

Know Your River – Seiont, Gwyrfai & Llyfni Salmon & Sea Trout Catchment Summary

Introduction

This report describes the status of the salmon and sea trout populations in the Seiont, Gwyrfai and Llyfni catchments. Bringing together data from rod catches, stock assessments and juvenile monitoring, it will describe the factors limiting the populations and set out the challenges faced in the catchment.

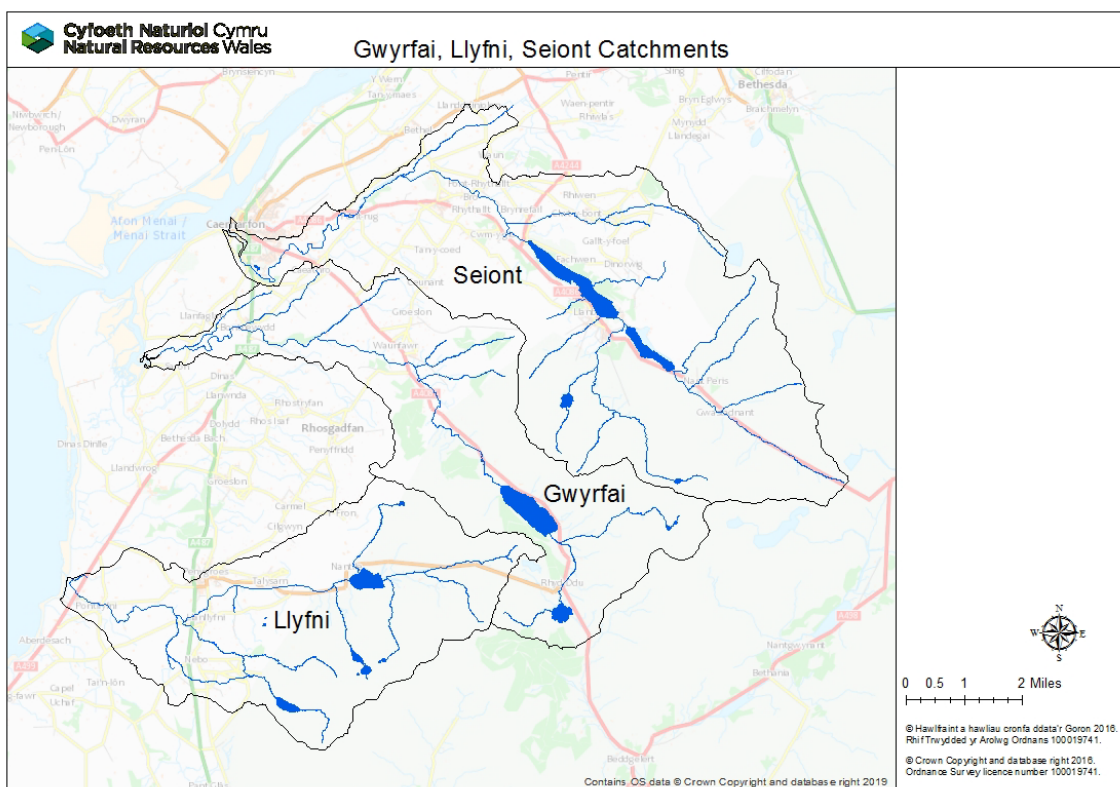
Action tables set out habitat improvements to restore freshwater productivity of salmon and sea trout populations. These tables also include some work which will be carried out by our partner organisations, not just Natural Resources Wales (NRW).

NRW has a duty, defined in the Environment (Wales) Act 2016 to have Sustainable Management of Natural Resources (SMNR) at the core of everything that we do. By applying the principles of SMNR in all our activities - from agriculture, forestry, and flood defence to development planning - we are undertaking catchment-wide initiatives that will deliver for fish stock improvements. Our reports highlight the importance of considering the whole catchment when identifying and addressing fisheries issues; and of working with partners.

NRW is committed to reporting on the status of salmon stocks in all our principal salmon rivers for the Salmon Action Plans and condition assessments under the Habitats Directive in SAC rivers; all fish species in all our rivers are reported for the Water Framework Directive (WFD). This report will fulfil these commitments and provide an informative and useful summary of stock status and remedial work planned, for our customers, specifically anglers, fishery and landowners, as well as our partners.

Catchment

The Seiont catchment, covering an area of 84.1 km², drains an extensively slate-mined upland area and lowland brown earth. Classed as a small spate river, the Afon Seiont rises at the head of the Llanberis Pass and is joined by many tributaries as it flows 7.8 km into Llyn Padarn (a 692-hectare lake, 3.2 km in length). From leaving this lake the river flows for 14.5 km before entering the Menai Straits by Caernarfon Castle.



Built beneath the old Dinorwig slate quarry, a hydro-electric power station (HEP) utilities Llyn Peris and Llyn Marchlyn Mawr, supplying electricity to the national grid. The power station owned by First Hydro Limited began operating in February 1982, building up to full capacity in 1984. Adult salmon and sea trout swimming up the Afon Seiont can swim through Llyn Padarn but not Llyn Peris due to HEP operations. Access for migratory salmonids to the upper part of the Seiont catchment (Afon Nant Peris and associated tributaries), by-passing Llyn Peris, is via a 2 km unlit fish tunnel. Salmon and sea trout are known to successfully negotiate the tunnel. To mitigate the loss of spawning grounds and juvenile habitat in the upper Seiont catchment to migratory salmonids, a stocking programme began in 1979. The stocking of fry and parr took place in Llyn Dwythwch, Nant Peris and associated tributary streams. All stocking was stopped in 2015 due to a NRW policy change. To replace the stocking programme options are being reviewed to open additional areas to migratory salmonids. Weirs and natural waterfalls limit access for migratory salmonids to most of the main and smaller tributaries. In addition to stocks of salmon and sea trout the Seiont system supports stocks of brown trout, eels, and Arctic charr within Llyn Padarn.

The Gwyrfai and Llyfni both have their sources at the foot of Snowdon near Rhyd Ddu. The rivers take two different routes out to sea with the Gwyrfai discharging into the Foryd estuary and the Llyfni flowing out into Caernarfon Bay at Pont Llyfni. The Gwyrfai catchment covers an area of 53km² and the Llyfni catchment covers an area of 50km² and they drain a predominantly upland catchment. The main populated areas are Bontnewydd on the Gwyrfai and Penygroes on the Llyfni. Both catchments focus on agriculture, sheep farming being the main land use. The area is an important tourist location due to large sections of the catchment being within the Snowdonia National Park.

The bulk of Eryri's rocks are of Cambrian age, although Ordovician rocks are found in both the north and the south of the area. Igneous intrusions have metamorphosed many of these sedimentary shales, resulting in the formation of slate, which was once so important to the local economy.

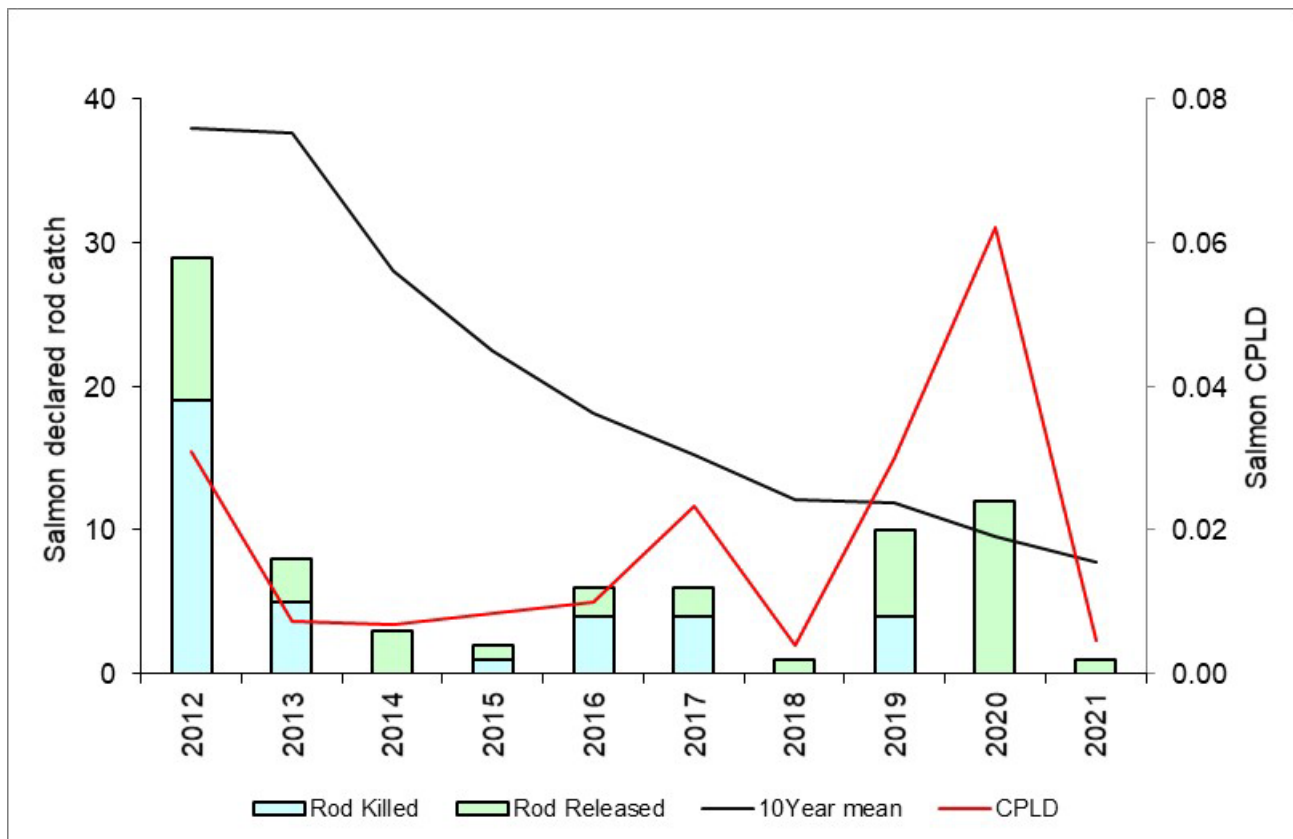
The Gwyrfai & Llyn Cwellyn are a SAC area based upon its salmon, otters & floating water plantain. Llyn Cwellyn hosts one of the three remaining native Welsh populations of Arctic char (*Salvelinus alpinus*) a locally distinct relict species from the last Ice Age.

Rod Catches

The following tables/graphs show the total declared rod catches of salmon and sea trout on the Seiont, and only sea trout for the Gwyrfai and Llyfni, as they are classed as sea trout rivers. Catch Per Licence Day (CPLD) is an estimate of the average catch per fishing day on a catchment.

