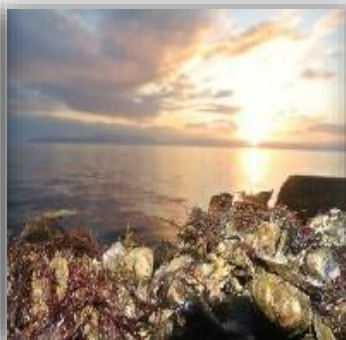# Pre-Fishery Stock Assessment

Lough Foyle Native Oyster Fishery

Autumn 2018

Loughs Agency
Gníomhaireacht na Lochanna
Factrie fur Loughs

Aquaculture & Shellfisheries

_____

Report Reference LA/0Y/0218

Version No.	Author	Date Issued	Amendments	Approved by
1	CMG	14/11/18	1st draft for comment	BF
2	CMG	21/11/18	Format and minor amendments	BF

Prepared by:

Ciarán McGonigle/Cass Bromley/Rachel Scott /Tom Sheerin/Luke Perry

Contents

List of Figures

List of Tables

1. Executive Summary

A pre-fishery stock assessment was conducted on the commercially active oyster beds in Lough Foyle during autumn 2018.

There has been a widespread spatfall on the oyster beds in Lough Foyle during 2018. This has helped to rebalance the length frequency that had been exhibiting a skew towards the larger size classes following successive poor recruitment of juveniles. This spat settlement appears to have taken place relatively late in the summer period. It remains to be seen if these spat, the majority of which are less than 20mm, can survive in great enough numbers to help sustain a broodstock and a fishery.

The biomass of oysters over 80mm on all oyster beds is estimated to be 269 tonnes. This is available to the fishery in 2018/19. The biomass over 70mm is currently estimated to be 458t. Landings from the fishery in the 2017/18 season amounted to just over 205 tonnes.

It is recommended that the fishery does not remove the total harvestable biomass in the 2018/19 season. This will help to prevent the loss of an effective spawning stock for the 2019 spawning period and help retain sufficient stock to support a sustainable fishery for 2019/20.
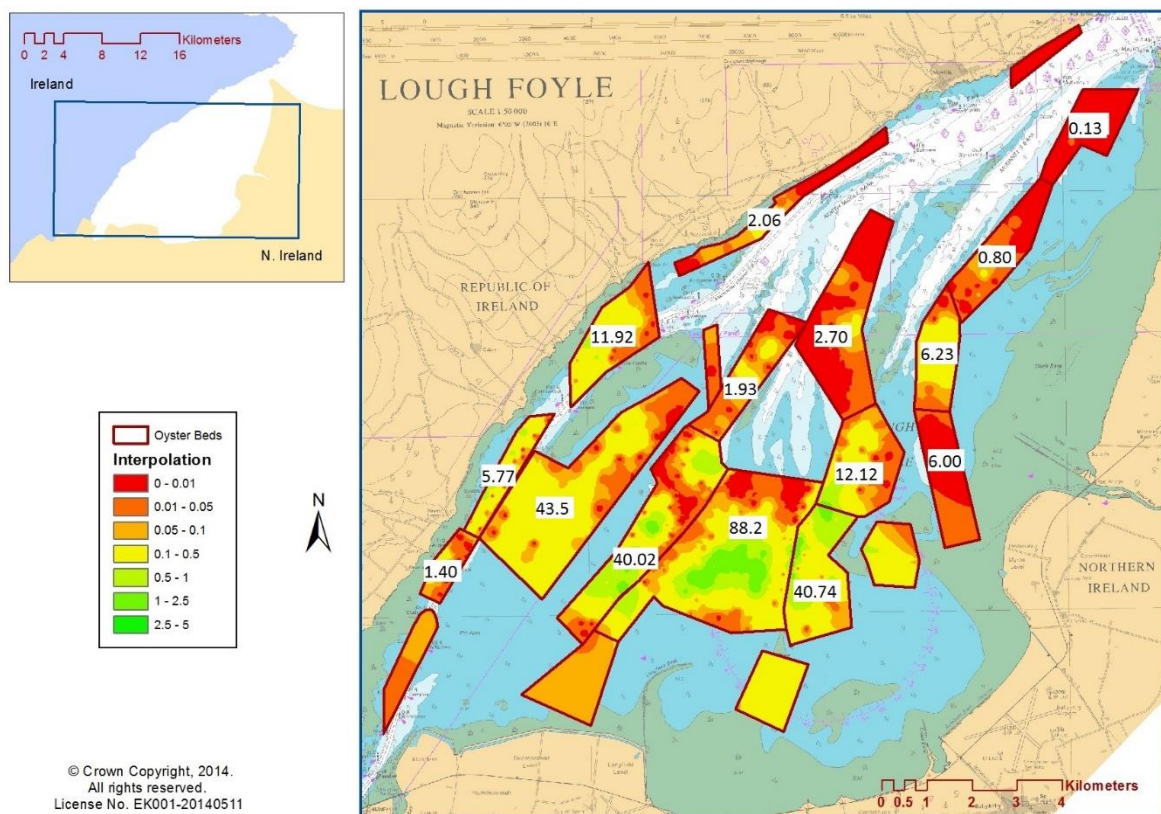
Figure 1 Estimated Biomass (tonnes) over 80mm on Foyle Oyster Beds Autumn 2018

2. Introduction

A pre-fishery survey of the native oyster beds in Lough Foyle took place during the period September to October 2018. This survey was conducted by Agency staff on board a local fishing vessel.

3. Methods

A dredge survey was carried out in Lough Foyle using a local fishing vessel. Scientific staff from the Loughs Agency assessed the population distribution and abundance by analysing dredge contents from each sample location (figure 2A-B). Oyster density is calculated by dividing the area dredged (m^2) by the total number of oysters after adjusting for dredge efficiency (25%) and any sub-sampling. Dredge efficiency has been taken from the work done in Lough Foyle during the Baseline Survey of Shellfish Resources conducted by Cefas in 2006. Oyster density is interpolated across the oyster beds using a six point Inverse Distance Weighting (IDW) method and this allows a biomass figure to be calculated based on the area (m^2) of the oyster bed within each density category (see Appendix I for full calculations). This follows the approach of similar work in Irish oyster fishery stock assessments conducted by the Marine Institute. The average weight of the oysters on each bed is used to factor up to an overall biomass based on mean density within each bed. Any fresh dead oysters are recorded as a measure of recent mortality (these exhibit no fouling on the inner surface of the shell valves). Oyster spat (<30mm) presence or absence was recorded at each sample point, as was total number of spat per dredge sample.
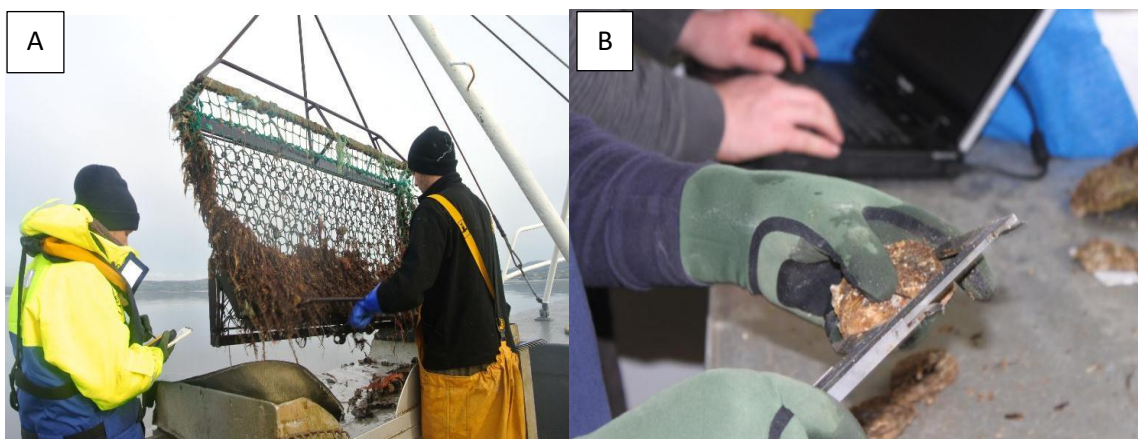
Figure 2 Methods used during survey: (A) Analysing and recording dredge contents. (B) Oysters are measured for length frequency analysis

4. Oyster Density

Oyster density was calculated for each of the sample stations (figure 3). The mean density for all beds is 0.21 oysters/m^2. This figure is in keeping with results from previous years (figure 4). The maximum density recorded was 2.47 oysters/ m^2 which was observed on the Flat Ground Bed. Only 4.8% of the sampled stations had an oyster density of over 1 oyster/m^2, this is represented by the green areas in Figure 3.

Oyster density recorded from each dredge tow has been represented as point data and then interpolated using a 6 point IDW methodology. The interpolation has been performed only in areas of the oyster beds that were surveyed and have point data present. A barrier feature has been placed within the interpolation between the oyster beds in or to the north of the navigation channel and all beds on the east of the navigation channel to help replicate the impacts of a natural barrier (a sandbank) between the beds in this area.
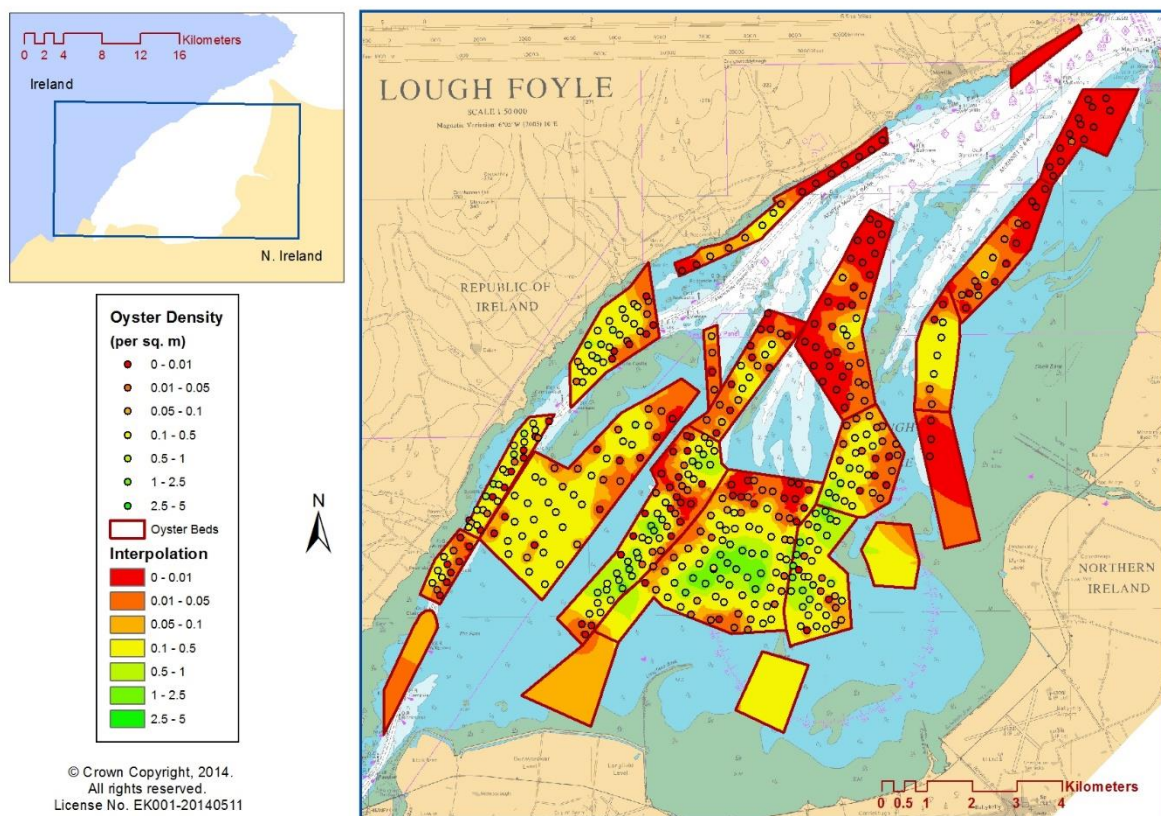
Figure 3 Interpolated oyster density Lough Foyle Autumn 2018
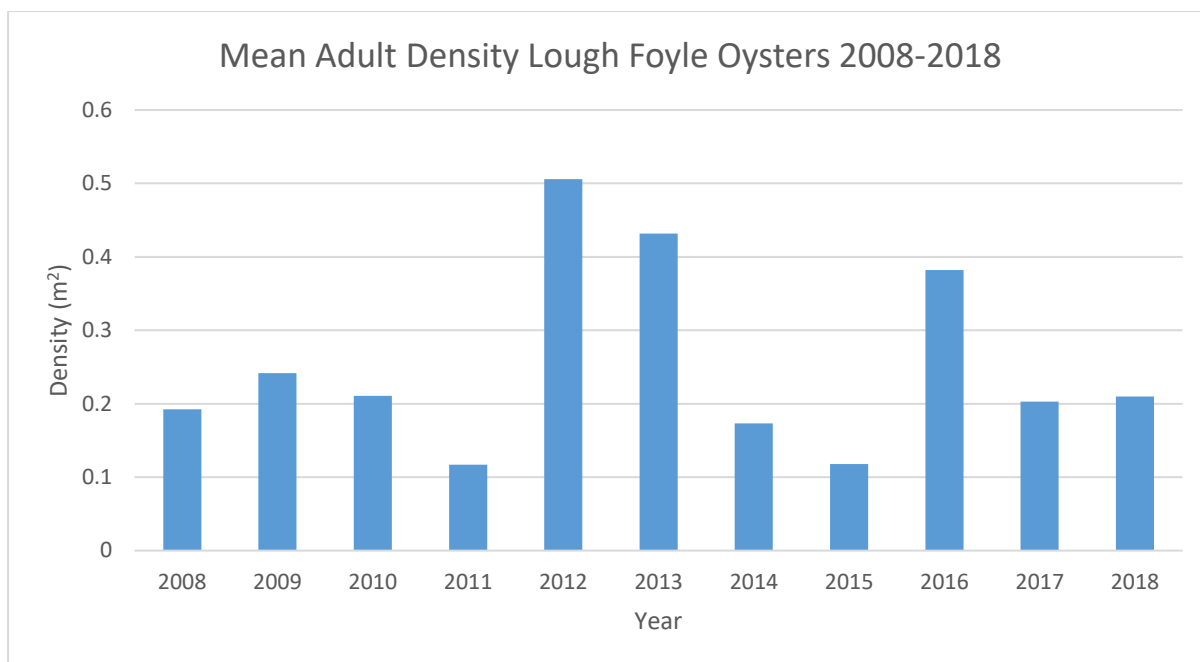
Figure 4 Mean Density Lough Foyle 2008-2018

5. Biomass Estimate

The estimated total oyster population biomass is 724 tonnes (table 1). This is an increase from the estimated biomass of 509 tonnes in spring 2018. Total stock biomass over 80mm is currently estimated to be 269 tonnes and biomass over 70mm is estimated to be 458 tonnes.

