Trials of modified designs of nets in the North East and Yorkshire coastal sea trout fishery

Project Report

December 2019

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Executive summary

Between June and August 2019, the Environment Agency undertook field trials of modified designs of beach nets in the Yorkshire and North East coastal net fishery. These trials were designed to determine whether modified nets were able to catch sea trout preferentially to salmon.

Trial netting berths for modified T nets were established at three separate locations in the North East, at Alnmouth, Amble and South Shields. An additional trial berth for a modified J net was located at Filey Bay in Yorkshire.

The Agency developed four success criteria for the modified net trials, which are summarised below:

1. There should be no increase in the level of exploitation of sea trout in any district above recent historic levels.

2. An interception rate for salmon not exceeding 5% of the total sea trout net catch.

3. Minimal physical damage to enmeshed or entangled salmon.

4. Levels of immediate mortality of enmeshed or entangled salmon set at not more than 50 salmon over the whole of the trial period in the North East, and not more than 10 salmon in Yorkshire.

The trials provided a substantial amount of new data to better inform our understanding of the operation of modified designs of nets to advise the future management of the net fishery.

The data collected from these trials provides an assessment of net performance in a single year only, at a limited number of locations. Historic net catches confirm the fishery has significant inter-annual variation in catches, and therefore these results should be interpreted with a degree of caution.

However, the information provided by the trials provides a good evidence base on which to evaluate the performance of the modified nets, and to inform future net fishery management.

The North East trial comprised 771 hours of netting in 87 separate netting events over an 11 week period. The data provided by logbook returns from licensed netsmen were validated by over 92 hours of independent fisheries observations and video surveillance of the operation of the nets by Environment Agency officers.

The trial in Yorkshire comprised a total of 14 netting events, over which 81 hours of netting were undertaken. The data provided by logbook returns from the trial berth were validated by over 36 hours of independent fisheries observations and video surveillance of the operation of the nets by Environment Agency officers.

Although there are some differences in the data provided by logbooks and fisheries observations, the total number of salmon recorded by both methods is small, and the results from both methods of assessment are in broad agreement.

In the North East, a total of 3342 sea trout and 46 salmon were landed during the trial. Based on comparison with recent historic catches at the trial berth locations, this represents a 97% reduction in salmon catch, whereas sea trout catches were only reduced by around 30%.

All 46 salmon entangled were released from the net and returned to sea with the minimum of delay. There were no immediate mortalities of salmon recorded, all fish were returned to the sea alive, generally with minimal to moderate scale loss.

Given the absence of any confirmed mortalities, the low interception rate for salmon and the relative ease with which most salmon entangled in the net could be released, the trial has shown that in June and July it would be unlikely there would be any significant adverse impact on salmon stocks were modified T nets allowed to fish for sea trout over a longer season, including those stocks originating from rivers on the east coast of Scotland where salmon are designated as an interest feature of Special Areas of Conservation (SACs).

Salmon bycatch in August was higher, and sea trout catches low, providing a weaker case to extend the season beyond the end of July, although no mortalities were recorded in August.

It is estimated that were the trial netting season and net design extended across the whole of the North East net fishery, and in the region of an additional hundred salmon may be intercepted, the great majority of which could be released to continue their spawning migration.

In Yorkshire, a total of 67 sea trout and 4 salmon were landed during the trial. Based on comparison with recent historic catches, salmon catches were around 74% lower than the recent average for this berth, with sea trout catches around 64% lower than average.

Only four salmon were entangled during the net trial, three of which were returned with no recorded significant injuries. The fourth salmon entangled was intercepted by a seal and killed before it could be released.

As the trial employed a single berth in Yorkshire, any assessment of the likely catch of salmon in the wider Yorkshire beach net should be treated with relatively low confidence.

However, given the low interception rate for salmon and the relative ease with which most salmon entangled in the net could be released, the trial results indicate it is likely there would be a minimal impact on salmon stocks were modified J nets allowed to fish for sea trout over a longer season, including those stocks originating from rivers on the east coast of Scotland where salmon are designated as an interest feature of Special Areas of Conservation (SACs).

Extending the sea trout netting season in the North East and Yorkshire would increase exploitation of sea trout, but given the modified design of J net is less effective at intercepting sea trout than the traditional design, not to the extent of the fishery prior to the introduction of the 2018 byelaws.

Any decision to propose an extension to the sea trout netting season would be dependent on an assessment that contributing sea trout stocks had a harvestable surplus available for exploitation.

Based on the results of these field trials, it has been concluded that:

In both the North East and Yorkshire the trial results show that the modified designs of nets proved successful in intercepting sea trout whilst only entangling a small number of salmon, the great majority of which were returned with minimal damage or delay.

In the North East the modified net design of T net met or came close to meeting all trial criteria and entangled very few salmon. If this design of net were extended to the whole of the North East net fishery over an extended season, the impact on salmon stocks is assessed to be very low.

In Yorkshire the evidence also indicates an extended sea trout fishery could meet the Agency's criteria, since only one salmon mortality was recorded and the net design met or came close to meeting all test criteria. If this design of net were extended to the whole of the Yorkshire net fishery over an extended season, the impact on salmon stocks is assessed to be very low.

Catches from both trials indicate an extension to the current sea trout netting season is likely to be economically viable.

Options for the future regulation of the net fishery should be further developed, based on the conclusions of this report and the latest assessment of the status of contributing salmon and sea trout stocks.

The most effective and appropriate means of extending the current netting season for sea trout should be further investigated, consistent with policy and carefully balancing our management objectives of providing vulnerable stocks with much needed added protection, while minimising the economic and social impacts of Agency regulations.

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1. Introduction

1.1 Background

In December 2018, new national byelaws were confirmed by the Fisheries Minister for the better protection of vulnerable salmon stocks. These byelaws had a significant impact on the North East and Yorkshire coastal net fishery, which typically accounts for around 95% of the salmon net catch in England.

These byelaws closed the drift net component of the net fishery completely, affecting 11 licensees. The beach net component of the fishery, comprising T nets and J nets (49 licensees in 2018) was closed for salmon, but allowed to continue to fish for sea trout only, generally over a shorter netting season, depending on the number of salmon typically taken in that part of the net fishery.

The beach net fishery is managed in seven coastal districts, with each having a different level of catch of salmon. The salmon net catch declines from north to south, with the northernmost district (District 1) having the greatest catch of salmon and the southernmost districts (Districts 6 and 7) having a negligible catch of salmon.

Until the introduction of the 2018 national byelaws, the netting season in each of the seven Districts commenced on 26 March and ended on 31 August in each year.

For Districts 1 and 2 in Northumberland and County Durham, the 2018 byelaws introduced a season from 26 March to 31 May. This represents a 3 month reduction from the former end date of 31 August.

Further south, in District 3 around Whitby, the end date for the netting season was set at the end of June, and for Districts 4 and 5, around Scarborough and Filey Bay, the season end date was set at the end of July.

In the most southerly part of the fishery, the existing end date to the netting season of 31 August was maintained for Districts 6 and 7, from Bridlington to Spurn Point, as very few salmon are caught in this area.

These changes were introduced to offer increased protection to vulnerable salmon stocks, but still allow a sea trout fishery in the earlier part of the year, as far as that was consistent with protecting salmon stocks. The end date for each district was set at that date after which it was determined that the level of bycatch on salmon became too large.

The 2018 byelaws placed a substantial financial burden on licensees. To mitigate the impact of the byelaws, the Fisheries Minister instructed the Agency to investigate the possibility of extending the T and J net netting season for sea trout only, if this was possible without impacting those salmon stocks exposed to the fishery.

1.2 Purpose and scope of the trials

In response to the Minister's instruction, we undertook a carefully monitored trial of a modified design of T net in the North East in 2019 to determine whether the sea trout only net fishery could be extended. The modified net was designed specifically such that it would be less likely to take salmon, but still catch sea trout. The trials were designed to test the species selectivity of the modified net.

We also undertook a shorter trial of a modified design of J net in Filey Bay in Yorkshire, also designed such that salmon catch would be minimised, but sea trout could still be caught, for the same purpose.

The results of these trials are presented in this report. We will use these results to inform our position on whether we propose to licence new designs and specifications of T and J nets to fish for sea trout and restore or partially restore the current sea trout netting season beyond the reduced dates set as a result of the 2018 national byelaws.

New net designs would have to have shown they selectively exploit sea trout and do not snag, gill or entangle a significant number of salmon for any season extension to be considered. The extension of the netting season and introduction of any new net designs on a more permanent basis would require both regional and national fisheries byelaws to be amended.

Such byelaw amendments would require the Agency to undertake the formal process of consultation on our proposals and presentation of our supporting evidence, followed by a period of advertisement, during which interested parties would be able to make submissions to advise our position. Any amended byelaws would only come into effect once confirmed by the Secretary of State.

We developed a number of success criteria for the modified net trials, which are summarised below:

1. There should be no increase in the level of exploitation of sea trout in any district above recent historic levels.

2. An interception* rate for salmon not exceeding 5% of the total sea trout net catch.

3. Minimal physical damage (scale loss, bleeding gills etc) to enmeshed or entangled salmon.

4. Levels of immediate mortality of enmeshed or entangled salmon set at not more than 50 salmon over the whole of the trial period in the North East, and not more than 10 salmon in Yorkshire.

*Interception being defined as salmon becoming entangled, gilled or otherwise physically retained or impeded by the net such that physical intervention is required to allow their release.

2. Description of the net fishery

A net fishery for salmon and sea trout has been in operation in one form or another in the North East of England for around 180 years. The earliest stake nets were made from hemp or cotton fibres and fixed by anchors to the beach. These were first recorded in the late 1830's on the North East coast.

Drift nets are referred to in historical fisheries reports from the 1860's and 1870's which record that drift netting for salmon and sea trout using hemp 'hang nets' began in the North East around 1840.

With the introduction of synthetic nets in the 1960's and monofilament nets from 1967, drift netting became considerably more effective. Catches increased markedly, and this attracted new entrants into the fishery.

To provide necessary protection to contributing salmon stocks, the drift net fishery was reduced over time by a series of Orders, until it was permanently closed in 2018 under the provisions of the National Salmon and Sea Trout Protection Byelaws. At this time, the beach net fishery was also closed for salmon, but allowed to continue as a sea trout only net fishery.

In the late 1940s, a new type of beach net, which later became known as a T net, began appearing along the Northumberland coast, initially near the port of Amble. At first these nets were lightly anchored to the seabed, and drifted to some extent with the tide, but over time the size of the anchors increased, and these nets became fixed.

A simpler type of anchored beach net known as a J net was developed independently in North Yorkshire.

The net fishery is comprised of the tidal waters from Berwick on Tweed to the mouth of the Humber estuary. It extends between the high water mark and the seaward limit of the Environment Agency’s jurisdiction at six nautical miles to sea (see Figure 1).

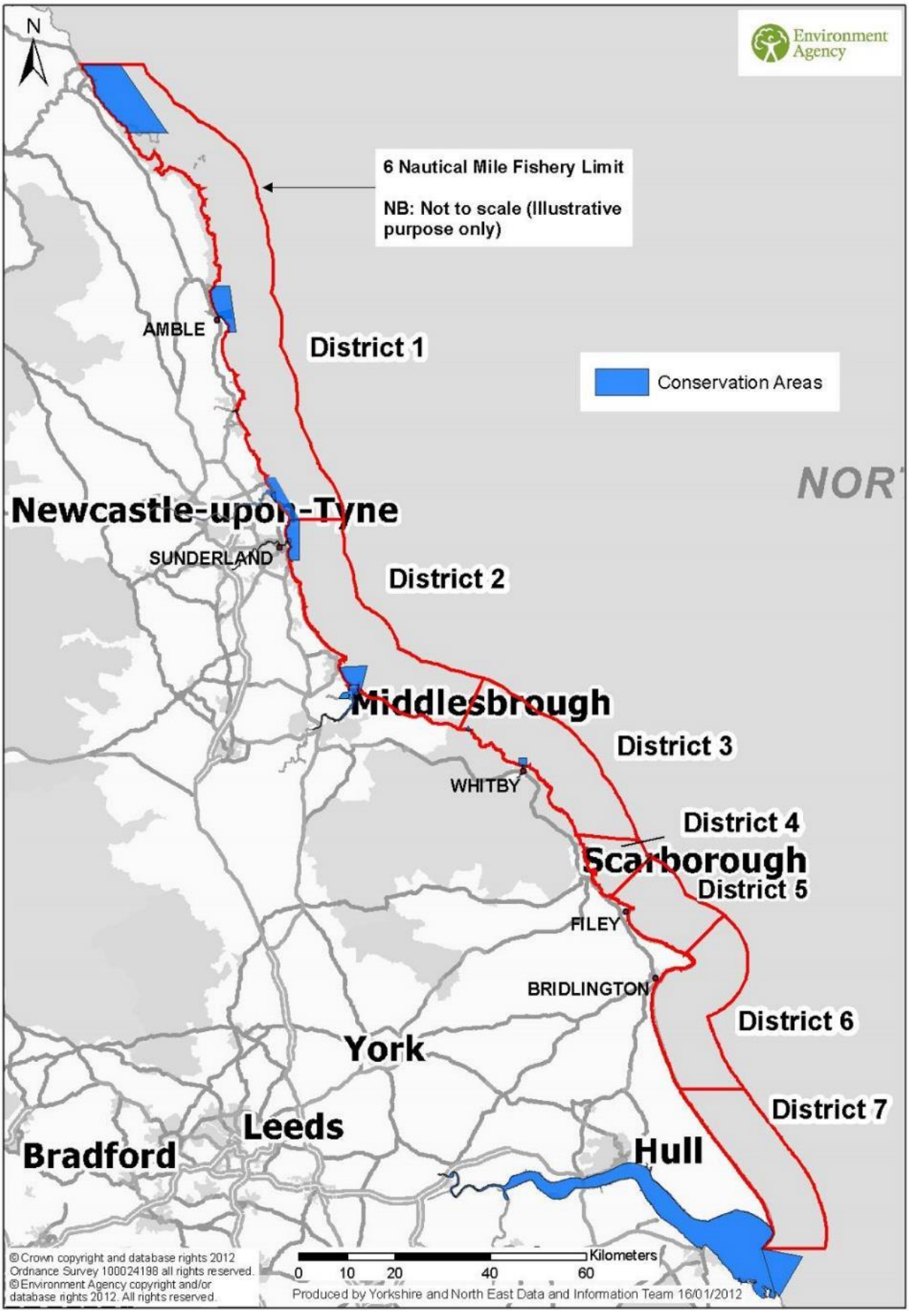

Figure 1: Districts of the North East coast net fishery map.

The fishery is divided into seven districts for beach nets (T and J nets). Most net fishing is prohibited in conservation areas, also known as ‘playgrounds’ or ‘boxes’ at and near the mouths of principal salmon rivers through regional fisheries byelaws, to better protect stocks.

Limited T netting is permitted in Tyne Conservation Area B (two berths) and Coquet Conservation Area B (5 berths).

2.1 T nets

T nets (Figures 2 & 3) are operated close to the shore. They comprise a 'leader' usually about 200 metres in length, stretching out from the beach to a “headpiece” up to 92 metres in length which contains two traps or monks, with funnel entrances.

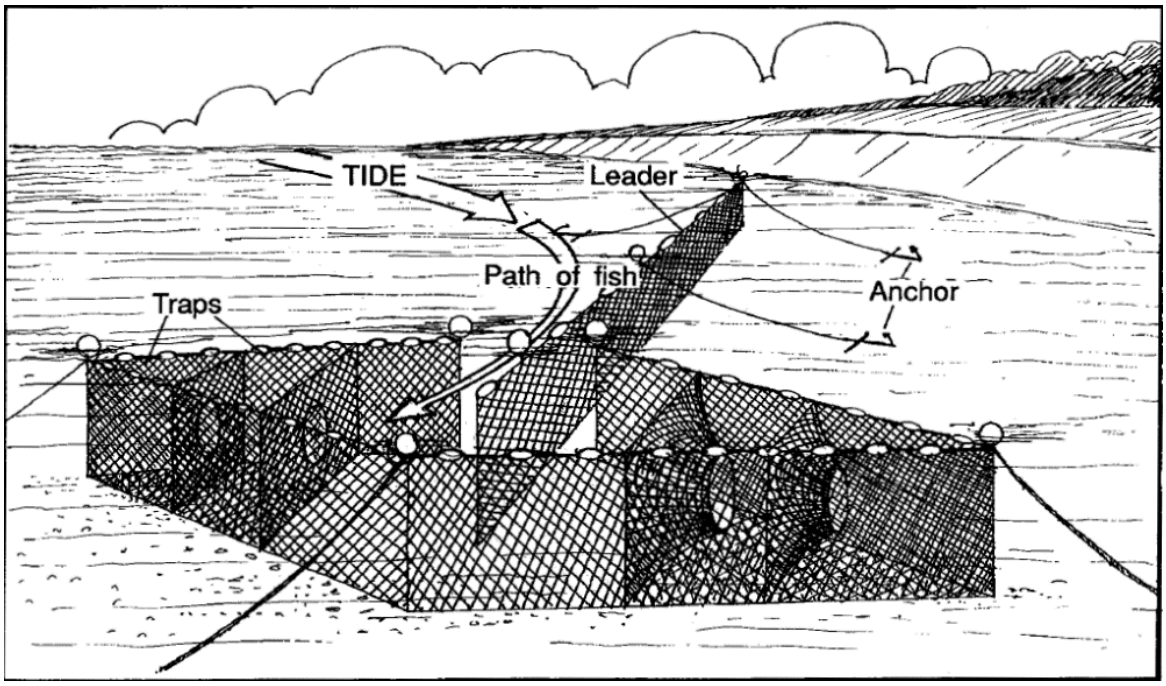

Figure 2. Diagram of a T-net (from MAFF laboratory leaflet 69 - Gill Netting)

Figure 3. Photograph of a T-net in the same orientation as Figure 2 above.

T nets are either shot from a boat or laid along the ground at low water in the form of a letter ‘T’, are maintained stationary by anchors or weights and suspended in the water by means of floats.

There is normally no monofilament netting used in T net, which are generally comprised of nylon netting, although the current byelaw specifications do not stipulate which materials the net may be constructed from.

The leader of a T net can enmesh salmon and sea trout, although typically only a small proportion of the catch is taken this way. Most fish, especially salmon are retained in the bags or traps comprising the headpiece free swimming, other fish, particularly the smaller sea trout, become entangled in the netting.

The design and description of the various components of a T net are shown in Figure 4 below.

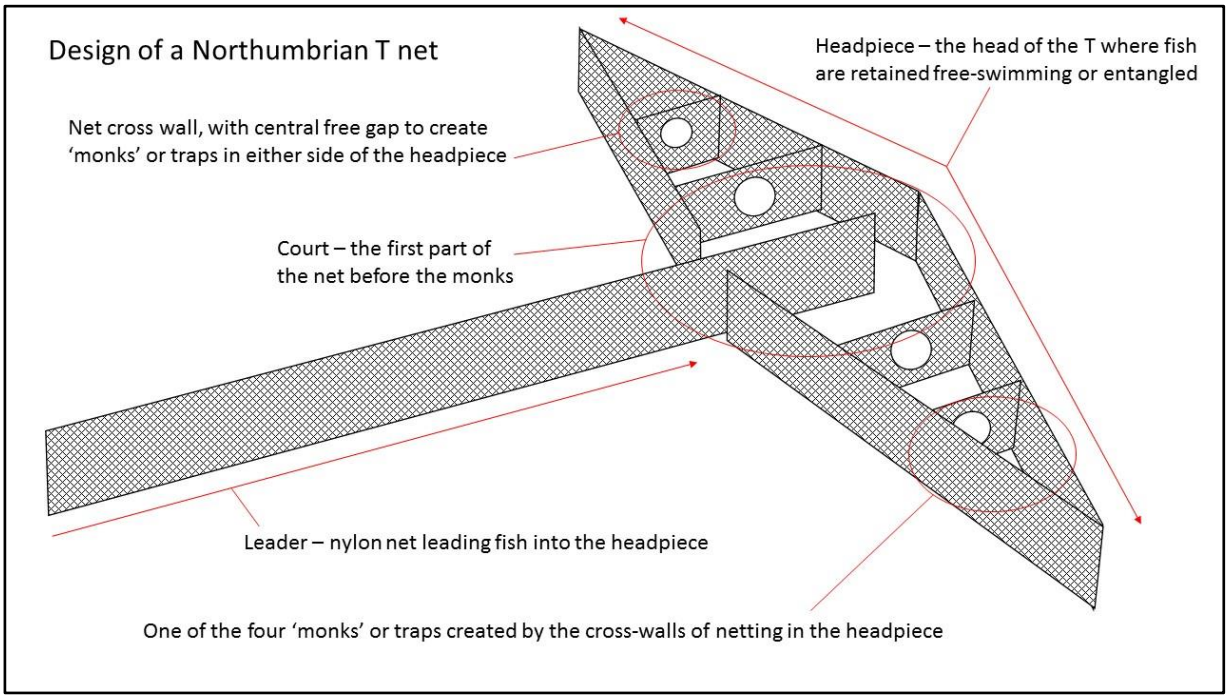

Figure 4. Design and components of a Northumbrian T net

2.2 J nets

The construction of this second type of net known as a J net (Figures 5 & 6) is much simpler than the T net. It is made from a length of plain, unarmoured netting up to 370 metres in total length which extends from the beach and is then turned back on itself to form a partly open box or compound, forming in plan view the shape of a letter J.

Like T nets, J nets are shot from a boat or laid along the ground at low water, maintained stationary by anchors or weights and suspended in the water by floats attached to the head rope.

Fish are caught in J nets by becoming enmeshed or entangled in the leader or within the walls of the compound forming the terminal letter J, which is comprised of monofilament netting.

