feeding in the estuary and inshore coastal areas until the following spring.

5.0 Water Framework Directive.

- The EC Water Framework Directive (Directive2000/60/EC) (WFD) outlines a target for all waterbodies within EU member states to be in a state of 'good ecological status' (GES) by a deadline of 2027. The overall classification of an individual waterbody is rated on a scale of Bad, Poor, Moderate, Good or High. This is based on the status of a standardised group of ecological and chemical elements measured within that waterbody, one of which is fish (**Figure 12**). Failure of any one element to reach the standard for 'good' results in the overall failure of that waterbody, in a '1 out – all out' principle. The classification of elements is updated annually with the availability of the latest monitoring data.

- The Taw and Torridge river catchments respectively encompass 43 and 37 separate WFD waterbodies. The current (2014) 'Fish' element classification of river waterbodies within both catchments is summarised below in Table 3.

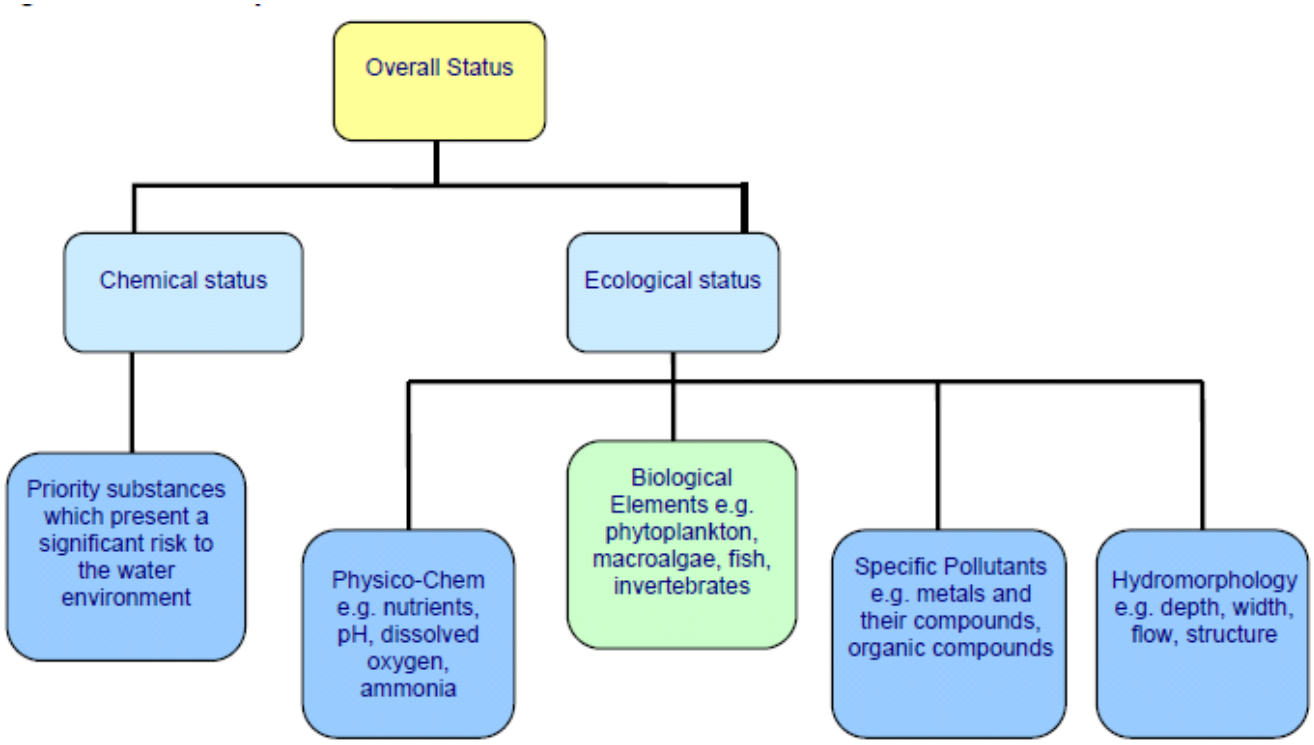

Figure (12) - The components of overall status for surface water bodies

(Reproduced from South West River Basin Management Plan)

	WFD River Waterbodies	Waterbodies at GES (2013)	Waterbodies < GES (2013)	Waterbodies failing for 'Fish'
Taw	**43**	**9***	**33**	**11****
Torridge	**37**	**6**	**31**	**9*****

Table (3) - WFD waterbodies in the Rivers Taw and Torridge currently failing for 'Fish'.