The total stock biomass is high relative to previous years (figure 5) and this is likely due to good growth in the younger cohort of oysters that settled in late summer 2014 and the carryover of stock from this settlement as a result of the reduction in total fishing effort per season since 2014. The majority of these oysters have now attained a length of between 80-100mm.   Mean weight was higher than previous years, with a mean of 64.3g for all oysters sampled during the survey (n=1440).

The previous biomass estimates have correlated well with the observed landings in the fishery (figure 6). Note that on this graph the survey estimate is that of the pre-season (autumn) survey and the landings figure is taken from logbook returns made by fishermen on a continuous basis throughout the season. On one occasion (2013/14) the stock assessment was not completed on all beds prior to the commencement of the fishery and the landings made prior to the survey being completed were separated for the comparison.

Table 1 Oyster biomass per oyster bed in Lough Foyle Spring 2018

Bed name	Area (ha)	Mean Weight (g)	Dredge Efficiency 25%		
			Bed Total (t)	Total (t) >80mm	Total (t) >70mm
Barney's Bank	200	85	0.17	0.13	0.15
Black Ghee	236	65	8.10	6.00	7.84
Drumskellan	91	58	4.38	1.40	3.20
Flat Ground	936	68	238.39	88.20	140.65
Great Bank	824	71	101.16	43.50	65.75
McGhee	167	66	8.90	4.01	7.83
Middle North	228	70	8.37	1.93	5.94
Middle South	531	62	108.15	40.02	73.54
Moville	250	55	2.00	0.80	1.62
Peak	208	75	15.57	6.23	12.61
Perch	276	66	33.12	11.92	22.86
Quigley's Pt	139	58	26.21	5.77	13.63
Redcastle	141	60	5.14	2.06	3.86
Sandy Ridge	474	58	3.81	2.70	3.35
Shooting Range	81	57	4.30	1.94	3.78
Southside North	312	69	43.29	12.12	18.61
Southside South	297	66	113.18	40.74	73.57
Total	5391.22	64.35	724.24	269.46	458.80
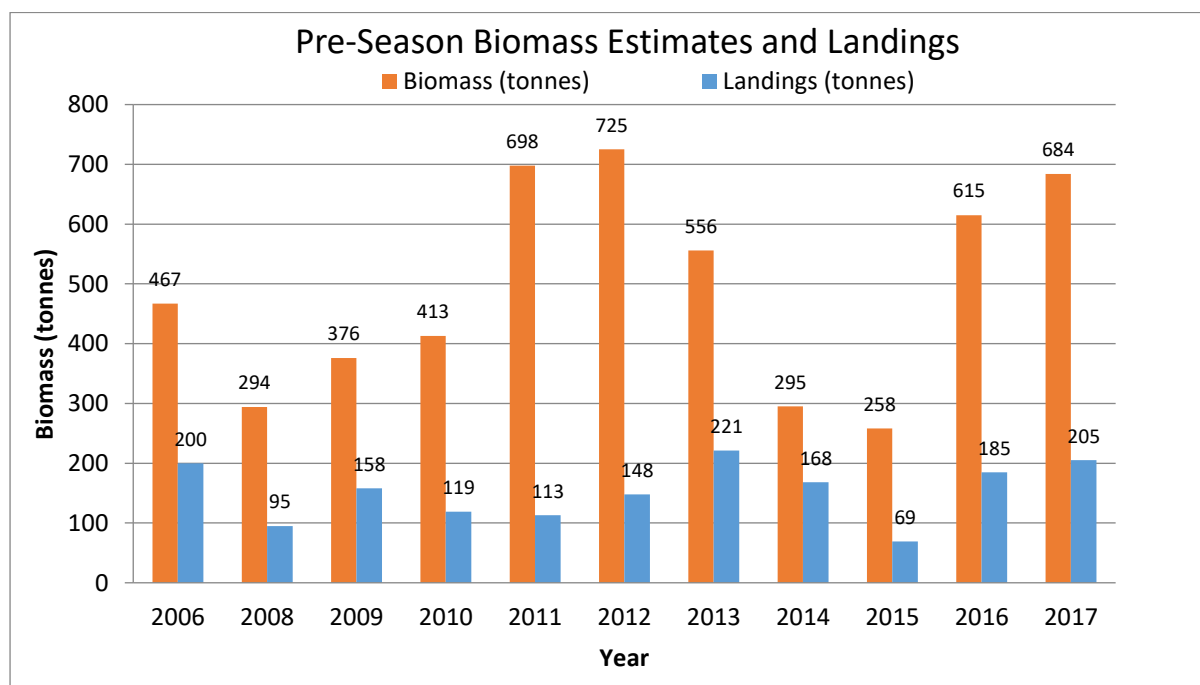
Figure 5 Historic Pre-Season Biomass Estimates and Landings Lough Foyle
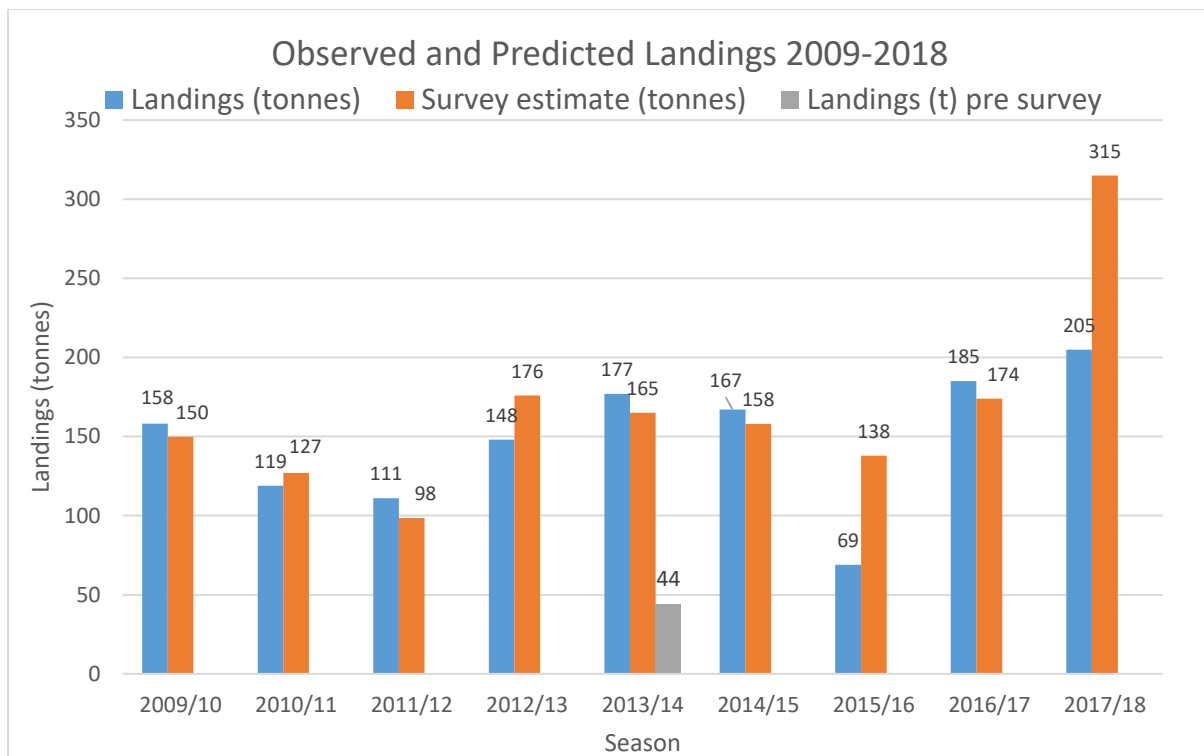
Figure 6 Observed and Estimated Landings from Lough Foyle

6. Spatfall

Oyster spawning and larval survival is thought to be heavily dependent on good environmental conditions throughout the spring and summer and the threshold water temperature values being exceeded for a minimum period of time, usually 15-16^{0}C for 2-4 weeks. If these conditions do not occur it is expected that spawning will be limited to a small percentage of the stock on each bed and the numbers of juveniles will be minimal. Spawning is also limited by oyster density and proximity of each individual oyster to another has an impact on fertilisation success. Removal of oysters during the fishing season reduces the oyster density.

Poor spawning and settlement was observed in the 2015, 2016 and a limited spawning event was recorded in 2017. A widespread spat settlement event appears to have occurred in 2018 on the majority of the beds with 44% of the stations sampled having spat present (figure 7 and 8). The majority of the spat recorded is less than 20mm in size suggesting that it settled out late in the summer period.

Spat density is almost twice as high as the previously recorded peak in 2008 showing just how significant this 2018 spatfall could be. The spat size is a concern and it is likely that survival of these juveniles will be lower than previously observed spatfalls which were in the 10-30mm size classes at this time of year. The historic trends reinforce the fact that successful spawning

occurs once or twice every 5 years at best (figure 9).   Settlement preference in 2018 appears to have been for bio-fouled razor clam shells however spat were observed on other substrate such as clam, cockle, mussel and oyster shells. Up to 15 individual spat were observed on 1 single razor clam shell with 2 articulated valves.
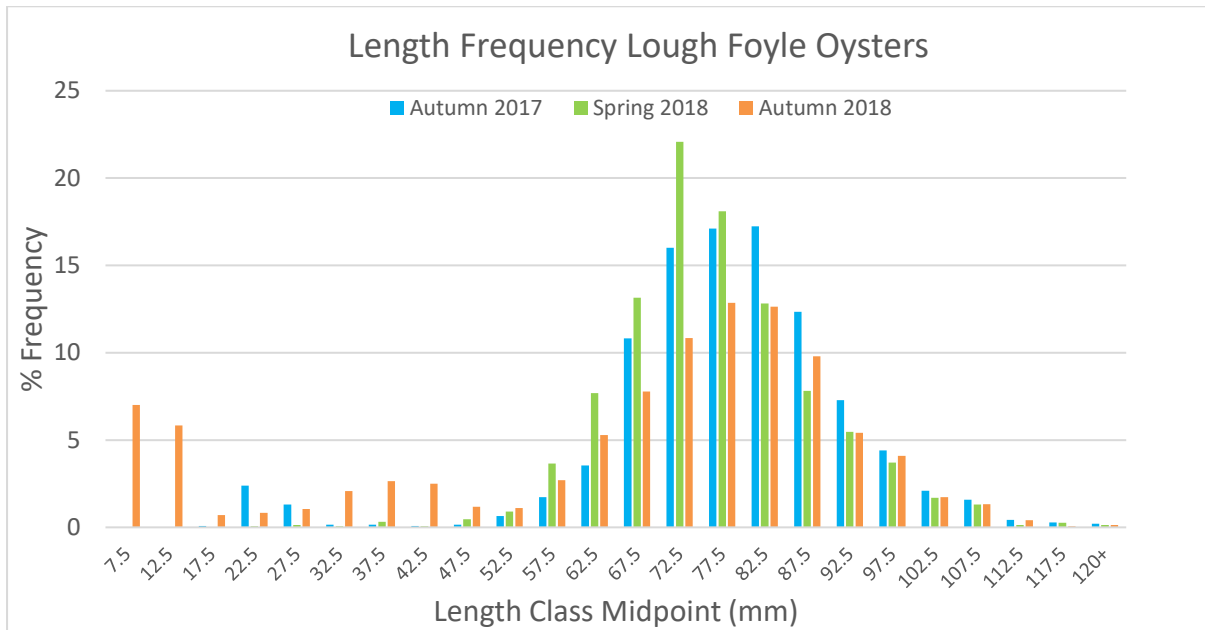
Figure 7 Length Frequency of oysters in Lough Foyle 2017-2018
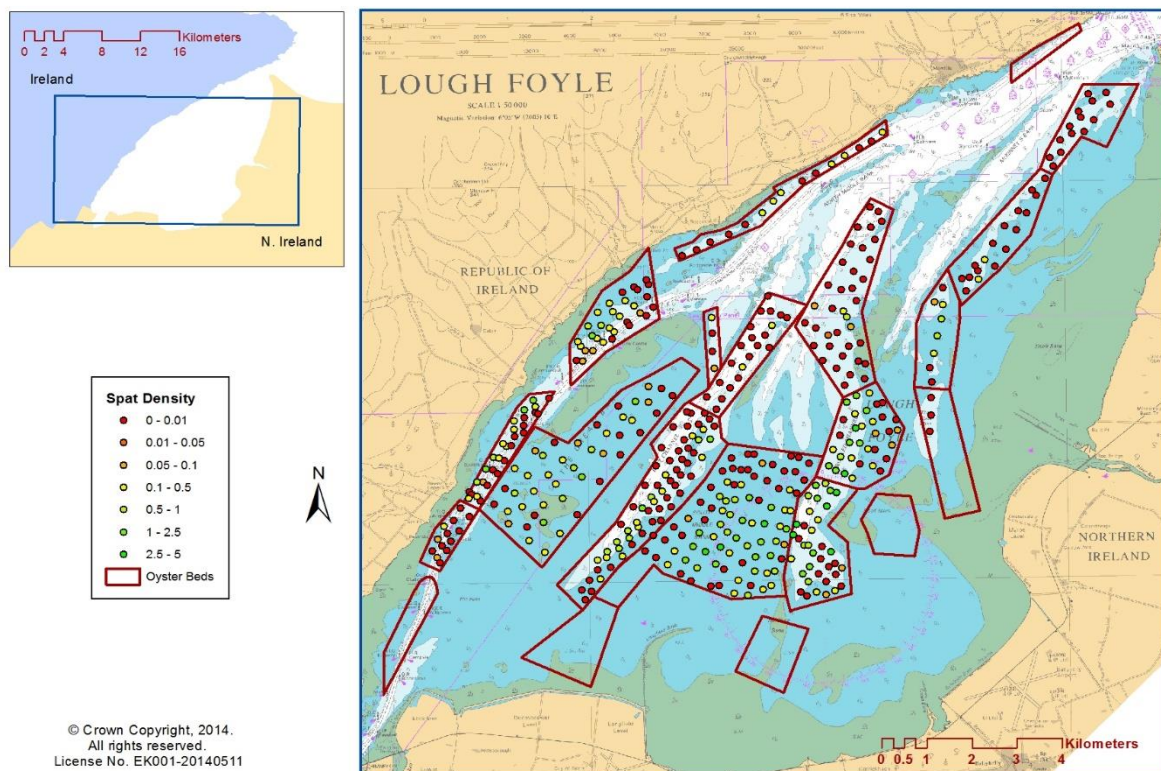
Figure 8 Oyster Spat Density in Lough Foyle Spring 2018
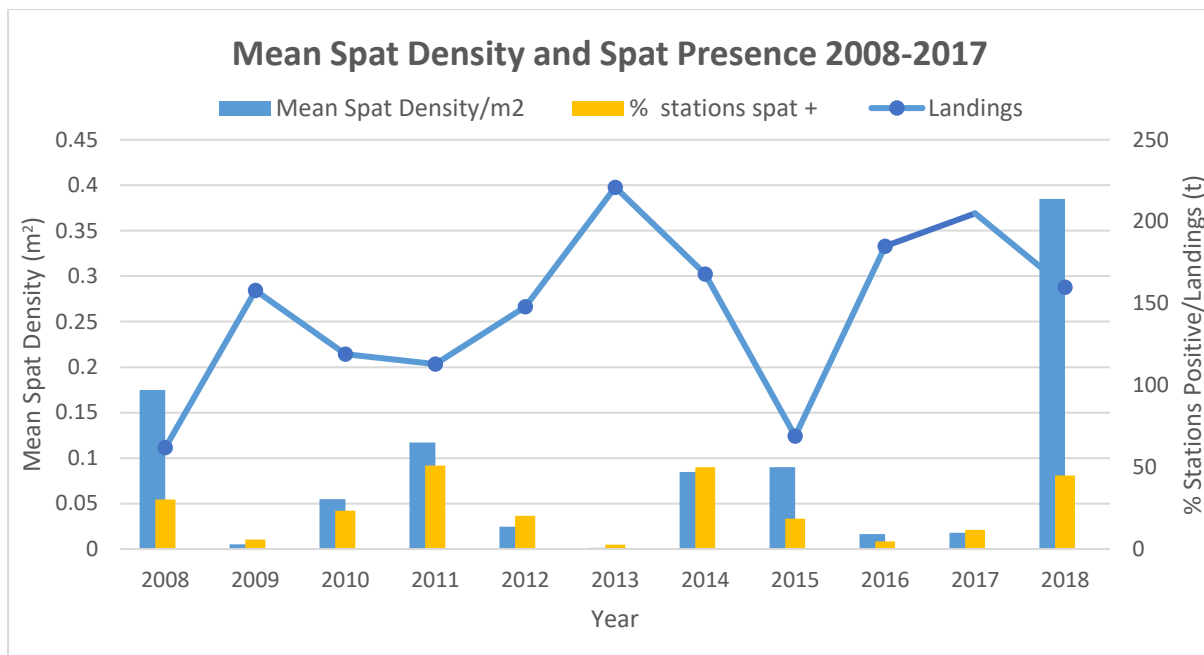
Figure 9 Historic Spat Density and Presence Lough Foyle