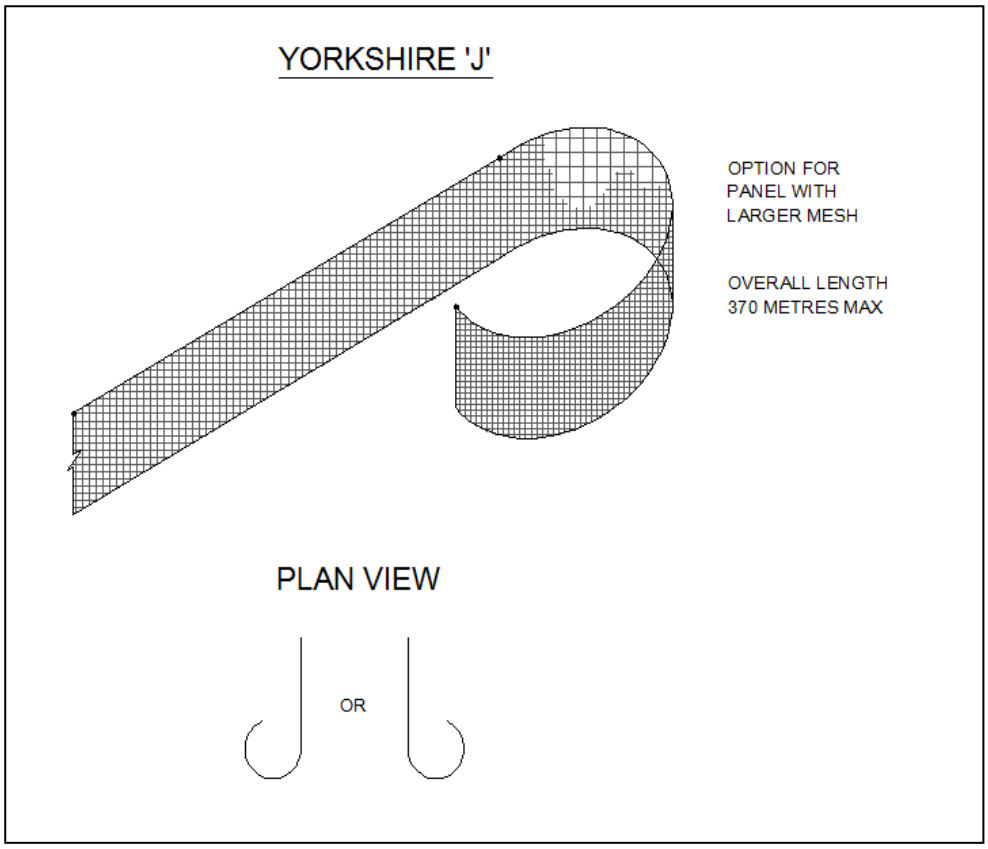

Figure 5: Diagram of a J net

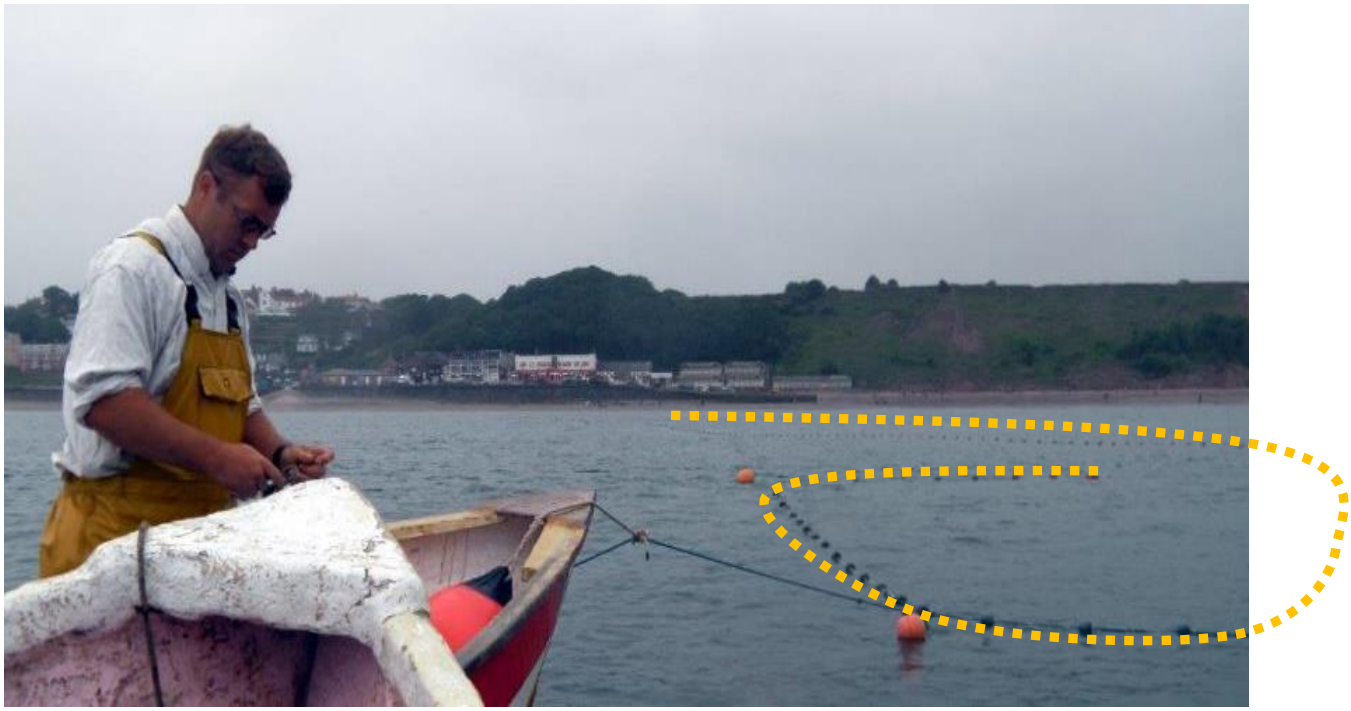

Figure 6: Photograph of a J net, with net configuration highlighted

3. Regulation of the net fishery

Fishing for migratory salmonids within the territorial waters of England and Wales has been licensed since 1865. With the introduction of synthetic nets in the late 1960s, netting became more productive, and more fishermen applied for licences. As a result, it was considered necessary to introduce additional restrictions on fishing effort by limiting the number of licences that could be issued in different areas and for different netting methods.

Consequently, the first Net Limitation Order (NLO) was introduced in 1964, followed by successive Orders in the 1970's and 1980's regulating different parts of the North East net fishery to protect stocks by limiting fishing effort.

The whole of the net fishery was brought under a single unifying NLO in 1992, which has been replaced every 10 years subsequently. The current 2012 NLO expires in December 2022.

Since 1973, fishing for migratory salmonids has been prohibited in waters off England and Wales beyond the six-mile limit. Within this limit, fishing is licensed by the Environment Agency.

3.1 The Environment Agency's role

Within the six mile limit, it is an offence for anyone to fish for migratory salmonids without a fishing licence issued by the Environment Agency under the Salmon and Freshwater Fisheries Act 1975. The methods that may be employed are specified in Acts, Orders and byelaws. In the North East the only types of nets permitted are T nets and J nets. The size and construction of these nets and when and where they may be used are specified and controlled by byelaws.

Under current legislation, in the absence of an NLO, we would be required to issue a licence to fish with a T or J net to anyone who applies and pays the appropriate fee. There would be no limit on the number of licences that could be issued.

The principal means of regulating the North East net fisheries are summarised below.

3.2 Net Limitation Orders

Since 1992, the whole of the net fishery has been regulated by a series of Net Limitation Orders (NLO). These Orders began initially to phase out of the drift net fishery. As licensees retired or otherwise left the fishery voluntarily, their licences were not made available to other potential licensees.

In this way from 1993, the drift net fishery began to reduce over time, without preventing those already participating in the fishery from continuing to do so if they chose to do so, in order to minimise any economic hardship.

In 2012 a new NLO extending these licence reducing provisions to T and J nets was introduced, so that since that time the fishery has contracted by natural turnover of licensees as they retire and have not been replaced.

3.3 National salmon and sea trout protection byelaws 2018

The UK Government has international obligations to close mixed stock coastal salmon net fisheries, as it is not possible to manage them in such a way as to effectively protect the various contributing salmon stocks, some of which are assessed as being at risk and requiring increased levels of protection.

Taking into account the latest evidence available relating to the status of salmon populations, the impact of the North East net fisheries upon contributing stocks, and the impact upon salmon net fishermen in the North East, we introduced new byelaws to close the drift net fishery in 2018.

These byelaws have had a substantial impact on the North East coastal net fishery, and are summarised below:

1. The North East coast drift net fishery was closed in December 2018.

2. The T and J net fisheries were closed for salmon in December 2018.

3. A sea trout only beach net fishery has been licensed in Yorkshire and the North East as follows:

Districts 1:	26 March to 31 May inclusive
District 2:	(No licences issued)
District 3:	26 March to 30 June inclusive
Districts 4 & 5:	26 March to 31 July inclusive
Districts 6 & 7:	26 March to 31 August inclusive

4. No person may use a net to fish for salmon and sea trout during the hours of darkness, (defined as from one hour before sunrise to one hour after sunset) in the Yorkshire and North East net fishery.

5. T and J nets will fish on a sea trout only basis, with any salmon captured being returned with the least delay.

The Minister confirmed these byelaws in December 2018.

3.4 Design and specification of nets

1. A T net (Figures 2, 3 and 4 above) shall comprise of plain unarmoured sheets of netting having one or more bags, pockets or monks, and consist of a headpiece not exceeding 92 meters in length and a tail piece not exceeding 230 meters in length and be shot from a boat manned by not more than three persons or laid along the ground at low water in the form of a letter ‘T’ and be or intended to be, maintained stationary by anchor or weights and be suspended in the water by means of floats. The bags of the T-net must have a mesh size between 38 and 50mm knot to knot.

2. A J net (Figures 5 and 6 above) shall comprise of plain unarmoured sheets of netting without bags or monks and not exceed 370 metres in total length measured along the head ropes and be shot from a boat manned by not more than three persons or laid along the ground at low water in the form of a letter ‘J’ and be intended to be maintained stationary by anchors and weights and be suspended in the water by means of floats. The minimum size of mesh in the nets that may be used shall, when the nets are measured wet, be approximately 51mm from knot to knot, or approximately 204mm round the four sides.

3.5 Weekly closed periods

1. The weekly close time for T nets and J nets is from 18:00 Friday to 0600 Monday.

3.6 Miscellaneous provisions

1. All nets must be attended when fishing (ie when any part of the net is covered by sea water).

2. All salmon and sea trout caught must be individually recorded in a logbook, with a record of the date and size of the fish, and for sea trout the tag number.

3. All sea trout must be tagged with a tag issued by the Environment Agency, which passes through the gill cover and around the jaw.

4. A number of areas are identified along the North East coast where net fishing is prohibited or is restricted. These ‘conservation areas’ are situated in and adjacent to river estuaries to prevent high levels of exploitation of fish attracted by the freshwater flow from the estuary.

5. Specific byelaws and a Code of Conduct are in place in District 5 to protect seabirds designated as an interest feature of the Flamborough Head and Bempton Cliffs SPA.

4. Catches and fishing effort in the beach net fishery

4.1 Historic beach net salmon catches

Netting for salmon in the beach net fishery was prohibited under the provisions of the 2018 national byelaws, which came into force for the 2019 netting season. Salmon beach net catches in the beach net fishery since 1993 are shown in Figure 7 and Figure 8 below for information.

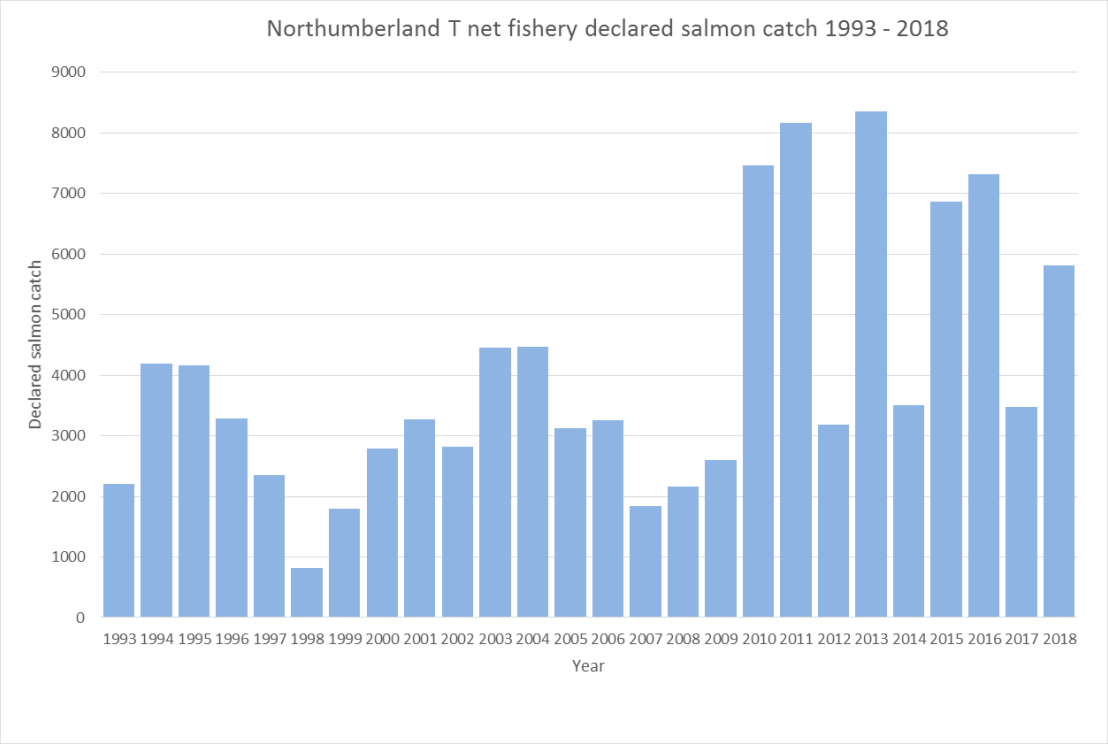

Figure 7. Salmon catches 1993 - 2018 in the T net fishery

Salmon catches in the T net fishery in Northumberland (Districts 1 & 2) are substantially higher than in Yorkshire (Districts 3-7). The T net catch over the last 5 years averaged 5392 salmon, compared to 503 salmon in the J net fishery in Yorkshire.

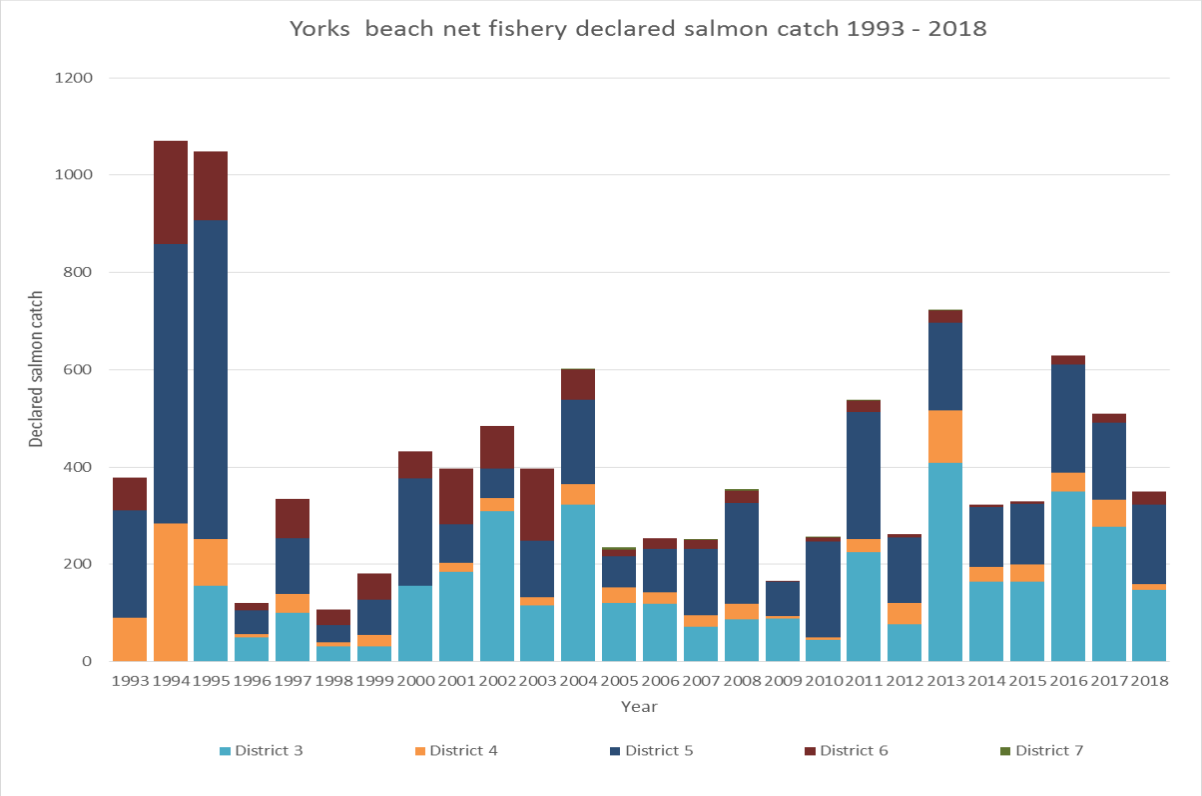

Figure 8. Salmon catches 1993 - 2018 in the Yorkshire beach net fishery

4.2 Historic beach net sea trout catches

Sea trout net catches in the beach net fishery since 1993 are shown in Figure 9 and Figure 10 below.

Sea trout catches are far more evenly distributed than salmon net catches between different districts in the beach net fishery.

T nets in District 1 account for the largest percentage of catches, averaging almost 60% of the declared beach net catch of sea trout in recent years.

Catches of sea trout over the last 5 years in District 1 averaged 19447, and over the same period in Yorkshire 14387.

4.3 Changes in fishing effort in the beach net fishery

The 1992 NLO set an upper level of licences available in each District of the beach net fishery, with a maximum number of licences being set at 75.

The 2012 NLO extended the reducing Order to beach nets, so since that time the maximum number of licences available in any year has been equal to the number of licences issued in the previous year.

In 2019 there were 42 licences issued in total - 21 T net licences and 21 J net licences, a 32% fall since the introduction of the reducing NLO in 2012.

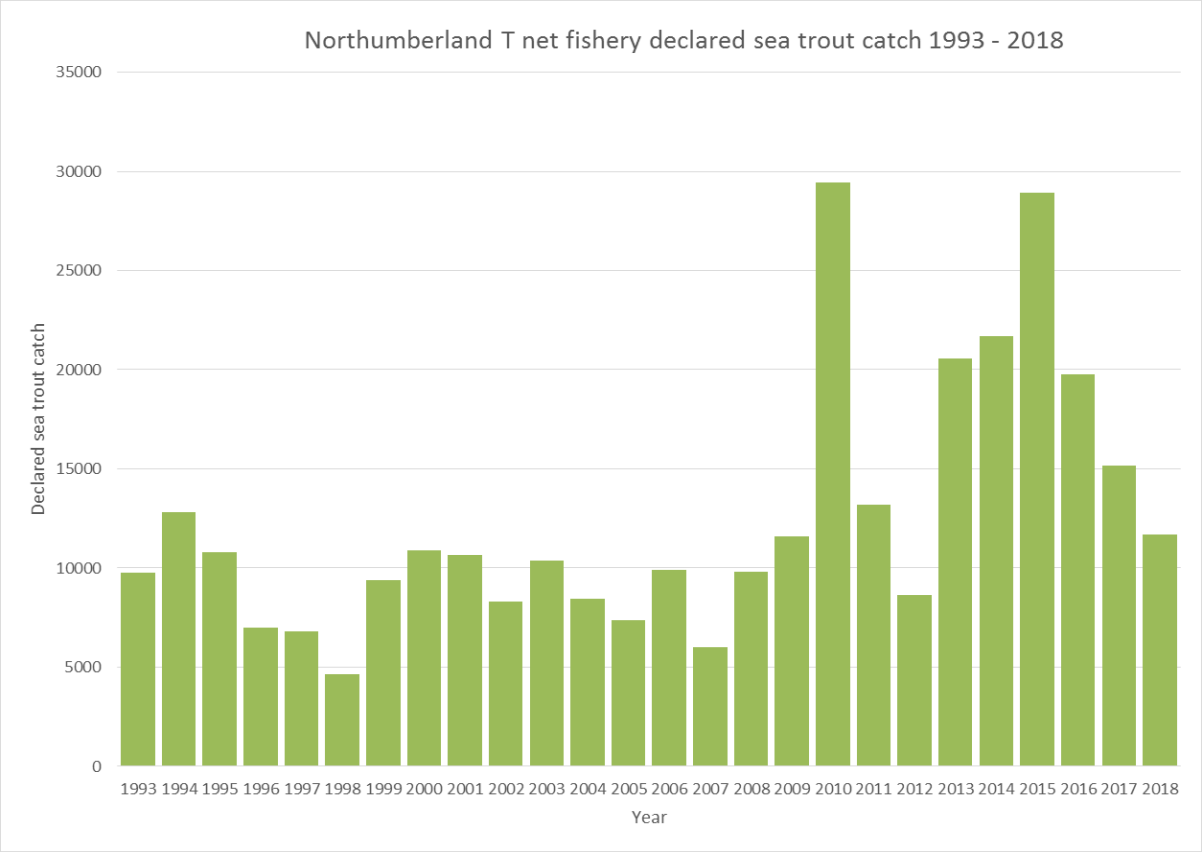

Figure 9. Sea trout catches in T net fishery 1993 - 2018.

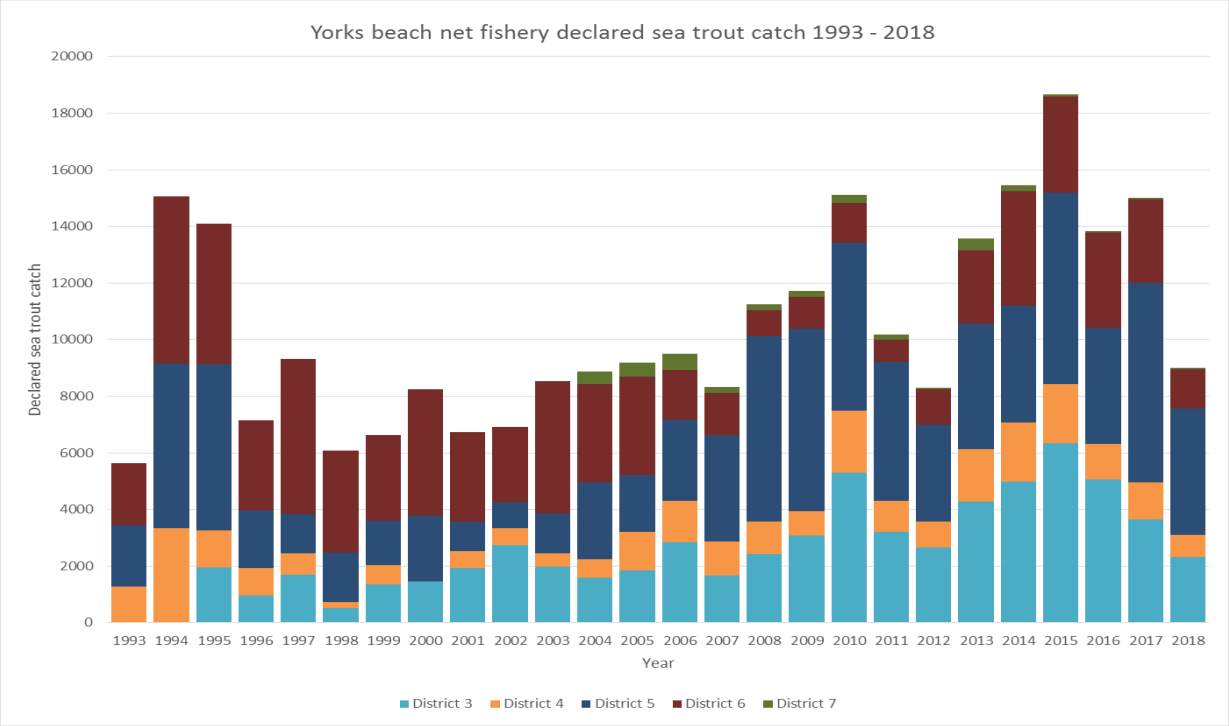

Figure 10. Sea trout catches in Yorkshire J net fishery 1993 - 2018.

The total number of beach net licences issued and the number of licences available are show in Figure 11 below.