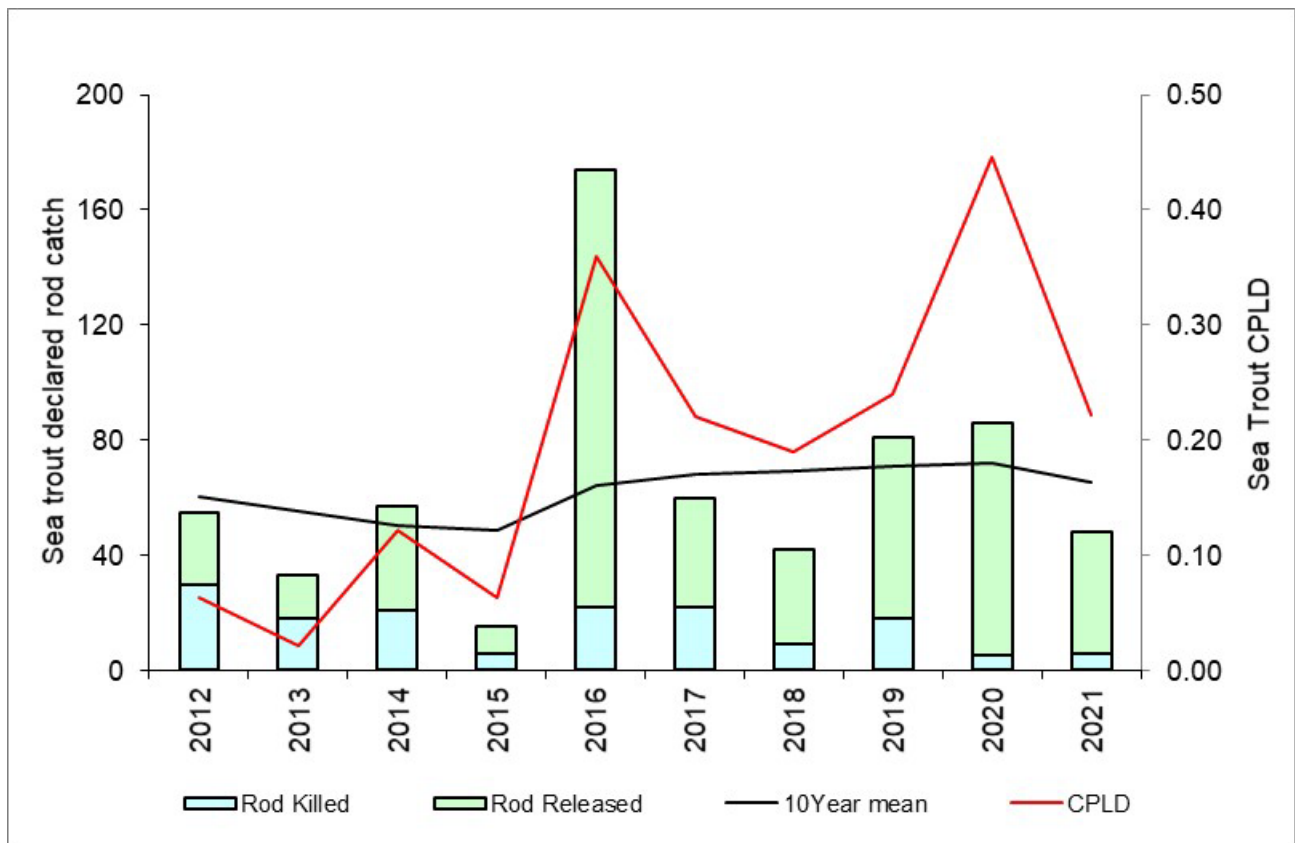
Salmon Rod Catch (Seiont)

| Year | Caught | Rod Killed | Rod Released | 10 Year mean | Percentage released | Catch per license day |
|------|--------|------------|--------------|--------------|---------------------|-----------------------|
| 2021 | 1 | 0 | 1 | 7.8 | 100 | 0.005 |
| 2020 | 12 | 0 | 12 | 9.6 | 100 | 0.062 |
| 2019 | 10 | 4 | 6 | 11.9 | 60 | 0.030 |
| 2018 | 1 | 0 | 1 | 12.1 | 100 | 0.004 |
| 2017 | 6 | 4 | 2 | 15.2 | 33 | 0.023 |
| 2016 | 6 | 4 | 2 | 18.1 | 33 | 0.010 |
| 2015 | 2 | 1 | 1 | 22.5 | 50 | 0.008 |
| 2014 | 3 | 0 | 3 | 28.0 | 100 | 0.007 |
| 2013 | 8 | 5 | 3 | 37.6 | 38 | 0.007 |
| 2012 | 29 | 19 | 10 | 38.0 | 34 | 0.031 |



Sea Trout Rod Catch (Seiont)

| Year | Caught | Rod Killed | Rod Released | 10 Year mean | Percentage released | Catch per license day |
|------|--------|------------|--------------|--------------|---------------------|-----------------------|
| 2021 | 48 | 6 | 42 | 65.1 | 88 | 0.222 |
| 2020 | 86 | 5 | 81 | 72.2 | 94.2 | 0.446 |
| 2019 | 81 | 18 | 63 | 70.7 | 77.8 | 0.240 |
| 2018 | 42 | 9 | 33 | 69.5 | 78.6 | 0.190 |
| 2017 | 60 | 22 | 38 | 68.1 | 63.3 | 0.220 |
| 2016 | 174 | 22 | 152 | 64.2 | 87.4 | 0.360 |
| 2015 | 15 | 6 | 9 | 48.7 | 60.0 | 0.063 |
| 2014 | 57 | 21 | 36 | 50.1 | 63.2 | 0.121 |
| 2013 | 33 | 18 | 15 | 55.6 | 45.5 | 0.022 |
| 2012 | 55 | 30 | 25 | 60.5 | 45.5 | 0.063 |

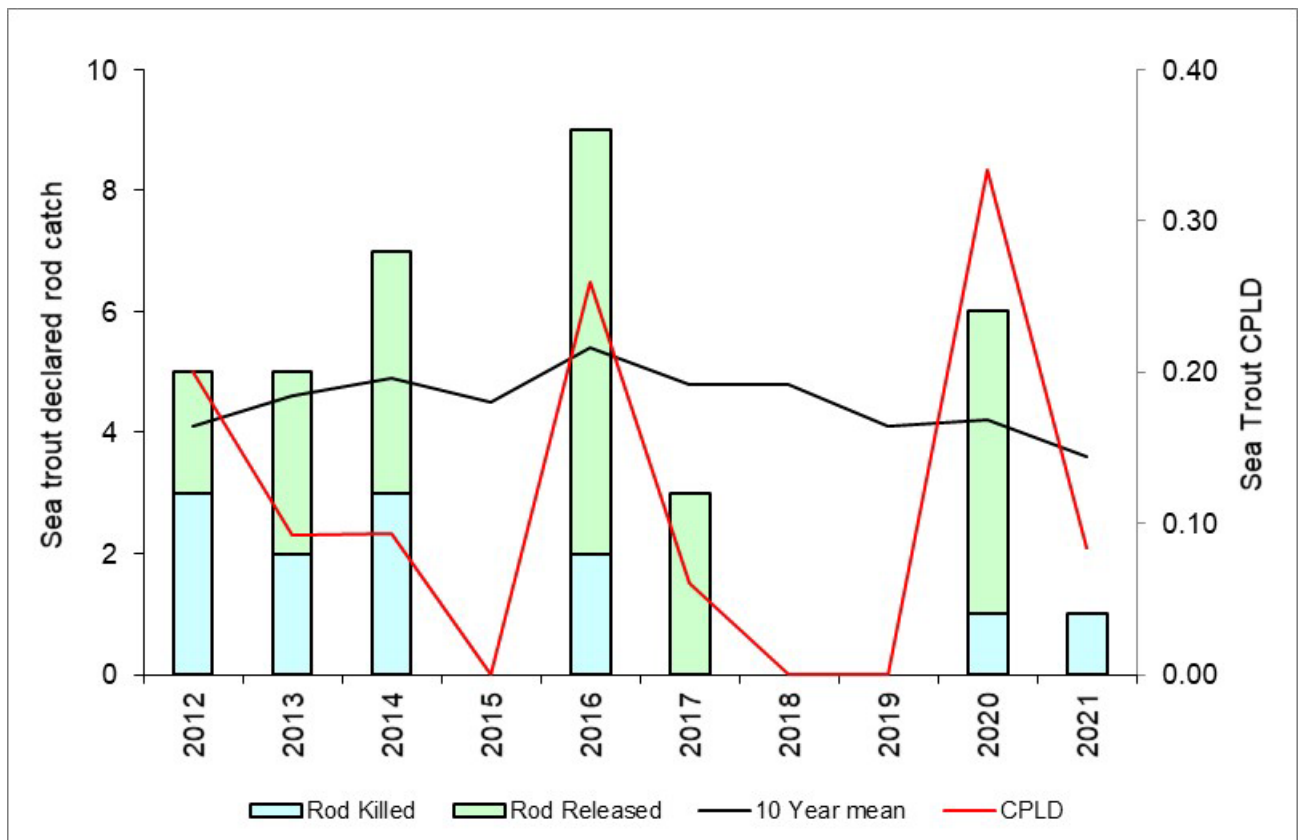


Rod Catches

As the Gwyrfai/Llyfni are classed as major sea trout rivers rather than salmon, only the sea trout data has been included. Salmon catches are minor. The following tables show the total declared rod catch for sea trout on the Gwyrfai/Llyfni. In years where there was no catch, percentage released is coded as NC (No Catch).