7. Mortality Levels

There was very limited evidence of recent mortality on the oyster beds (figure 10). Mortality was recorded in 14.6% of the samples taken and the majority of these appeared to be due to natural causes. The latest *Bonamia* test results show infection rates of between 10-20%.

Total mortality throughout the stock has gradually begun to climb again since 2016 (figure 11). This may be a result of increased fishing intensity or may be density dependent. Stock biomass has been relatively high in the past 2 seasons and these increased densities may be causing a slight increase in natural mortality.

There was some evidence of mortality linked to fishing gear with some chipped and cracked oyster shells being observed. This needs further investigation to determine which types of gear are having the biggest impact. Heavy dredges with hydroplanes to help depress the dredge into the substratum may be having more of an impact that the traditional oyster dredge which does not have a hydroplane. The weight of the dredges should be investigated to determine the impact this has on survival of the catch and by-catch.
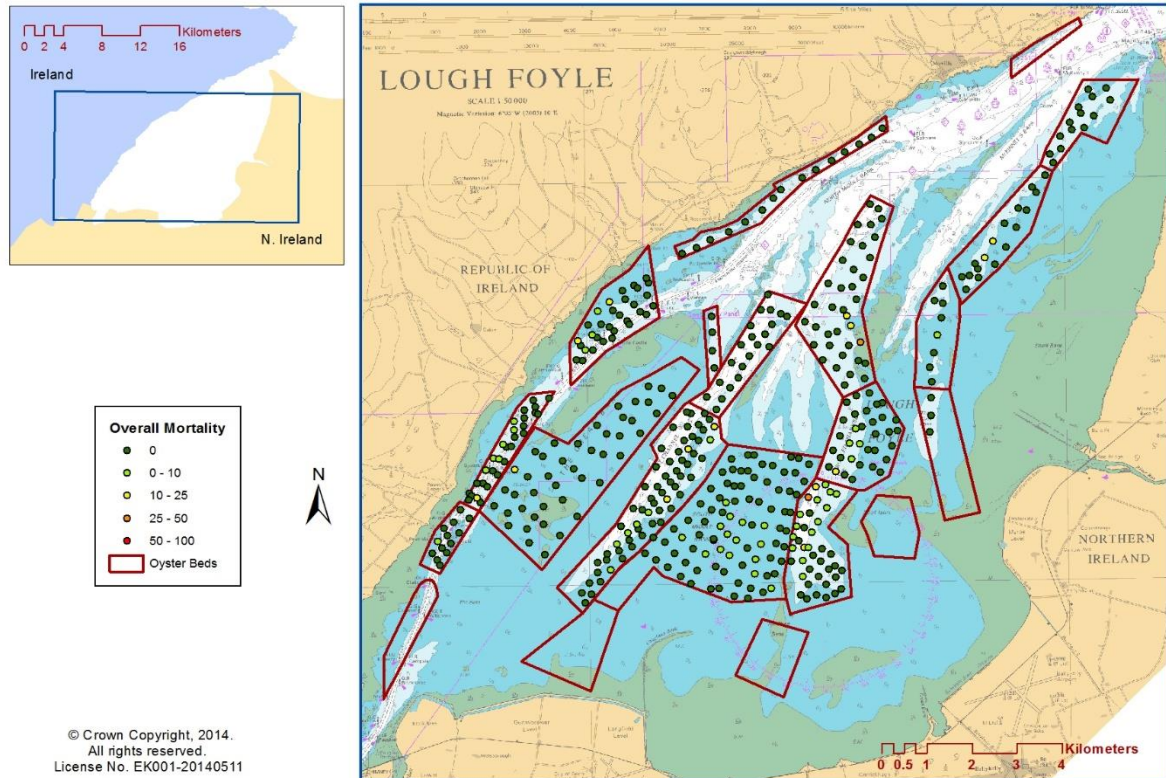
Figure 10 Oyster mortality observed in Lough Foyle Autumn 2018
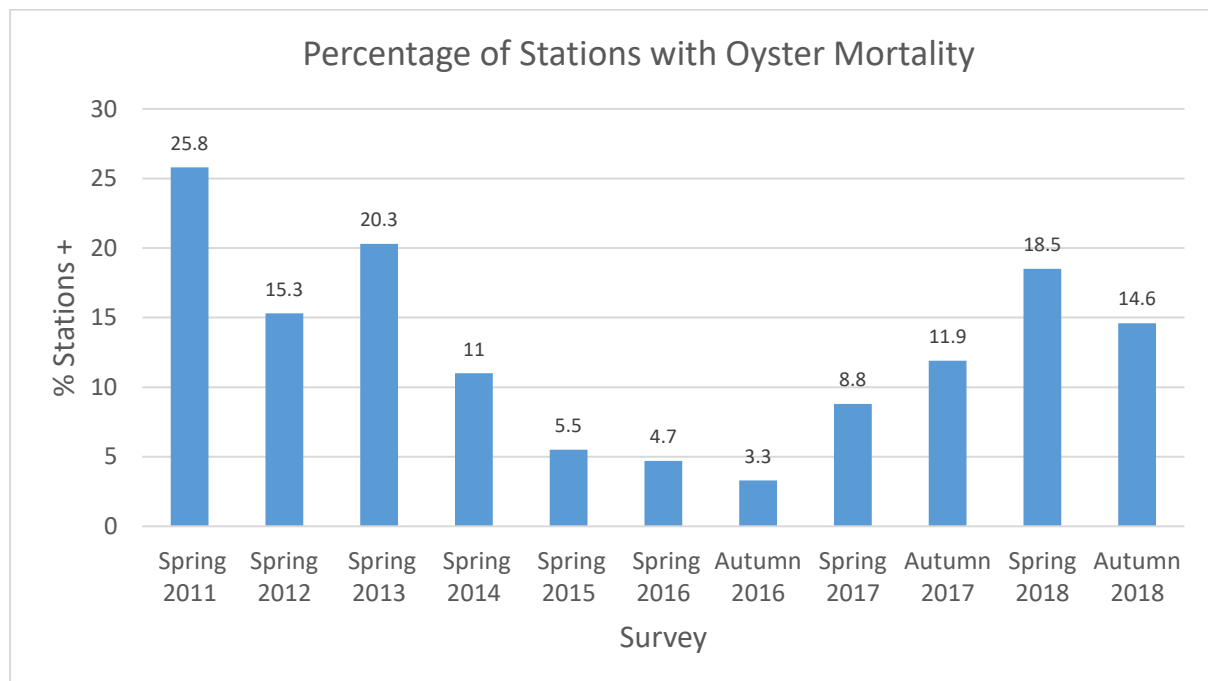
Figure 11 Oyster Mortality levels Lough Foyle 2011-2018

8. Population Structure

The length frequency of the oyster population shows that the proportion of larger size classes has increased since the 2007 stock survey. The 2007 results show there was poor representation of oysters 75mm and above in the population. In the years since the regulation of the fishery in 2008 there has been greater evidence of larger oysters within the population (see figure 12).

The larger oysters are an important resource within the population. These size classes constitute the majority of the spawning stock biomass. Although oysters as small as 35mm are capable of spawning, the larger oysters are capable of producing large quantities of larvae for the fishery, and are therefore of great importance. If there is a higher percentage of large oysters present in high enough densities in the population, along with suitable environmental conditions, there is a greater chance of spawning success. The overall sampled population consists of 56% above 70mm. Figure 12 highlights the bias towards larger length classes as a result of poor recruitment in the last 3 seasons.

The spawning event observed in 2018 has helped to begin to shift the balance with more evidence of juvenile oysters in the population. These oysters will help to sustain the population in the coming years and are likely to recruit into the fishery in 2021/22 at the earliest.
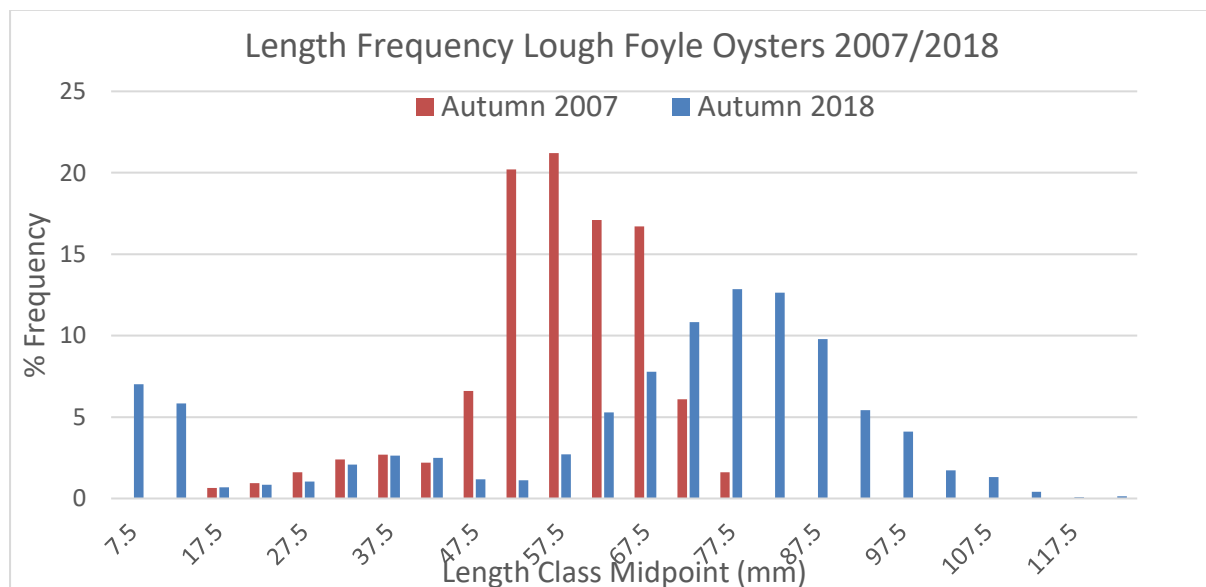
Figure 12 Length Frequency of Lough Foyle Oysters 2007 & 2018