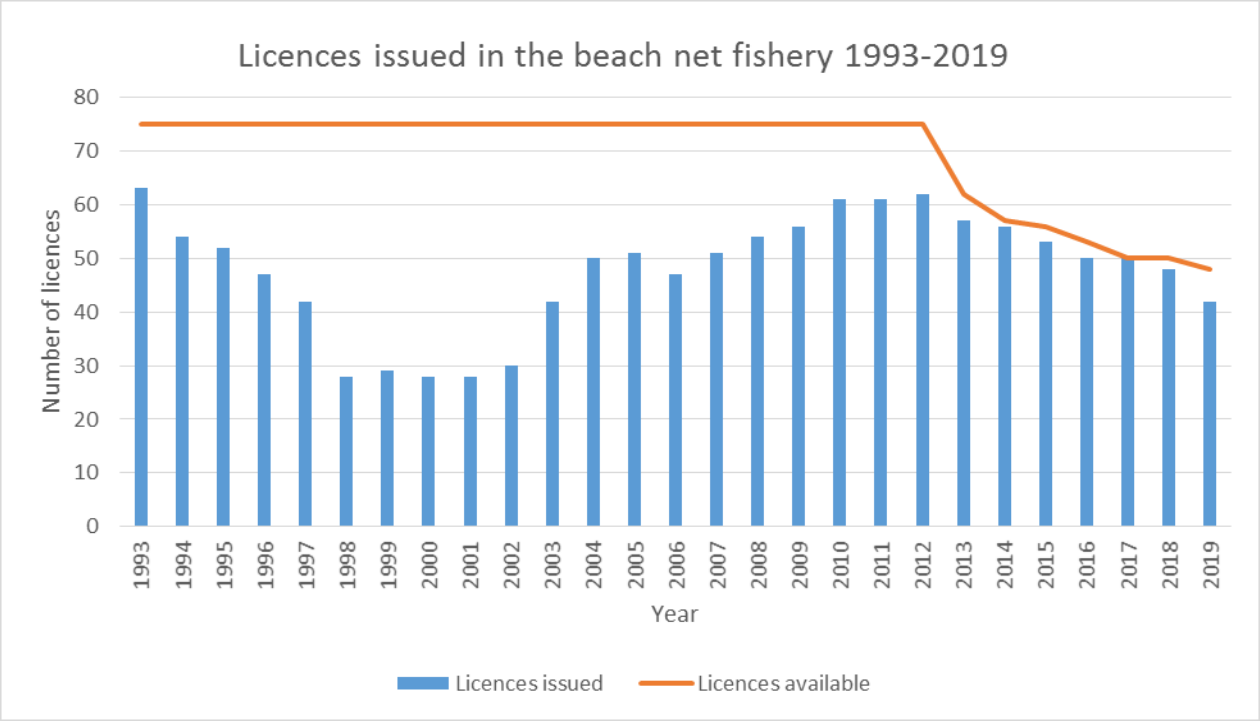

Figure 11. Licences available and licence uptake in the beach net fishery 1993 - 2019

The number of licences issued in each District in the beach net fishery in 2019 is summarised in Table 1 below, compared to the number issued in 2012, when the reducing NLO was extended to beach nets.

Number of beach net licences issued				
District	**2012**	**2019**	**Difference**	**% fall**
1	26	21	-5	19.2
2	1	0	-1	100.0
3	10	7	-3	30.0
4	1	1	0	0.0
5	9	6	-3	33.3
6	12	5	-7	58.3
7	3	2	-1	33.3
Total	**62**	**42**	**-20**	**32.3**

Table 1: Number of beach net licences issued in each District in 2012 and in 2019

5. Description of the trial in District 1

5.1 The modified design of T net

The new design of T net provides a minor modification of the existing Northumbrian T net, as described in Section 2.1 above. The new design is shown in Figure 12 below.

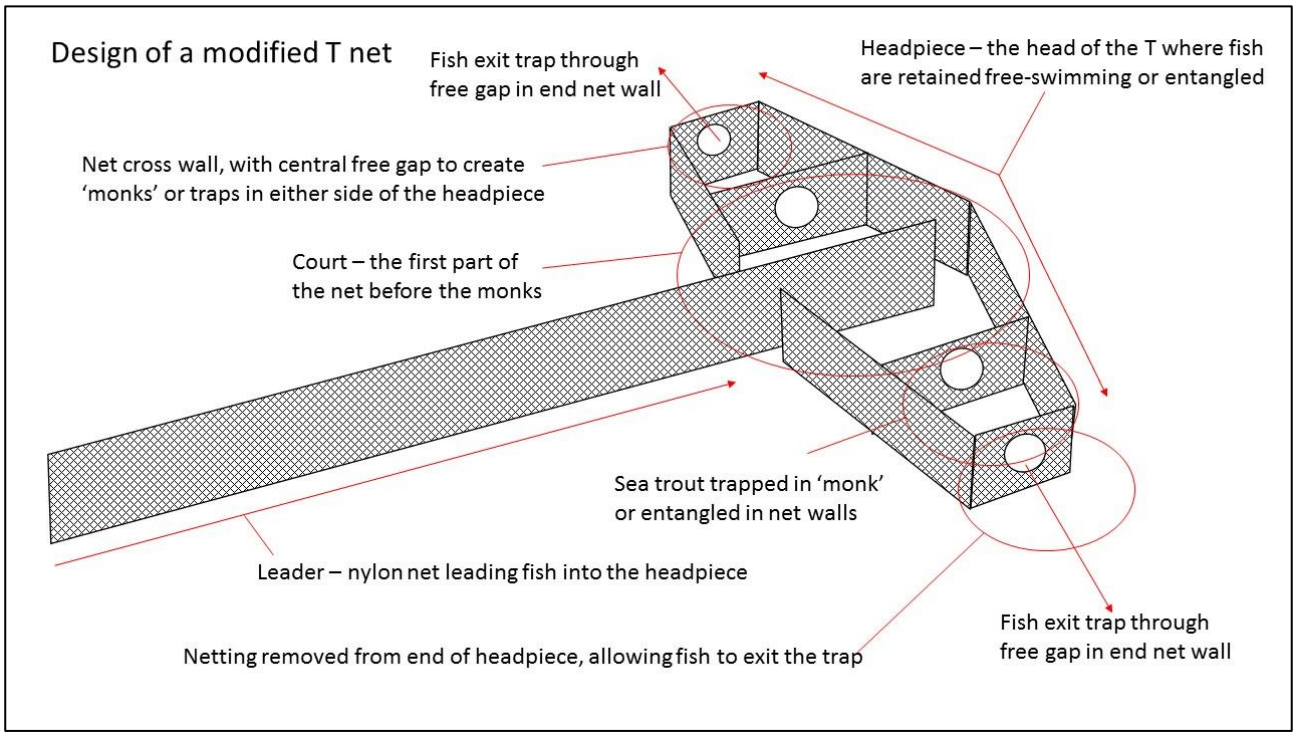

Figure 12. Design of modified T net

The general configuration is identical to a traditional T net, with a leader of up to 230 metres in length, comprised of nylon netting (6Z, 8Z or similar) measuring 2" knot to knot.

Up to 62m of the net may be comprised of single strand monofilament netting of the same dimensions, at the landward end of the leader. This design allows for the leader to be set over rocky ground with less likelihood of becoming entangled than would be the case with nylon netting.

The headpiece forms the same T shape in plan view, not exceeding 92 meters in length, with the open court of the headpiece leading on each side to two arms comprising the terminal T.

In each side of the headpiece, one or two sheets of netting may be set at right angles to the side netting, creating boxes or monks, each with a free gap measuring not less than 60cm wide on the upper side, not less than 75cm deep, and not less than 45cm wide on the lower side, located in the upper part of the net to allow fish passage.

The side netting that would have comprised the terminal box forming the end of the headpiece in a traditional T is removed. This adaption allows fish which pass through the two inscales to escape the T net into the open sea.

The free gap in each of the nets forming the inscales must be maintained at all times, and the T net configured and anchored in such a way as to maintain free movement of fishes not entangled out of the T net to the open sea.

5.2 Operation of the modified T net

T nets were shot from a boat and maintained stationary by anchors or weights and suspended in the water by means of floats, with the open court of the headpiece leading on each side to two arms comprising the terminal T.

Nets were closely attended in a boat at all times when fishing. “Fishing” is defined as being when sea water starts to cover any mesh of the net.

Licensees were required to closely observe the net at all times whilst the net was fishing, in order that any salmon entangled could be released with least possible delay.

All salmon or grilse that became snagged or entangled in any part of the net were removed and returned immediately to the water with the least possible injury. This applied whether the salmon or grilse are alive or dead – no salmon were retained.

5.3 Data collection, recording and evidence

Trial participants agreed that anonymous catch returns could be published as part of reporting of the trial results. This included the number, species, size and condition of all fishes landed and the dates, times and locations of any fishing activity.

Participants also agreed that photographs and video recordings of any fishing and related activities, including fishes being captured or entangled in nets, nets in operation, catches of fishes and the behaviour of fishes encountering or approaching the net may be published as part of reporting the trials.

Observations included on-board inspections by Environment Agency fisheries enforcement officers and fisheries scientists, observations from an Environment Agency Rigid Inflatable Boat (RIB) and from the foreshore.

Fisheries observations are shown in Figures 13 and 14. Additional evidence was collected using aerial drones, as shown in Figure 15, and underwater using a Remote Operated Vehicle, as shown in Figures 16.

For each occasion that participants in the net trial fished, they recorded in the standard logbook:

1. The date and time fished, and the hours spent fishing
2. The species and weight of each individual fish caught in the net.
3. For any salmon caught the size and condition of the fish, any damage sustained and whether it was returned alive or dead.
4. For all sea trout captured, the number of the jaw tag applied to the fish.

Licensees made their logbook available for inspection and for recording of catches by Environment Agency officers at regular intervals during the trial, in order that an assessment of the performance of the nets participating in the trial was maintained in as close to real time as possible.

Figure 13. Fisheries observers monitor netting activities

Figure 14. Fisheries observers monitor netsmen checking a T net from a RIB

Figure 15. Agency staff use an aerial drone to monitor a T net in operation.

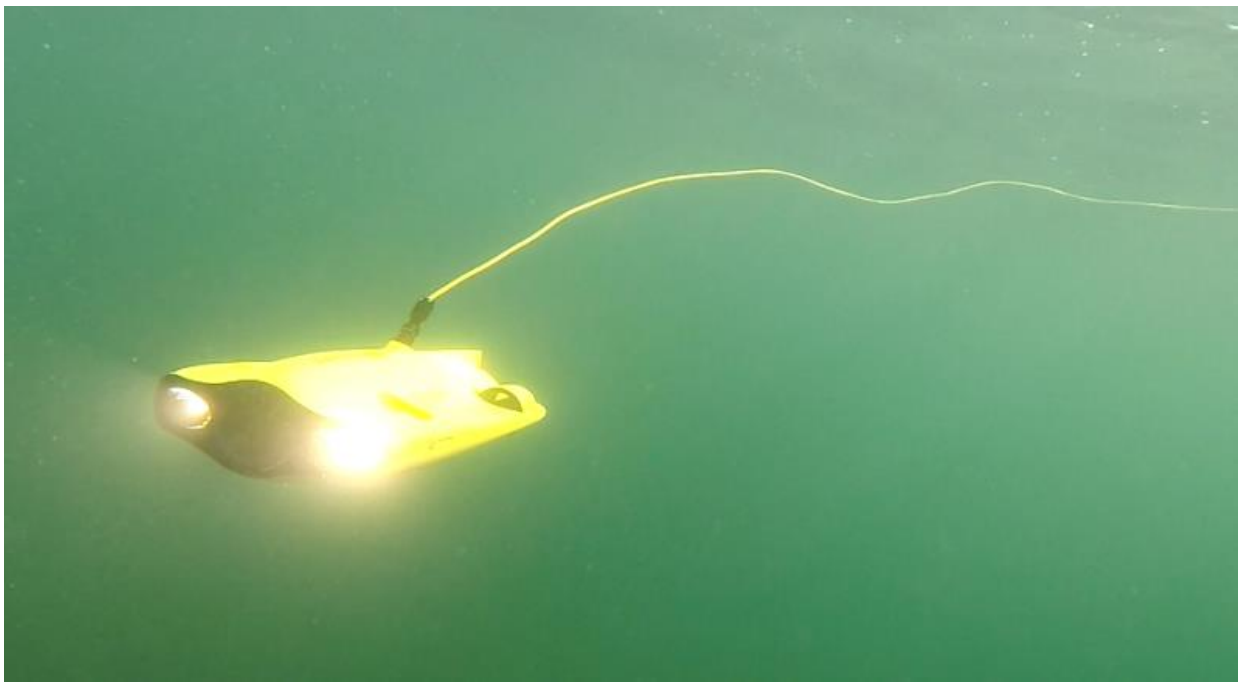

Figure 16. An ROV (supplied by Team UAV) monitoring a T net at South Shields underwater

5.4 Netting station locations

All T net licensees in District 1 were invited to express their interest in participating in the trial of modified T nets.

Five licensees responded, indicating their interest. These licensees agreed to the terms of participation for the netting trial, and fished at three separate locations within the district, at Alnmouth, Amble and South Shields. Details of the berths locations and site characteristics are shown below in Figures 17 to 23.

Figure 17. Map showing net trial berth locations in District 1

The berths at South Shields and Alnmouth were fished by two licensees each, who operated a single net at each berth in rotation. A fifth licensee operated a net at the Amble berth.

Berths were selected based on license interest in participating in the trial, and to reflect variations in geography and berth conditions across District 1. The Alnmouth berth operated on a beach with sandy substrate, at a number of locations from the beach. The Amble berth operated on a rocky shore, both in the northern part of District 1. The South Shields berth operated from the southern pier of the Tyne in the southern part of the District.

Alnmouth berth -- grid references NU 253 100 and NU 254 107

Figure 18. The Alnmouth berth locations - marked in red

Figure 19. Netting at the Alnmouth berth

Amble berth - grid reference NU 276 045

Figure 20. The Amble berth location - marked in red

Figure 21. Netting at the Amble berth

South Shields berth - grid reference NZ 378 682

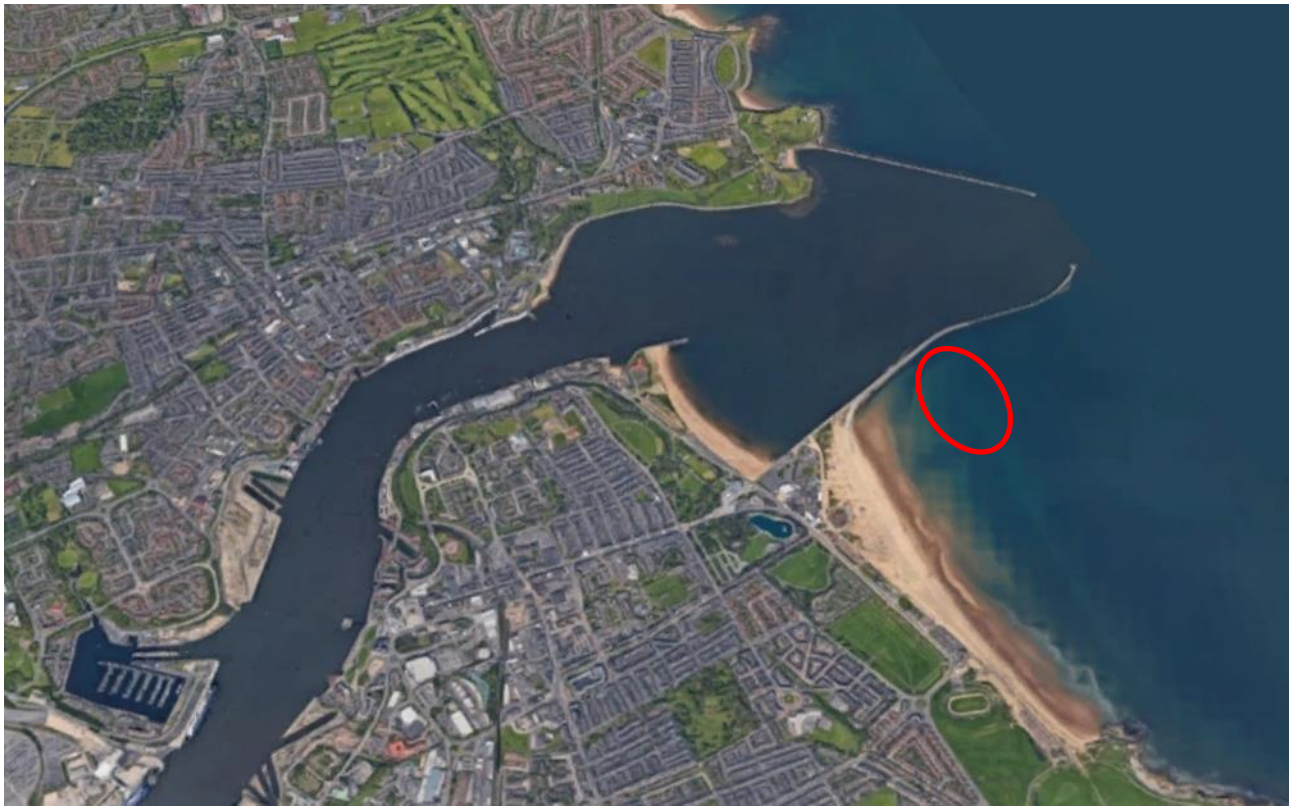

Figure 22. The South Shields berth location - marked in red

Figure 23. Netting at the South Shields berth

5.5 Trial duration

The trial began on Monday 17th June 2019, and concluded on Friday 30th August 2019. The total days fishing available within the trial period was, accounting for the weekend closed periods, 55 days at each berth, a total of 165 netting-days for the entire trial.

6. Results from District 1

A summary of daily fishing effort and catches for each berth is provided in Appendix 1.

6.1 Fishing effort and effort utilisation

6.1.1. Days fished

The number of days fished each week at each berth is shown in Figure 24 below.

A 'day fished' is defined as any day when any active fishing activity occurred, regardless of duration.

Fishing effort was highest in the earlier part of the season, and remained high until the later part of July. Effort utilisation at South Shields was higher than at the two more northerly berths.

From late July effort falls markedly, particularly in the two northern berths at Alnmouth and Amble, in response to falling catches.

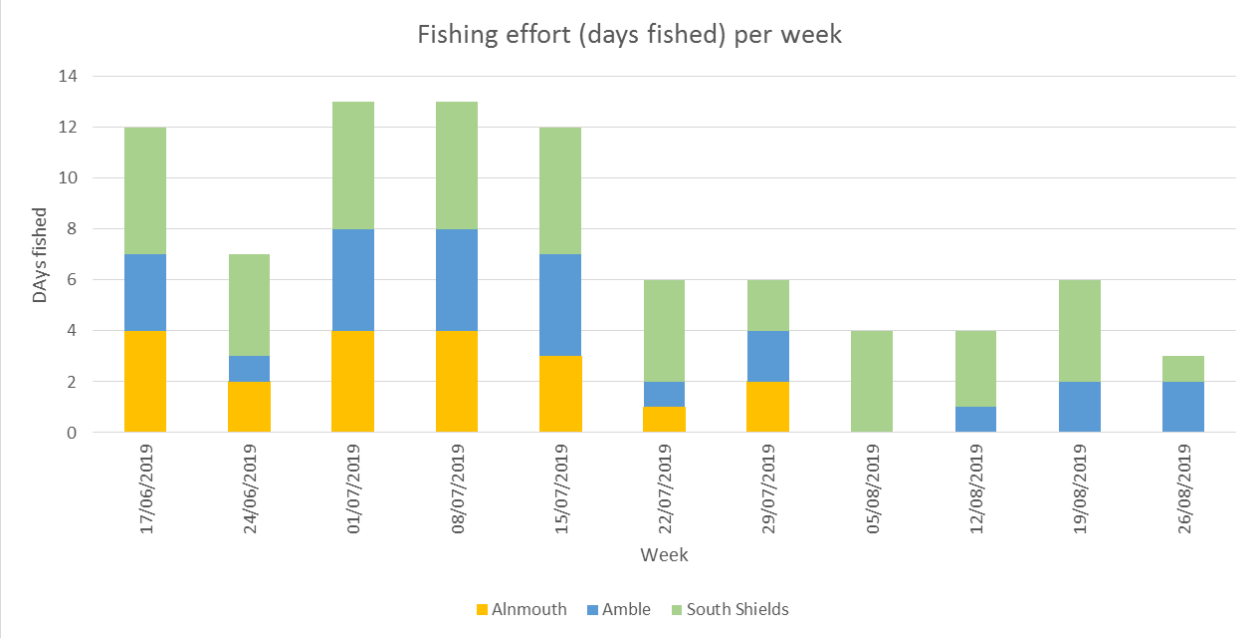

Figure 24. Weekly fishing effort (days fished) at each berth.

The cumulative total fishing days available per berth and the cumulative total number of days fished in each berth is shown in Figure 25 below.

Over the whole of the trial period, fishing effort utilisation was highest at the South Shields berth, where 42 days were fished (76% of available days) followed by the Amble berth where 24 days were fished (44% of available days) and the Alnmouth berth 21 days were fished (38% of available days). The Alnmouth berth was not fished in August.

Overall, the total effort utilisation from all three participating berths over the whole trial period was 87 days, representing 52.5% of fishing days available.

This is higher than the average seasonal effort utilisation for T nets in District 1 (for the whole season) between 2014 and 2018 of between 26% and 35%, averaging 30.5% over the five year period.

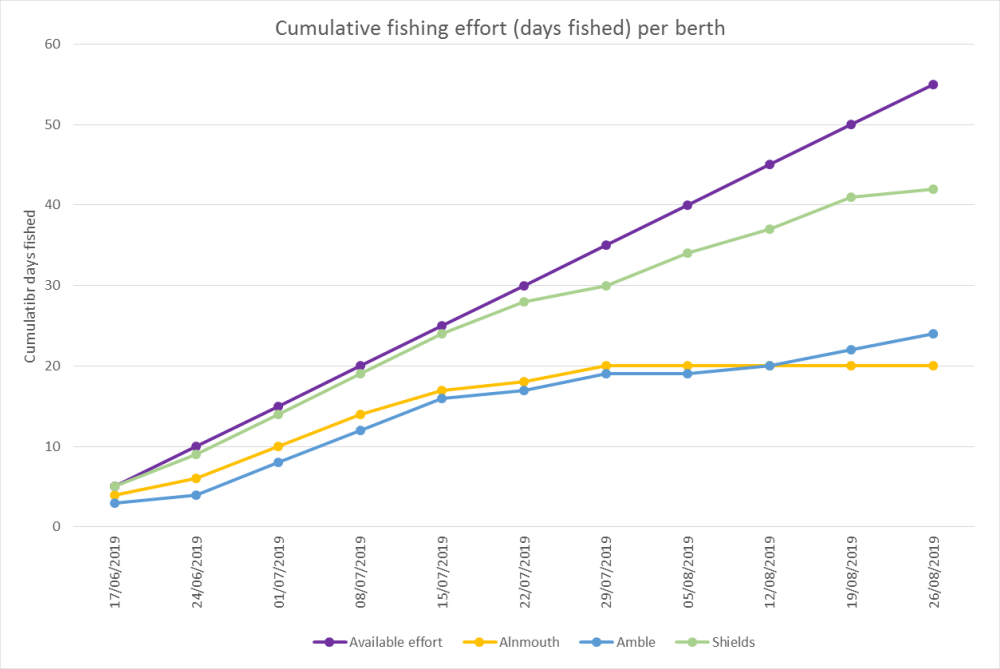

Figure 25. Available and utilised fishing effort for each trial berth

6.1.2 Hours fished

The total hours fished by each berth in each week is shown below in Figure 26.

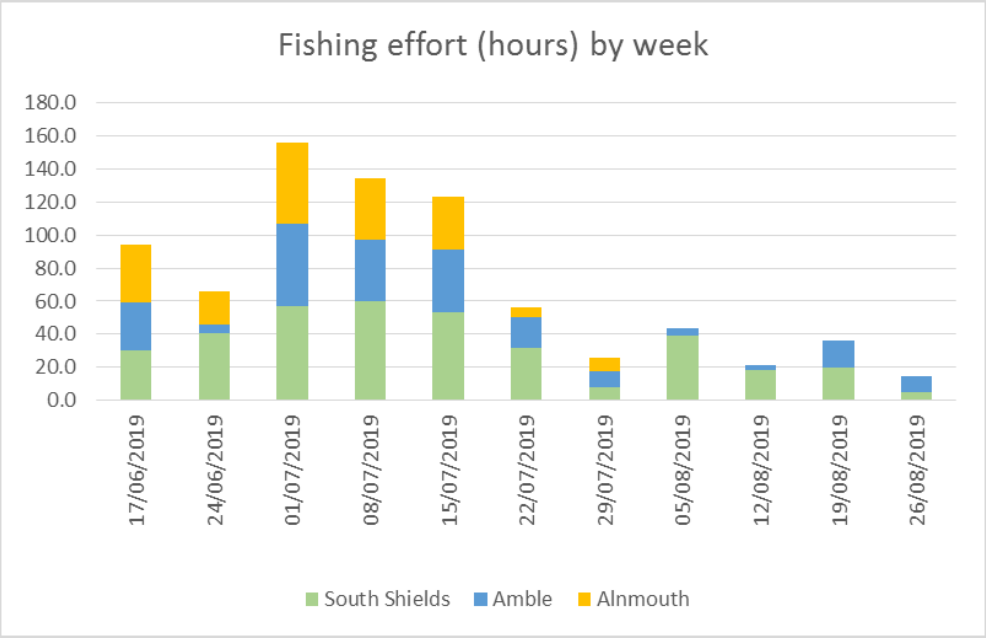

Figure 26. Fishing effort (hours) per week

A total of 771 hours fishing were recorded during the trial. On three occasions, the number of hours fished was not recorded in logbooks.