Note for Table 3:-

* Coney Gut waterbody omitted as it is designated a 'Heavily Modified Waterbody' so has target of 'Good Ecological Potential'.

**29 waterbodies within this catchment were not assessed for fish in this classification year.

***24 waterbodies within this catchment not assessed for fish in this classification year.

- Based on the 2014 classification results, 20 waterbodies within the Taw and Torridge river catchments are failing the standard of GES with fish as a responsible element. Absence, or lower than expected numbers of juvenile salmonids at monitoring sites within these waterbodies are a primary reason for these failures.

- Reasons for the general decline in stocks of migratory salmonids can be categorised as pressures affecting either the freshwater or marine stages of their lifecycles.

- The main pressures on freshwater stages (egg-smolt & migrating-spawning adults) within the Taw and Torridge catchments are impacts from diffuse agricultural pollution and barriers to migration. The Torridge in particular is significantly impacted by siltation of in-stream gravels used for spawning and juvenile habitat.

- Pressures during marine stages of the lifecycle (smolt – migrating adult) are more complex, less well understood and can affect large proportions of the salmon stock as a whole, instead of being specific to an individual river population. Historically, exploitation of mixed-stocks at sea through interceptory fisheries in high-seas and coastal areas has been recognised as a major contributory factor for the decline of European salmon stocks. Difficulties exist in conservation of salmon at sea due to migration routes transcending international boundaries and the current lack of a universally adopted and cohesive approach to management of exploitation in the North Atlantic. The effects of climate change on the marine environment are an increasing area of concern.

- Licensed salmon netting within the Taw and Torridge estuaries has been reduced over time in response to the observed depression of the populations, however this does not mitigate for losses of fish experienced through bycatch in other netting activities. The specific impacts of estuary gill netting on salmon are considered in subsequent sections of this report.

6.0 Dartmoor Special Area of Conservation (SAC) consideration.

- The headwaters of the River Taw are designated as part of the Dartmoor Special Area of Conservation (SAC). Salmon are listed under Annex II of the EU Habitat Directive (Council Directive 92/43/EEC) and are a qualifying species of this SAC. The most recent condition assessment of Salmon in the Dartmoor SAC was undertaken in 2007.

- The collective salmon populations of the 6 rivers included within the Dartmoor SAC investigated as part of this assessment were considered to be of Grade C status (i.e. *at least national importance*). The upper-most reaches of the East and West Okement (part of the Okement sub-catchment within the Torridge catchment) also sit within the boundary of the Dartmoor SAC, but were not included in the scope of the latest condition assessment.

- In general, good survival of fry to parr was noted in areas where they were present, suggesting factors limiting salmon production within the Dartmoor SAC may be attributable to poor spawning success. Historic issues of reduced access to the moorland headwaters caused by barriers to migration and the possibility that spawning habitat may be of poor quality were suggested as reasons for this. Good numbers of salmon fry and parr were recorded at some sites on the upper Taw, however they were found to be virtually absent from others. It is noted that quality salmon spawning and juvenile habitats are not ubiquitous on the upper taw on Dartmoor and the c.3km reach through Taw Marsh in particular does not support areas where salmon would be expected to spawn.

- Fish passage has been addressed progressively over a number of years by the EA, the West Country Rivers Trust (WRT) riparian owners groups and fishing associations through making improvements to major barriers on the main stem of the Taw and many of its tributaries. This has ranged from total removal of barriers, provision of technical fish passes and fish easements, reductions in crest heights of weirs and regulation of water resources. This work in combination has lead to the overall improved access of migrating salmon to the upper Taw on within the boundary of the Dartmoor SAC.