The cumulative length frequency (figure 13) shows the reduction in the proportion of oysters in the larger length classes as a result of fishing removal and the large increase in the proportion of the stock less than 40mm as a result of the new spat settlement.
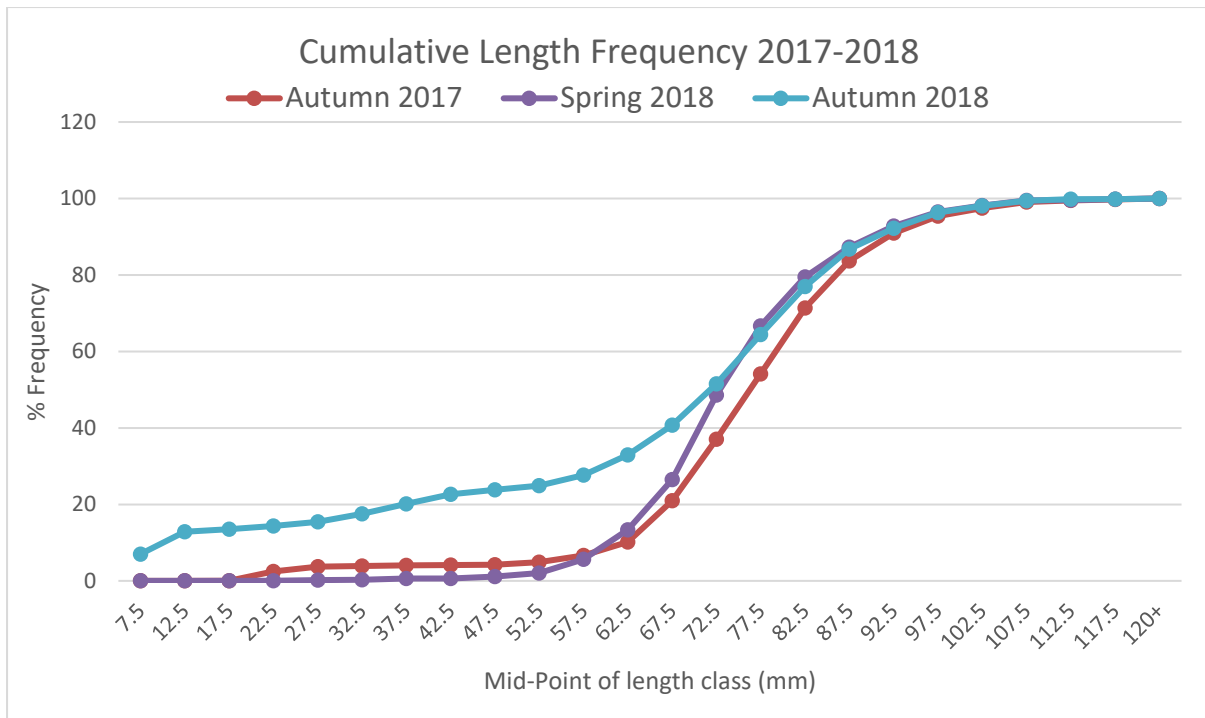
Figure 13 Cumulative Frequency across all oyster beds in Lough Foyle 2017-2018

The pie chart in figure 14 shows a better representation of smaller size classes than had been evident in the past 3 years. The spawning event in 2018 has increased the numbers of oysters in the <30mm sizes classes with the majority of the spat falling into the 1-20mm size class.
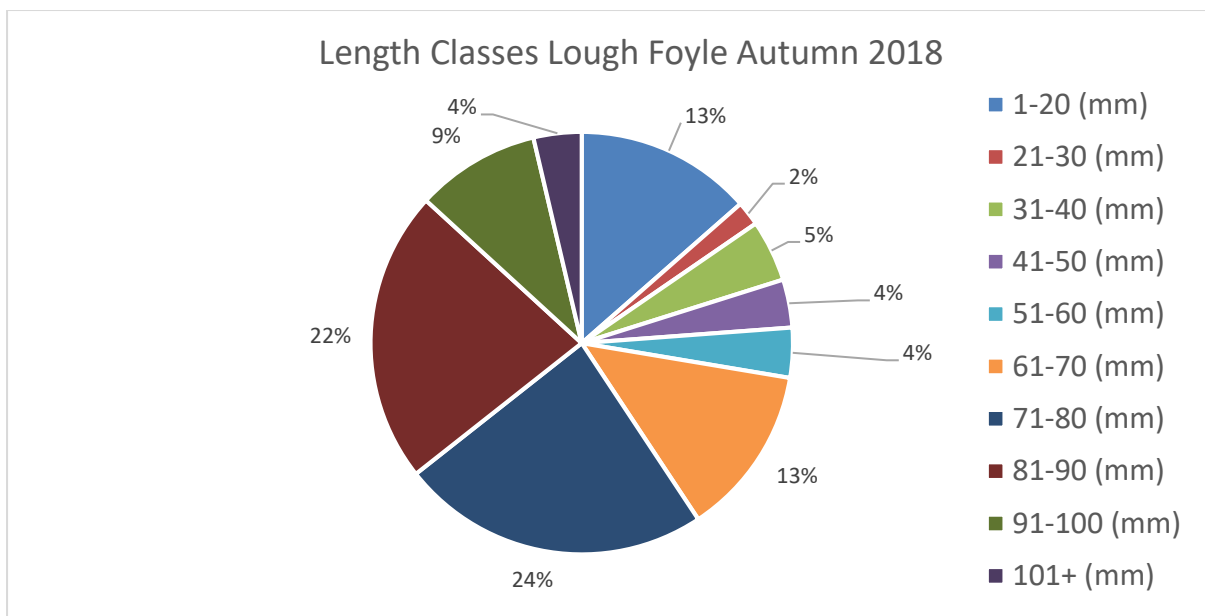
Figure 14 Length classes on oyster beds Lough Foyle Autumn 2018

Figure 15 illustrates the percentage of each length class on the oyster beds in Lough Foyle. This chart highlights the differences between beds in terms of the health of their stock structure. The beds which consistently produce commercially important quantities of oysters (Middle

Bed, Perch, and Flat Ground) have good representation of length classes from 61mm-101mm+. This chart shows the strong evidence of the recent spatfall on the flat Ground, Southside and Great Bank beds with high percentages of the stocks on these beds <20mm
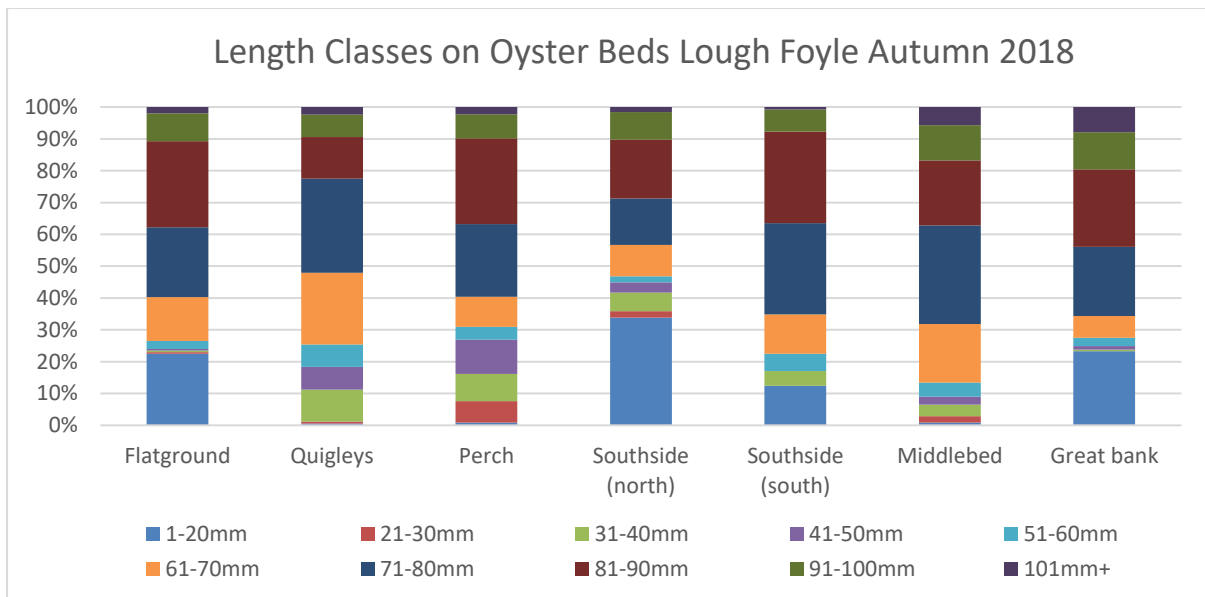
Figure 15 Size class on each bed in Lough Foyle Autumn 2018

9. Oyster Bed Review
9.1 The Perch

Table 2 Summary Information: The Perch

Bed Name	**Perch**
Area (h)	276
Total Biomass (t)	33.12
Biomass (t) >80mm	11.92

The Perch is one of the 5 main commercially fished oyster beds with the highest density in Lough Foyle and it covers an area of 276 hectares. The overall biomass estimated for this bed is 33.12 tonnes, 11.92 tonnes of that figure is currently over 80mm and is available to the fishery. 11.9 tonnes of oysters were landed from this bed during the 2017/18 fishing season. The length frequency for the Perch shows less evidence of the new spat settlement from summer 2018 with a small quantity of spat in the 12.5-30mm size classes. The poor recruitment of juveniles into the stock on this bed in the past few seasons is evident from the lack of oysters in the 45-65mm size classes.
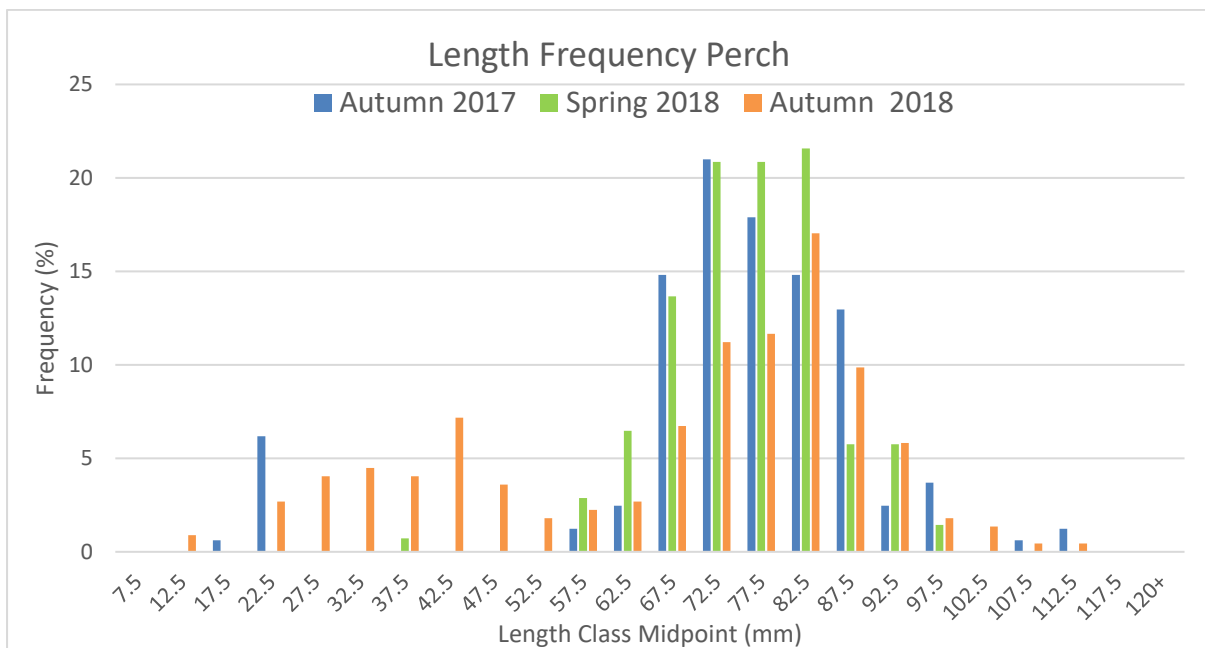
Figure 16 Proportional Length Frequency: The Perch 2017-18
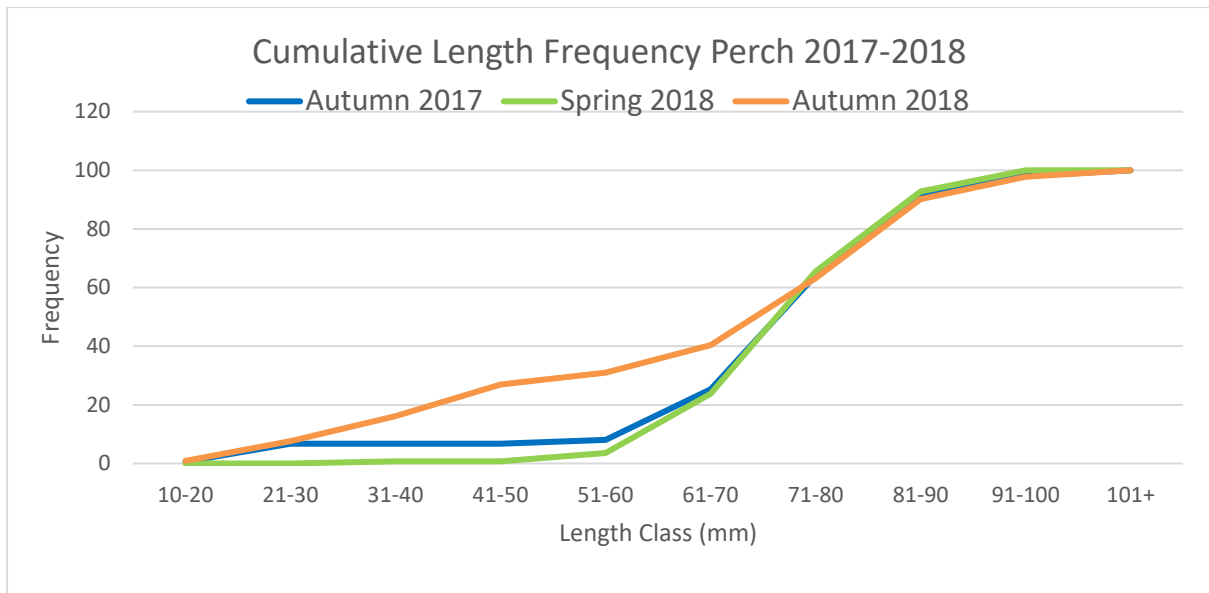
Figure 17 Cumulative Frequency: The Perch 2017-2018