The berth at South Shields accounted for the largest proportion of total fishing effort, at 363 hours, followed by Amble at 221 hours and Alnmouth at 187 hours across the whole of the trial period. The overall proportion of effort expended in hours over the trial is shown below in Figure 27.

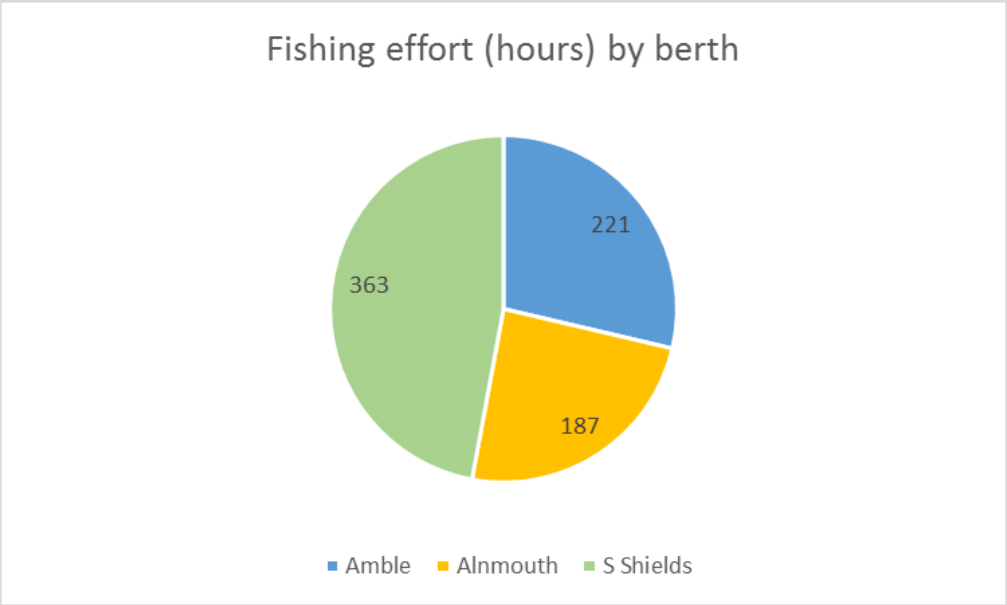

Figure 27. Total hours fished by berth

6.2 Catch data from logbook returns

6.2.1 Sea trout catches

A total of 3342 sea trout were landed during the trial. Daily catches of sea trout at each berth are shown in Figure 28 below.

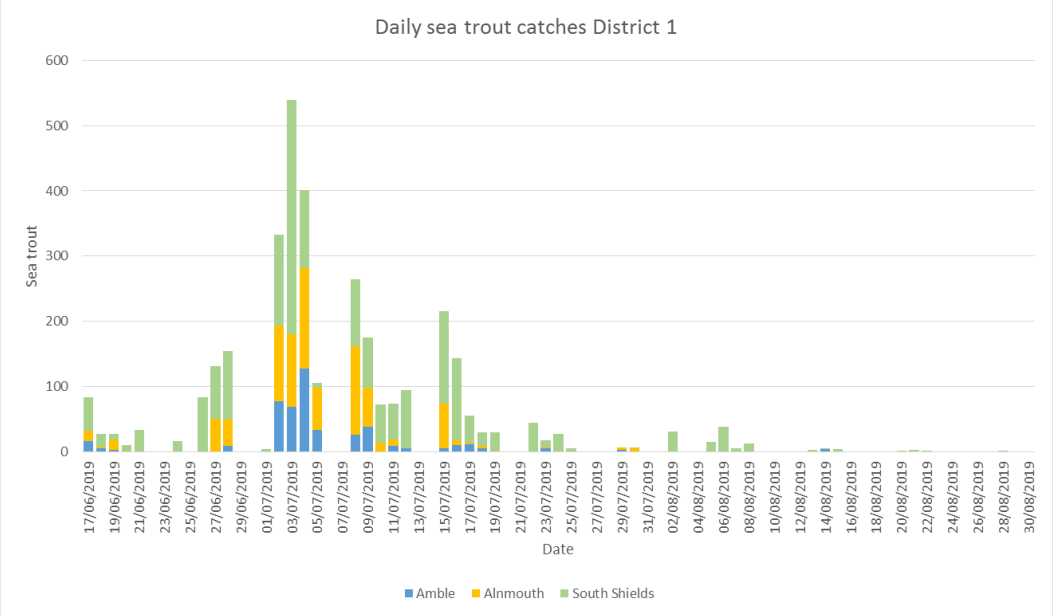

Figure 28. Daily catches of sea trout by berth

Aggregated weekly catches of sea trout are shown in Figure 29 and Table 2 below.

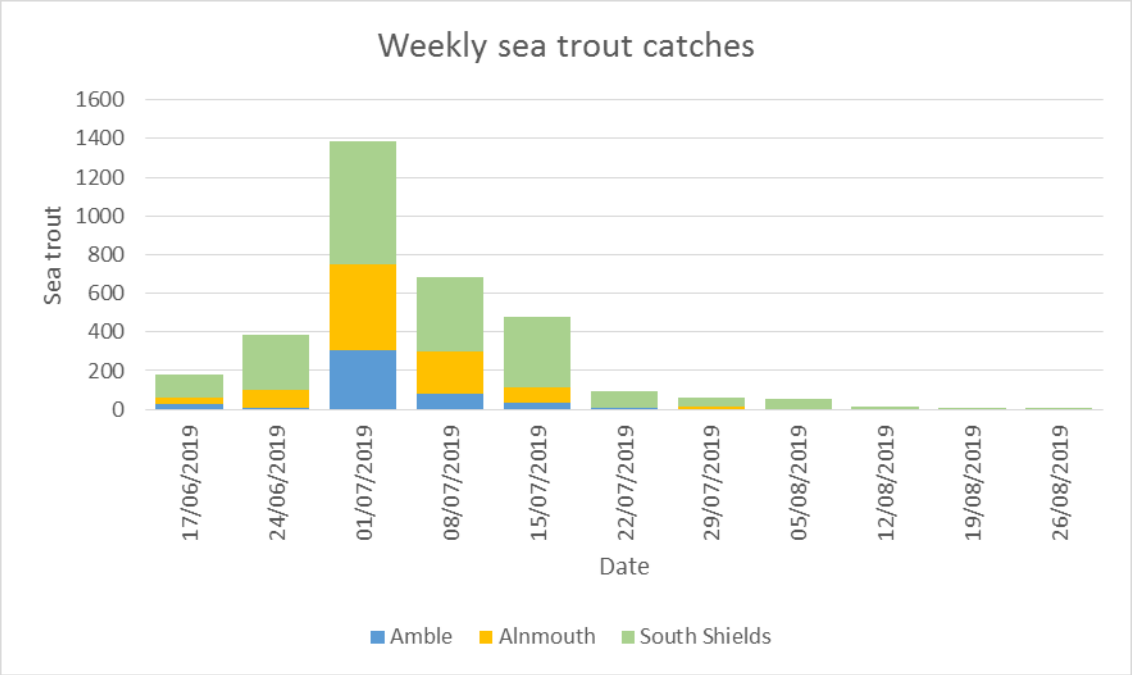

Figure 29. Weekly catches of sea trout by berth

Week	Amble	Alnmouth	S. Shields	Total
17/06/2019	25	35	122	182
24/06/2019	9	91	284	384
01/07/2019	307	446	630	1383
08/07/2019	78	220	383	681
15/07/2019	33	82	361	476
22/07/2019	5	2	90	97
29/07/2019	4	8	48	60
05/08/2019	0	0	57	57
12/08/2019	4	0	9	13
19/08/2019	2	0	5	7
26/08/2019	0	0	2	2
Total	**467**	**884**	**1991**	**3342**

Table 2. Weekly catches of sea trout by berth

The berth at South Shields was the most productive, accounting for 59.6% of the total catch, followed by Alnmouth (26.5%) and Amble (14%) respectively. The distribution of the sea trout catch by berth is shown in Figure 30 below.

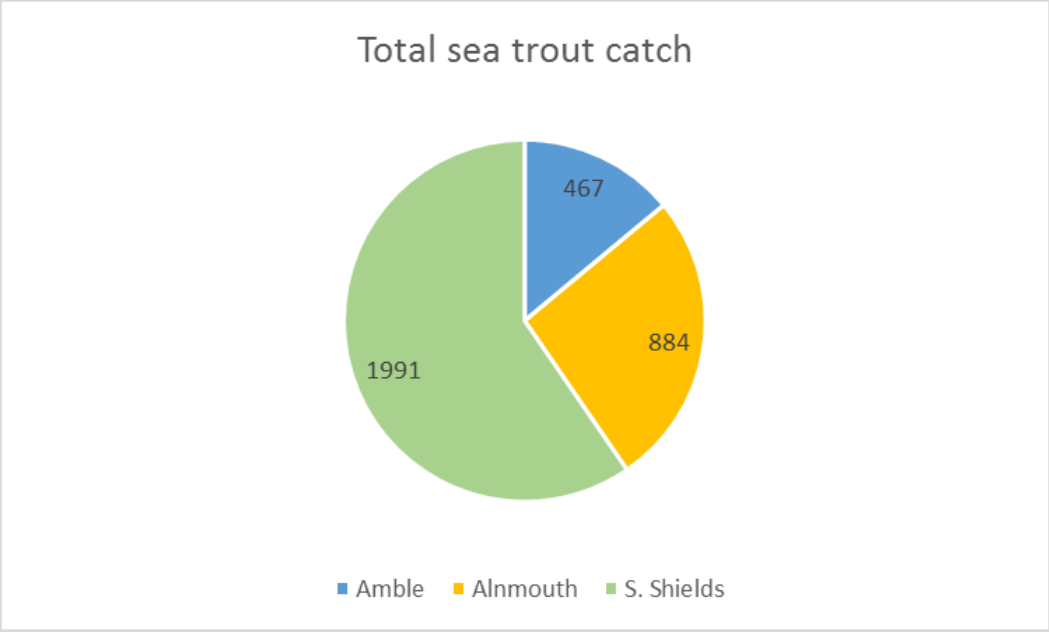

Figure 30. Distribution of sea trout catch by berth

6.2.2 Comparison with historic sea trout catches

Sea trout catches were lower than average catches (2014-2018) in the same berth locations over the equivalent period, as summarised in Tables 3 and 4 below.

Note 1: Historic catches have been adjusted for the month of June as the trial period did not cover the whole month.

Note 2: Where two licensees shared a berth during the trial period, rather than both netting at adjacent berths concurrently as is the usual practice, their combined average historic catches have been used for comparison with catches during the trial.

Month	Amble	Alnmouth	S. Shields	Total
June	34	126	406	566
July	427	758	1466	2651
August	6	0	119	125
Total	**467**	**884**	**1991**	**3342**

Table 3. Sea trout catches in 2019

Month	Amble	Alnmouth	S Shields	Total
June*	250	276	544	1070
July	404	352	1180	1936
August	93	115	397	605
Season	**997**	**1018**	**2665**	**4681**

Table 4. Sea trout catches 2013 - 2018 average (*June adjusted)

The percentage reduction in sea trout catch in the trial period compared to average catches with a traditional T net over the same period at the same berths is shown in Table 5 below.

Month	Amble	Alnmouth	S Shields	Total
June	-86.4	-54.3	-25.4	-47.1
July	5.7	115.2	24.2	36.9
August	-93.6	N/A	-70.0	-79.3
Season	**-53.2**	**-13.2**	**-25.3**	**-28.6**

Table 5. Percentage reduction in sea trout catch in 2019 compared to historic average

Catches were lower than recent average catches using a traditional net, ranging from 53.2% lower at South Shields to 13.2% lower at Alnmouth, with an average sea trout catch reduction of 28.6%.

6.2.3 Sea trout catch rates

The catch rate (expressed as sea trout caught per hour) for each berth is shown in Figure 31 below.

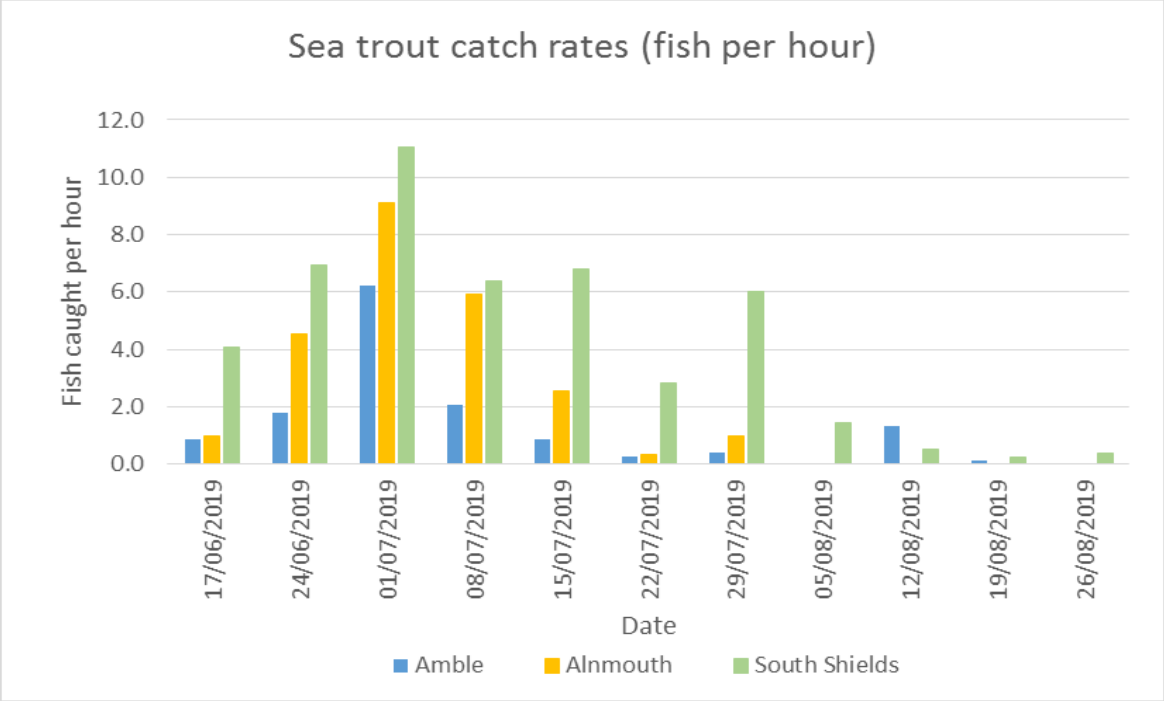

Figure 31. Catch rates for sea trout (fish per hour) for each berth

Catch rates across the trial were highest in July, when catches were largest. Catch rates at South Shields were higher than at the two more northerly berths, as is typically the case in the T net fishery.

Over the whole trial, the catch rate for sea trout was 4.7 fish per hour at Alnmouth, 2.1 fish per hour at Amble and 5.5 fish per hour at South Shields. The overall catch rate for the whole trial was 4.3 sea trout per hour fished.

6.2.4 Comparison with historic sea trout catch rates

The catch rates experienced during the trial are generally lower than those achieved in the same berth locations using a traditional design of T net, as shown in Tables 6 and 7 below.

Month	Amble	Alnmouth	S Shields
Jun	1.0	2.3	5.7
July	2.8	5.7	7.1
August	0.2	N/A	1.4
Season	**2.1**	**4.7**	**5.5**

Table 6. Sea trout catch rate (fish per hour) in 2019

Month	Amble	Alnmouth	S Shields
Jun	2.7	3.4	7.8
Jul	1.9	2.4	8.5
Aug	0.7	0.8	3.4
Season	**1.9**	**2.3**	**6.7**

Table 7. Sea trout catch rate (fish per hour) 2013 - 2018 average

The percentage change in sea trout catch rates in the trial period compared to average catch rates with a traditional T net over the same period at the same berths is shown in Table 8 below.

Month	Amble	Alnmouth	S Shields
Jun	-62.4	-33.4	-26.8
July	47.9	142.0	-15.9
August	-73.8	NA	-58.8
Season	**13.9**	**107.1**	**-17.8**

Table 8. Percentage change in catch rate in 2019

At South Shields, catch rates were consistently lower in every month of the trial compared to those averaged each month using a traditional closed ended T net, showing a 17.8% reduction over the whole trial period.

The two more northerly berths saw reduced catch rates in June and August, but higher catches in July provided increased catch rates overall than compared to the traditional T net in recent years.

The large July sea trout catch at these berths gave a full season improvement in catch rates compared to recent averages, particularly at Alnmouth where catch rate improved by over 100%.

6.2.5 Sea trout weight frequency distribution

The weight of each sea trout netted was estimated by netsmen and recorded. Although these weights are estimated rather than measured, licensees participating in the trial were very experienced in visually assessing the weight of fish, and therefore any estimation error is likely to be low. The weight frequency distribution of sea trout landed in total is shown in Figure 32 below.

Individual weights were recorded for 2997 of the 3342 sea trout landed. For the remaining 345 sea trout, weights were aggregated and reported as the total combined weight for several fish. These aggregated weights are excluded from the weight frequency distribution.

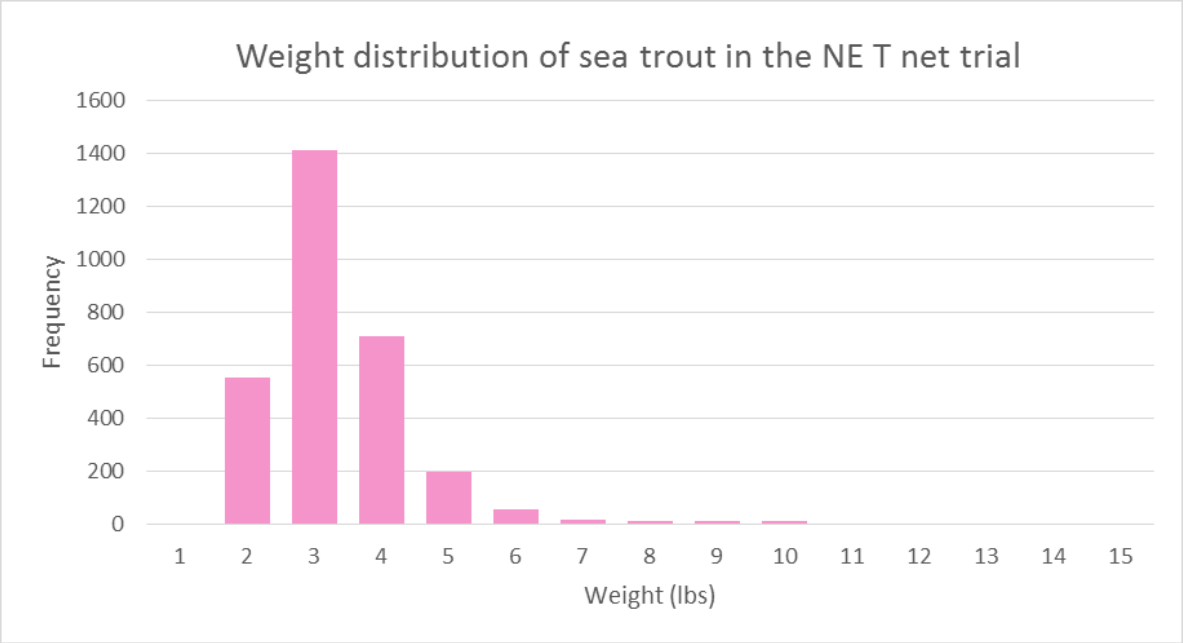

Figure 32. Weight frequency distribution of sea trout

Sea trout landed ranged from 1lb to 12lbs in weight, with an average weight of 3.35lbs. The average weight of sea trout landed at Amble was 4.1lbs (n=174). At Alnmouth the average weight of sea trout was 3.8lbs (n=875). At South Shields the average weight of sea trout was lower, at 3.1lbs (n=1948) where a larger proportion of 1-2lb sea trout were reported in the catch than at the more northerly berths.

These figures are in close agreement with the average weights of sea trout landed in District 1 T net fishery declared in recent years. For the last 5 years where catch data are available (2014 - 2018) the average weight for sea trout landed in District 1 was 3.5lbs.

Sea trout weight frequency distributions for those fish where an individual weight was recorded for each berth are shown in Figures 33 to 35 below.