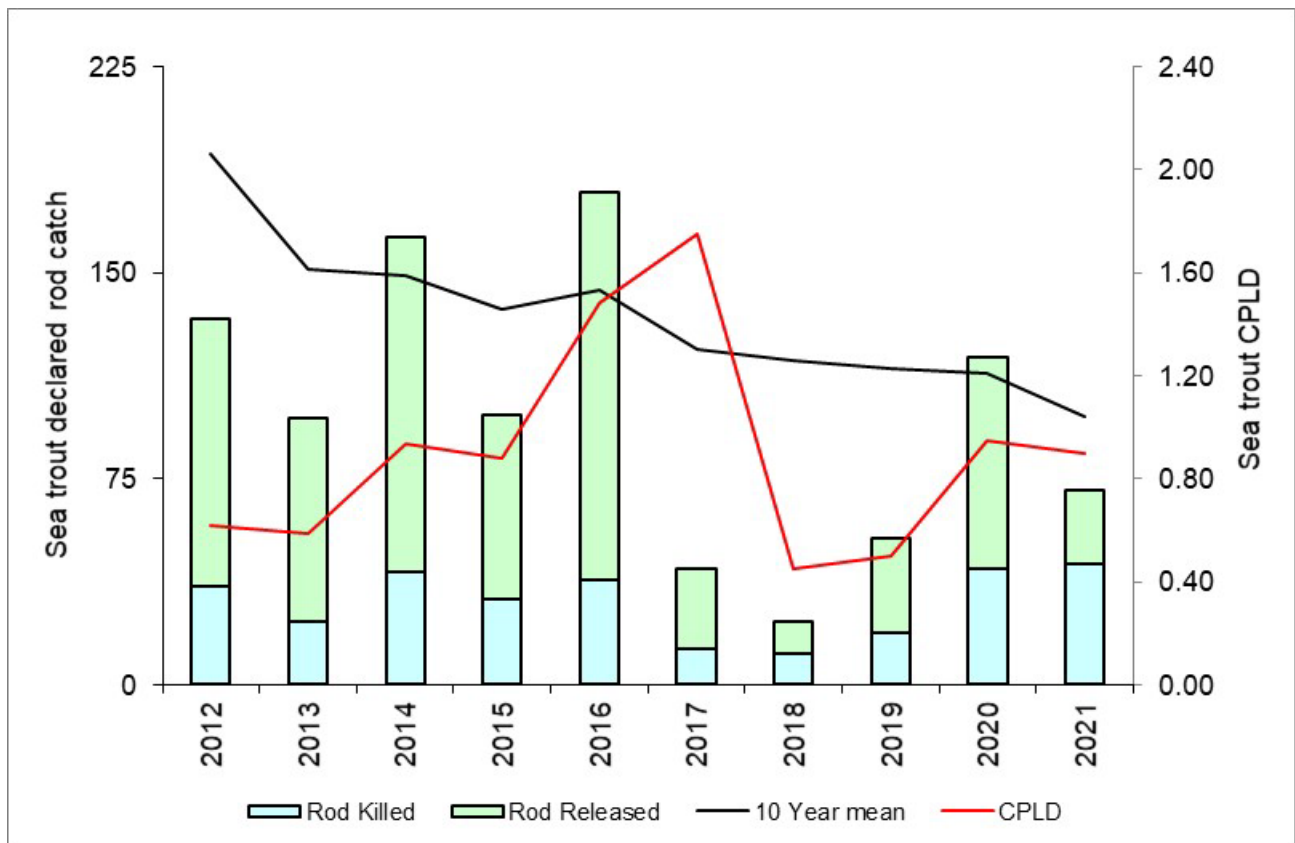
Sea Trout Rod Catch (Gwyrfai)

| Year | Caught | Rod Killed | Rod Released | 10 Year mean | Percentage released | Catch per license day |
|------|--------|------------|--------------|--------------|---------------------|-----------------------|
| 2021 | 1 | 0 | 1 | 3.6 | 0 | 0.083 |
| 2020 | 6 | 1 | 5 | 4.2 | 83 | 0.333 |
| 2019 | 0 | 0 | 0 | 4.1 | NC | NC |
| 2018 | 0 | 0 | 0 | 4.8 | NC | NC |
| 2017 | 3 | 3 | 0 | 4.8 | 100 | 0.060 |
| 2016 | 9 | 7 | 2 | 5.4 | 78 | 0.260 |
| 2015 | 0 | 0 | 0 | 4.5 | NC | NC |
| 2014 | 7 | 4 | 3 | 4.9 | 57 | 0.093 |
| 2013 | 5 | 3 | 2 | 4.6 | 60 | 0.093 |
| 2012 | 5 | 2 | 3 | 4.1 | 40 | 0.200 |



Sea Trout Rod Catch (Llyfni)

| Year | Caught | Rod Killed | Rod Released | 10 Year mean | Percentage released | Catch per license day |
|------|--------|------------|--------------|--------------|---------------------|-----------------------|
| 2021 | 71 | 44 | 27 | 97.8 | 38 | 0.899 |
| 2020 | 119 | 42 | 77 | 113.6 | 65 | 1.090 |
| 2019 | 53 | 19 | 34 | 115.1 | 64 | 0.500 |
| 2018 | 23 | 12 | 11 | 118.3 | 52 | 0.450 |
| 2017 | 42 | 29 | 13 | 122.3 | 69 | 1.750 |
| 2016 | 179 | 141 | 38 | 143.8 | 79 | 1.480 |
| 2015 | 98 | 67 | 31 | 136.7 | 68 | 0.882 |
| 2014 | 163 | 122 | 41 | 149.0 | 75 | 0.938 |
| 2013 | 97 | 74 | 23 | 151.4 | 76 | 0.587 |
| 2012 | 133 | 97 | 36 | 193.5 | 73 | 0.618 |

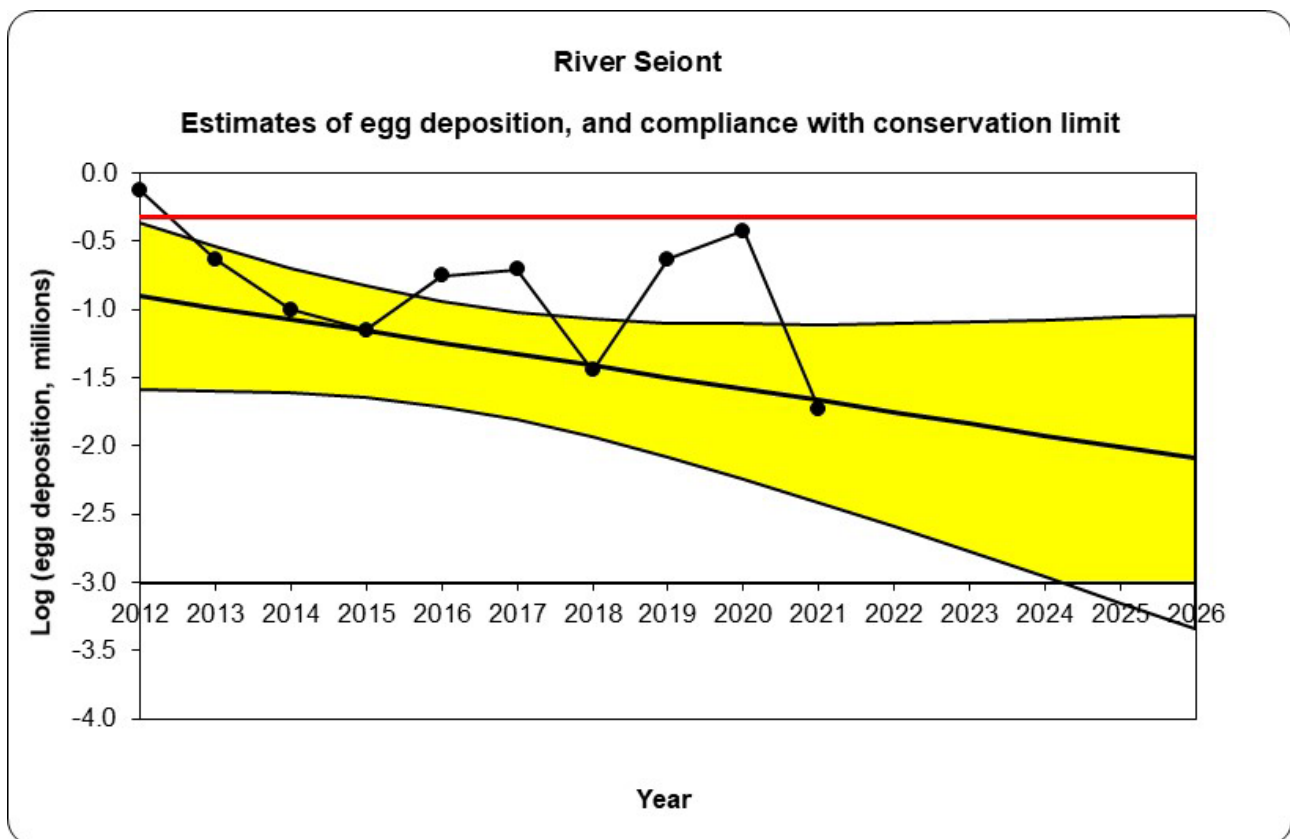


Stock Status

Conservation of Salmon

Salmon stock status is assessed using 'Conservation Limits' which provide an objective reference point against which to assess the status of salmon stocks in individual rivers.

This is calculated by applying assumed angling exploitation rates to catch data to derive run estimates; adopting standard sex ratios and weight-fecundity relationships to generate egg deposition figures. The numbers of salmon a river can produce (and consequently the catches that the stocks support) are a function of the quality and quantity of accessible spawning and rearing area. Therefore, in general, big rivers have larger catches and have correspondingly bigger total spawning requirements than small rivers. Thus, for any given rivers there should be an optimum level of stock which the conservation limit seeks to protect. The conservation limit represents the number of eggs that must be deposited each year within a given catchment in order to conserve salmon stocks in the future.



Are enough salmon eggs being deposited to conserve salmon stocks in the catchment?

The red line represents the number of eggs required to be deposited to sustain a healthy salmon stock. The black trend line and its confidence limits (the yellow band) is fitted to the most recent ten-year series of egg deposition estimates (2012-2021).