- The improvements made to increase salmon access to the Dartmoor SAC allow for greater usage of the available spawning habitat within the catchment, with the intention of increasing the gross smolt output from the system. Maximising the number of possible spawners that can take advantage of the improved access to habitat must be achieved in order for this to be possible. This means that reduction in exploitation of adult fish at all stages of their migration must be considered a key a conservation objective for the Dartmoor SAC.

7.0 Interaction between drift nets and migratory salmonids in the estuary.

- The EA are concerned that drift net fishing for sea fish species in the estuary is having a significant negative impact on the migratory salmonid populations of the Rivers Taw and Torridge. The reductions in exploitation pressures gained from the licensed draft net and rod fisheries through statutory and voluntary measures over the past 30 years are not likely to deliver the desired effect of increasing numbers of spawning adults if unintended exploitation and by-catch from the sea fish drift net fishery is also not reduced.

- There has been a recognised shift in the nature of net fishing in the Taw and Torridge estuary over the past 50 years. A 1977 report produced by South West Water Authority states that over 60 individuals were at that time involved in drift netting on the estuary and that at least 15 were known to own drift nets. On peak weekends, up to 9 boats were observed to be operating at one time (Bray 1978).

- Bray (1978) conservatively estimated that between 750 and 1,000 salmon and at least the same number of sea trout were illegally taken from the combined estuary each year in drift nets. Conversely, boat checks undertaken on a total of 33 vessels in 1972 and 1976 found only 6 sea fish, 3 of which were taken on a hand line. This suggests that either the methods and gear employed by drift netsmen were ineffective at catching sea fish, or effort was being focused on illegal fishing for salmon and sea trout. Bass (and increasingly mullet) remain the target species for drift net fishing in the estuary with salmon and sea trout regarded as ‘nuisance’ bycatch.

- As a large area of the estuary is not included within either of the BNA’s, it is possible for drift nets to be fished across significant widths of any of the low-water channels. At times it has been observed by EA/IFCA Fisheries Officers that up to 90% of a channel can be covered by a single net for up to 1 hr on the last of the ebbing tide and the start of the flood. EA/IFCA officers routinely observe 1-2, and sometimes up to 4 vessels, fishing in this manner during the same low water period. Officers have observed that drift nets often become fixed on natural river obstructions (exposed rocks and mussel beds) which significantly increases the efficiency of entangling and catching fish in such nets. The lack of boat traffic in the estuary at low water means that these nets can fish un-interrupted for extended periods of time effectively creating a barrier for salmonids passing upstream and downstream whilst waiting for suitable conditions to enter freshwater. **Figure 13** indicates the commonly observed low-water netting locations within the estuary (reproduced from EA/IFCA Fishery Officer notes). **Figures 14, 15 and 16** provide an example of a drift net being deployed in the estuary and a salmon that was subsequently enmeshed this net.

- The period around low water and the beginning of the flood tide are critical for movements of migratory fish, as they utilise the up-stream direction of flow and increased depth of water to swim up river. Migrating salmonids are vulnerable to capture in gear targeting bass and mullet, as the commonly used mesh sizes in the 98-105mm range are also considered optimal for catching salmon and sea trout (Sumner, 2015). Similar gear is used for targeted fishing for salmon and sea trout in the licensed salmon drift net fisheries, such as on the River Camel.

Figure (13) - Observed low water drift netting locations within the estuary.
(reproduced from Fishery Officer notes)

Figure (14) – A typical drift net set in the Taw and Torridge estuary.

Figure (15) - Net set perpendicular to the shoreline.

Note: The net is extending across approx. 50% of the low flow channel. The white buoy attached to the headline of the net can be seen in the foreground. The other end is attached to the vessel in the background

Figure (16) A badly enmeshed salmon caught in the net shown in Figures 14 and 15

- The gear and methods currently used by netsmen in the Taw and Torridge estuary have not changed significantly since described by Bray (1978), when significant exploitation of salmon stocks was occurring through the use of drift nets.