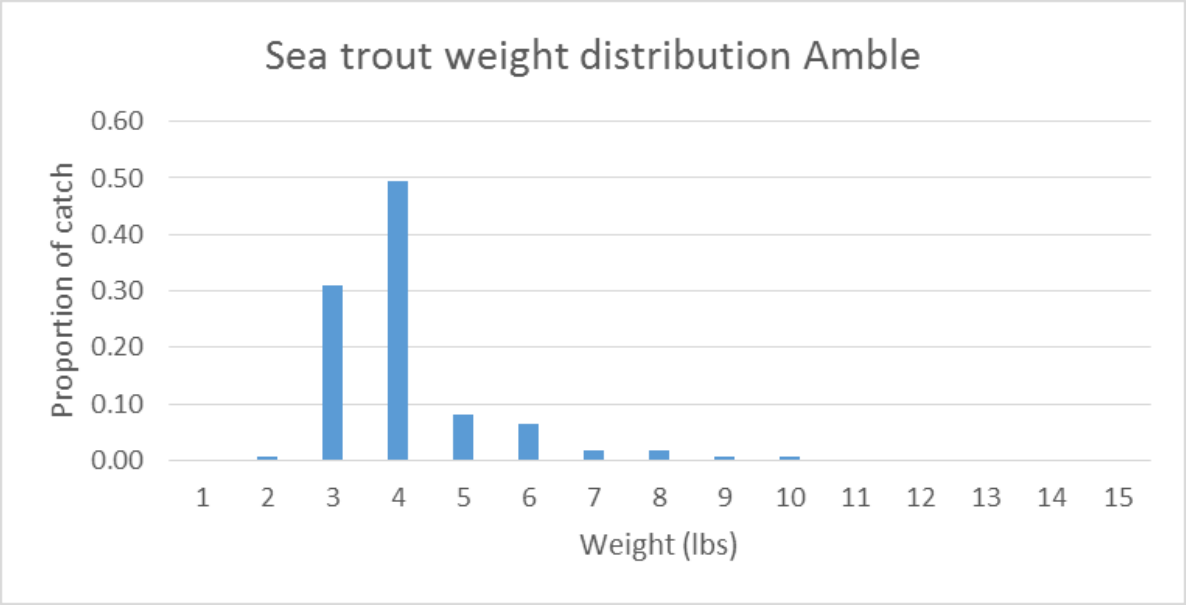

Figure 33. Sea trout weight frequency distribution at Amble

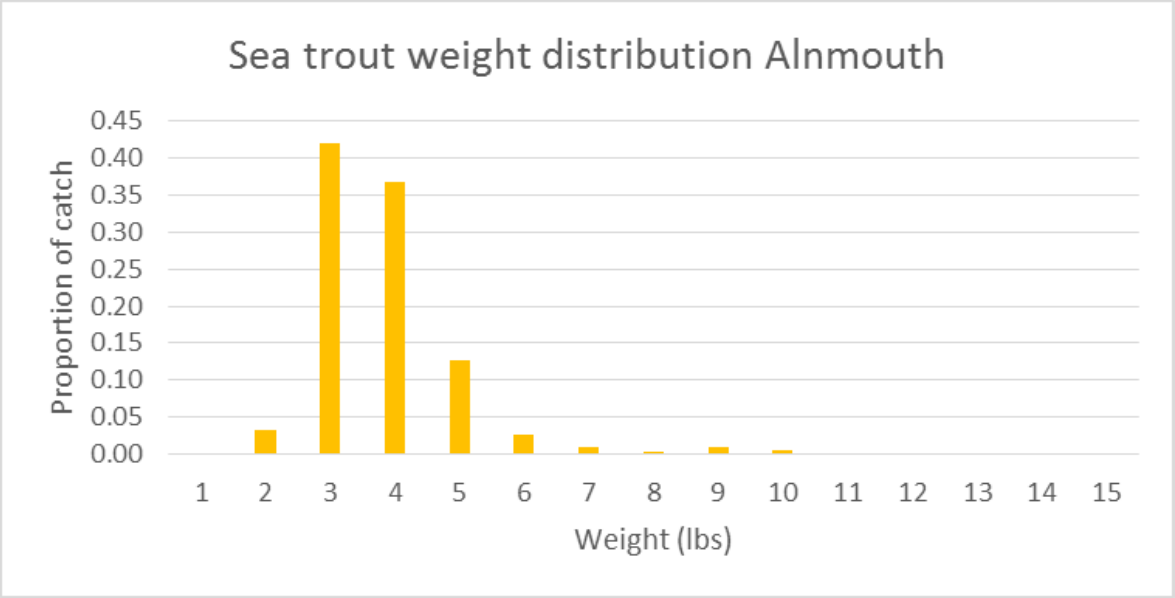

Figure 34. Sea trout weight frequency distribution at Alnmouth

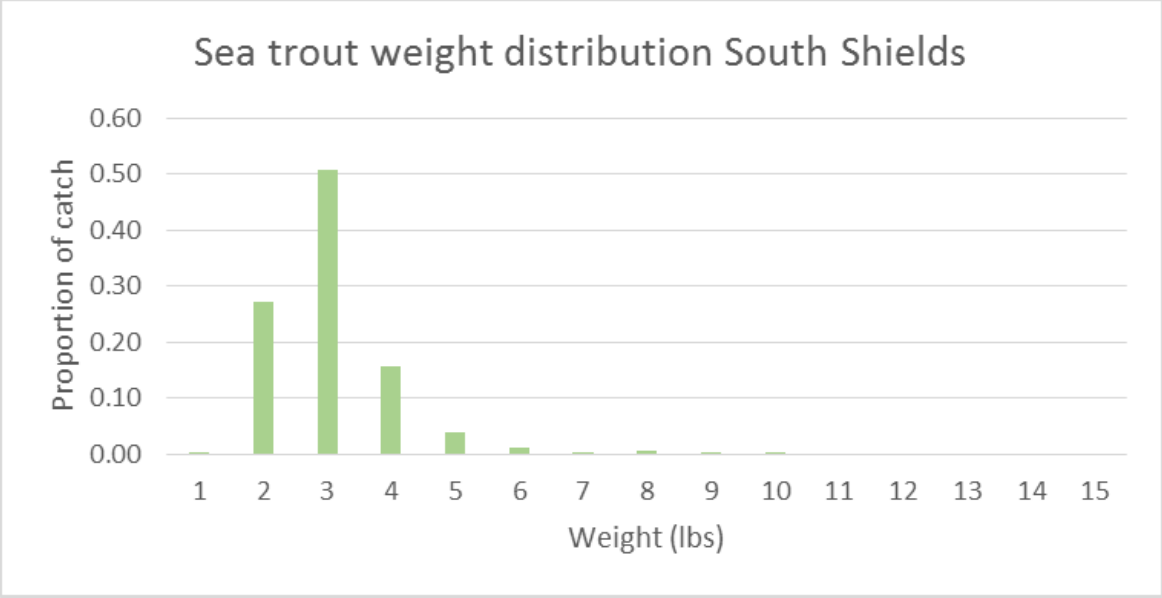

Figure 35. Sea trout weight frequency distribution at South Shields

6.2.6 Salmon catches

A total of 46 salmon were recorded as requiring release from the net during the trial. The cumulative declared catches of salmon for all berths are shown in Figure 36 below.

All salmon recorded in logbooks were recorded as being released alive by licensees.

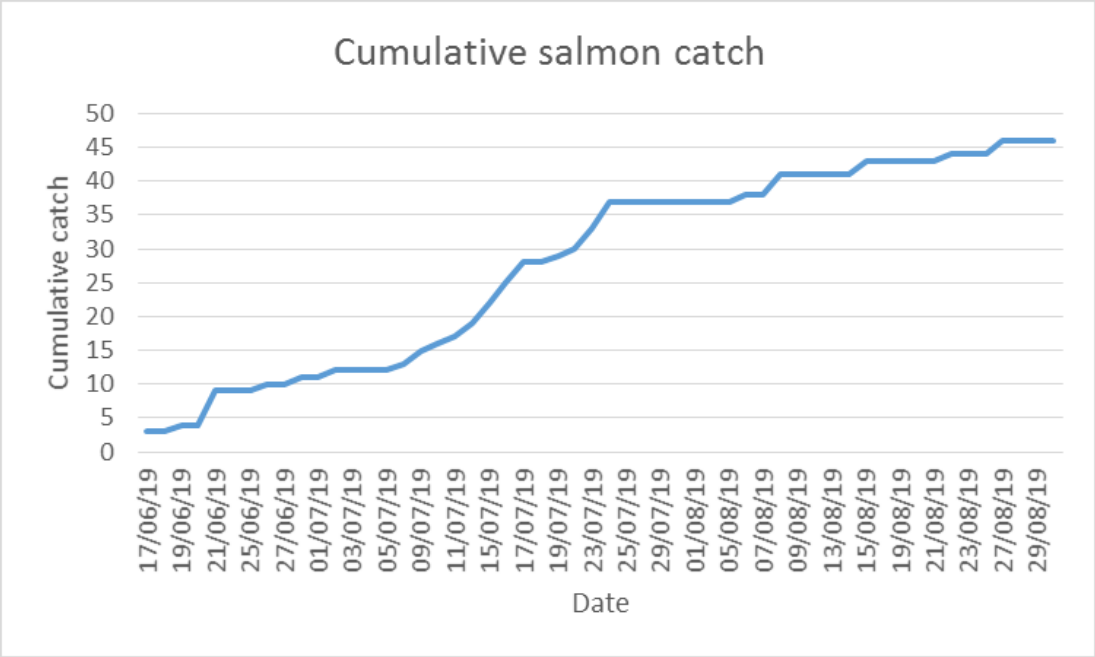

Figure 36. Cumulative salmon requiring release for all berths

The number of salmon caught and requiring intervention for their release by week for each berth is summarised in Figure 37 and Table 9 below.

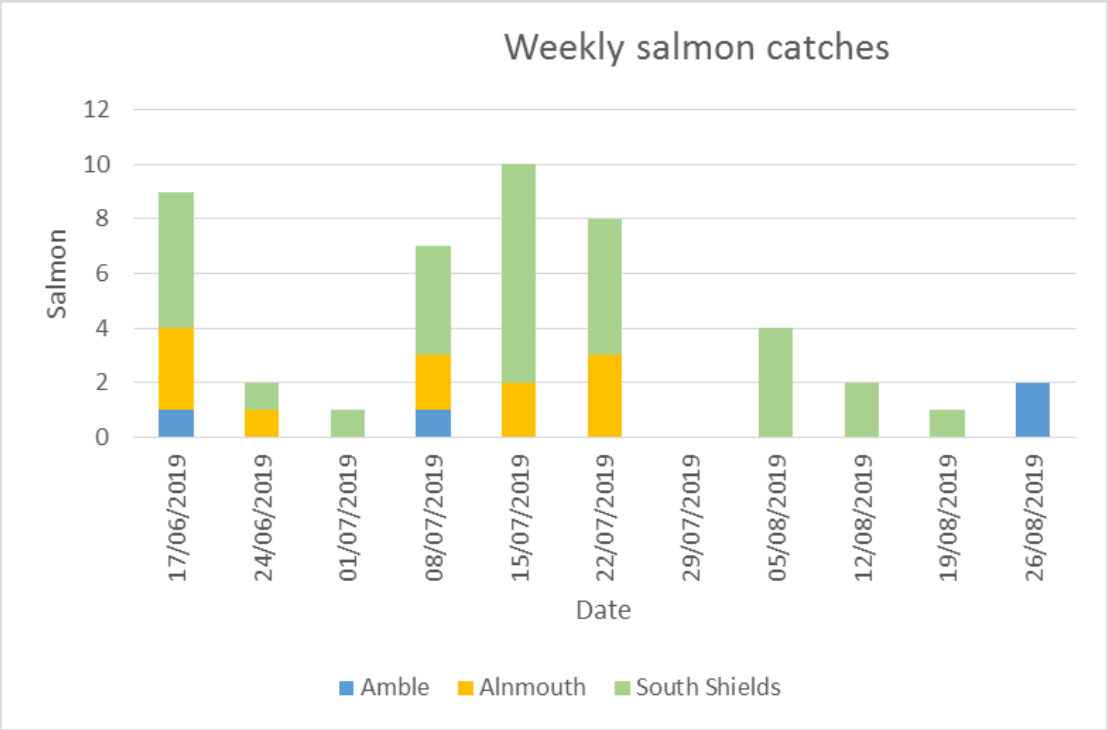

Figure 36. Weekly salmon catches by berth

Week	Amble	Alnmouth	S. Shields	Total
17/06/2019	1	3	5	9
24/06/2019	0	1	1	2
01/07/2019	0	0	1	1
08/07/2019	1	2	4	7
15/07/2019	0	2	8	10
22/07/2019	0	3	5	8
29/07/2019	0	0	0	0
05/08/2019	0	0	4	4
12/08/2019	0	0	2	2
19/08/2019	0	0	1	1
26/08/2019	2	0	0	2
Total	**4**	**11**	**31**	**46**

Table 9. Weekly catches of salmon by berth

For the whole trial period, salmon catches by berth are shown in Figure 38 below. The berth at South Shields intercepted the most salmon, accounting for 67.4% of the total salmon catch, followed by the berths at Alnmouth (23.9%) and Amble (8.7%) respectively.

Salmon were recorded on 25 of the 90 netting events, representing 27.8% of all netting events.

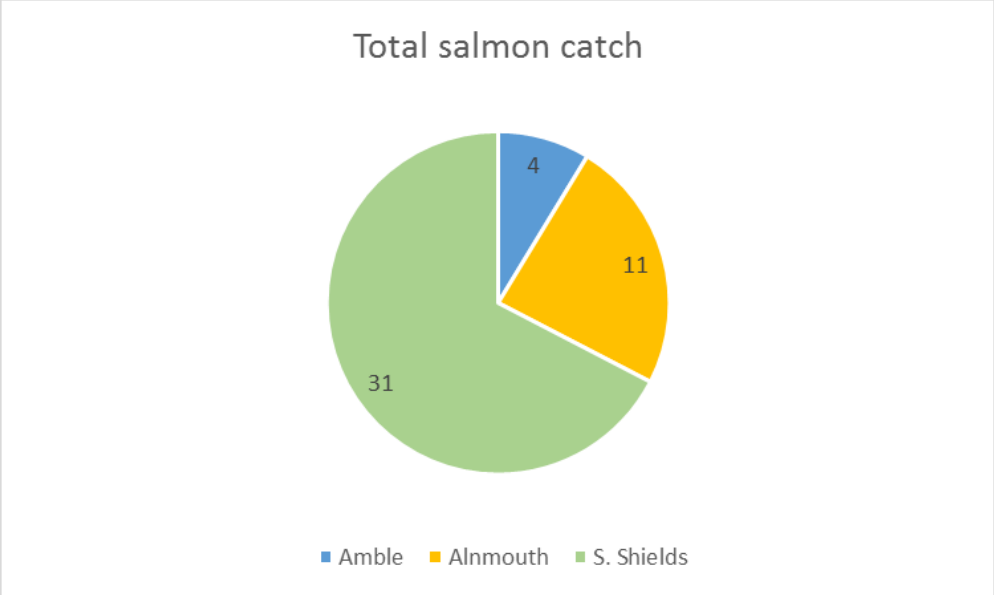

Figure 38. Distribution of salmon catch by berth

6.2.7 Comparison with historic salmon catches

Salmon catches were significantly lower than average catches in the same berth locations over the equivalent period, as summarised in Tables 10 and 11 below.

Note 1: Historic catches have been adjusted for the month of June as the trial period did not cover the whole month.

Note 2: Where two licensees shared a berth during the trial period, rather than both netting at adjacent berths concurrently, as is the usual practice, their combined average historic catches have been used for comparison with catches during the trial.

Month	Amble	Alnmouth	S. Shields	Total
June	1	4	6	11
July	1	7	18	26
August	2	0	7	9
Season	**4**	**11**	**31**	**46**

Table 10. Salmon catches in 2019

Month	Amble	Alnmouth	S Shields	Total
June*	35	35	144	214
July	109	144	415	668
August	74	82	393	549
Season	**253**	**296**	**1097**	**1432**

Table 11. Salmon catches 2013 - 2018 average (*June adjusted)

The percentage reduction in salmon catch in the trial period compared to average catches with a traditional T net over the same period at the same berths is shown in Table 12 below.

Month	Amble	Alnmouth	S Shields	Total
June	-97.2	-88.5	-95.8	-94.9
July	-99.1	-95.1	-95.7	-96.1
August	-97.3	-100.0	-98.2	-98.4
Season	**-98.4**	**-96.3**	**-97.2**	**-96.8**

Table 12. Percentage reduction in salmon catch in 2019 compared to historic average

All salmon were released from the net and returned to sea with the minimum of delay. Weight data for salmon were not frequently recorded, since salmon could often be released from the net without being taken from the water, by rolling them over the top of the head rope, or by being untangled from the net whilst still in the water.

There were no immediate mortalities of salmon recorded, all fish were returned to the sea alive, generally with minimal to moderate scale loss. Further data on the condition of salmon and their interaction with and release from the net is given in 6.4 and 6.5 below.

6.2.8 Catch rates for salmon

Catch rates for salmon were very low. The catch rate (expressed as salmon caught per hour) for each berth is shown in Figure 39 below.

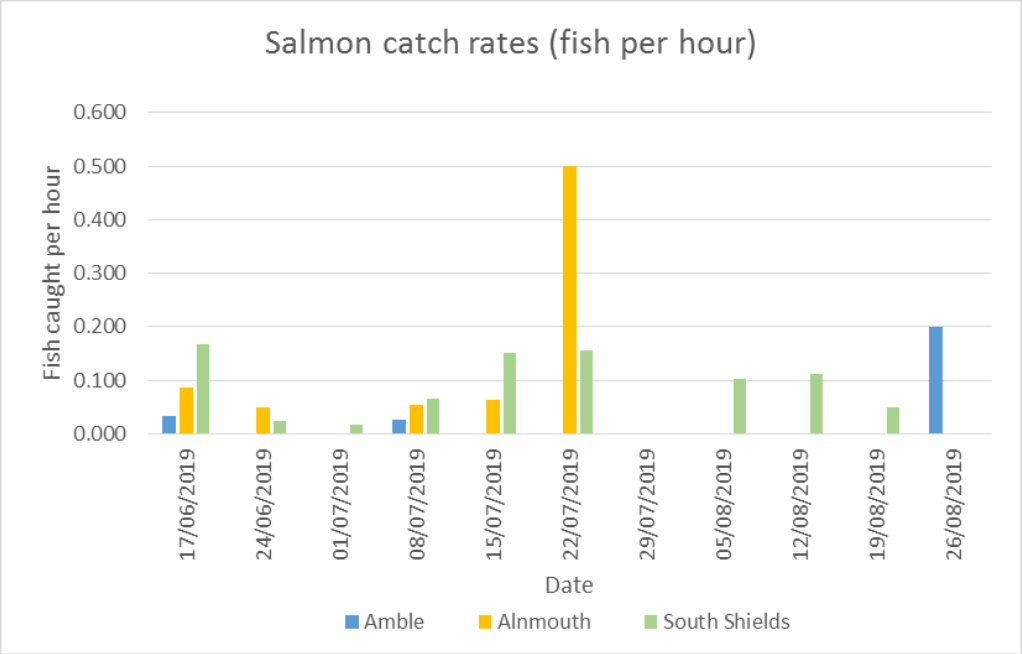

Figure 39. Catch rates for salmon (fish per hour) for each berth

The catch rate per hour for salmon was highest at South Shields at 0.085 salmon per hour. The catch rate for salmon at Alnmouth was lower, at 0.059 salmon per hour and the catch rate for salmon at Amble was 0.018 salmon per hour over the trial period.

6.2.9 Comparison with historic salmon catch rates

These figures show very substantial reductions in catch rate from recent historical figures. Salmon catches were reduced from recent average catch rates for these berths by over 90% in all cases.

The catch rates as salmon caught per hour from the trial, and from recent seasons as an average net catch rate for the same berth, together with the percentage change in catch rate for the whole period covered by the trial is shown in Table 13 below.

Salmon catch	Amble	Alnmouth	S Shields
Average 2014-2018	0.43	0.67	2.67
2019	0.02	0.06	0.09
Percentage change	**-95.84**	**-91.17**	**-96.80**

Table 13. Net trial and historic catch rates and percentage change.

6.3 Relative composition of net catches

6.3.1 Proportions of sea trout and salmon in catches in 2019

The overall catches of sea trout and salmon recorded at each berth in each month of the net trial are shown in Table 3 and Table 10 above respectively.

The catch ratio of sea trout to salmon recorded in the trial is shown in Table 14 below.

Month	Amble	Alnmouth	S. Shields	Total
June	34.0	31.5	67.7	51.5
July	427.0	108.3	81.4	102.0
August	3.0	NA	17.0	13.9
Season	**116.8**	**80.4**	**64.2**	**72.7**

Table 14. Ratio of sea trout to salmon by month at each berth

The ratio of sea trout to salmon decreased from north to south over the trial area. At all three trial berths, the ration was highest in July, reflecting the peak abundance of sea trout at this time.

The ratio of sea trout to salmon caught fell very markedly in August, except at Alnmouth where no netting took place during the last month of the trial, as the sea trout run declined.

6.3.2 Percentage of salmon comprising the net catch

The salmon catch is expressed as a percentage of the total catch in Table 15 below.

Month	Amble	Alnmouth	S. Shields	Total
June	2.9	3.1	1.5	1.9
July	0.2	0.9	1.2	1.0
August	25.0	NA	5.6	6.7
Season	**0.8**	**1.2**	**1.5**	**1.4**

Table 15. Salmon as a percentage of the total catch for each berth 2019

Over the duration of the trial, salmon comprised on average 1.4% of the total declared catch. The proportion of salmon in the catch was highest in August, when sea trout catches fell substantially.

6.3.3 Proportions of sea trout and salmon in catches 2014 to 2018

Historic sea trout and salmon catches at these berths over the trial period are shown in Tables 4 and 11 above, respectively.

The ratios of sea trout to salmon at the trial berth locations in recent years are shown in Table 16 below.

Month	Amble	Alnmouth	S. Shields	Total
June*	7.1	7.9	3.8	5.0
July	3.7	2.4	2.8	2.9
August	1.3	1.4	1.0	1.1
Season	**3.9**	**3.4**	**2.4**	**3.3**

Table 16. Ratio of sea trout to salmon by month at each berth 2014 - 2018

The salmon catch over the period 2014 to 2018 is expressed as a percentage of the total catch in Table 17 below.

Month	Amble	Alnmouth	S. Shields	Total
June*	12.3	11.2	21.0	16.7
July	21.2	29.0	26.0	25.6
August	44.3	41.7	49.7	47.6
Season	**20.2**	**22.5**	**29.2**	**23.4**

Table 17. Salmon as a percentage of the total catch for each berth 2014 - 2018

Historically, salmon have comprised almost a quarter of the total catch at the participating berths, where they comprise on average 23.4% of the total catch. The contribution of salmon to the total catch has historically been greatest at South Shields, where the average contribution is 29.2%.

The proportion of salmon in the catch increases as the season progresses, as the sea trout run typically falls off in August, when the salmon run is increasing.

6.3.4 Comparison of catch composition in trial and traditional nets

Catches recorded at the berths participating in the trial using the traditional closed ended T net over the period 2014 to 2018 showed a ratio of sea trout to salmon of 3.3 to 1, meaning salmon comprised 23.4% of the total net catch.

The modified design of T net returned a ratio of 72.7 to 1 over the trial period, when salmon were recorded as comprising on average 1.4% of the fish caught.

The proportion of salmon comprising the net catch was therefore approximately 17 times greater using a traditional net than using a modified T net.

6.4 Catch data from fisheries observations

6.4.1 Monitoring effort

A total of 29 separate fisheries observations were made by fisheries enforcement and scientific officers by RIB over the course of the trial in District 1, totalling 96.2 hours of direct fisheries observations.

This represents observations made for at least part of the netting period on 32% of all days fished during the trial, and direct observation of a total of 12.5% of all hours of fishing effort.

A list of all fisheries observations and the number of sea trout and salmon recorded during each observation is given in Appendix 2

A summary of monitoring effort in fisheries observations is given for each berth in Table 18 and for each month of the trial in Table 19 below

Berth	Obs.	Hours
Amble	4	15.8
Alnmouth	6	19.2
Shields	19	61.2
Total	**29**	**96.2**

Table 18. Total fishery observations and hours fished at each berth

Month	Obs.	Hours
June	10	36.1
July	12	38
August	7	22.1
Total	**29**	**96.2**

Table 19.Fisheries observations fisheries in each month of the trial.

6.4.2 Catches and catch rates for salmon observed

The number of sea trout and salmon observed encountering the net during fisheries observations at each berth and in each month are shown in Tables 20 and 21, together with catch rate (fish per hour) for both salmon and sea trout, and with the ratio of sea trout to salmon observed in each location. Salmon were recorded on 11 of the 29 fisheries observations, representing 38% of all fisheries observations.

Berth	Catch		Catch rate		Ratio
	Sea Trout	Salmon	Sea Trout	Salmon	ST:SA
Amble	28	3	1.77	0.19	9.33
Alnmouth	97	1	5.05	0.05	97.00
Shields	220	18	3.59	0.29	12.22
Total	**345**	**22**	**3.59**	**0.23**	**15.68**

Table 20. Fisheries observation data shown by berth

Month	Catch		Catch rate		Ratio
	Sea Trout	Salmon	Sea Trout	Salmon	ST:SA
June	197	8	5.46	0.22	24.63
July	127	6	3.34	0.16	21.17
August	21	8	0.95	0.36	2.63
Total	**345**	**22**	**3.59**	**0.23**	**15.68**

Table 21. Fisheries observation data shown by month

Observed catches of salmon and sea trout are by berth in Figures 39 and by month in Figure 40 below.