The cumulative frequency of the stock on the Perch Bed shows evidence of the increase in oysters in the 30-40mm size class from a limited spat settlement in 2018.
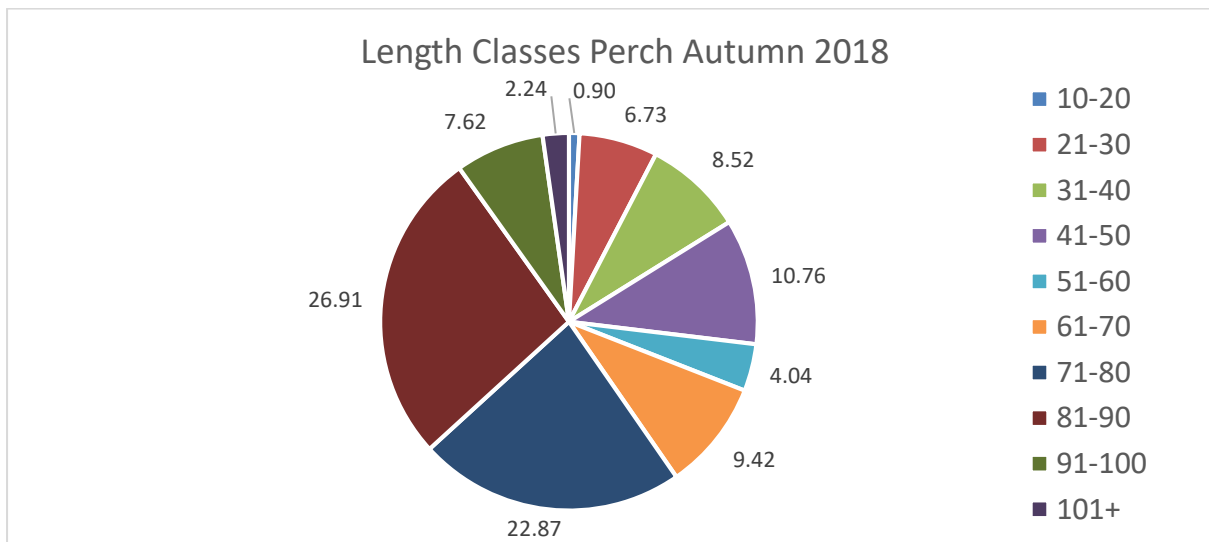
Figure 18 Length classes: The Perch 2018

The length class structure is beginning to improve on the Perch Bed with a series of limited spat settlements in the past few years. The majority of the stock is still above 60mm.

9.2 The Flat Ground

Table 3 Summary Information: The Flat Ground

Bed Name	Flat Ground
Area (h)	936
Total Biomass (t)	238.39
Biomass (t) >80mm	88.2

The Flat Ground covers an area of 936 hectares. Total stock biomass for this bed is estimated to be 238.39 tonnes. 88.2 tonnes is above 80mm in size and therefore is available to the fishery in 2018/19. 48 tonnes of oysters were landed from the Flat Ground during the 2017/18 season.

The length frequency (figure 19) shows evidence of the spatfall (<20mm) that was recorded during the survey on most oyster beds. It is yet to be seen if these fragile oyster spat can survive over winter and contribute to the population in the coming years. In keeping with the overall length frequencies there is good representation of older age classes which would not have been recorded in the stock assessments during the period 2007-2010.
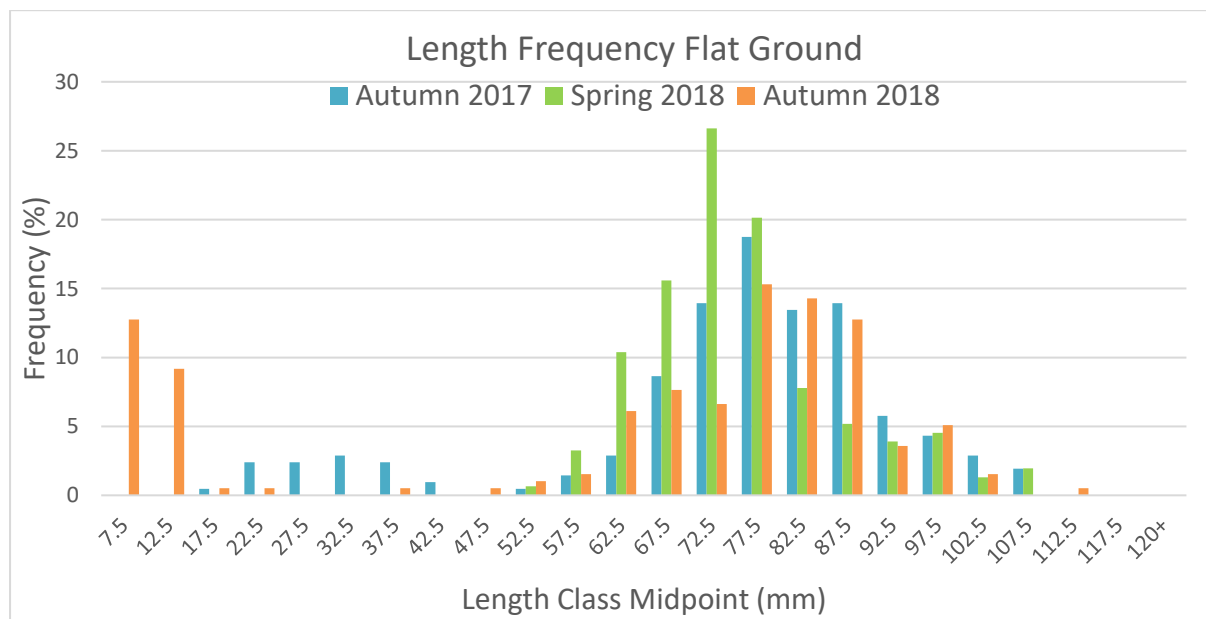
Figure 19 Proportional Length Frequency: Flat Ground 2017-18

The cumulative frequency (Figure 20) for the stock on the Flat Ground shows the impact of the spat settlement in the smallest size classes and the growth in the larger size classes.
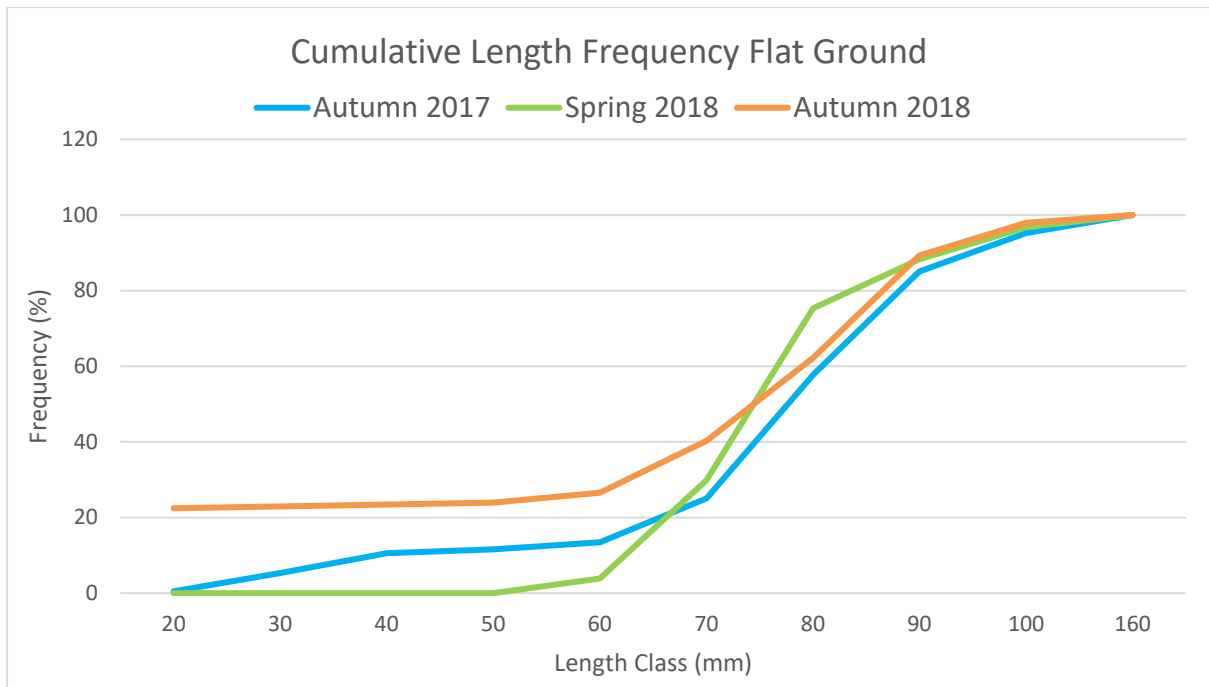
Figure 20 Cumulative Frequency: Flat Ground 2017-2018

The pie chart (Figure 21) also shows evidence of the larger spat settlement on this bed with almost 30% of the stock in the 10-20mm size class.
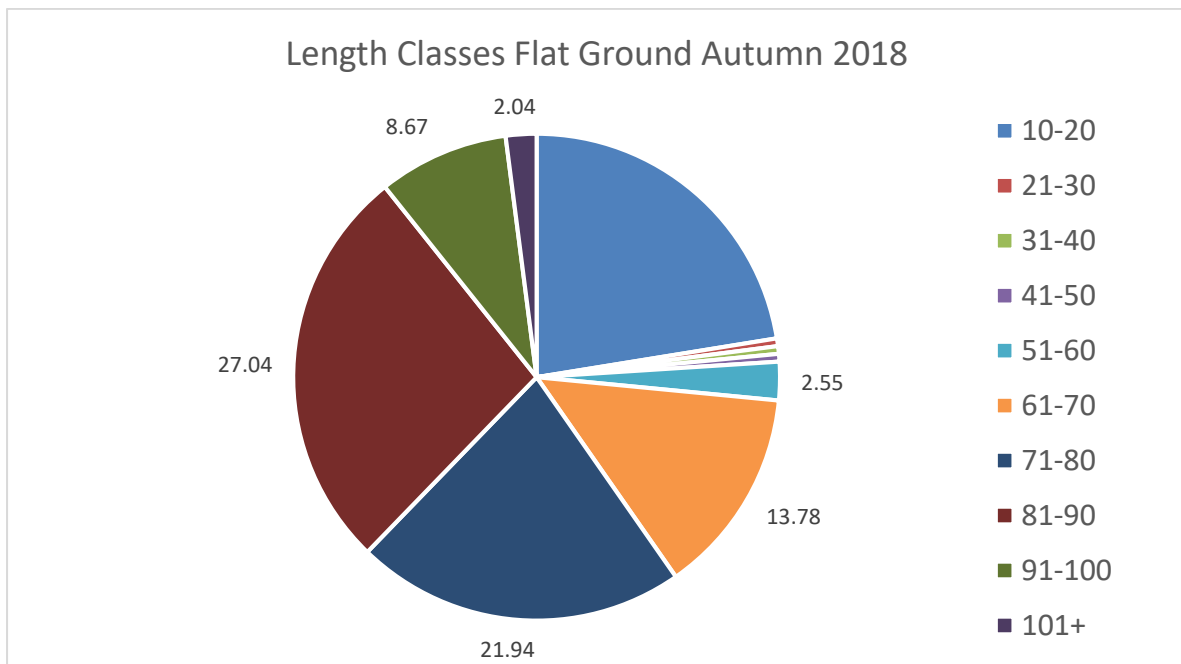
Figure 21 Percentage of each length class: Flat Ground 2018

9.3 Quigley's Point

Table 4 Summary Information: Quigley's Point

Bed Name	**Quigley's Point**
Area (h)	139
Total Biomass (t)	26.2
Biomass (t) >80mm	5.7

Quigley's Point covers an area of 139 hectares. The total biomass has been estimated to be 26.2 tonnes on this bed with 5.7 tonnes above 80mm. 10.9 tonnes were landed from Quigley's Point bed during the fishing season of 2017/18.