- National and local byelaws in place on the Taw and Torridge rod and net fisheries to protect vulnerable salmonid stock components (restrictions on gear, methods, season and size limits) and these may be undermined by damage caused to fish by the comparatively un-restricted sea fish net fishery.

- Contemporary EA/IFCA Fishery Officer reports confirm that salmon and sea trout are still caught by drifting nets targeting sea fish species. However, due to the operational difficulties associated with surveillance of a large twin estuary such as the Taw/Torridge, it is difficult to accurately estimate the rate of interaction between these species and the nets. Observations of set/fishing nets (often at long ranges) alone do not allow an officer to accurately record rates of bycatch. Observing the net being hauled from a distance still may not allow an officer to identify exactly which species have been caught and released or to assess the condition of the fish following contact with the net. It is also noted that non-target fish such as salmonids will often be released from the net without bringing it aboard, which may be considered good handling practice, but again reduces the opportunity for to the officer to gain data. Drift netting also occurs over night time tides on the Taw/Torridge estuary, further limiting the opportunity to effectively observe netting activity.

- Anecdotal reports received by EA/IFCA officers from commercial netsmen do refer to them encountering enmeshed salmon and sea trout in their nets. Reports often specify catches in the order of 1's and 2's per drift, but officer observations have at times confirmed between 4 and 6 salmonids being released after a single drift. This obviously doesn't take in to account fish which manage disentangle from the net before being landed, which may also receive damage. One report received by fisheries officers stated that one netsman had caught 300+ salmon and sea trout over the course of a season, although this cannot be verified.

- Reporting in this manner is sporadic and can be considered unsuitable upon which to make firm quantitative estimates of salmonids caught by the nets. They do however go some way in confirming the observations and claims of fishery officers that numbers of salmonids are being caught by drifting nets targeting sea fish. Although these fish should lawfully be released, damage as a result of being entangled and the act of being disentangled from the mesh can still lead to unacceptably high rates of post-release mortality, discussed in more detail in the next section.

- Sea fish netsmen are not required to officially record or report numbers of salmonids encountered, so detailed data is lacking. However, sufficient historic evidence is provided from previous officer reports around drift netting using similar gear illegally for salmon and sea trout to infer that the technique is effective at catching these species and that numbers of migratory salmonids must still be being caught, especially considering the manner in which this gear is set (at time multiple nets covering the full width and depth of the low-flow channel).

- All netting was banned under byelaw within the Exe estuary due to similar concerns around impacts on migratory salmonids. At the time of the implementation of this bylaw, it

was successfully argued that a commercially viable sea fish net fishery did not exist and the limited value of the activity being conducted did not outweigh the requirement to properly protect salmon and sea trout stocks.

- It has been noted by fishery officers that drift netting effort on the Taw and Torridge estuary over the summer of 2015 has been exceptionally low. It has often been the case that no boats have been observed fishing on favourable daytime tides during regular officer inspections this year. Catches from nets that do fish have also been comparatively low, often landing single fish. Reports from these fishermen suggest that there aren't numbers of bass or mullet within the estuary this season.

- The low fishing effort this season suggests that a similar situation exists on the Taw/Torridge to the one previously on the Exe, in that drift netting for sea species is not heavily relied upon by the local fishing community (either as a result of the declining status of bass stocks or that more lucrative fishing opportunities are available locally).

- A shift in activity has been noted recently amongst some commercial vessels in that rod and line methods for targeted bass fishing have been adopted, taking advantage of the lack of restriction on use of live sand eel as bait. Some fisherman engaged in shell fish gathering locally at different states of the tide are now choosing to remain afloat in larger vessels and rod and line fish for Bass within the estuary at the start of the flood tide, instead of coming ashore to deploy a netting craft.

7.1 Key issues for sea fish drift netting and salmonid fisheries management.

- Observations by EA Officers have indicated that salmonids are regularly being captured in drift nets (although rates of capture may be less as a reflection of the overall depression in stocks). Whilst many fish are discarded, some of which have been subsequently found freshly dead, there are still concerns regarding illegal capture, presenting an ongoing enforcement issue in an area that is difficult to access.