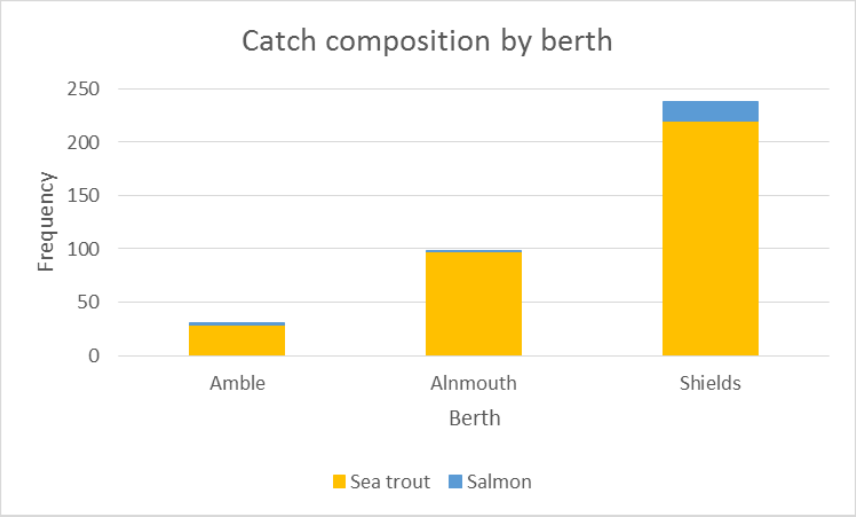

Figure 39. Observed catch composition by berth

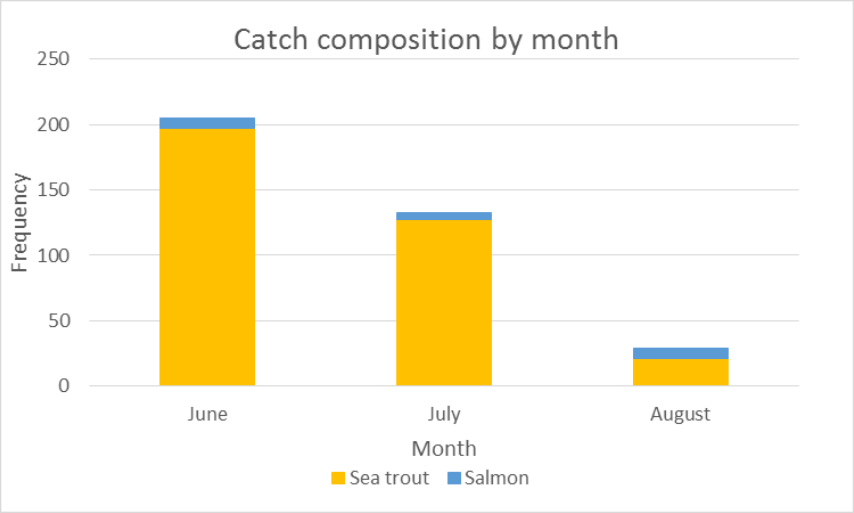

Figure 40. Observed catch composition by month

6.4.3 Percentage of salmon comprising the net catch

The percentage salmon comprised of the total catch observed during fisheries observations is shown in Table 21 by berth and Table 22 by month below.

Berth	% SA
Amble	9.68
Alnmouth	1.02
Shields	7.56
Total	**5.99**

Table 22. Salmon as a percentage of the total catch observed at each berth

Month	% SA
June	3.90
July	4.51
August	27.59
Total	**5.99**

Table 23. Salmon as a percentage of the total catch observed each month

6.4.4 Field observations of condition of salmon released

Where possible, fisheries observers made contemporaneous field notes to record the condition of any salmon they observed, together with other details concerning the event.

These are summarised in Table 24 below.

If fish were lightly entangled, salmon could often be released by being rolled over the head rope of the T net, or freed from the net manually without leaving the water.

Salmon that were entangled to a greater degree required bringing onto the licensees boat to be untangled from the net manually, before being returned to the sea. This process was generally relatively straightforward and took little time.

Generally, salmon requiring release were assessed by fisheries observers as having sustained minimal damage.

Date	Berth	Salmon	Fisheries observer field notes
19/06/2019	Amble	1	Salmon not gilled, just rolled in net. Easily released.
21/06/2019	S. Shields	5	One salmon chased into leader by a seal, released after some effort. Four lightly snagged in T headpiece and released easily.
27/06/2019	Alnmouth	1	Salmon appeared in good condition but meshed around the gills. Sank to the bottom after release, cannot confirm swam away.
28/06/2019	S. Shields	1	Salmon caught with teeth and snout in mesh. Quickly released and swam away.
17/07/2019	S. Shields	3	Two salmon unmarked, one sufferred moderate scale loss. All released alive.
22/07/2019	S. Shields	1	A larger salmon was well-enmeshed and required bringing into boat to release, but swam away strongly. One salmon also observed to swim through headpiece without becoming entangled.
24/07/2019	S. Shields	2	Two salmon snagged both MSW fish, the largest around 90cm. Went away easily with minimal damage. Two further salmon seen swimming through net, did not become entangled.
08/08/2019	S. Shields	3	One of the salmon returned was moribund and probably unlikely to survive. One grilse also observed hardly meshed, so not recorded.
15/08/2019	S. Shields	2	One salmon and one grilse caught. Grilse firmly entangled and the net had to be cut to allow its release. Fish went away with minimal damage, some slight scale loss only.
22/08/2019	S. Shields	1	Large grilse or smallish salmon gilled and to be released on board to be released. Incurred some damage to the operculum. Went away OK. One salmon observed to swim through headpiece without becoming entangled.
27/08/2019	Amble	2	Salmon slightly tangled, released very quickly. Small grilse badly tangled and had to be cut out of net. Took time to recover but eventually swam away showing no ill effects, but quite badly net marked.

Table 24. Fisheries observers' field notes on released salmon.

On one observation (8 August) a salmon was released that was assessed by the observer as being 'unlikely' to survive.

On one occasion (21 June) an enmeshed salmon was observed being attacked by a seal at the South Shields berth. This salmon suffered damage to its head. It is unclear the degree of physical damage this salmon sustained, but it was released alive and was observed to swim away from the net.

On a number of occasions, fisheries observers noted both salmon and sea trout escaping T nets through the open end of the headpiece.

6.5 Video and photographic evidence

Video and photographic evidence was collected during fisheries observations to generate a visual record of the performance of the nets during the trial.

Fisheries observers mounted a waterproof video camera on a pole to capture video of salmon and sea trout encountering and interacting with the net, their behaviour in response, and subsequent escape, or entanglement and release.

Footage was also captured of netting activities, including inspecting the net and release and return of any salmon entangled. To better demonstrate and record the size, location and configuration of the modified design of T net, aerial footage was captured at South Shields on 21 June.

Underwater video of the modified T net was also captured using a tethered Remote Operated Vehicle (ROV) provided by specialist contractors Team SUV at South Shields on 20 August.

Video footage has been edited to provide an overview of the net trial. This footage can be viewed on the Environment Agency's YouTube channel, by clicking the hyperlink below or visiting:

(Add URL and hyperlink)

Selected stills from the video footage are included in Appendix 5. The footage supports fisheries observers field reports, which indicated that salmon were caught infrequently and in low numbers,

and that on most occasions salmon could be released and returned with minimal delay or physical damage.

6.6 Comparison of data from logbooks and field observations

6.6.1 Monthly catches and proportion of salmon and sea trout by berth

A comparison of logbook reported catches and catch data collected during fisheries observations for each berth for each month of the trial is shown in Tables 25, 26 and 27 below.

Alnmouth						
Month	Logbook			Observations		
	ST	SA	%SA	ST	SA	%SA
June	126	4	3.08	43	1	2.27
July	758	7	0.92	54	0	0.00
August	NA	NA	NA	NA	NA	NA
Season	**884**	**11**	**1.23**	**97**	**1**	**1.02**

Table 25. Comparison between logbook returns and fisheries observations at Alnmouth

Amble						
Month	Logbook			Observations		
	ST	SA	%SA	ST	SA	%SA
June	34	1	2.86	3	1	25.00
July	427	1	0.23	25	0	0.00
August	6	2	25.00	0	2	100.00
Season	**467**	**4**	**0.85**	**28**	**3**	**9.68**

Table 26. Comparison between logbook returns and fisheries observations at Amble

South Shields						
Month	Logbook			Observations		
	ST	SA	%SA	ST	SA	%SA
June	406	6	1.46	151	6	3.82
July	1466	18	1.21	48	6	11.11
August	119	7	5.56	21	6	22.22
Season	**1991**	**31**	**1.53**	**220**	**18**	**7.56**

Table 27. Comparison between logbook returns and fisheries observations at South Shields

A total of 10.3% of all netting activity was observed at the Alnmouth berth during the trial. The proportion of salmon in the net catch was comparable when calculated from logbook data and from fisheries observations, with logbook data providing a slightly higher estimate of contribution of salmon to the net catch.

At the other berths, fisheries observations provided a higher estimate of catch contribution for salmon.

The difference in estimated contribution of salmon was greatest at Amble, where the observed contribution of salmon in fisheries observations was more than 10 times greater than that recorded in the logbook data, although the observed contribution is highly variable between observations, with the proportion of salmon comprising the catch observed ranging from zero to 100% of the catch. A total of 7.1% of all netting activity was observed at the Amble berth during the trial.

A total of 16.9% of all netting activity was observed at the South Shields berth during the trial. The contribution of salmon to the catch assessed from fisheries observations increased as the trial progressed at South Shields. Logbook data showed a similar pattern of increase, with the August contribution being higher than that reported in June and July. The estimated contribution of salmon to the net catch was approximately five times higher in fisheries observations than from logbook data over the course of the trial.

6.6.2 Monthly catch rates for salmon by berth

A comparison of logbook reported catch rates and catch rate data determined from fisheries observations, expressed as salmon per hour for each berth for each month of the trial is shown in Tables 28, 29 and 30 below.

Month	Alnmouth					
	Logbook			Fisheries observations		
	Hours fished	Salmon	Catch rate	Hrs observed	Salmon	Catch rate
June	55	4	0.07	6.4	1	0.16
July	132	7	0.05	12.8	0	0.00
August	NA	NA	NA	NA	NA	NA
Season	**187**	**11**	**0.06**	**19.2**	**1**	**0.05**

Table 28. Comparison between logbook returns and fisheries observations for salmon at Alnmouth

Month	Amble					
	Logbook			Fisheries observations		
	Hours fished	Salmon	Catch rate	Hrs observed	Salmon	Catch rate
June	34	1	0.03	4.8	1	0.21
July	153	1	0.01	7.5	0	0.00
August	34	2	0.06	3.5	2	0.57
Season	**221**	**4**	**0.02**	**15.8**	**3**	**0.19**

Table 29. Comparison between logbook returns and fisheries observations for salmon at Amble

Month	South Shields					
	Logbook			Fisheries observations		
	Hours fished	Salmon	Catch rate	Hrs observed	Salmon	Catch rate
June	71	6	0.08	24.9	6	0.24
July	206	18	0.09	17.7	6	0.34
August	86	7	0.08	18.6	6	0.32
Season	**363**	**31**	**0.09**	**61.2**	**18**	**0.29**

Table 30. Comparison between logbook returns and fisheries observations for salmon at South Shields

The catch rate at Alnmouth was comparable when assessed from logbook records and fisheries observation data.

At Amble the observed catch rate was approximately 10.5 times greater when assessed from fisheries observations, and at South Shields 3.4 times greater when assessed from fisheries observations than from catches recorded in logbooks.

6.2.3 Monthly catch rates for sea trout by berth

A comparison of logbook reported catch rates and catch rate data determined from fisheries observations, expressed as sea trout per hour for each berth for each month of the trial is shown in Tables 31, 32 and 33 below.

Month	Alnmouth					
	Logbook			Fisheries observations		
	Hours fished	Sea trout	Catch rate	Hrs observed	Sea trout	Catch rate
June	55	126	2.29	6.4	43	6.72
July	132	758	5.74	12.8	54	4.22
August	NA	NA	NA	NA	NA	NA
Season	**187**	**884**	**4.73**	**19.2**	**97**	**5.05**

Table 31. Comparison between logbook returns and fisheries observations for sea trout at Alnmouth

Month	Amble					
	Logbook			Fisheries observations		
	Hours fished	Sea trout	Catch rate	Hrs observed	Sea trout	Catch rate
June	34	34	1.00	4.8	3	0.63
July	153	427	2.79	7.5	25	3.33
August	34	6	0.18	3.5	0	0.00
Season	**221**	**467**	**2.11**	**15.8**	**28**	**1.77**

Table 32. Comparison between logbook returns and fisheries observations for sea trout at Amble

Month	South Shields					
	Logbook			Fisheries observations		
	Hours fished	Sea trout	Catch rate	Hrs observed	Sea trout	Catch rate
June	71	406	5.72	24.9	151	6.06
July	206	1466	7.12	17.7	48	2.71
August	86	119	1.38	18.6	21	1.13
Season	**363**	**1991**	**5.48**	**61.2**	**220**	**3.59**

Table 33. Comparison between logbook returns and fisheries observations for sea trout at South Shields

Catch rate estimates for sea trout from logbook data and from fisheries observations are similar at all three berths.

7. Description of the Trial in District 5

7.1 The modified design of J net

The design of the modified J net was closely based on the existing J net, as described in 2.2 above.

The modified net was made from a length of plain, unarmoured netting without bags, pockets or monks not exceeding 370 metres in total length which extends from the beach and is then turned back on itself to form a partly open box or compound in the form of a letter ‘J’. The net was maintained stationary by anchors or weights and suspended in the water by means of floats.

The key modification in design is that the trial net was constructed with nylon netting only, with no monofilament or multi-monofilament mesh elements included.

As with the existing design of J net used in District 5, the leader was constructed of high visibility, black nylon mesh. This has the effect of reducing fish entanglement in the leader, and minimises by-catch of diving seabirds.

7.2 Operation of the modified J net

The net was shot from a boat and maintained stationary by anchors or weights and suspended in the water by means of floats, in the shape of a letter J.

The net was closely attended in a boat at all times when fishing. “Fishing” is defined as being when sea water starts to cover any mesh of the net.

The licensee was required to closely observe the net at all times whilst the net was fishing, in order that any salmon entangled could be released with least possible delay.

Any salmon or grilse that became snagged or entangled in any part of the net were removed and returned immediately to the water with the least possible injury. This applied whether the salmon or grilse are alive or dead – no salmon were retained.

7.3 Data collection, recording and evidence

Data collection was as described in 5.3 above.

Environment Agency observers conducted on-board inspections, and additional evidence was collected using an aerial drone, and underwater using a Remote Operated Vehicle

For each occasion that the participant in the net trial fished, they recorded in the standard logbook:

1. The date and time fished, and the hours spent fishing
2. The species and weight of each individual fish caught in the net.
3. For any salmon caught the size and condition of the fish, any damage sustained and whether it was returned alive or dead.
4. For all sea trout captured, the number of the jaw tag applied to the fish.

7.4 Netting station location

All J net licensees in Districts 3 to 7 were invited to express their interest in participating in the trial of modified J nets. A single license expressed an interest, and agreed to the terms of participation for the netting trial.

This licensee fished at Filey Bay, within District 5 of the fishery. Details of the berth location and site characteristics are shown in Figures 41 to 43 below.

Figure 41. Map showing the location of the trial berth in District 5

Filey berth - grid reference TA131 813

Figure 42. The Filey berth location - marked in red

Figure 43. Netting at the Filey berth

7.5 Trial duration

The trial began on Thursday 1 August 2019, and concluded on Friday 30th August 2019.

The total days fishing available within the trial period was therefore, accounting for the weekend closed periods, 22 days.

8. Results from District 5

A summary of daily fishing effort and catches for each berth is provided in Appendix 3.

8.1 Fishing effort and effort utilisation

8.1.1. Days fished

A 'day fished' is defined as any day when any active fishing activity occurred, regardless of duration.

A total of 14 days were fished during the trial, compared to an average of 18 days at this berth in the month of August recent years. This represents 63.6% effort utilisation in the trial period.

This is much higher than the recent average effort utilisation in the Yorkshire beach net fishery between 2014 and 2018, which varied between 26% and 37%, and averaged 33% for the whole of the netting season.

The number of days fished in each week of the trial is shown in Figure 44 below.

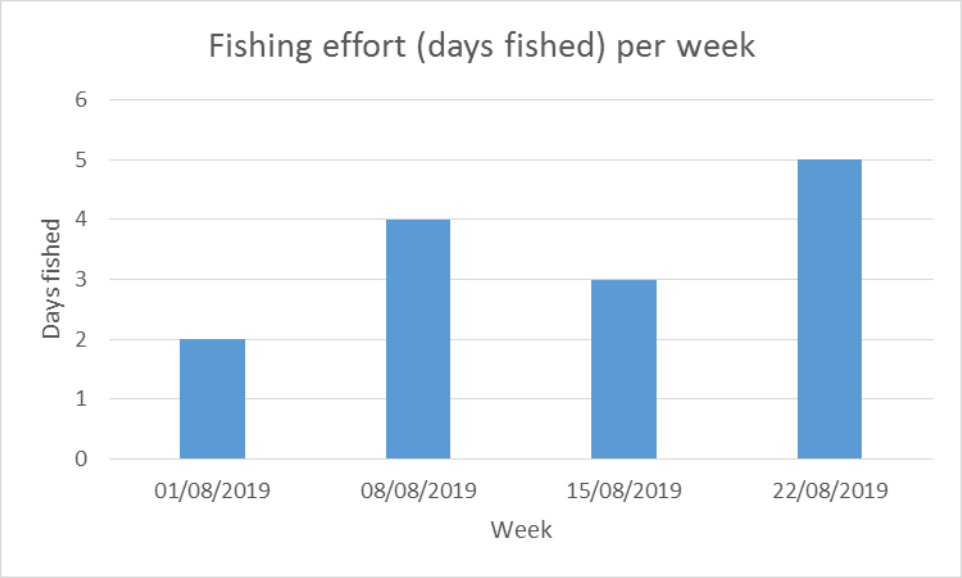

Figure 44. Fishing effort (days fished) per week

The cumulative total number of fishing days and the cumulative total available effort is shown in Figure 45 below.

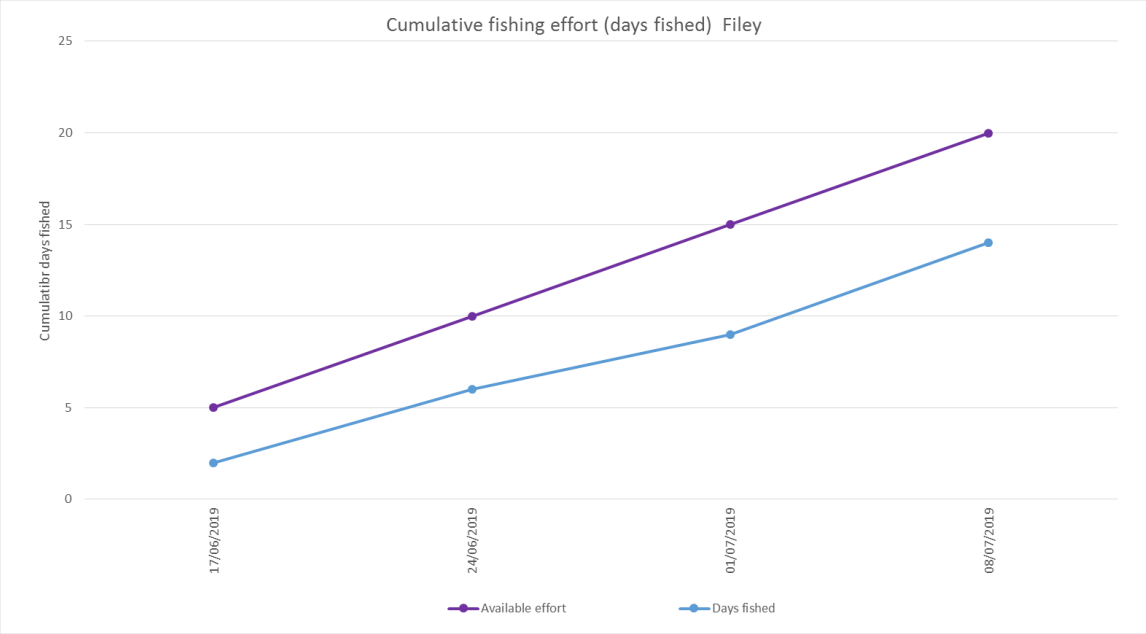

Figure 45. Available and utilised fishing effort at Filey

8.1.2 Hours fished

A total of 81 hours were fished during the trial. The hours fished for each week is shown in Figure 46 below. This is below the recent (2014 - 2018) average hours fished for August at the trial berth of 120 hours.

The number of hours fished per week closely follows the number of fishing events, as expected.

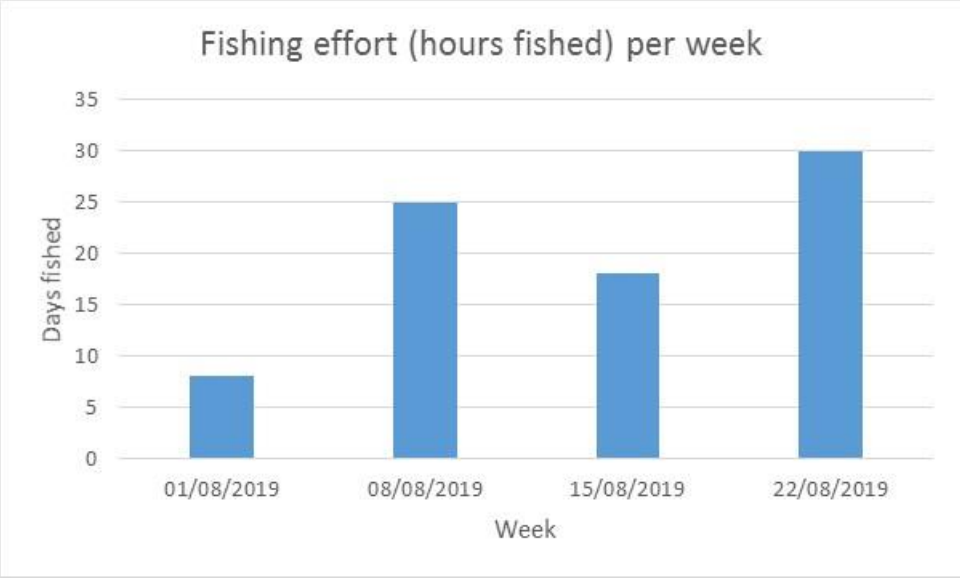

Figure 46. Fishing effort (hours fished) per week

8.2 Catch data from logbook returns

8.2.1 Sea trout catches

A total of 67 sea trout were landed during the trial. Daily and weekly catches of sea trout are shown in Figures 47 and 48 respectively below.

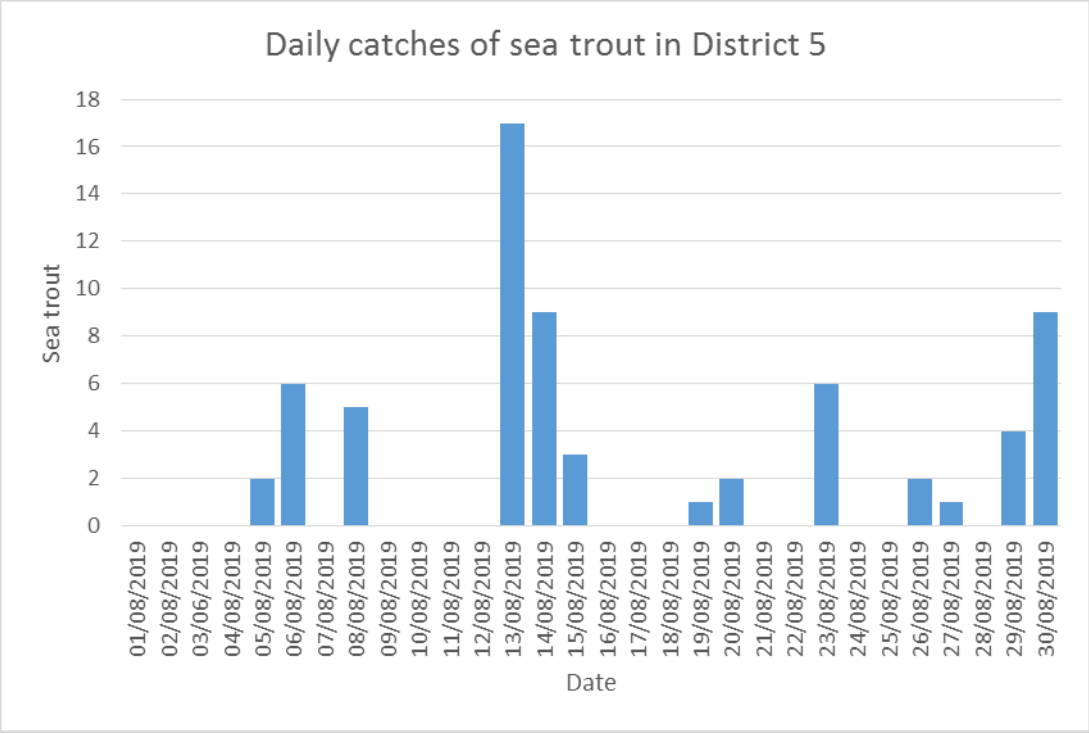

Figure 47. Daily catches of sea trout

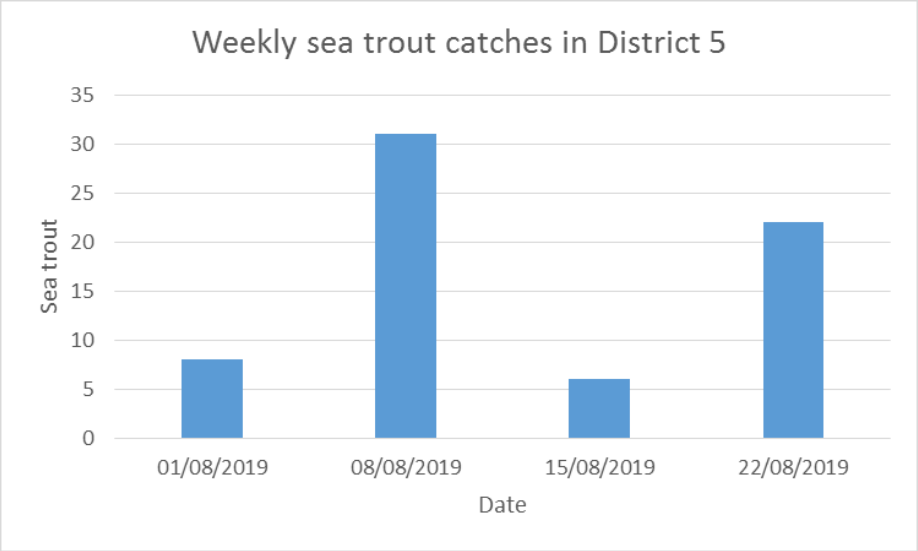

Figure 48. Weekly catches of sea trout

8.2.2 Comparison with historic sea trout catches

Sea trout catches in the trial were lower than for the equivalent period in recent years. The August sea trout catch for the month of August at this berth between 2014 - 2018 ranges from 105 to 266 sea trout, with an average catch of 190 fish.