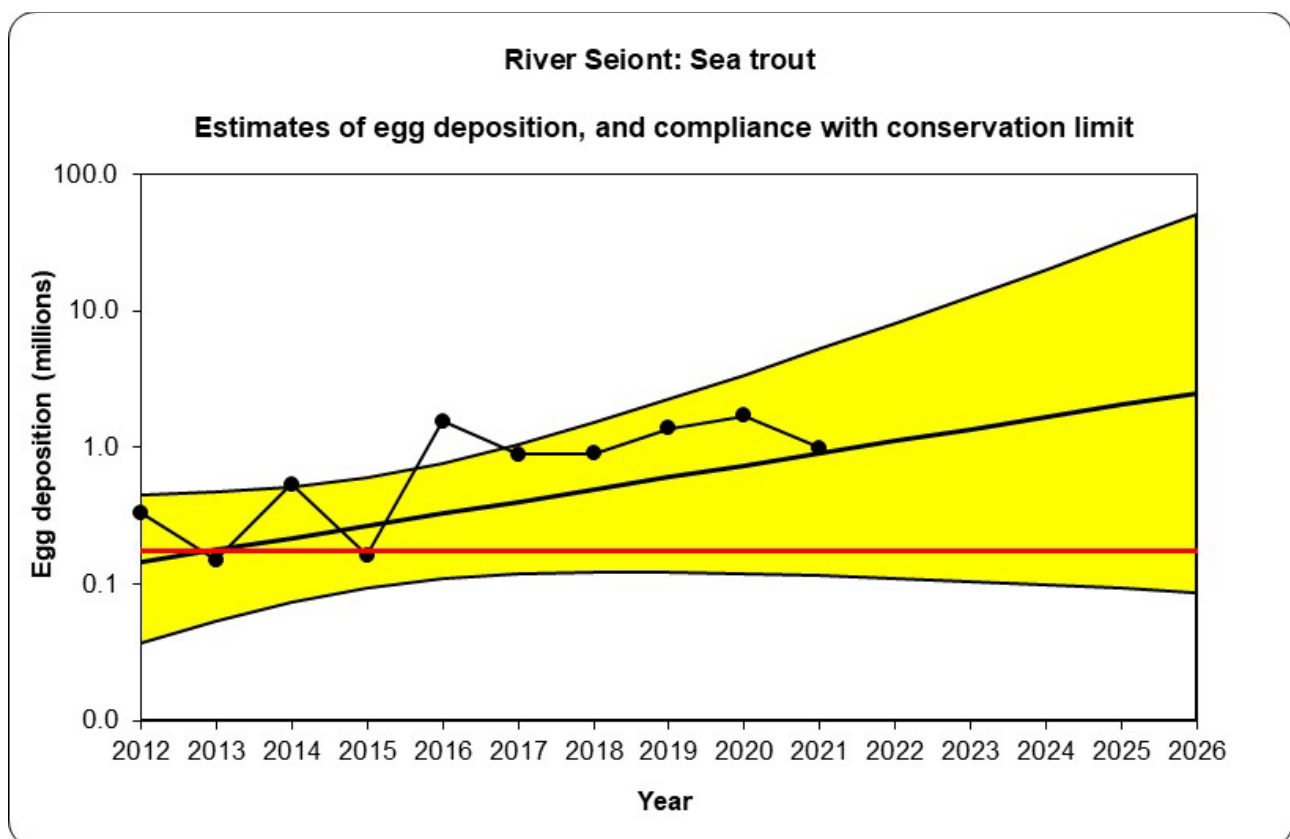
- Current number of eggs being deposited puts stocks **at risk**
- In five years' time the predicted status of salmon stocks will be **at risk**
- Based on current data, and the projection of the graph, the stocks of salmon on the Seint will continue to **decline (uncertain trend)**

Conservation of Sea Trout - Seiont

In contrast to salmon, no established methods of setting Conservation Limits or similar have been available for sea trout. In the absence of such analysis, NRW and the Environment Agency have, for several years, routinely applied a fishery-based assessment to the principal sea trout rivers. This method – used previously in this report - utilises time-series' of angling catch per unit effort (CPUE) data ('catch per day') to examine sea trout performance on a river-by-river basis.

Recently an alternative stock-based assessment method has been developed by NRW and is applied here. This utilises angling catch data to derive run and egg deposition estimates for sea trout in much the same way that similar data sets are used in Conservation Limit compliance procedures for salmon assessment.

Further details on this method are given in the recent Technical Case supporting net and rod fishery byelaw proposals on all rivers in Wales and the cross-border rivers Wye and Dee (see: [Technical case for fishing controls to protect salmon and sea trout](#)).

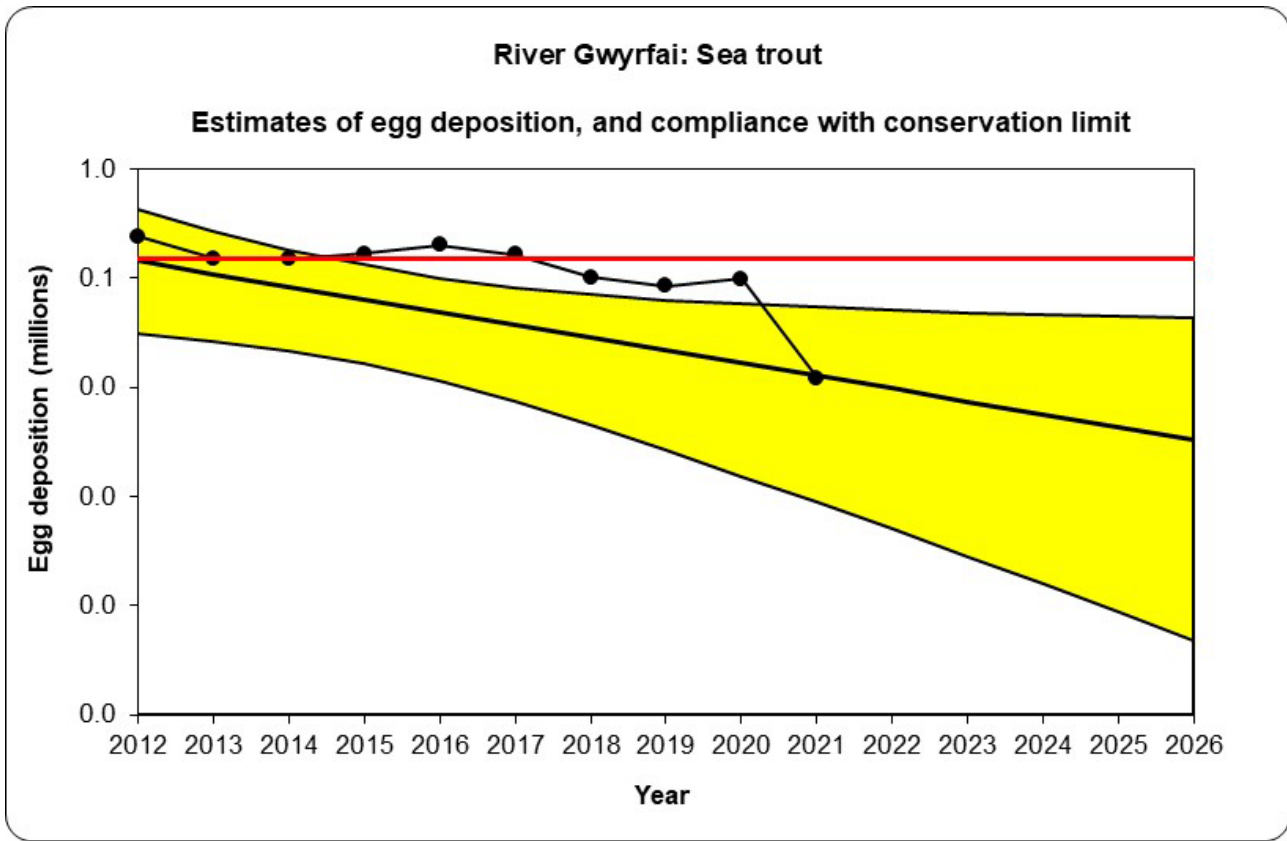


Are enough sea trout eggs being deposited to conserve stocks in the catchment?

The red line represents the number of eggs required to be deposited to sustain a healthy sea trout stock. The black trend line and its confidence limits (the yellow band) is fitted to the most recent ten-year series of egg deposition estimates (2012-2021).

- Current number of eggs being deposited puts stocks **probably not at risk**
- In five years' time the predicted status of salmon stocks will be **probably not at risk**
- Based on current data, and the projection of the graph, the stocks of sea trout on the Seiont will continue to **improve (uncertain trend)**

Conservation of Sea Trout - Gwyrfai

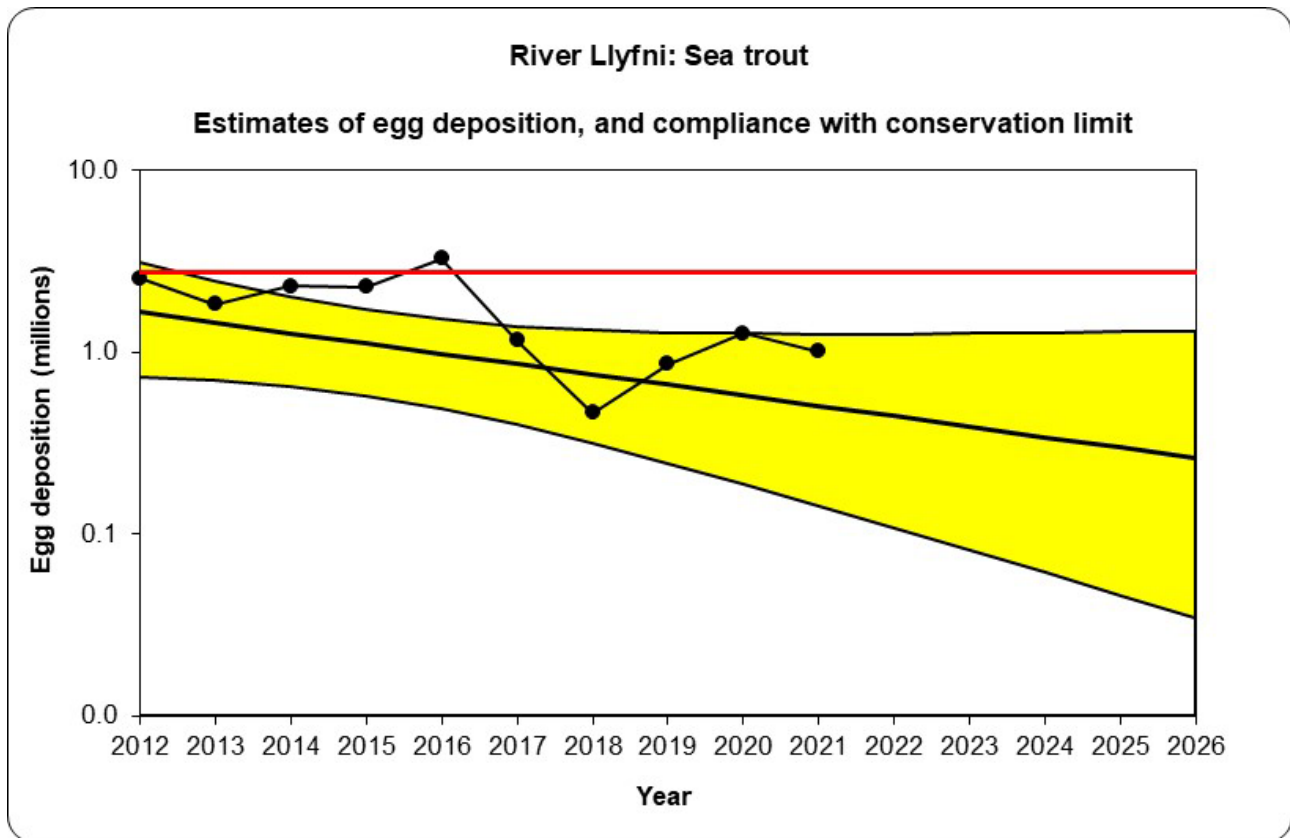


Are enough sea trout eggs being deposited to conserve stocks in the catchment?