- The situation on the Taw and Torridge estuary is not exceptional in comparison to other BNA's within the D&S IFCA District as many have open periods when sea fish netting with drift nets can operate even within bass nursery areas. This is placing salmonids at risk and restricting the opportunity for stock recovery and realising the economic benefits that can be accrued from the fisheries that legitimately target Salmonid fish species.

- Unlike the salmonid draft net fishery, netting for sea fish is not seasonally restricted or limited by a NLO. This effectively means that migratory salmonids throughout the year are susceptible to capture by an unlimited number of netting vessels.

- Salmonid susceptibility to capture would be expected to vary annually as a result of environmental conditions with periods of dry weather and low river flows resulting in salmonids remaining in the estuary moving up and downstream with the tide on a daily basis. These multiple upstream and downstream movements through the estuary make them particularly susceptible to encountering nets throughout the year. Downstream migrating spent fish or 'Kelts' of both species are vulnerable to estuary drift netting in the winter and spring period.

8.0 Effects of accidental capture in gill nets

- Entrapment in gill nets can result in a range of damaging effects to fish. These include: scale loss (particularly around the head/operculum), secondary fungal infection, surface bruising, general softening of the flesh, acute and chronic stress, internal haemorrhaging and fatal damage to the circulatory system. (Thompson & Hunter 1973; Potter & Pawson 1991; Mäkinen et al 2000; (Kojima et al 2004; Baker et al 2013). The likelihood of a fish being retained in a gill net relates to mesh type (i.e. multifilament or monofilament mesh), mesh size, soak time (duration of fishing effort) and location.

- Once a fish comes into contact with a gill net, most damage is caused either by the fishes own attempts to disentangle itself from the gear or in the process of manually removing a fish from the mesh. The type and severity of damage experienced by fish is dependent on factors such as whether the fish is 'gilled' or tangled in the mesh and the quality of handling when it is removed from the net (Thompson & Hunter 1973; Potter & Pawson 1991).

- The severity of damage caused to salmon that manage to escape from gill nets is thought to be low, as fish which do not fully engage with the net (either being too large to sufficiently penetrate the mesh and become wedged; or, so small that they pass through) will often rapidly escape without signs of significant damage (Potter & Pawson 1991).

- Escape rates of salmon caught in drifting gill nets (under field conditions) have been observed to be as low as <1% suggesting that once a fish has come into contact with a net it will either: very quickly escape without significant damage, or; become firmly wedged and unable to escape (Potter & Pawson 1991). The landing efficiency of a net (i.e. its ability to retain fish engaged in the mesh to landing) will therefore have a bearing on the number of fish which may die following contact with a net, described as 'non-catch fishing mortality'. It is considered that fish manually removed from nets receive more severe damage than those which disentangle themselves.

- Although soak time is low, the nature and locations of the drift netting on the Taw and Torridge mean that migrating fish are highly susceptible to being intercepted by nets. Feedback received from an active drift net fisherman on the River Camel indicated that in his experienced view salmon and sea trout do not last more than about 5 minutes when firmly entangled in the net. Removal will often cause more damage to the fish particularly in the loss of mucus and scales which are crucial in preventing disease once in freshwater.

- The severity of damage caused by release from gill nets and rates of post-release survival are heavily dependent on how the fish has been caught in the net (i.e. gilling, tangling), how long the fish has been in the net, quality of handling and environmental conditions. Rates of immediate post release survival of >99% have been achieved in experimental trials on gill net caught Chinook salmon, however this involved careful revival of seriously damaged fish in on-board recovery boxes (5.2% & 31.4% of total catch in 8" and 5.5" mesh nets respectively) and a strict handling procedure designed to minimise stress to the fish. The same trial estimated survival of these fish until spawning to be only 51% (8"

mesh) & 57% (5.5” mesh). (Vander Haegen et al 2004). Long term mortality of salmonids released from gill nets (i.e. not surviving to spawn) is thought to be around 40-100%. (Thompson & Hunter 1973;).