The length frequency for Quigley's Point (figure 22) shows limited evidence of any spatfall on the bed. The cohort that settled in 2017 has now attained a size of 35mm+ on average. There was some limited evidence of settlement in 2018 on this bed with the oysters
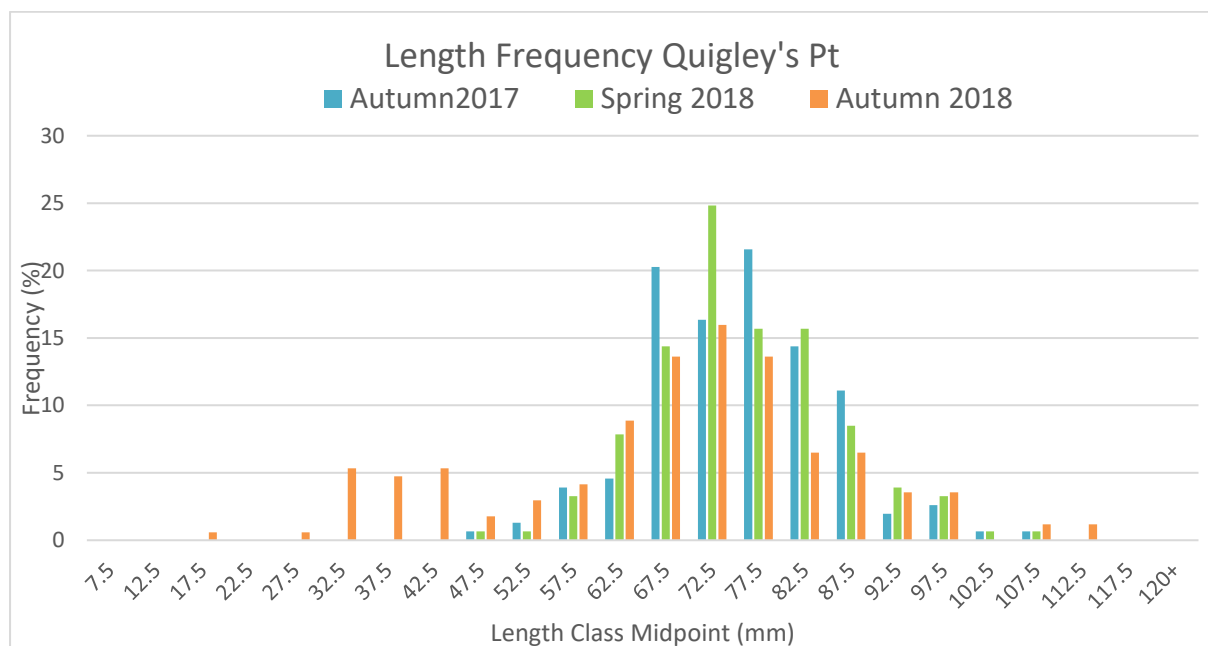
Figure 22 Proportional Length Frequency Quigley's Point 2017-18

The cumulative frequency (Figure 23) again shows evidence of a limited spat settlement in the 20-30mm size class.
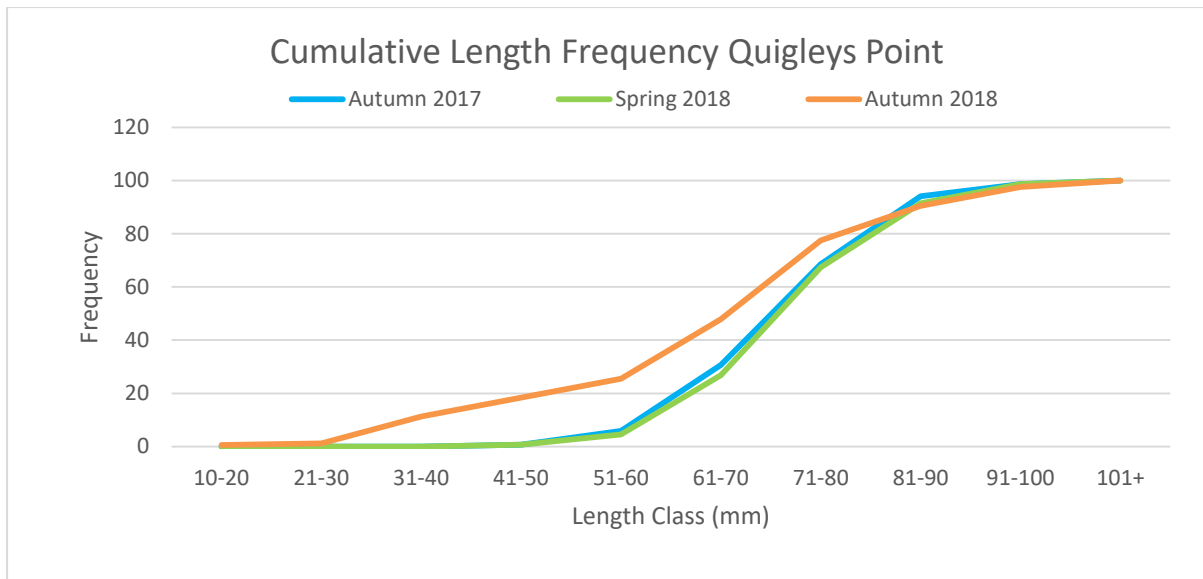
Figure 23 Cumulative Frequency: Quigley's point 2017-2018

Figure 24 shows the proportion of each length class on the bed. It is clear that smaller size classes are not very well represented on this bed with almost 75% of the stock above 60mm.
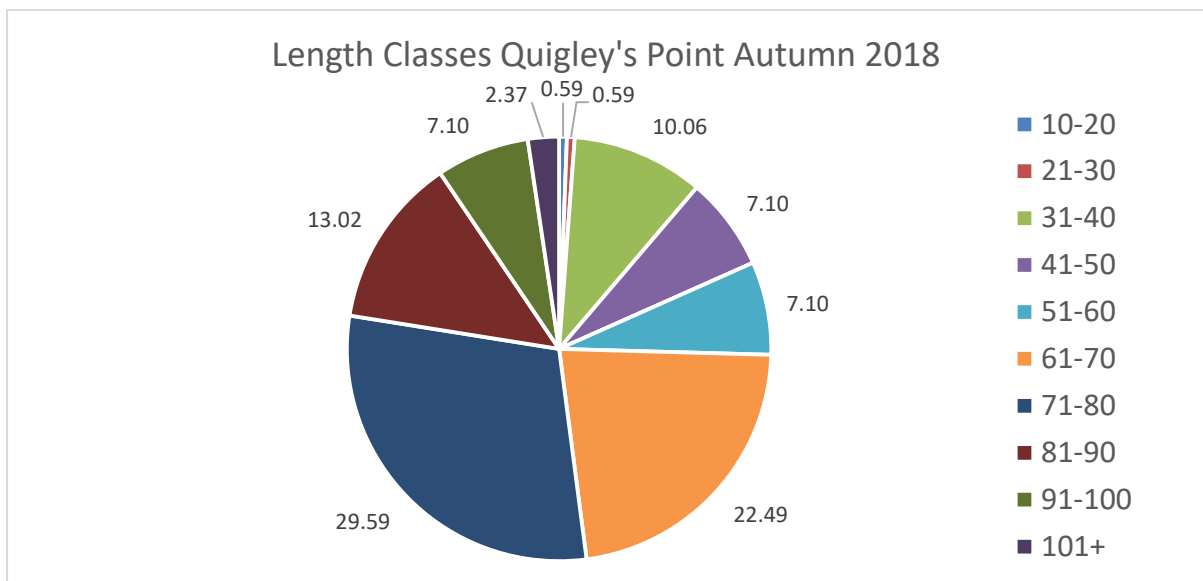
Figure 24 Percentage of length classes: Quigley's Point 2018

9.4 Middle Bed South

Table 5 Summary Information: Middle Bed South

Bed Name	Middle Bed South
Area (h)	531
Total Biomass (t)	108.1
Biomass (t) >80mm	40.0

The south section of the Middle Bed covers an area of 531 hectares. There is an estimated total biomass of 108.1 tonnes on this bed and 40 tonnes of that figure is over 80mm which should be available to the 2018/19 fishery.

The length frequency for the Middle Bed South (figure 25) shows that the majority of oysters on this bed are now over 50mm, indicating poor juvenile recruitment in 2015 and 2016. There was some limited evidence of a spatfall in 2018 with oyster spat in the 12.5-32.5mm size classes observed during the survey.
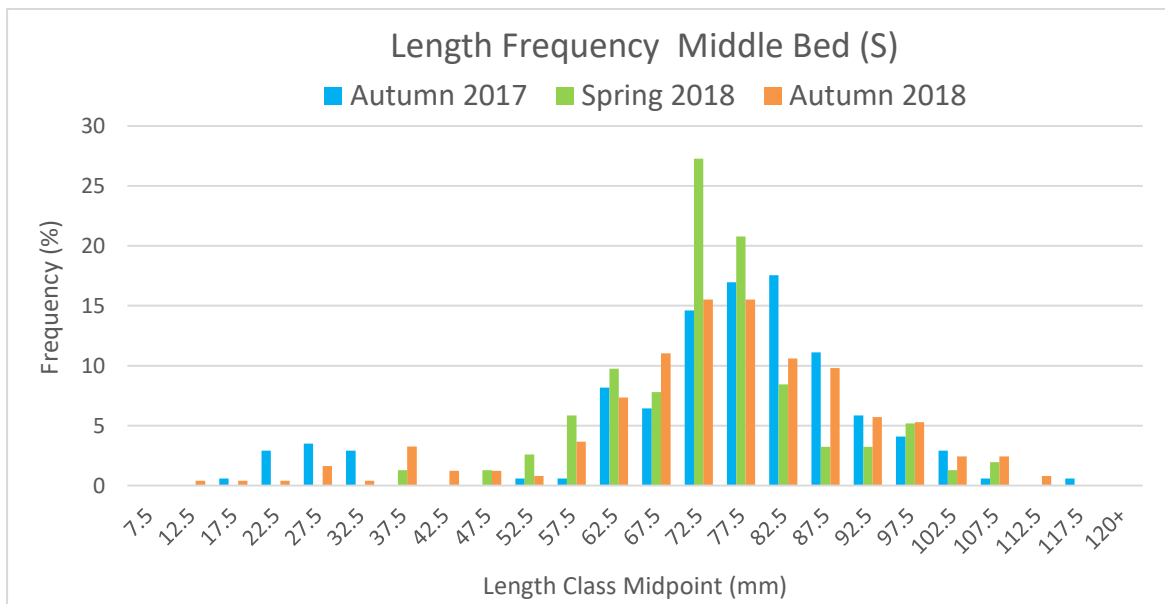
Figure 25 Proportional Length Frequency Middle bed 2017-18

The cumulative frequency (Figure 26) shows an increase in the proportion of larger length classes since the spring 2017 survey. This movement reflects the good growing conditions observed in 2017.

The pie chart (Figure 27) shows evidence of a skew towards larger age classes once again with over 40% of the stock above the market size of 80mm.
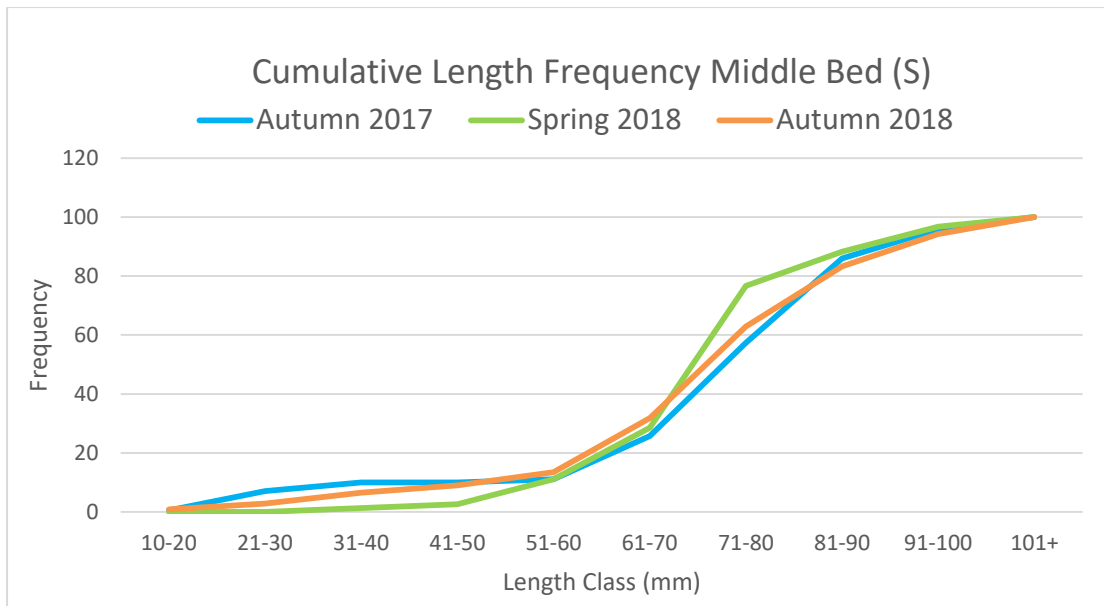
Figure 26 Cumulative Frequency Middle Bed 2016-2018
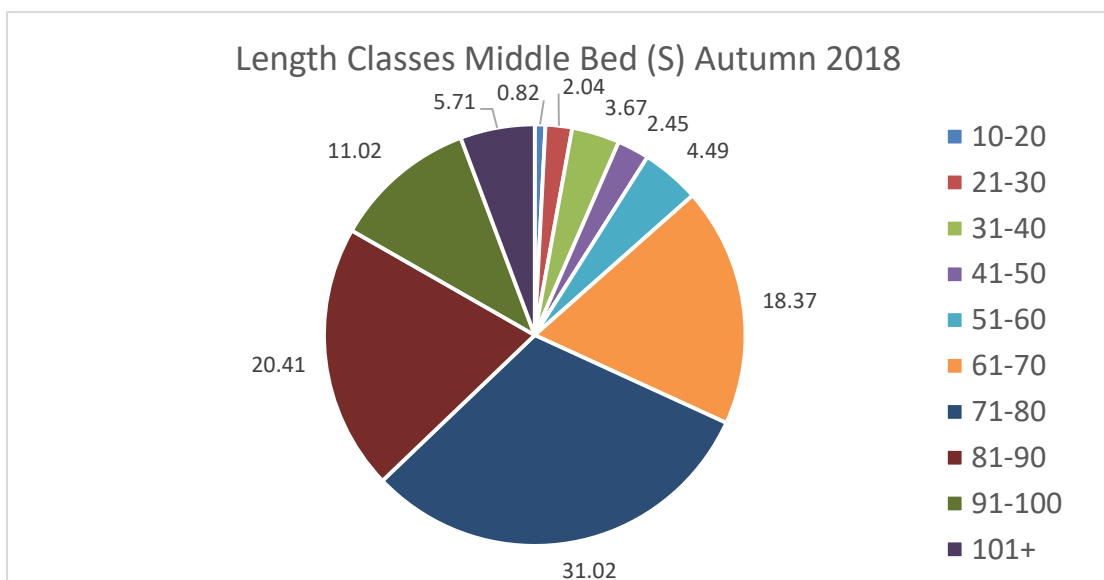
Figure 27 Percentage of length classes Middle Bed 2018

9.5 Southside North

Table 6 Summary Information: Southside North

Bed Name	Southside North
Area (h)	312
Total Biomass (t)	43.2
Biomass (t) >80mm	12.1

The northern portion of the Southside bed covers an area of 312 hectares. The overall biomass on this bed is estimated to be 43.2 tonnes, 12.1 tonnes of this figure represents oysters over 80mm in length.