The red line represents the number of eggs required to be deposited to sustain a healthy sea trout stock. The black trend line and its confidence limits (the yellow band) is fitted to the most recent ten-year series of egg deposition estimates (2012-2021).

- Current number of eggs being deposited puts stocks **at risk**
- In five years' time the predicted status of salmon stocks will be **at risk**
- Based on current data, and the projection of the graph, the stocks of sea trout on the Gwyrfai will continue to **decline (downward trend)**

Conservation of Sea Trout - Llyfni



Are enough sea trout eggs being deposited to conserve stocks in the catchment?

The red line represents the number of eggs required to be deposited to sustain a healthy sea trout stock. The black trend line and its confidence limits (the yellow band) is fitted to the most recent ten-year series of egg deposition estimates (2012-2021).

- Current number of eggs being deposited puts stocks **at risk**
- In five years' time the predicted status of salmon stocks will be **at risk**
- Based on current data, and the projection of the graph, the stocks of sea trout on the Llyfni will continue to **decline (uncertain trend)**

Juvenile Salmonid Monitoring Programme

In 2022 the temporal (annual) programme consisted of one semi quantitative site on each catchment for the Seiont, Gwyrfai & Llyfni. Three additional five-minute fry temporals have also been added to each catchment. The temporal data is used to look at trends in juvenile salmon and trout densities giving an indication of spawning across the whole catchment.

Salmon and Trout Classifications

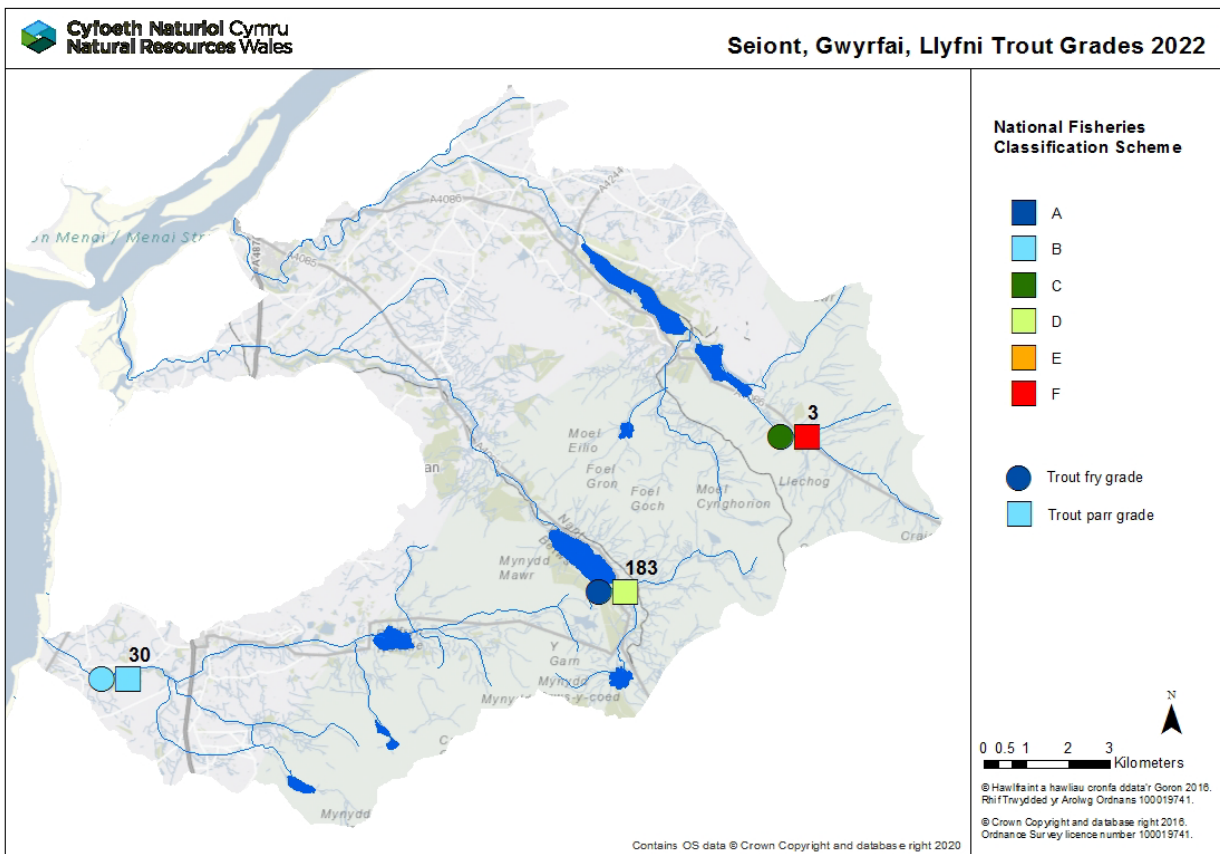
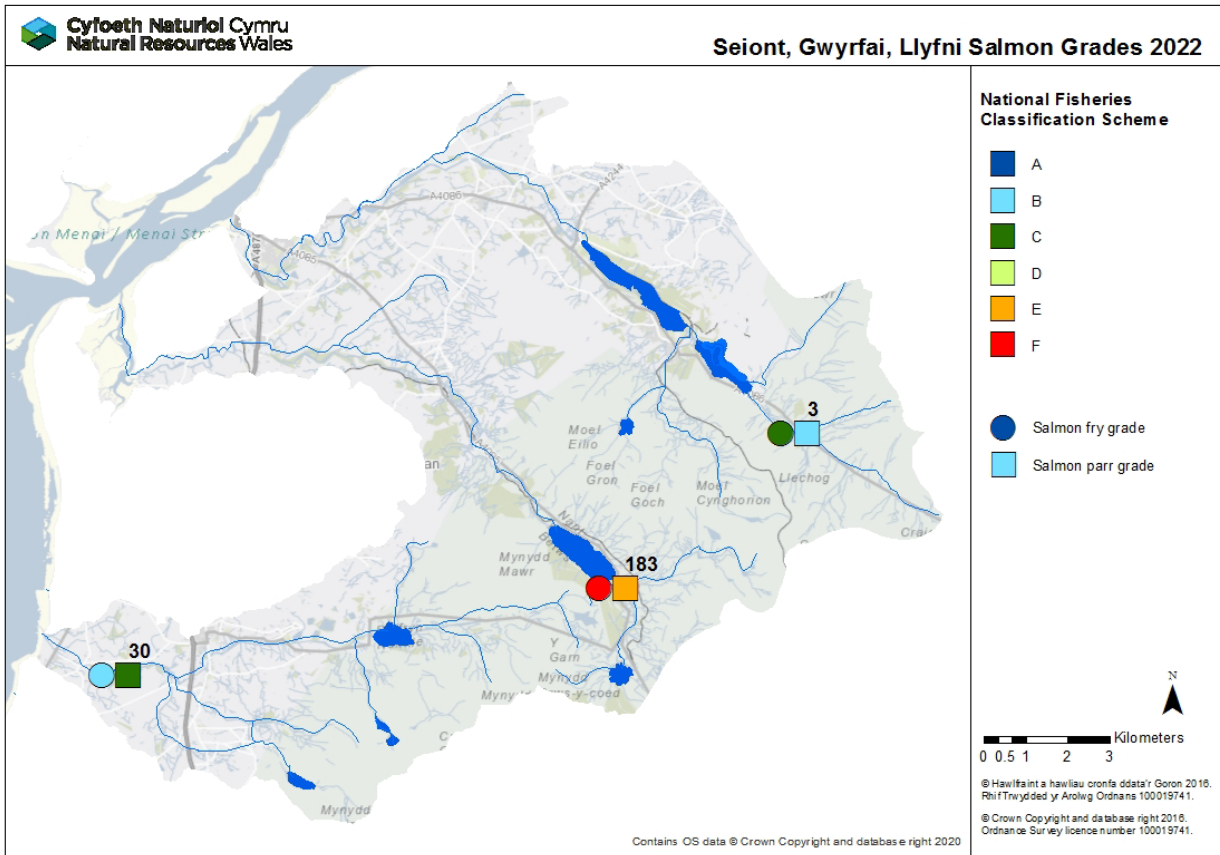
The following tables/maps shows the results of the routine juvenile salmonid population surveys from 2022 on the Seiont, Gwyrfai & Llyfni.

The symbols display the National Fish Classification Scheme (NFCS) grades which have been developed to evaluate and compare the results of fish population surveys in a consistent manner. The NFCS ranks survey data by comparing fish abundance at the survey sites with sites across Wales and England where juvenile salmonids are present. Sites are classified into categories A to F, depending on densities of juvenile salmonids at the site. The following table shows the values and classification of NFCS.

| Grade | Descriptor | Interpretation |
|----------|------------|--|
| A | Excellent | In the top 20% for a fishery of this type |
| B | Good | In the top 40% for a fishery of this type |
| C | Fair | In the middle 20% for a fishery of this type |
| D | Fair | In the bottom 40% for a fishery of this type |
| E | Poor | In the bottom 20% for a fishery of this type |
| F | Fishless | No fish of this type present |

| Catchment | Site code | Year | Salmon fry grade | Salmon parr grade | Trout fry grade | Trout parr grade |
|-----------|-----------|------|------------------|-------------------|-----------------|------------------|
| Seiont | 3 | 2022 | C | B | C | F |
| Gwyrfai | 183 | 2022 | F | E | A | D |
| Llyfni | 30 | 2022 | B | C | B | B |