- Fish captured and released from gill nets have been shown to undergo extensive downstream running (mean extent, 18.1km) when captured during the early phase of migration (Mäkinen et al 2000). This behaviour delays migration and increases susceptibility to predation and recapture by nets.

- It is recognised that although some straying does occur, salmon caught within an estuary are overwhelmingly likely to belong to the population of that river. This means that interceptory fisheries in estuaries are only likely to impact upon the populations of that river. Given the shared nature of the Taw/Torridge estuary it is difficult to estimate the relative impact the bass fishery may be having on either individual river population. Coastal movements of sea trout are understood to be complex and can involve mixed stocks interacting within estuaries other than those of their natal river. This means that the impacts of the bass fishery may be further reaching and could be impacting upon sea trout populations of other rivers.

- The restriction of draft net fishing from June – July, means that only migrating adult salmon and sea trout are likely to be encountered. Further, the important spring run of large multi-sea-winter salmon (which disproportionately contribute a higher % of the total egg deposition in a given year) are protected. Netting for sea fish is not seasonally restricted, meaning that fish at various stages of maturity and undergoing different migrations are susceptible to capture. Sea trout in particular can undergo multiple transitions between fresh and saline water throughout their life, often entering rivers after one summer at sea as immature ‘school peal’, or by undergoing several spawning migrations as mature adults. These multiple up-stream and downstream movements through the estuary make them particularly susceptible to encountering nets throughout the year. Down-stream migrating spent fish or ‘Kelts’ of both species are vulnerable to estuary drift netting in winter and spring.

9.0 Other migratory fish species in need of protection.

- Other species of conservation value are found in the Taw and Torridge Estuary. Twaite shad (*Alosa fallax*) and Allis shad (*Alosa alosa*) have been regularly recorded. Significantly, there have been records of both species in spawning condition within the shared estuary and lower River Torridge. Both native shad species are UK Biodiversity Action Plan priority species and are listed under; Annex II & V of the EU Habitats Directive and Appendix III of the Bern Convention. Shad are particularly sensitive and do not tolerate handling, so contact with fishing gear and especially physical removal from gill nets can be incredibly damaging to the fish.
- The known presence of shad species further justifies the prohibition of sea fish netting in the Taw and Torridge estuary.

10. Conclusions

1. The Rivers Taw and Torridge represent important migratory salmonid fisheries within North Devon bringing significant socio-economic benefit to the local community both in terms of fishery and heritage value.

2. Salmon and sea trout are key species to enable achievement of WFD good ecological status. Significant funding and investment has been made by the UK Government and partner organisations using UK and European strategic funding streams to maintain and improve habitats within the River Taw and Torridge to benefit species such as salmon and sea trout.

3. The upper reaches of the River Taw fall within the boundary of the Dartmoor SAC of which, Atlantic salmon are a designated interest feature. The migratory pathway of salmon and plans or projects (such as netting activity) that have potential to influence the pathway to the designated reaches of the upper Taw catchment must therefore be fully considered under the Habitats Regulations.

4. Salmon stocks on both rivers are defined to be “Probably at Risk”. The salmon fishery has been carefully managed and regulated in recent years to ensure that the salmon fisheries remain sustainable. The loss of salmon as by-catch in the sea fish net fishery is not sustainable with these losses effectively reducing the socio-economic potential and viability of legitimate salmonid fisheries.

5. It is imperative that all adult salmon and sea trout entering the Taw and Torridge estuary have the opportunity to be exploited solely by the licensed net or rod fisheries which are carefully managed to prevent over exploitation of the remaining stock. We therefore wish to request the removal of the high risk of deliberate or accidental capture by nets targeting sea fish in the estuary.

6. Observations by EA Officers have indicated an ongoing risk and those significant quantities of salmonids could be taken in favourable conditions. The Environment Agency considers this to be an unacceptable risk taking into account the current status of salmon stocks.

7. Bass stocks are also under considerable pressure and it would be pragmatic to close the drift net fishery to conserve this species within what is clearly a significant bass nursery area.

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