The length frequency (figure 28) shows strong evidence of a late settlement in 2018 with a very large proportion of the stock less than 20mm. This widespread settlement on the bed should help sustain the stock in the future provided that survival is good over the next few seasons.
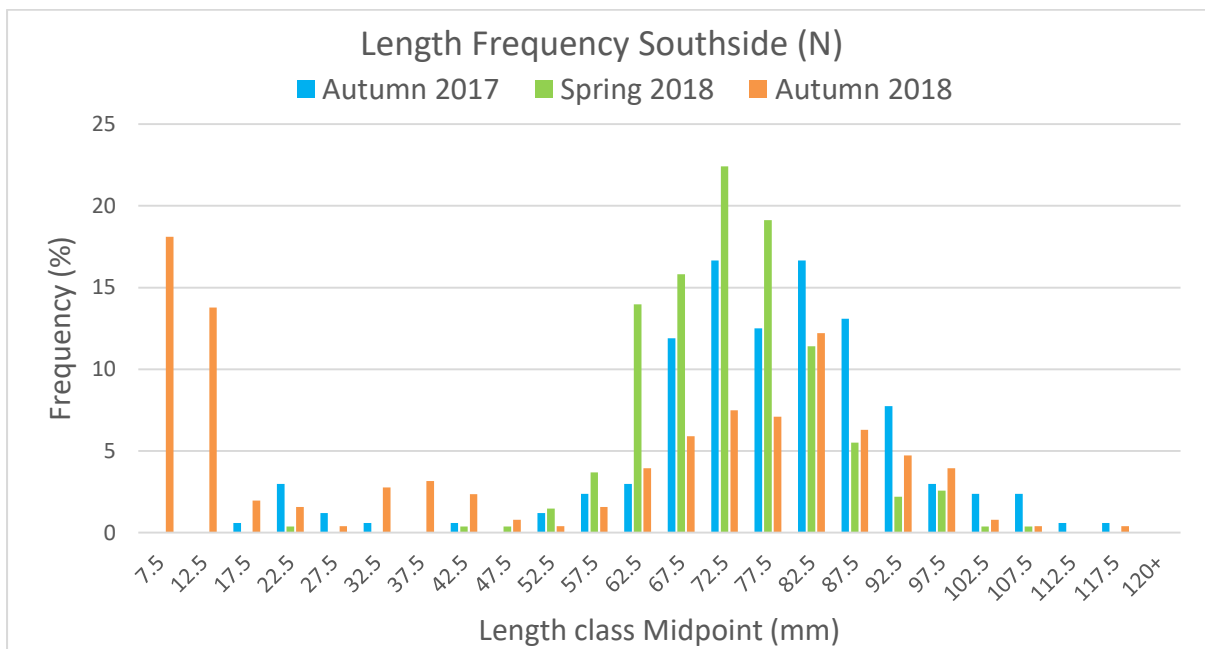
Figure 28 Proportional Length Frequency Southside (N) 2017-18
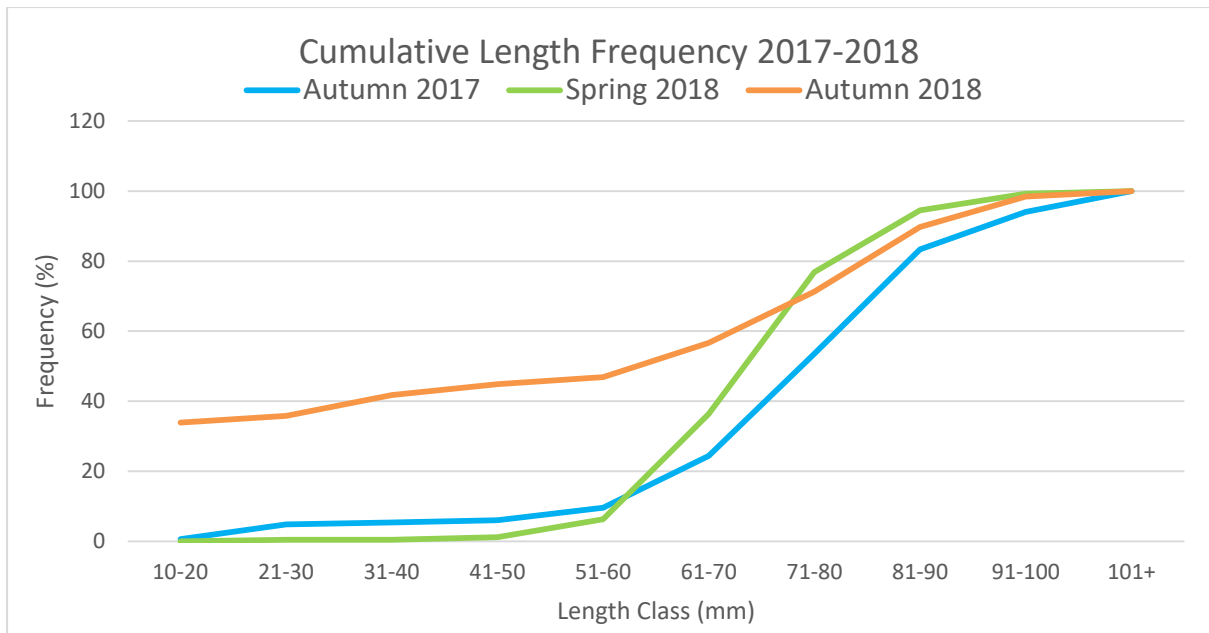
Figure 29 Cumulative Frequency Southside (N) 2016-2018

The cumulative length frequency is dominated by the large addition of newly settled spat in the 10-20mm size class.
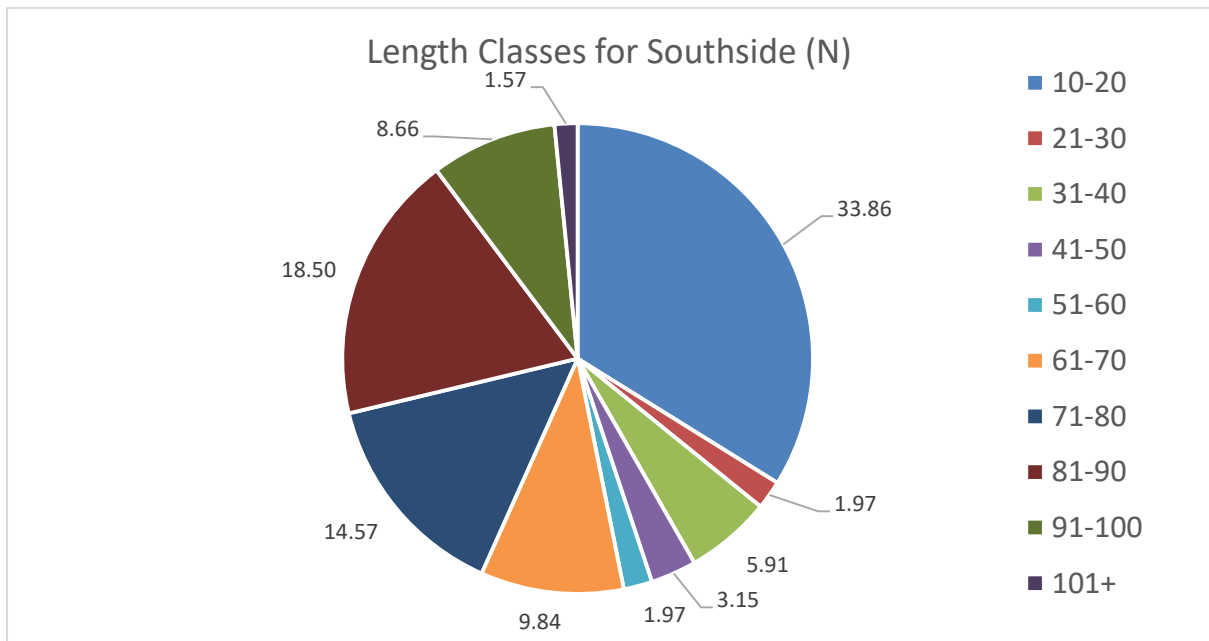
Figure 30 Percentage of length classes: Southside (N) 2018

33% of the stock on this bed is in the 10-20mm size class showing just how strong the spat settlement has been in 2018.

9.6 Southside South

Bed Name	Southside South
Area (h)	297
Total Biomass (t)	113.1
Biomass (t) >80mm	40.7

The south section of the Southside bed covers 319.0 hectares in total. The overall biomass of oysters calculated during the autumn 2018 survey is 113.1 tonnes and 40.7 tonnes of this figure is currently above 80mm therefore is available to the fishery for the 2018/19 season.

Again, like the length frequency for the northern section of the Southside there was widespread evidence of spat (<20mm) recorded during this survey. The stock on this bed is skewed towards the larger or smaller size classes with the majority above 70mm or less than 20mm in length.
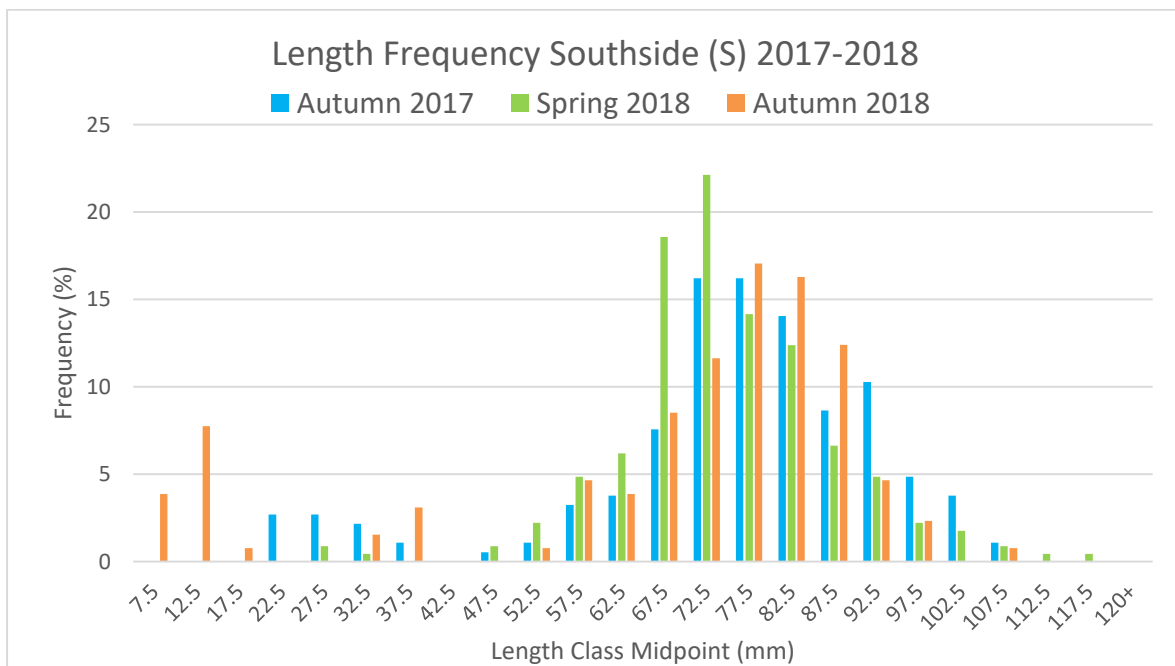
Figure 31 Length Frequency Southside (S) 2017-18
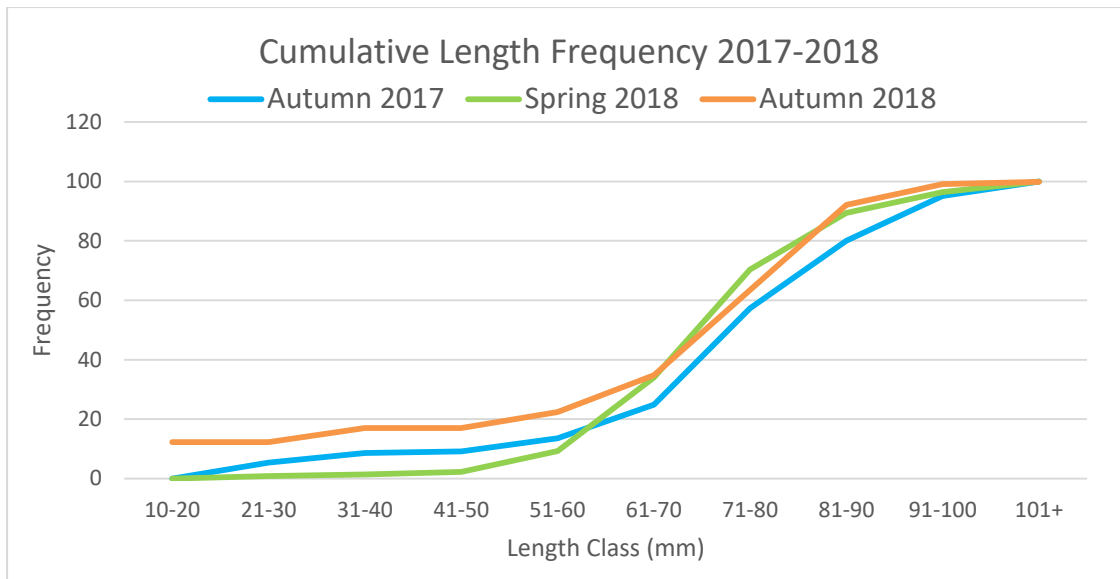
Figure 32 Cumulative Length Frequency Southside (S) 2016-2018

The cumulative length frequency shows a small increase in the proportion of the stock in the smaller size classes thanks to the spatfall on this bed.
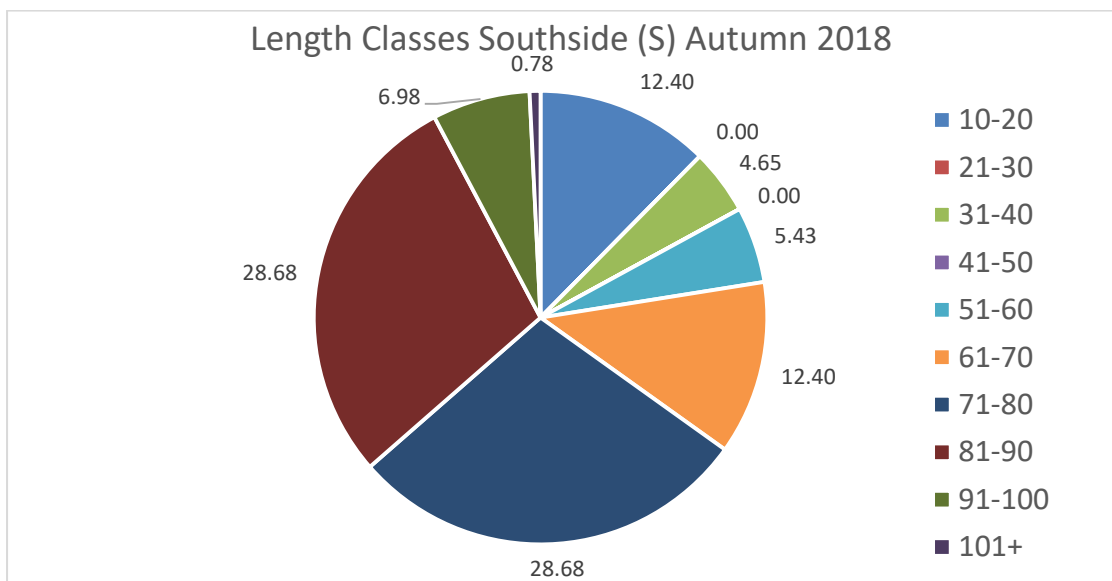
Figure 33 Percentage of length classes: Southside (S) 2018

9.7 Great Bank

Bed Name	Great Bank
Area (h)	824
Total Biomass (t)	101.1
Biomass (t) >80mm	43.5

The Great Bank Bed has an area of 824 hectares. The overall biomass of oysters calculated during the survey is 101.1 tonnes and 43.5 tonnes of this figure is currently above 80mm and therefore should be available to the fishery for the 2018/19 season.