Seiont, Gwyrfai and Llyfni Juvenile Salmon/Trout Grades 2022



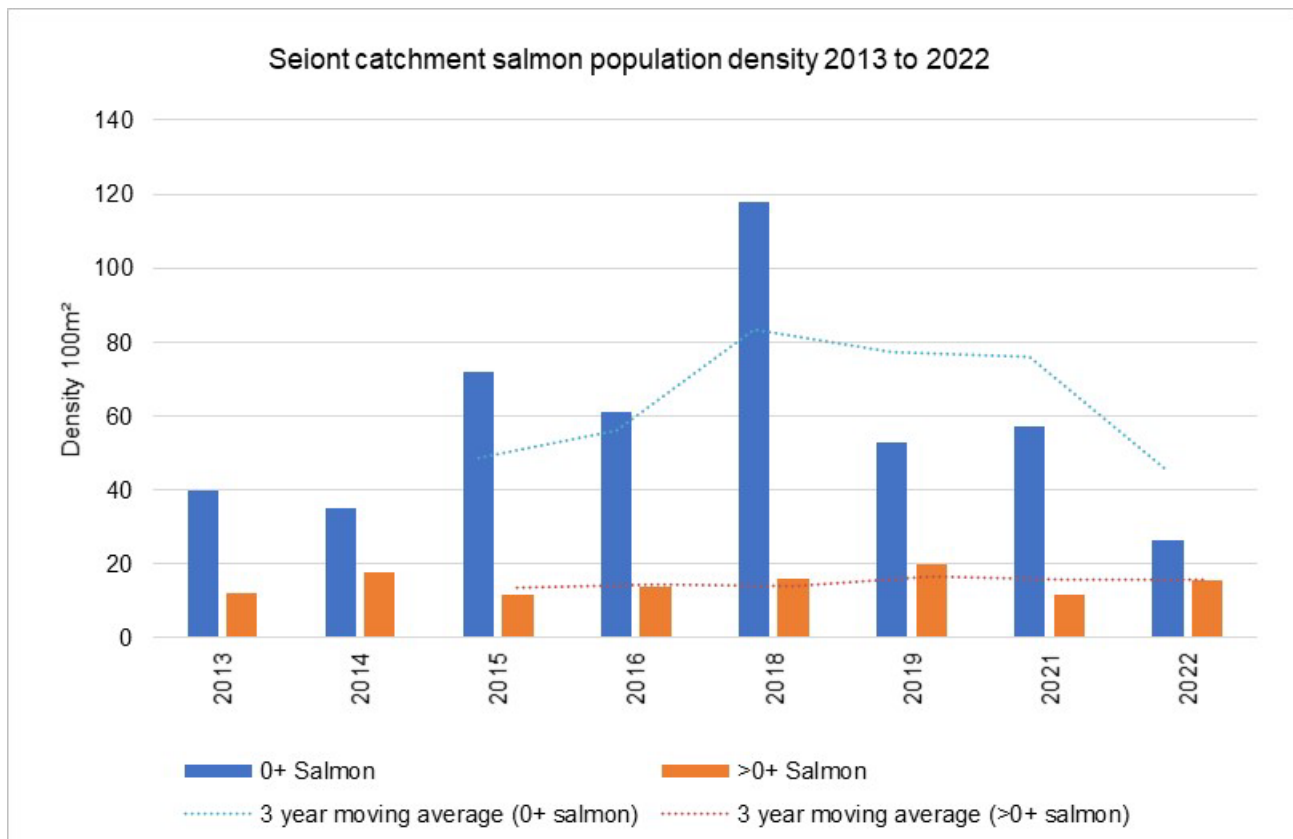
Catchment Population Trends

The table below show a simple comparison of average salmon and trout densities on the Seiont catchment (Nant Peris temporal site) since 2013. NB – no survey was carried out in 2017 due to high flows, covid restrictions cancelled all surveys in 2020. NA stands for not applicable.

Since 2014 an additional twenty metres have been fished at the Nant Peris site to better represent all fish species.

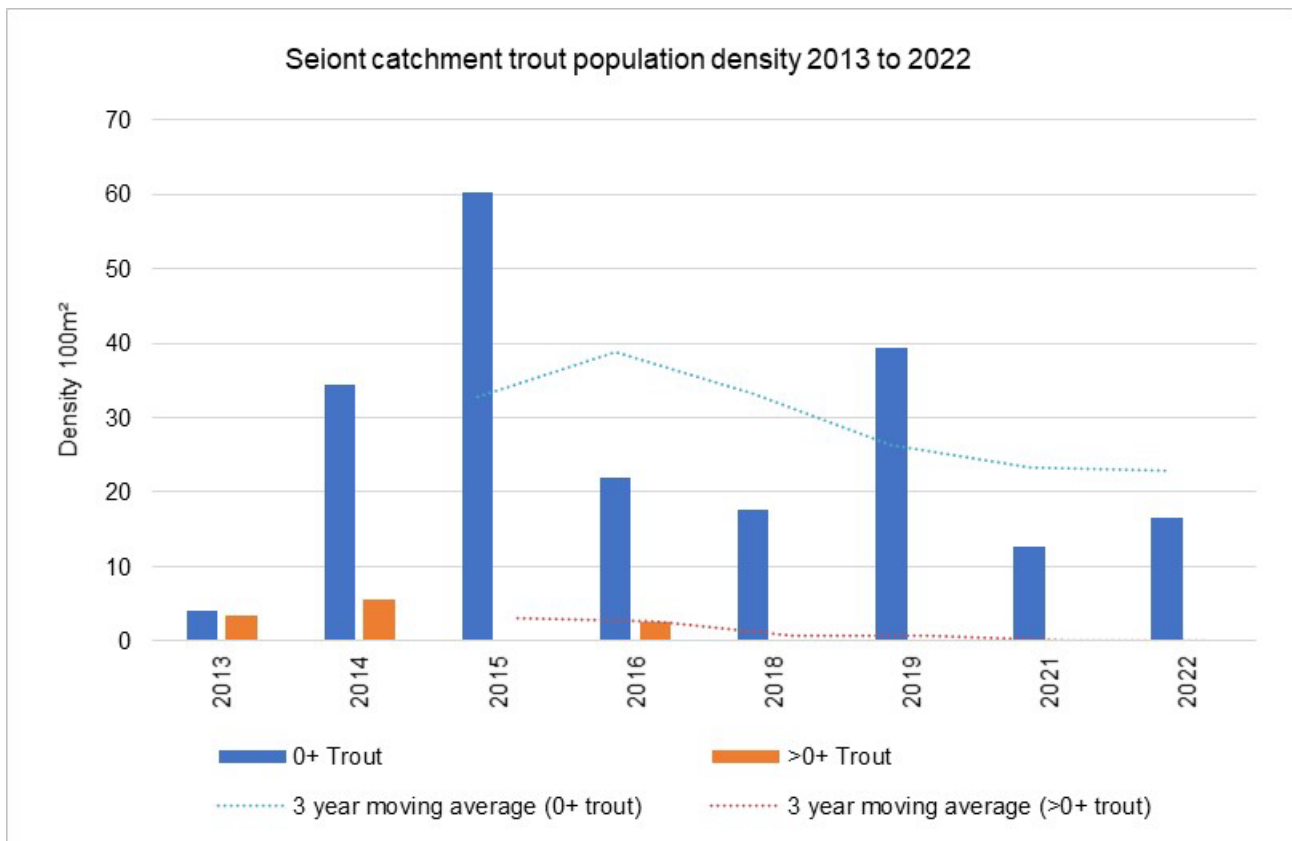
Salmon population estimate - Seiont

| Year | 0+ Salmon | 3-year average (0+ salmon) | >0+ Salmon | 3-year average (>0+ salmon) |
|------|-----------|----------------------------|------------|-----------------------------|
| 2022 | 26.5 | 45.5 | 15.4 | 15.6 |
| 2021 | 57.1 | 75.9 | 11.5 | 15.9 |
| 2019 | 52.8 | 77.2 | 20.0 | 16.7 |
| 2018 | 117.8 | 83.6 | 16.2 | 13.9 |
| 2016 | 61.1 | 56.1 | 13.8 | 14.4 |
| 2015 | 71.9 | 49.0 | 11.6 | 13.8 |
| 2014 | 35.1 | NA | 17.9 | NA |
| 2013 | 39.8 | NA | 12.0 | NA |



Trout population estimate - Seiont

| Year | 0+ Trout | 3-year average (0+ trout) | >0+ Trout | 3-year average (>0+ trout) |
|------|----------|---------------------------|-----------|----------------------------|
| 2022 | 16.6 | 22.9 | 0.0 | 0.0 |
| 2021 | 12.7 | 23.2 | 0.0 | 0.0 |
| 2019 | 39.4 | 26.3 | 0.0 | 0.8 |
| 2018 | 17.5 | 33.2 | 0.0 | 0.8 |
| 2016 | 21.8 | 38.8 | 2.5 | 2.7 |
| 2015 | 60.2 | 32.9 | 0.0 | 3.0 |
| 2014 | 34.4 | NA | 5.5 | NA |
| 2013 | 4.1 | NA | 3.5 | NA |

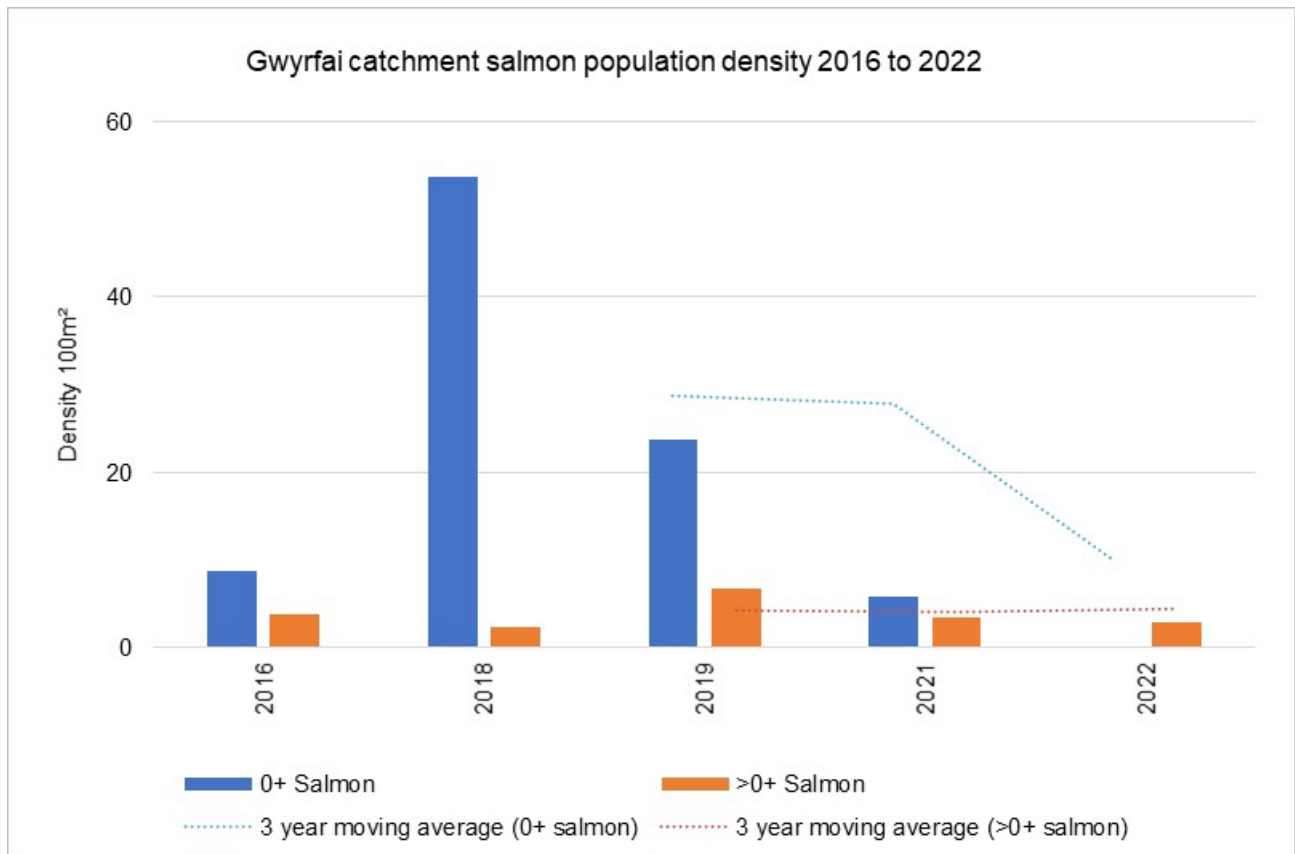


Catchment Population Trends

The table below show a simple comparison of average salmon and trout densities on the Gwyrfai catchment since 2016 when we first started fishing the site. NB – no survey was carried out in 2017 due to high flows, covid restrictions cancelled all surveys in 2020. NA stands for not applicable.