The sea trout catch in 2019 represents a 64.7% reduction on the average recent catch.

8.2.3 Sea trout catch rates and historic catch rates

The catch rate for sea trout during the trial period was 0.83 fish per hour fished.

The catch rate for sea trout during the trial period was approximately half that of the recent historic average (2014 - 2018) of 1.61 fish per hour for August (range 2.43 - 1.01 fish per hour).

8.2.4 Sea trout weight frequency distribution

The weight of each sea trout netted was estimated by the netsman and recorded.

Although these weights are estimated rather than measured, the licensee participating in the trial was very experienced in visually assessing the weight of fish, and therefore any estimation error is likely to be low.

The weight frequency distribution of sea trout landed in total is shown in Figure 49 below. The average weight of sea trout netted during the trial was 4.3lbs, which is slightly above the recent historic average weight of 4.06lbs.

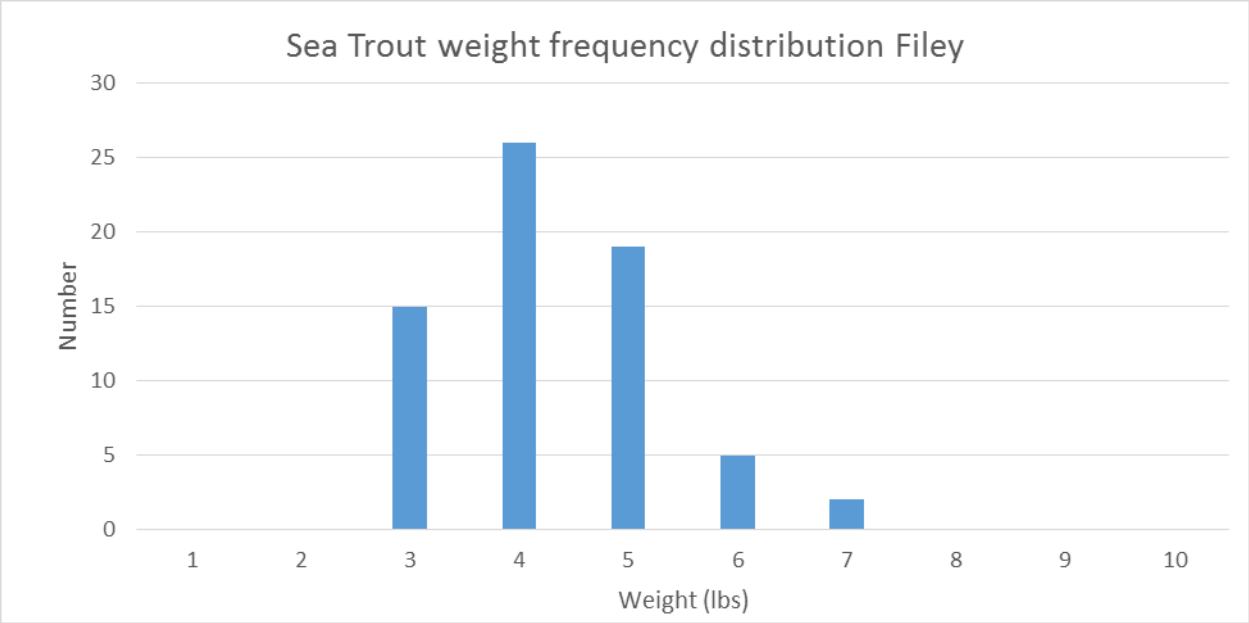

Figure 49. Weight frequency distribution of sea trout

8.2.5 Salmon catches

A total of 4 salmon were recorded as requiring release from the net during the trial. One salmon was caught in the first week of the trial, two in the second week, and a fourth in the third week of the trial. No salmon were caught in the final trial week.

The salmon caught in the third week was attacked by a seal whilst entangled in the net, before the licensee could release it and did not survive. The remaining three salmon were released with minimal damage.

Salmon were recorded on 4 of 14 netting events, representing 28.6% of all netting events.

8.2.6 Comparison with historic salmon catches

Salmon catches were significantly lower during the trial than average catches at the same berth over the same period in recent years.

Salmon catches at the trial berth in August over the period 2014 to 2018 have ranged between 7 and 34 salmon netted, with an average salmon catch of 15.2 salmon.

The catch in 2019 of 4 salmon represents a reduction in catch of 73.7% compared to the average catch.

8.2.7 Catch rates and historic catch rates for salmon

Catch rates for salmon were low, at 0.05 salmon per hour netted.

The historic catch rate at the trial berth in August over the period 2014 to 2018 ranges between 0.05 salmon per hour and 0.28 salmon per hour netted, averaging 0.13 salmon per hour.

The catch rate during the trial of 0.05 salmon per hour represents a 73.7% reduction in catch rate compared to the recent average.

8.3 Relative composition of net catch

8.3.1 Proportions of sea trout and salmon in the catch in 2019

The proportion of sea trout and salmon in the net catch is shown in Figure 50 below. The ratio of sea trout to salmon in the catch was 16.75 to 1. The salmon catch represented 5.63% of the total net catch during the trial.

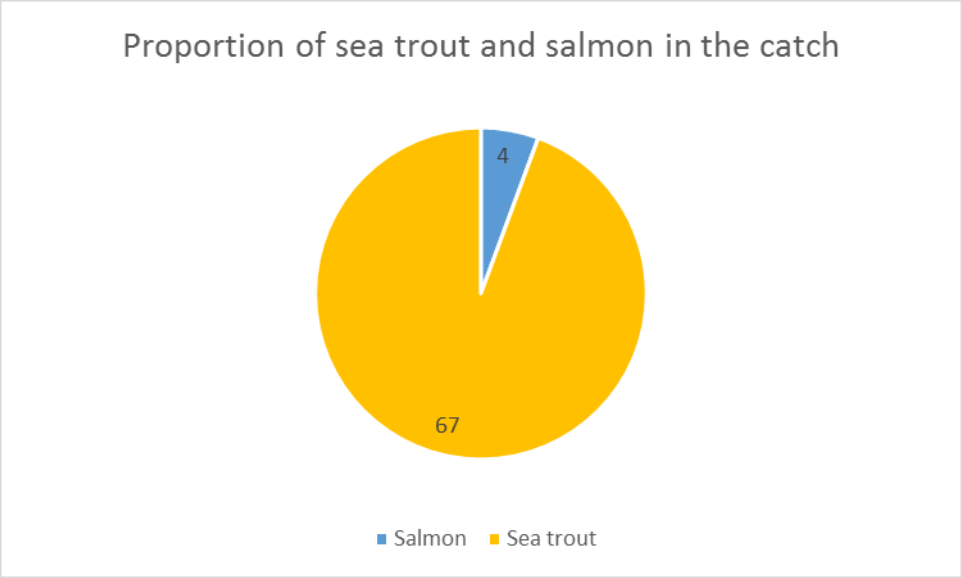

Figure 50. Proportion of sea trout and salmon in the net catch

8.3.2 Comparison of catch composition in trial and traditional nets

Catch ratios of sea trout to salmon using the traditional design of J net at this berth in August over the period 2014 to 2018 have ranged between a ratio of 5.9 to 1 in 2016 to 20.5 to 1 in 2015.

The average ratio of sea trout to salmon over this period is 15.3 to 1, compared to a trial ratio of 16.75 to 1.

Salmon comprised between 14.5% of the catch in 2016 to 4.7% of the catch in 2015, averaging 7.41% of the catch in August, compared to a trial composition of 5.63% salmon in the catch.

8.4 Catch data from fisheries observations

8.4.1 Monitoring effort

A total of 11 separate fisheries observations were made by fisheries enforcement and scientific officers, who accompanied the licensee in their fishing boat. A total of 36 hours of direct observations were made over the course of the trial in District 5.

This represents observations made for at least part of the netting period on 79% of all days fished during the trial, and direct observation of 44.4% of all hours of fishing effort.

8.4.2 Catches observed

Fisheries observers recorded 23 sea trout and 3 salmon during direct observations, as shown in Figure 51 below. The observed ratio of sea trout to salmon was therefore 8.7 to 1, with salmon comprising 10.3% of the observed catch.

A list of all fisheries observations and the number of salmon and sea trout observed is given in Appendix 4 below.

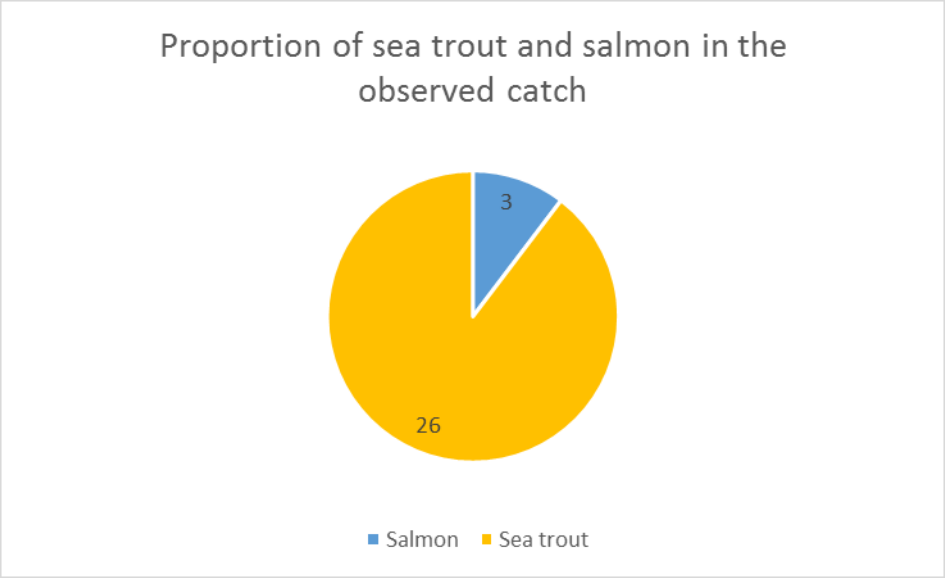

Figure 51. Proportion of sea trout and salmon in the observed catch

8.4.3 Field observations on the condition of salmon released

Fisheries observers made contemporaneous field notes to record the condition of any salmon they observed, together with other details concerning the event. Notes for the three occasions salmon were observed are shown in Table 34 below.

Date	Salmon	Fisheries observer field notes
08/08/2019	1	Grilse entangled at 16:00. Took 30 seconds to release. Negligble to moderate net marks.
13/08/2019	1	(No contemperaneous note regarding condition of salmon)
15/08/2019	1	One grilse caught 12:30. Dead in net - seal crushed head. Took 30 seconds to get to fish 30 seconds to release from net. Took photos of dead grilse and retained for inspection.

Table 34. Fisheries observers' field notes on released salmon.

8.5 Video and photographic evidence

Video and photographic evidence was collected during fisheries observations to generate a visual record of the performance of the nets during the trial.

Footage was captured of netting activities, including inspecting the net and release and return of any salmon entangled. To better demonstrate and record the size, location and configuration of the modified design of T net, aerial footage was captured at Filey on 13 August.

Underwater video of the modified J net was also captured using a tethered Remote Operated Vehicle (ROV) provided by specialist contractors Team SUV at Filey on 19th August.

Video footage has been edited to provide an overview of the net trial. This footage can be viewed on the Environment Agency's YouTube channel, by clicking the hyperlink below or visiting:

(Add URL and hyperlink)

Selected stills from the video footage are included in Appendix 5.

8.5 Comparison of data from logbooks and field observations

The proportion of salmon in the catch and the catch rate for salmon expressed as fish caught per hour are shown for logbook data and for fisheries observations in Table 35 below.

Method	Hours	ST	SA	% SA	Catch rate SA	Catch rate ST
Logbook	81	67	4	5.63	0.05	0.83
Observation	36	26	3	10.34	0.08	0.72

Table 35. Comparison of catches and catch rates for logbooks and observations at Filey

The observed proportion of salmon in the net catch and the catch rate for salmon were both higher when calculated from fisheries observations than from logbook records. The catch rate for sea trout was slightly lower when calculated from fisheries observations than from logbook returns.

9. The netsmen's perspective

Netsmen participating in the trials were invited to provide their perspective and experience of undertaking the modified net trials. A number of questions were presented to assist in providing consistent responses.

The main responses from this consultation are summarised below.

9.1 District 1 T net trial

The modified T net was unanimously considered to be significantly less efficient than the original T net design for both salmon and sea trout. Large numbers of salmon, grilse and sea trout were reported as being observed swimming through both monks and exiting the net during the trial. Ordinarily, these fish would have been retained in the headpiece of the net, and contributed to catches.

Sea trout were reported as being more likely to remain within the headpiece than salmon, and more likely to become entangled in the mesh comprising the headpiece.

Netsmen advise that salmon have frequently been observed to react differently to sea trout in traditional T nets, often being guided by the net into the ends of the headpiece. This is why the original T net design is so effective, and why salmon are better able to navigate through the modified design and escape than sea trout, which are more likely to become entangled in both the traditional and modified designs of T net.

The new design of net was felt to have minimal impact on those salmon enmeshed, with the great majority of salmon passing through the net without becoming entangled and continuing their migration by exiting the open ends of the headpiece without human intervention.

Of the small number of salmon that were impeded by the net, most were lightly entangled by the teeth, gill cover or fins. Some rested or lay against the netting without being physically impeded and could simply be rolled over the head rope and out of the net without leaving the water.

It was often possible to release salmon directly from the net into the water, generally they were not landed into the boat.

Entangled salmon could be released quickly and easily, with minimal scale loss or damage. This is as a result of the new net design and the experience and skill of the participating licensees.

The small number of salmon that were intercepted in the net were generally either ushered through the monks as intended or tipped over the headline. The nets were closely observed at all times and salmon were able to be released without harm.

The performance of the modified net did allow for a high percentage of salmon to escape, which resulted in catches that were greatly reduced compared with last year.

However, from a single season trial it is difficult to say to what extent catches were influenced by the new net design, sometimes poor weather and fishing conditions and the number of fish available to the fishery. During the trial, catches were very poor in August, which has not been the case in some recent years.

Willingness to use the modified net design was mixed, with some netsmen indicating they would be willing to use an open ended T net from the beginning of the netting season, were it to be extended, and others advising they would prefer to use a traditional design in the pre-June period when salmon are scarce, to improve catch efficiency for sea trout.

Netsmen indicated they would be interested in participating in an extended sea trout fishery if it were to prove economically viable, although expressed frustration that the salmon net fishery has been closed, thus reducing the income available from net fishing.

The strong preference was to have the net fishing season restored to the end of August, returning to the former season dates.

9.2 District 5 J net trial

Feedback from the netsman fishing the modified J net in District 5 was that the all-nylon net fished similarly to a J net comprised of a nylon leader and monofilament headpiece.

The frequent westerly winds and clear water during the trial were thought to have reduced netting efficiency as the all-nylon net was more visible to fish in these conditions, but salmon and sea trout responded to the modified net in largely the same way as the traditional design.

The few salmon entangled were released in good condition, and the net operated as expected. It may be possible to further improve netting operation if more experience was gained in working the new net design.

The use of high visibility black corline netting in the leader was recommended, to prevent sea trout becoming enmeshed when the water is muddy or cloudy. This net type also minimises the incidental bycatch potential for non-target species of fish, crustaceans and seabirds.

An extension to the net fishery season was thought likely to be economically viable.

10. Discussion

10.1 Experimental design and data quality

The 2019 sea trout netting trials in both District 1 and in District 5 have provided a substantial amount of new data to better inform our understanding of the operation of modified designs of nets to advise the future management of the net fishery.

The data collected from these trials provides an assessment of net performance in a single year only, at a limited number of locations. Historic net catches confirm the fishery has significant inter-annual variation in catches, and therefore these results should be interpreted with a degree of caution.

However, with this caveat, the information provided by the trials provides a good evidence base on which to evaluate the performance of the modified nets, and to inform future net fishery management.

The data secured from logbook returns and from fisheries observations generally yielded differing results, with the exception of the Alnmouth berth, where results from both logbooks and observations showed close agreement.

Elsewhere, fisheries observations provided higher estimations of the proportion of salmon in the net catch, and higher catch rates for salmon than proportions recorded in logbooks.

A number of factors are likely to have contributed to these differences in assessment.

The difference between the percentages of salmon in the catch recorded in logbooks and in fisheries observations may reflect the fact that fisheries observations provide only a sub-sample of overall netting effort, covering 12% of the total time spent fishing.

Given the variable catches of salmon and sea trout across the whole trial period, the relative catch proportions observed during direct observations may not exactly replicate the catch proportions when considering the trial period as a whole.

In order to maximise the number of fish observed, the available fisheries observation monitoring effort was largely focused around the high tide, rather than across the whole of each day's netting.

This is the period when the greatest proportion of the catch is usually netted. It is possible that salmon are over-represented in catches at this state of tide compared to other periods in the netting session.

Effort was also specifically focused on the earlier weeks of the netting trial, in order that any significant catches of salmon that had occurred could have been identified at an early stage and the trial, if necessary, brought to an early conclusion.

Licensees applied a different interpretation of 'entangled' to fisheries observers. Netsmen typically included fish physically enmeshed and which required their intervention to release, but excluded fish which were assisted in leaving the net, for example by being rolled over the head rope, but which they assessed would have been likely to escape the net without intervention if they had been left in-situ.

Fisheries observers included all salmon which were assisted in exiting the net, regardless of the degree on entanglement or whether it was thought likely salmon would have exited the net without assistance.

A further possibility is that netsmen under-reported their catches of salmon at times when fisheries observers were not present, although it must be stressed that there is no evidence of this occurring.

The trial in District 1 was extensive, totalling 771 hours netting comprised of 87 separate netting events over an 11 week period at three netting stations. The data provided by logbook returns was validated by over 92 hours of independent fisheries observations and video surveillance of the operation of the nets. There is general agreement between the results obtained from netsmen's logbooks, and directly from fisheries observations.

The trial in District 5 comprised a total of 14 days fishing, over which 81 hours of netting were undertaken. The data provided by logbook returns was validated by over 36 hours of independent fisheries observations and video surveillance of the operation of the nets.

As with the trial in District 1, there is broad agreement between the results obtained from netsmen's logbooks, and from fisheries observations.

Although there are some differences in the data provided by logbooks and fisheries observations, the total number of salmon recorded by both methods is small, and the results from both methods of assessment are in broad agreement.

10.2 Assessment against success criteria

The Agency established four criteria against which the performance of the modified net design would assessed during the trial period, summarised below.

1. There should be no increase in the level of exploitation of sea trout in any district above recent historic levels.

2. An interception* rate for salmon not exceeding 5% of the total sea trout net catch.

3. Minimal physical damage (scale loss, bleeding gills etc) to enmeshed or entangled salmon.

4. Levels of immediate mortality of enmeshed or entangled salmon set at not more than 50 salmon over the whole of the trial period in the North East, and not more than 10 salmon in Yorkshire.

The performance of the modified nets against these criteria is discussed below, together with an assessment of the viability and impact of the modified net design in any future potential extension to the netting season.

10.3 The trial in District 1

The performance of the modified T net design against the four success criteria established by the Environment Agency is considered below.

10.3.1. There should be no increase in the level of exploitation of sea trout in any district above recent historic levels

At each berth, catches are influenced by net design, fishing effort and the numbers of sea trout and salmon encountering the net at that location. Results from logbooks show that sea trout catches at all three berths during the trial were lower than recent average sea trout catches at these berths over a comparable period.

Over the whole trial, catches of sea trout were around 30% lower at the trial berths than recent average catches of sea trout, suggesting the modified net is less efficient at entangling sea trout than the traditional design.

This is supported by observations by both netsmen and fisheries officers who noted sea trout passing through the open end of the modified T net, whereas a traditional closed-ended T net would retain sea trout entering the monks comprising the ends of headpiece.

However, catches within the fishery are naturally variable, and the number of fish exposed to the fishery will also affect catches. Data on stock performance for contributing sea trout stocks for 2019 are not yet available, although the combined upstream counts of salmon and sea trout at the Agency's fish counter on the River Tyne suggest the combined run in 2019 was relatively low.

Catches of sea trout were modest in the first two weeks of the trial, rose substantially in the first two weeks of June, and then fell to low levels during August, as sea trout became less abundant.

Catch rates were lower than average at South Shields, but were slightly higher at Amble and approximately double the average catch rate at Alnmouth. This last result reflects some very high daily catches in July when a large number of sea trout were landed.

The average weight of sea trout landed in the modified nets was 3.35lbs. This is comparable to the average weight of sea trout of 3.5lbs in District 1 in recent years, suggesting the modified design of net does not preferentially select sea trout of a particular size, compared to the traditional design.

The evidence from the trial strongly suggests that adoption of the modified design of net would not increase levels of exploitation of sea trout above recent historic levels using a closed-ended net, and would reduce exploitation compared to a traditional design of T net.

10.3.2 An interception rate for salmon not exceeding 5% of the total sea trout net catch

The salmon catch in the modified nets was very low, both in logbooks returns and as recorded by fisheries observers.

Logbook returns indicated that salmon comprised on average only 1.4% of the total catch across the whole trial, compared to an average of 23.4% of the catch at these berths over the same period in recent years.

Fisheries observations recorded a higher percentage of salmon in the net catch, at an average of around 6% of the total catch.

The percentage of the catch comprising salmon increased as the trial progressed, with logbook returns indicating salmon comprising less than 2% of the catch in June and July, rising to 6.7% in August.

Fisheries observations recorded a percentage of salmon in the net catch in June and July as 3.9 % and 4.5% respectively, rising to 27.6% in August.

Compared to recent average salmon catches at these berths over the same period, logbook returns indicate the salmon catch using the modified net was reduced by around 97% during the trial period. Catch rates for salmon were reduced by a similar percentage.

The ratio of sea trout to salmon in the catch recorded in logbooks averaged around 73 to 1 across the whole of the trial, compared to 3.3 to 1 in recent years at these berths using a traditional design of T net.

Data from logbooks indicate the 5% contribution criteria has been met. Results from fisheries observations present a more variable assessment of performance, with Alnmouth meeting the criteria, and Amble and South Shields slightly exceeding the criteria, especially in August.