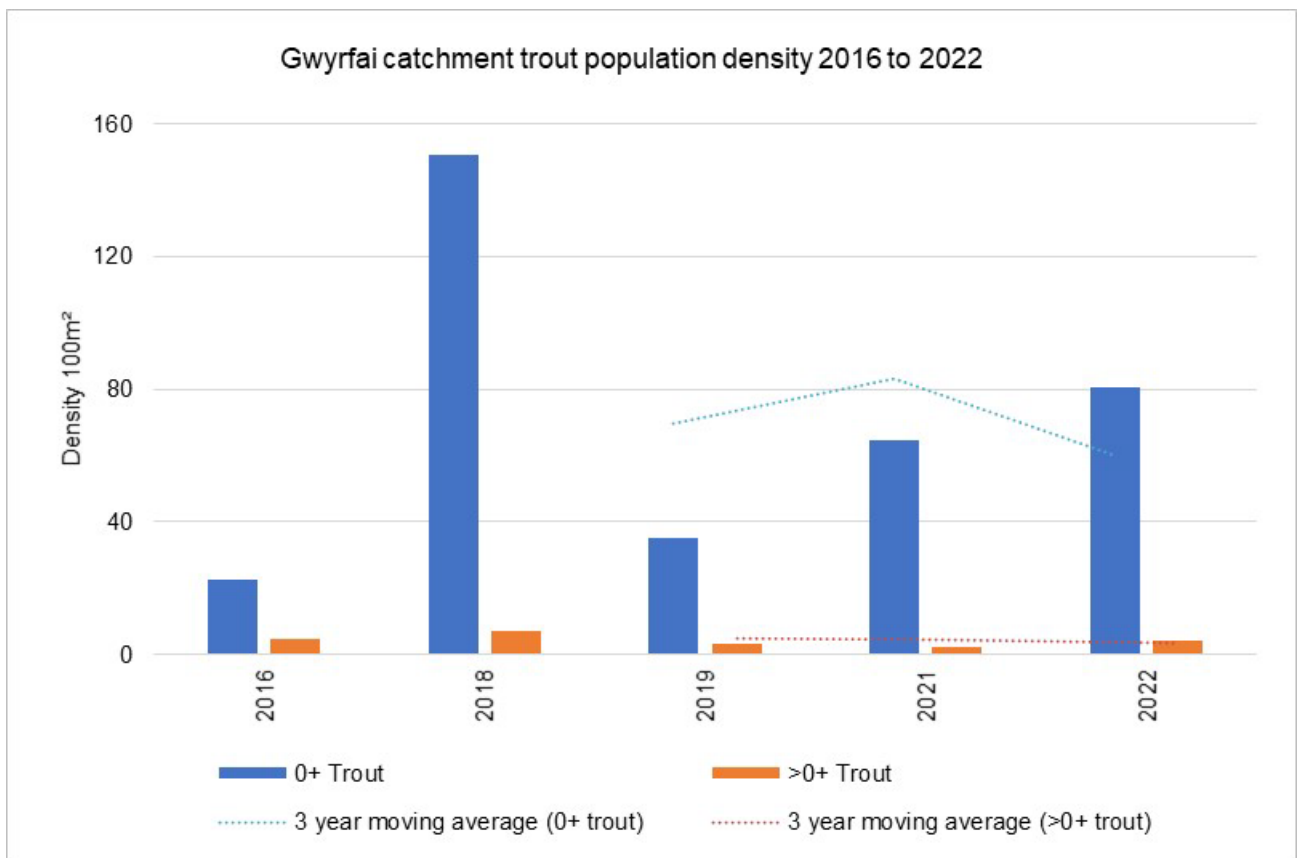
Salmon population estimate - Gwyrfai

| Year | 0+ Salmon | 3-year average (0+ salmon) | >0+ Salmon | 3-year average (>0+ salmon) |
|------|-----------|----------------------------|------------|-----------------------------|
| 2022 | 0.0 | 9.9 | 2.9 | 4.3 |
| 2021 | 5.9 | 27.7 | 3.4 | 4.1 |
| 2019 | 23.7 | 28.7 | 6.8 | 4.3 |
| 2018 | 53.6 | NA | 2.3 | NA |
| 2016 | 8.7 | NA | 3.8 | NA |



Trout population estimate – Gwyrfai

| Year | 0+ Trout | 3-year average (0+ trout) | >0+ Trout | 3-year average (>0+ trout) |
|------|----------|---------------------------|-----------|----------------------------|
| 2022 | 80.5 | 60.0 | 4.1 | 3.3 |
| 2021 | 64.3 | 83.3 | 2.4 | 4.2 |
| 2019 | 35.1 | 69.5 | 3.3 | 5.0 |
| 2018 | 150.5 | NA | 7.0 | NA |
| 2016 | 22.7 | NA | 4.7 | NA |

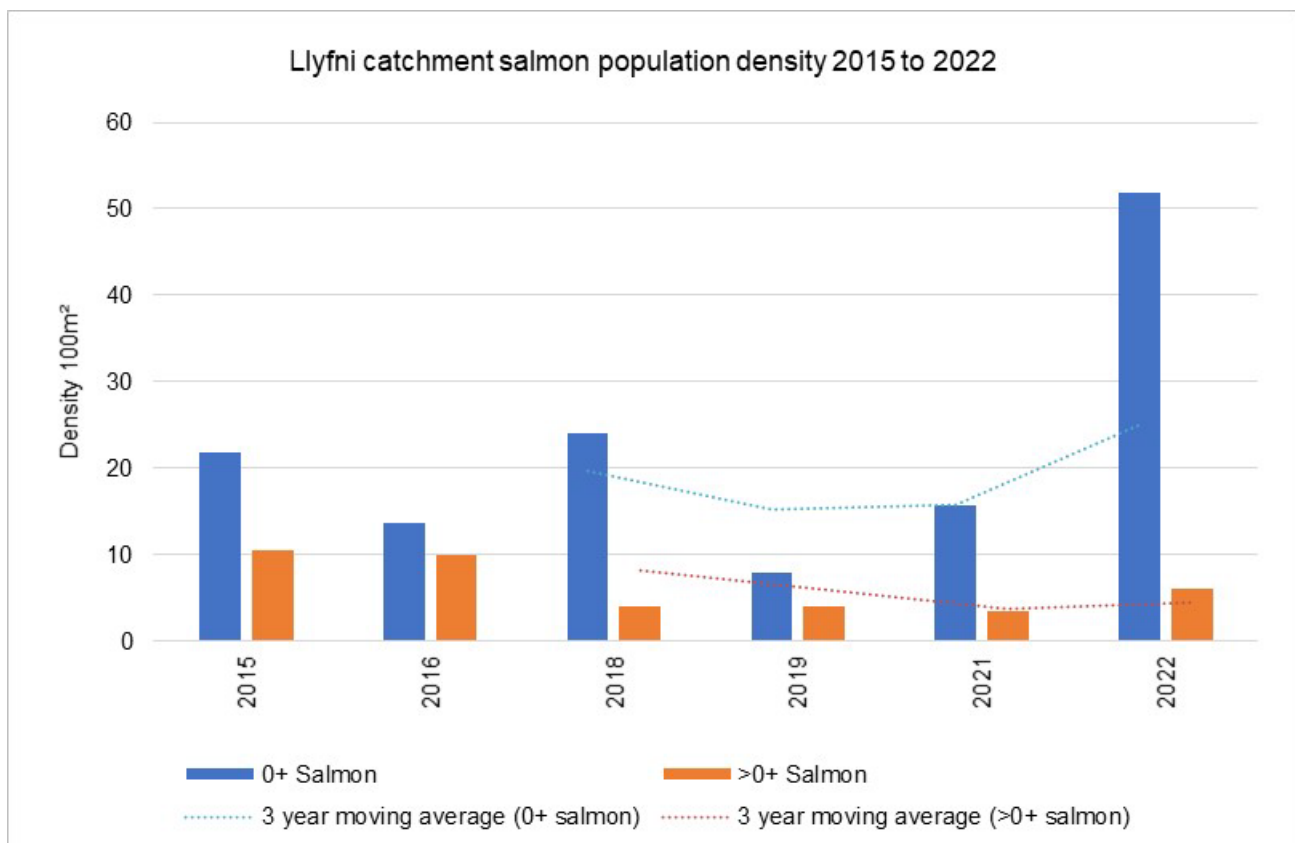


Catchment Population Trends

The table below show a simple comparison of average salmon and trout densities on the Llyfni catchment since 2015 when we first started fishing the site. NB – no survey was carried out in 2017 due to high flows, covid restrictions cancelled all surveys in 2020. NA stands for not applicable

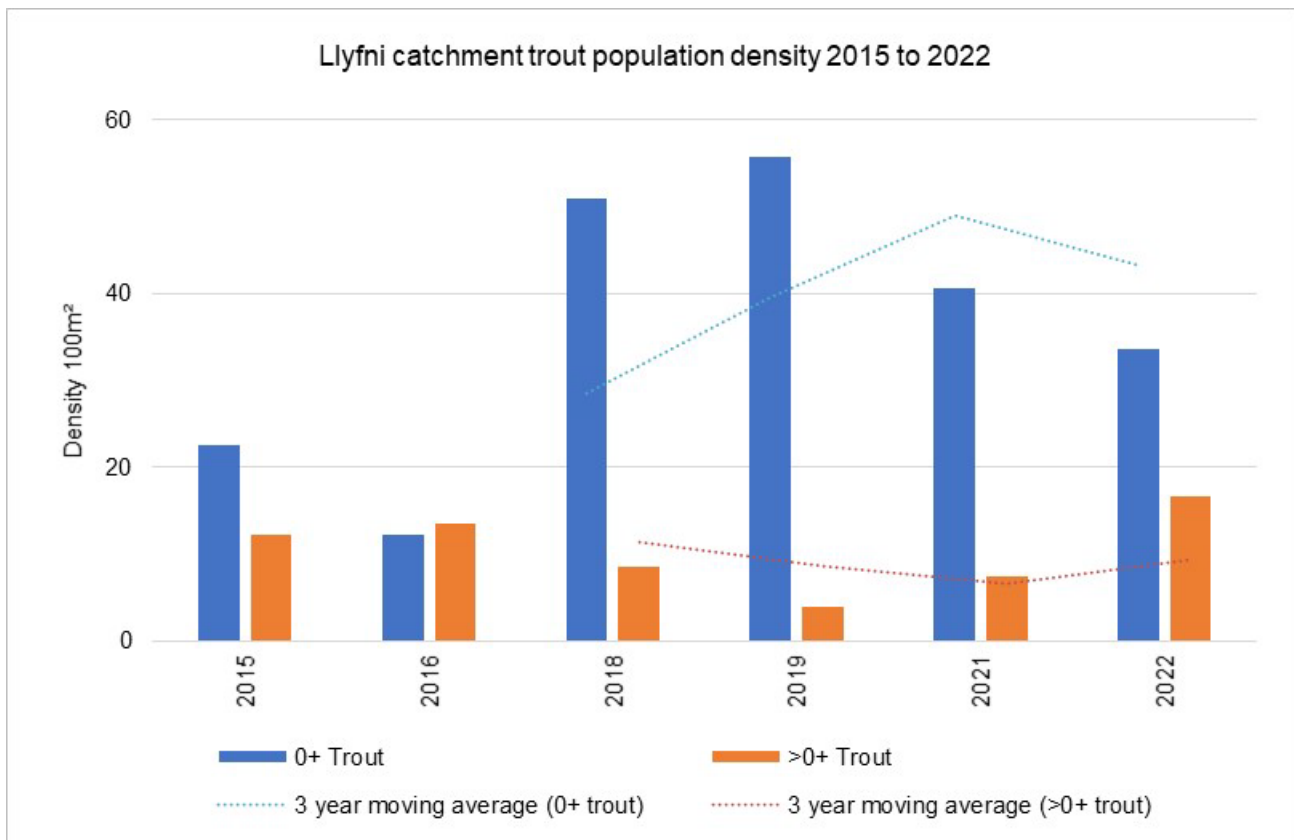
Salmon population estimate - Llyfni

| Year | 0+ Salmon | 3-year average (0+ salmon) | >0+ Salmon | 3-year average (>0+ salmon) |
|------|-----------|----------------------------|------------|-----------------------------|
| 2022 | 51.8 | 25.1 | 6.0 | 4.4 |
| 2021 | 15.7 | 15.8 | 3.3 | 3.7 |
| 2019 | 7.8 | 15.1 | 3.9 | 5.9 |
| 2018 | 23.9 | 19.7 | 3.9 | 8.1 |
| 2016 | 13.6 | NA | 9.9 | NA |
| 2015 | 21.7 | NA | 10.4 | NA |



Trout population estimate - Llyfni

| Year | 0+ Trout | 3-year average (0+ trout) | >0+ Trout | 3-year average (>0+ trout) |
|------|----------|---------------------------|-----------|----------------------------|
| 2022 | 33.6 | 43.2 | 16.6 | 9.3 |
| 2021 | 40.5 | 49.0 | 7.4 | 6.6 |
| 2019 | 55.6 | 39.5 | 3.8 | 8.6 |
| 2018 | 50.8 | 28.5 | 8.5 | 11.4 |
| 2016 | 12.2 | NA | 13.4 | NA |
| 2015 | 22.5 | NA | 12.2 | NA |

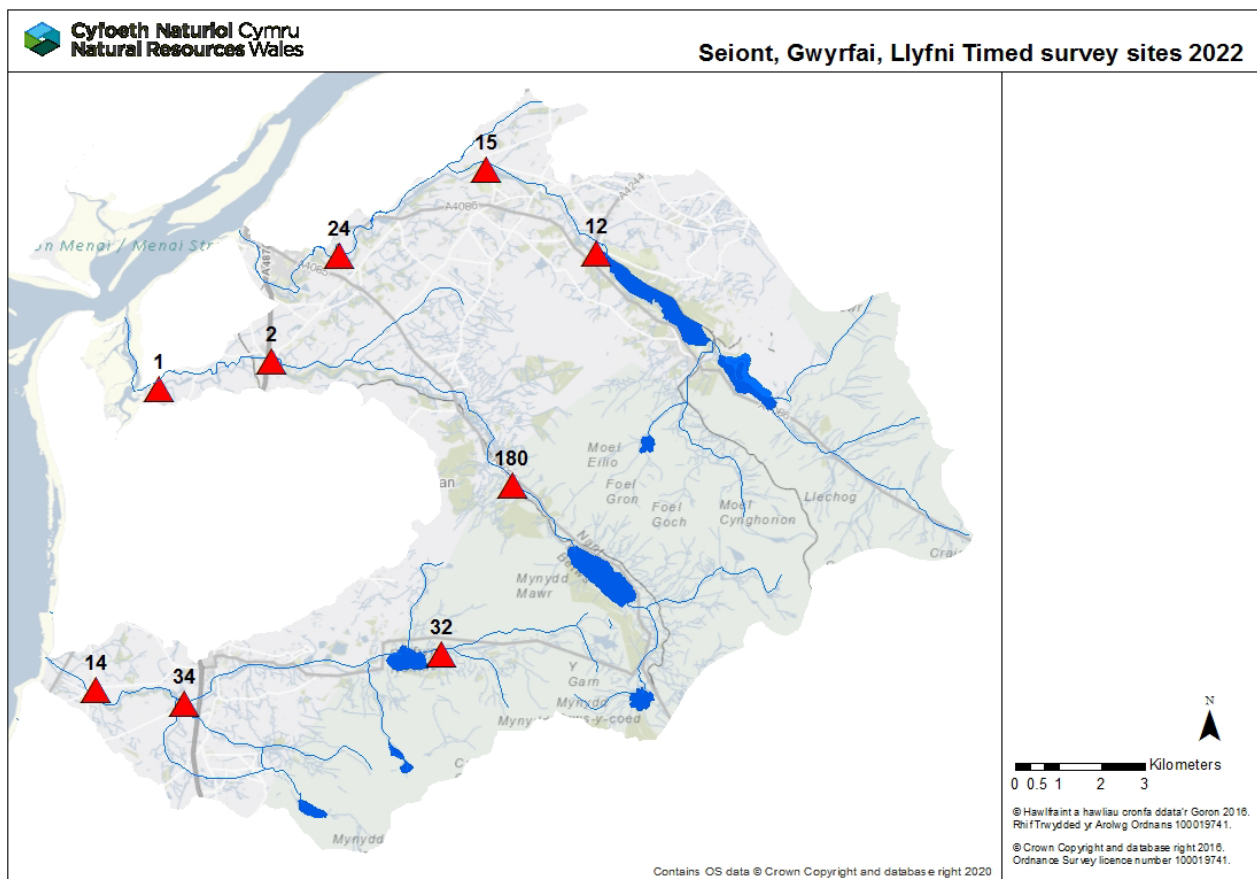


Seiont, Gwyrfai & Llyfni temporal five-minute fry surveys

Three additional five-minute fry surveys have been added on each catchment to give a better overview of production throughout the waterbody. As this is the first time that some sites have been surveyed, we will only present the data in a tabulated form. The map on the following page highlights where the sites are.

Five-minute fry surveys – number caught

| Catchment | Site Code | Name | Salmon fry | Salmon parr | Trout fry | Trout parr |
|-----------|-----------|-----------------|------------|-------------|-----------|------------|
| Seiont | 12 | Penllyn | 2 | 3 | 11 | 3 |
| Seiont | 15 | Crawia | 3 | 3 | 6 | 1 |
| Seiont | 24 | Glan Gwna | 2 | 11 | 18 | 1 |
| Gwyrfai | 1 | Penrhyn Bach | 0 | 3 | 7 | 6 |
| Gwyrfai | 2 | Bontnewydd | 3 | 20 | 17 | 3 |
| Gwyrfai | 180 | Irish bridge | 21 | 3 | 15 | 4 |
| Llyfni | 14 | Pont y Cim | 1 | 2 | 15 | 5 |
| Llyfni | 32 | US Llyn Nantlle | 0 | 0 | 21 | 1 |
| Llyfni | 34 | DS Crychddwr | 0 | 25 | 16 | 11 |



Seiont, Gwyrfai and Llyfni Fisheries Action Plan

| Planned actions | Benefits | Lead | Partner(s) | Timescale for delivery |
|--|--|---------------------------------|---|------------------------|
| <p>Seiont alternative mitigation habitat improvements: Investigation and delivery of improvements to habitat (riparian and/or instream) and/or fish passage over barriers.</p> | <p>Improved river function, through more naturalised systems, increased flow diversity, improved spawning and juvenile habitat and gravels. Improved numbers of fish and more resilient populations. and improved.</p> | <p>North Wales Rivers Trust</p> | | <p>2022-2024</p> |
| <p>Habitat improvements: We will investigate where there is opportunity to improve habitat for fish through improving access over barriers, restoration of riparian and instream habitat, including control of invasive species.</p> | <p>More natural river system, reduced siltation, increased flow diversity, improved spawning gravels and juvenile habitat. Improved fish numbers.</p> | <p>NRW</p> | | <p>On-going</p> |
| <p>Water Framework Directive: We will continue to work to ensure no deterioration, monitor the status of the environment and investigate the causes of failures. Together with our partners we will look to put in place measures that protect and improve the status of the water environment.</p> | <p>Waterbodies protected and improved WFD waterbodies achieving Good Status/Potential.</p> | <p>NRW</p> | <p>NRW Wildlife trusts Local authorities Landowner DCWW</p> | <p>On-going</p> |
| <p>Enforcement: Action to reduce illegal activity on information provided and investigations.</p> | <p>Reduce illegal activity, more fish remain in the system.</p> | <p>NRW</p> | <p>Stakeholders North Wales Police</p> | <p>On-going</p> |