Overall, these results indicate that the modified design of T net approximately meets the contribution criteria for salmon bycatch in June and July, but in August, when sea trout are less abundant, the salmon catch contribution is more likely to be exceeded.

10.3.3. Minimal physical damage to enmeshed or entangled salmon

A total of 46 salmon were recorded as requiring intervention to allow their release from the modified nets. Information on the condition of these fish was not generally recorded in logbooks, due in large part to the focus on their return to the water with least delay and least damage. All salmon entangled were recorded as being released alive.

Fisheries observers recorded a total of 22 salmon, of which the majority were observed to be released in good condition and with minimal damage. Even salmon that had become enmeshed to a greater degree could usually be released and returned with minimal injury.

Fisheries observers also recorded salmon exiting the open end of the headpiece without becoming entangled, corroborating reports from the licensees participating in the trial.

These observations are supported by video evidence, which shows salmon encountering the net, becoming enmeshed, typically only lightly, and their subsequent release.

On one occasion, an enmeshed salmon was observed being attacked by a seal. This salmon appeared to suffer damage to its head. It is unclear to what extent this salmon suffered injury before being released.

Observations confirm that this criteria has been met successfully over the course of the trial, and that the majority of salmon encountering the net do not suffer significant physical damage.

10.3.4 The upper level of immediate mortality of enmeshed or entangled salmon was set at not more than 50 salmon over the whole of the trial period

Over the course of the trial there were no confirmed immediate mortalities of salmon at any of the berths. Only one salmon was recorded by fisheries observers as being 'unlikely' to survive, although the fate of this fish was not established. Most salmon observed were lightly meshed or snagged, and could be released with minimal delay and physical damage.

Video footage shows a number of salmon becoming enmeshed and their subsequent release and return, generally with minimal to moderate scale loss.

These observations indicate the performance of the trial nets has comfortably achieved this criteria.

10.3.5 Impact on salmon stocks

Given the absence of any confirmed mortalities, the low interception rate for salmon and the relative ease with which most salmon entangled in the net could be released, the trial has shown that in June and July it would be unlikely there would be any significant adverse impact on salmon stocks were modified T nets allowed to fish for sea trout over a longer season, including those stocks originating from rivers on the east coast of Scotland where salmon are designated as an interest feature of Special Areas of Conservation (SACs).

Salmon bycatch in August was higher, and sea trout catches low, providing a weaker case to extend the season beyond the end of July, although no mortalities were recorded in August.

The catch from the three participating berths has typically constituted around 40 to 50% of the total salmon catch in District 1 over the period 2014 to 2018.

Making the assumption that the salmon bycatch across the whole of District 1 would reflect this catch distribution, a bycatch of salmon for the whole District may be estimated at around 100 salmon over the same period.

Effort utilisation for the trial period was higher than full season comparison, largely because participating licensees elected to fish in periods of relatively low catches in order to secure a comprehensive dataset for the trial. A more typical level of fishing effort would be likely to produce a lower salmon bycatch.

10.3.6 Impact on sea trout stocks

The closure of the drift net fishery in 2018 and the substantial reduction in netting season in District 1 has substantially reduced levels of sea trout exploitation in the net fishery, which is likely to proportionately reduce sea trout net catches proportionately in 2019 and beyond.

Restoring part or all of the sea trout netting season would be likely to increase exploitation of sea trout above the 2019 level, but given the modified design of T net allows a proportion of sea trout to escape the net through the open ends of the headpiece, not to the levels previously recorded in the historic net fishery.

Typical levels of effort utilisation in the net fishery would be likely to produce lower catches than in the trial period.

Any decision to propose an extension to the sea trout netting season would be contingent on an assessment that contributing sea trout stocks had a harvestable surplus available for exploitation, based on latest stock performance data.

10.3.7 Economic viability of an extended fishery

The total weight of sea trout landed during the trial in District 1 was 11104lbs (5047kg). Taking a representative first sale value for whole fresh sea trout of £10 per kg, the total value of the sea trout catch is therefore approximately £50.5K.

This estimated value suggests an extended sea trout net fishery would be economically viable.

10.4 The trial in District 5

The performance of the modified J net design against the four success criteria established by the Environment Agency is considered below.

10.4.1 There should be no increase in the level of exploitation of sea trout in any district above recent historic levels

Sea trout catches during the trial were around 65% lower than the recent average monthly catch for August at the trial berth, and the catch rate was around half the average over the same period using an unmodified net, suggesting the replacement of the monofilament mesh in the headpiece of the net with nylon mesh reduced the efficiency of the net.

The average weight of sea trout caught during the trial was comparable to recent average weights, suggesting the modified design does not select sea trout of a different size to the traditional design of net.

The reduced catches and catch rates recorded during the trial suggest that adoption of the modified design of J net would not increase levels of exploitation of sea trout above recent historic levels using monofilament netting in the headpiece, although it is recognised that this performance will also have been influenced by the availability of sea trout to the net fishery.

10.4.2 An interception rate for salmon not exceeding 5% of the total sea trout net catch

The salmon catch in the trial was very low, comprising 5.6% of the total catch recorded in the logbook. Fisheries observations recorded a higher percentage of salmon in the observed catch, at 10.3%.

Salmon catches were significantly lower than the average catch for this berth in August, and the catch rate for salmon was around 74% lower than average. The ratio of sea trout to salmon in the catch was almost 17 to 1, which is only slightly above the typical ratio using the traditional design of net. Fisheries observations recorded a sea trout to salmon ratio of almost 9 to 1.

These results show the performance of the modified design of net slightly exceeds the criteria set by the Agency when developing the trial. Considering this assessment is based on a very low number of salmon being intercepted, the estimated exceedance is not a material consideration in determining the future management of the fishery.

10.4.3 Minimal physical damage to enmeshed or entangled salmon

Only four salmon were entangled during the net trial, three of which were returned with no recorded significant injuries. The fourth salmon entangled was intercepted by a seal and killed before it could be released.

These results indicate that salmon can be successfully released from the net with minimal injury, meeting this criteria. As with any design of net, seal predation may result in some mortality of entangled fish.

10.4.4 The upper level of immediate mortality of enmeshed or entangled salmon was set at not more than 10 salmon in District 5

A single salmon mortality was recorded during the trial. This loss was as a result of seal predation rather than the direct impact of being netted.

The performance of the trial net has therefore achieved this criteria.

10.4.5 Impact on salmon stocks

As the trial employed a single berth in District 5, any assessment of the likely catch of salmon in the wider Yorkshire beach net should be treated with relatively low confidence.

However, given the low interception rate for salmon and the relative ease with which most salmon entangled in the net could be released, the trial results indicate it is likely there would be a minimal impact on salmon stocks were modified J nets allowed to fish for sea trout over a longer season, including those stocks originating from rivers on the east coast of Scotland where salmon are designated as an interest feature of Special Areas of Conservation (SACs).

10.4.6 Impact on sea trout stocks

Extending the sea trout netting season would increase exploitation of sea trout, but given the modified design of J net is less effective at intercepting sea trout than the traditional design, not to the extent of the fishery prior to the introduction of the 2018 byelaws.

Any decision to propose an extension to the sea trout netting season would be contingent on an assessment that contributing sea trout stocks had a harvestable surplus available for exploitation.

10.4.7 Economic viability of an extended fishery

The total weight of sea trout landed during the trial in District 5 was 288lbs (131kg). Taking a representative first sale value for whole fresh sea trout of £10 per kg, the total value of the sea trout catch is therefore approximately £1.3K. This estimated value suggests an extended sea trout net fishery could be economically viable.

11. Conclusions

In both District 1 and District 5, the trial results show that the modified designs of nets proved successful in intercepting sea trout whilst only entangling a small number of salmon, the great majority of which were returned with minimal damage or delay.

In District 1 the modified net design of T net met or came close to meeting all trial criteria and entangled very few salmon. If this design of net were extended to the whole of District 1 over an extended season, the impact on salmon stocks is assessed to be very low.

In District 5, the evidence also indicates an extended sea trout fishery could meet the Agency's criteria, since only one salmon mortality was recorded and the net design met or came close to meeting all test criteria. If this design of net were extended to the whole of the Yorkshire net fishery over an extended season, the impact on salmon stocks is assessed to be very low.

Catches from both trials indicate an extension to the current sea trout netting season is likely to be economically viable.

Options for the future regulation of the net fishery should be further developed, based on the conclusions of this report and our latest assessment of the status of contributing salmon and sea trout stocks.

The most effective and appropriate means of extending the current netting season for sea trout should be further investigated, consistent with policy and carefully balancing our management objectives of providing vulnerable stocks with much needed added protection, while minimising the economic and social impacts of our regulations.

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Appendix 1: Catches and effort in D1

A1.1 Amble

Daily catches of sea trout and salmon and hours fished at the Amble berth

Date	Location	Hrs fished	Sea trout	Salmon
17/06/2019	Amble	12.5	17	0
18/06/2019	Amble	11.5	5	0
19/06/2019	Amble	5	3	1
28/06/2019	Amble	5	9	0
02/07/2019	Amble	12	78	0
03/07/2019	Amble	11	69	0
04/07/2019	Amble	17	127	0
05/07/2019	Amble	9.5	33	0
08/07/2019	Amble	5.5	26	0
09/07/2019	Amble	13.5	38	1
11/07/2019	Amble	13	9	0
12/07/2019	Amble	5.5	5	0
15/07/2019	Amble	8	6	0
16/07/2019	Amble	11.5	10	0
17/07/2019	Amble	12.5	11	0
18/07/2019	Amble	6	6	0
23/07/2019	Amble	12.5	5	0
24/07/2019	Amble	6	0	0
29/07/2019	Amble	5	3	0
30/07/2019	Amble	4.5	1	0
05/08/2019	Amble	4.5	0	0
14/08/2019	Amble	3	4	0
20/08/2019	Amble	4.5	1	0
21/08/2019	Amble	6	1	0
22/08/2019	Amble	6	0	0
27/08/2019	Amble	5	0	2
28/08/2019	Amble	5	0	0
Total		**221**	**467**	**4**

A1.2 Alnmouth

Daily catches of sea trout and salmon and hours fished at the Alnmouth berth

Date	Location	Hrs fished	Sea trout	Salmon
17/06/2019	Alnmouth	10	15	3
18/06/2019	Alnmouth	10	3	0
19/06/2019	Alnmouth	12	16	0
20/06/2019	Alnmouth	3	1	0
27/06/2019	Alnmouth	10	51	1
28/06/2019	Alnmouth	10	40	0
02/07/2019	Alnmouth	10	116	0
03/07/2019	Alnmouth	14	111	0
04/07/2019	Alnmouth	15	154	0
05/07/2019	Alnmouth	10	65	0
08/07/2019	Alnmouth	15	136	1
09/07/2019	Alnmouth	12	60	1
10/07/2019	Alnmouth	6	14	0
11/07/2019	Alnmouth	4	10	0
15/07/2019	Alnmouth	11	68	2
16/07/2019	Alnmouth	10	8	0
16/07/2019	Alnmouth	2	3	0
18/07/2019	Alnmouth	9	3	0
23/07/2019	Alnmouth	6	2	3
29/07/2019	Alnmouth	3	4	0
30/07/2019	Alnmouth	5	4	0
Total		**187**	**884**	**11**

A1.3 South Shields

Daily catches of sea trout and salmon and hours fished at the Alnmouth berth

Date	Location	Hrs fished	Sea trout	Salmon
17/06/2019	Shields	10	51	0
18/06/2019	Shields	13	20	0
19/06/2019	Shields	7	9	0
20/06/2019	Shields	NR	9	0
21/06/2019	Shields	NR	33	5
24/06/2019	Shields	5	16	0
26/06/2019	Shields	12	83	0
27/06/2019	Shields	12	80	0
28/06/2019	Shields	12	105	1
01/07/2019	Shields	5	4	0
02/07/2019	Shields	15	139	1
03/07/2019	Shields	14	359	0
04/07/2019	Shields	15	120	0
05/07/2019	Shields	8	8	0
08/07/2019	Shields	12	102	0
09/07/2019	Shields	11	77	0
10/07/2019	Shields	13	59	1
11/07/2019	Shields	12	55	1
12/07/2019	Shields	12	90	2
15/07/2019	Shields	13	142	1
16/07/2019	Shields	15	126	3
17/07/2019	Shields	9	42	3
18/07/2019	Shields	9	21	0
19/07/2019	Shields	7	30	1
22/07/2019	Shields	9	45	1
23/07/2019	Shields	6	11	0
24/07/2019	Shields	11	28	4
25/07/2019	Shields	6	6	0
30/07/2019	Shields	4	2	0
02/08/2019	Shields	4	31	0
05/08/2019	Shields	10	15	0
06/08/2019	Shields	10	38	1
07/08/2019	Shields	8	6	0
08/08/2019	Shields	11	13	3
13/08/2019	Shields	7	3	0
14/08/2019	Shields	5	2	0
15/08/2019	Shields	6	4	2
19/08/2019	Shields	7	0	0
20/08/2019	Shields	7	1	0
21/08/2019	Shields	NR	2	0
22/08/2019	Shields	6	2	1
28/08/2019	Shields	5	2	0
Total		**363**	**1991**	**31**

Appendix 2: Fisheries observations and catches in D1

Summary of daily fisheries observations in District 1

Date	Berth	Hours observed	Sea trout	Salmon
17/06/2019	Shields	4.80	23	0
18/06/2019	Shields	3.50	15	0
19/06/2019	Amble	4.80	3	1
19/06/2019	Boulmer	3.00	5	0
20/06/2019	Shields	3.00	1	0
21/06/2019	Shields	4.40	33	5
24/06/2019	Shields	1.00	10	0
26/06/2019	Shields	5.20	15	0
27/06/2019	Boulmer	3.40	38	1
28/06/2019	Shields	3.00	54	1
01/07/2019	Shields	2.75	0	0
02/07/2019	Boulmer	3.30	23	0
03/07/2019	Amble	4.00	22	0
03/07/2019	Boulmer	4.25	27	0
05/07/2019	Shields	2.25	7	0
16/07/2019	Amble	3.50	3	0
16/07/2019	Boulmer	2.50	0	0
17/07/2019	Shields	4.00	22	3
22/07/2019	Shields	3.10	12	1
24/07/2019	Shields	4.60	5	2
29/07/2019	Boulmer	2.75	4	0
30/07/2019	Shields	1.00	2	0
07/08/2019	Shields	4.2	5	0
08/08/2019	Shields	5.5	10	3
15/08/2019	Shields	1.50	3	2
20/08/2019	Shields	3	1	0
22/08/2019	Shields	3.2	1	1
27/08/2019	Amble	3.5	0	2
28/08/2019	Shields	1.2	1	0
Total		**96.2**	**345**	**22**

Appendix 3. Catches and effort in D5

Daily catches of sea trout and salmon and hours fished at the Filey berth

Date	Location	Hrs fished	Sea trout	Salmon
05/08/2029	Filey	4	2	0
06/08/2019	Filey	4	6	1
08/08/2019	Filey	6	5	1
12/08/2019	Filey	4	0	0
13/08/2019	Filey	10	17	1
14/08/2019	Filey	5	9	0
15/08/2019	Filey	4	3	1
19/08/2019	Filey	4	1	0
20/08/2019	Filey	10	2	0
23/08/2019	Filey	8	6	0
26/08/2019	Filey	9	2	0
27/08/2019	Filey	5	1	0
29/08/2019	Filey	4	4	0
30/08/2019	Filey	4	9	0
Total		**81**	**67**	**4**

Appendix 4: Fisheries observations and catches in D5

Summary of daily fisheries observations in district 5

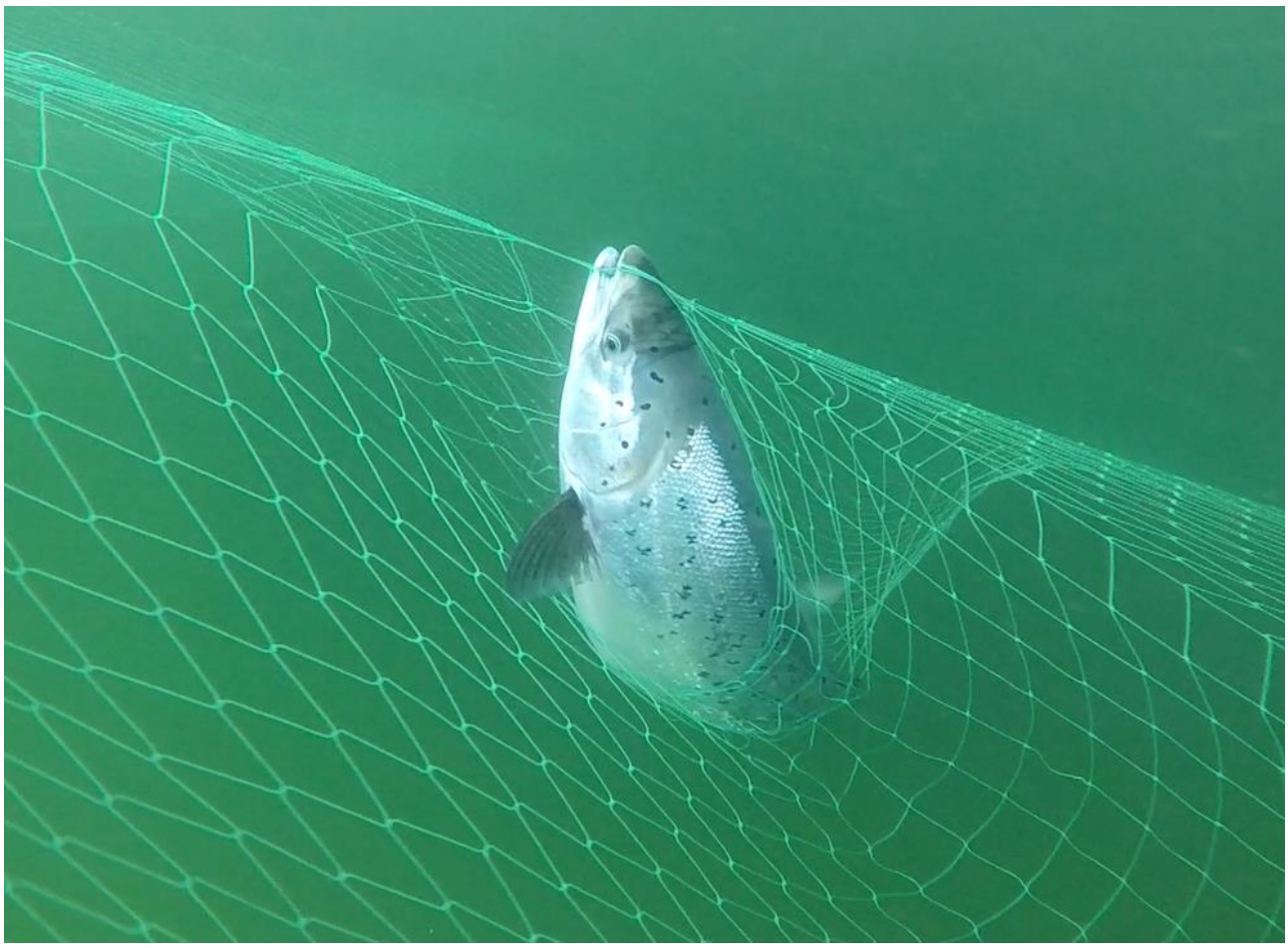
Date	Hours observed	Sea trout	Salmon
05/08/2019	2.5	2	0
06/08/2019	2.75	6	0
08/08/2019	6	4	1
12/08/2019	3.5	0	0
13/08/2019	3.75	0	1
15/08/2019	4	3	1
19/08/2019	2	0	0
20/08/2019	3.5	1	0
23/08/2019	5	6	0
27/08/2019	1	1	0
29/08/2019	2	3	0
Total	**36**	**26**	**3**

Appendix 5. Example video evidence

A5.1 South Shields

1. T net at South Shields set from the South pier, with fisheries observers in attendance

2. Salmon being released from the headpiece of a modified T net at South Shields



3. Salmon entangled in the T net, immediately prior to release

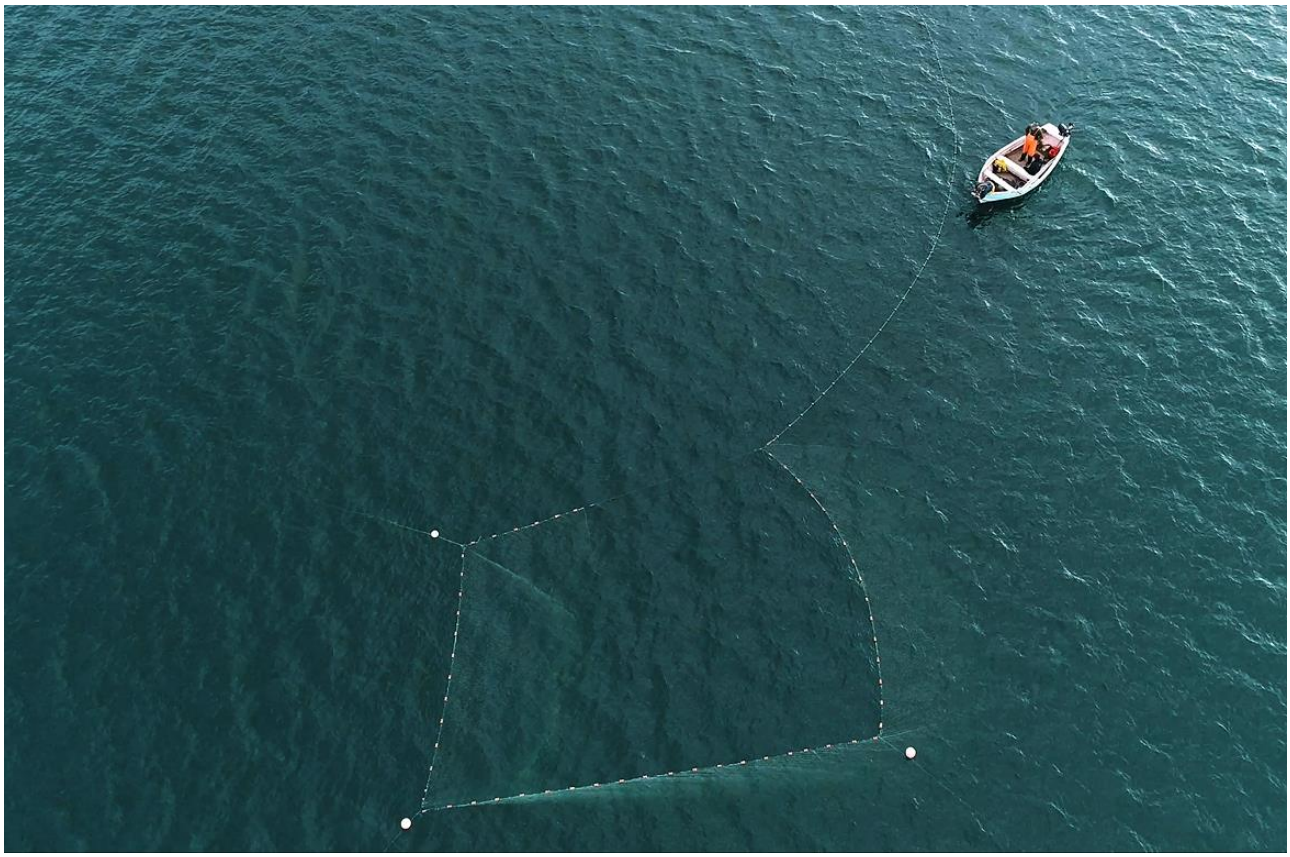
4. Sea trout entangled in the head piece of the modified T net

5. Salmon immediately after release from a T net, in good condition

6. Fisheries observations from an Agency RIB

A5.2 Filey

1. J net location in Filey bay



2. Aerial view of the modified J net showing the terminal 'J' shape

3. Salmon being returned at Filey Bay

4. J net at Filey with flatfish bycatch

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