There was a widespread spatfall on this bed and the length frequency data shows that once again these were most less than 20mm in size. The stock on this bed is skewed towards the larger and smaller size classes with the majority above 75mm or less than 20mm in length.
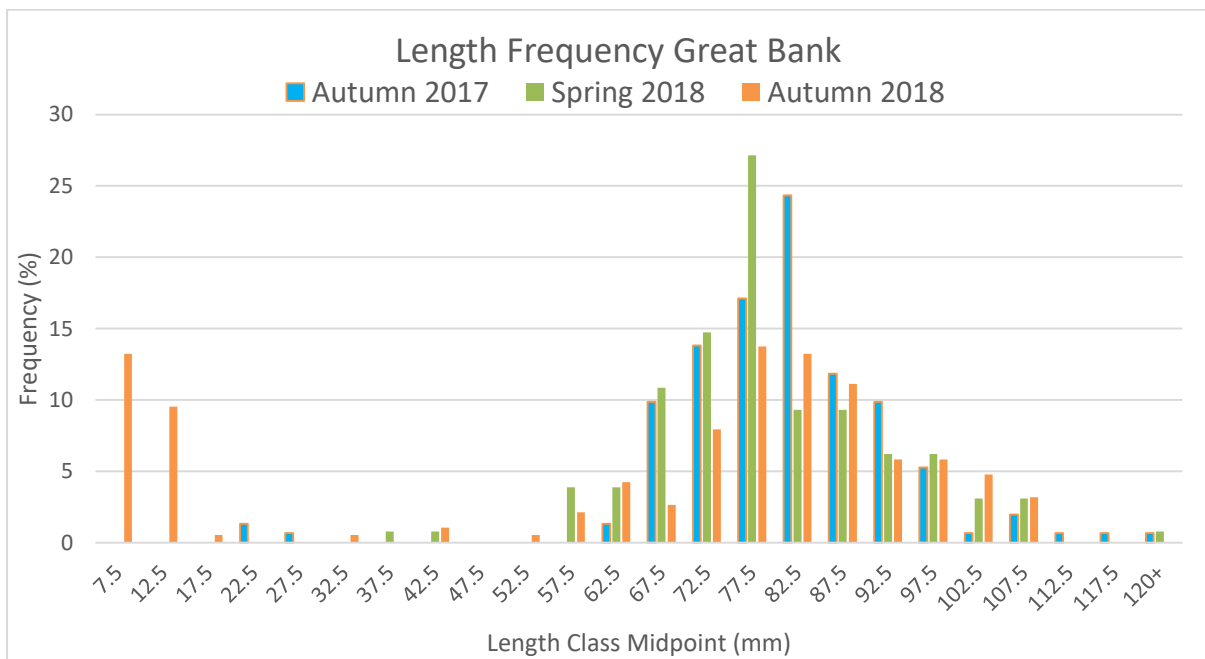
Figure 34 Length Frequency Great Bank 2017-18
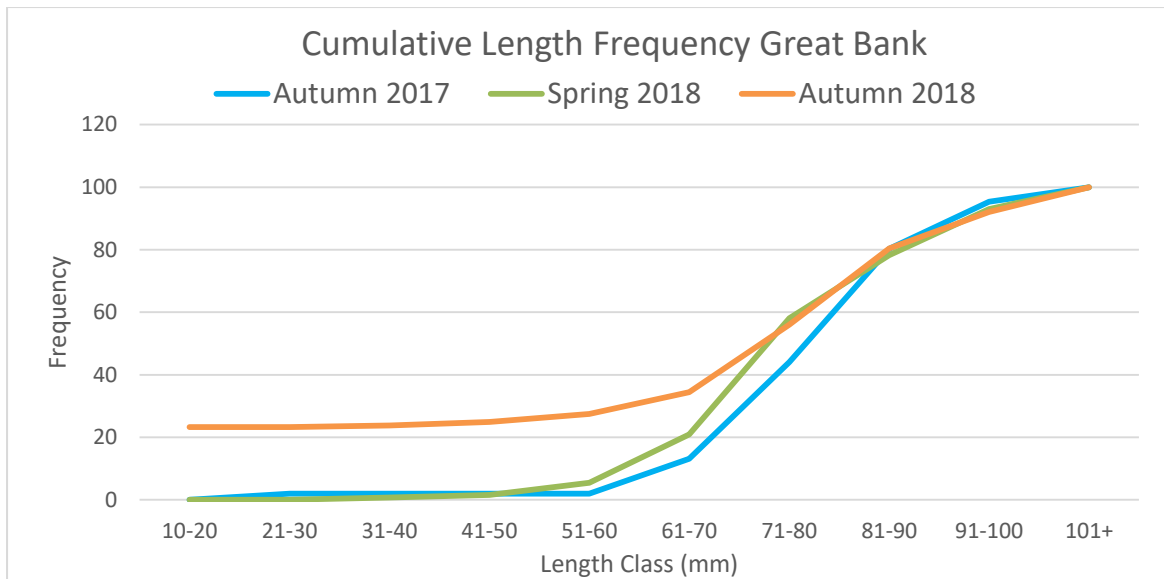
Figure 35 Cumulative Length Frequency Great Bank 2016-2018

Cumulative length frequency for the great bank shows evidence of the spatfall with a large increase in the 10-20mm size class.
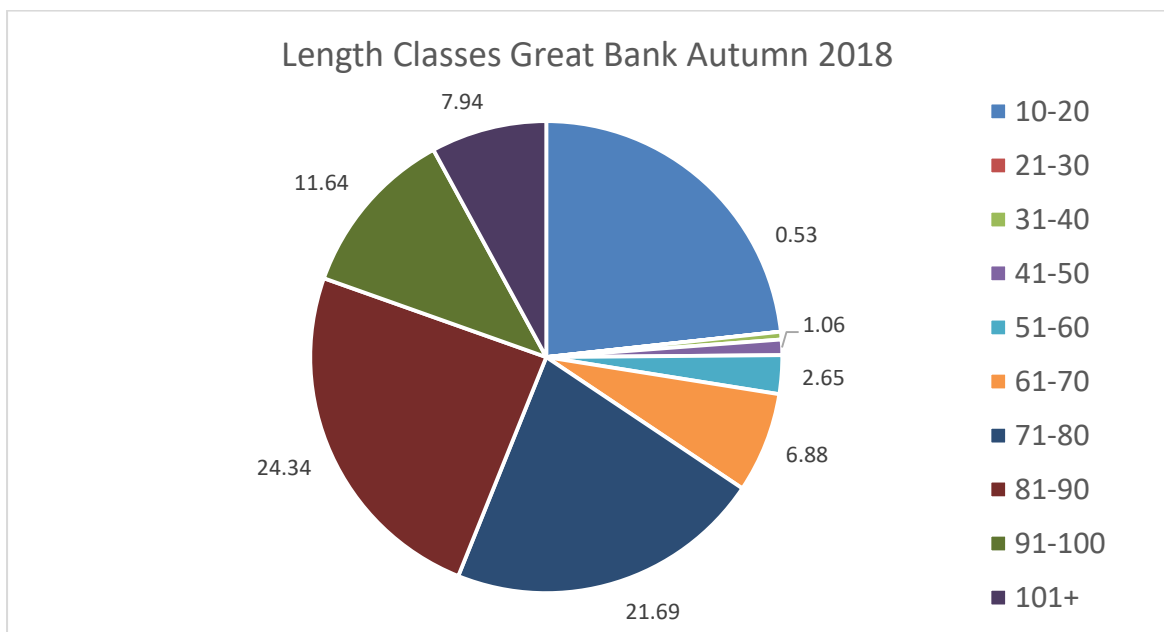
Figure 36 Percentage of length classes: Great Bank 2018

10. Conclusions

The total biomass estimated for the stock is an increase on the autumn 2017 figure. There has been evidence of a widespread spatfall in 2018 and this is positive for the fishery with the likelihood that this spat will add to the broodstock biomass and recruit into the fishery from 2021 onwards. The biomass above the minimum landing size of 80mm is estimated to be 269 tonnes. There has been a large carry over (>100t) of fishable stock from the 2017/18 season to help to sustain an effective spawning stock biomass. It is likely that this stock made a substantial contribution to the spawning activity and consequent spatfall observed during the summer. This validates the management approach adopted in the past 4 years which has seen partial removal of the total market sized stock.

11.Recommendations

Consider partial removal of the harvestable stock biomass to help alleviate pressure on the stock from fishing activity and help sustain an effective spawning broodstock and a viable fishable stock for 2019/20.

Appendix I. Raw data from interpolated density data and biomass estimates

Bed name	Class Range	N	Polygon Area (m2)	Mean Weight (g)	No. of Oysters	Total Biomass (tonnes)
Barneys	0 - 0.01000	13	1982087	85	1982	0.17
Barneys	0.01001 - 0.05000	1	19993	85	200	0.02
Barneys	0.05001 - 0.10000	0	0	85	0	0.00
Barneys	0.10001 - 0.50000	0	0	85	0	0.00
Barneys	0.50001 - 1.00000	0	0	85	0	0.00
Barneys	1.00001 - 2.50000	0	0	85	0	0.00
Barneys	2.50001 - 5.00000	0	0	85	0	0.00
Drumskellan	0 - 0.01000	7	164951	58	165	0.01
Drumskellan	0.01001 - 0.05000	2	346304	58	11202	0.65
Drumskellan	0.05001 - 0.10000	1	174649	58	8732	0.51
Drumskellan	0.10001 - 0.50000	4	218874	58	55370	3.21
Drumskellan	0.50001 - 1.00000	0	0	58	0	0.00
Drumskellan	1.00001 - 2.50000	0	0	58	0	0.00
Drumskellan	2.50001 - 5.00000	0	0	58	0	0.00
Flat Ground	0 - 0.01000	15	1044749	68	1045	0.07
Flat Ground	0.01001 - 0.05000	18	1320744	68	37212	2.53
Flat Ground	0.05001 - 0.10000	14	1154935	68	75076	5.11
Flat Ground	0.10001 - 0.50000	31	3756927	68	994525	67.63
Flat Ground	0.50001 - 1.00000	9	1456676	68	1043828	70.98
Flat Ground	1.00001 - 2.50000	11	959525	68	1354072	92.08
Flat Ground	2.50001 - 5.00000	0	0	68	0	0
Black Ghee	0 - 0.01000	0	0	65	0	0
Black Ghee	0.01001 - 0.05000	0	0	65	0	0
Black Ghee	0.05001 - 0.10000	0	0	65	0	0
Black Ghee	0.10001 - 0.50000	0	0	65	0	0
Black Ghee	0.50001 - 1.00000	0	0	65	0	0
Black Ghee	1.00001 - 2.50000	0	0	65	0	0
Black Ghee	2.50001 - 5.00000	0	0	65	0	0
Great Bank	0 - 0.01000	6	741929	71	742	0.05
Great Bank	0.01001 - 0.05000	4	1270254	71	29319	2.08
Great Bank	0.05001 - 0.10000	4	1364072	71	98674	7.01
Great Bank	0.10001 - 0.50000	18	4865734	71	1296031	92.02
Great Bank	0.50001 - 1.00000	0	0	71	0	0
Great Bank	1.00001 - 2.50000	0	0	71	0	0
Great Bank	2.50001 - 5.00000	0	0	71	0	0

Middle (north)	0 - 0.01000	11	613613	70	614	0.04
Middle (north)	0.01001 - 0.05000	5	795037	70	19171	1.34
Middle (north)	0.05001 - 0.10000	4	467495	70	34837	2.44
Middle (north)	0.10001 - 0.50000	5	399715	70	64994	4.55
Middle (north)	0.50001 - 1.00000	0	0	70	0	0
Middle (north)	1.00001 - 2.50000	0	0	70	0	0
Middle (north)	2.50001 - 5.00000	0	0	70	0	0
Middle (south)	0 - 0.01000	20	860342	62	860	0.05
Middle (south)	0.01001 - 0.05000	8	850983	62	21573	1.34
Middle (south)	0.05001 - 0.10000	2	496582	62	35017	2.17
Middle (south)	0.10001 - 0.50000	15	1722826	62	558504	34.63
Middle (south)	0.50001 - 1.00000	13	1220187	62	926236	57.43
Middle (south)	1.00001 - 2.50000	4	145037	62	202168	12.53
Middle (south)	2.50001 - 5.00000	0	0	62	0	0.00
Moville	0 - 0.01000	10	1594642	55	1595	0.09
Moville	0.01001 - 0.05000	4	587932	55	10892	0.60
Moville	0.05001 - 0.10000	2	294427	55	21956	1.21
Moville	0.10001 - 0.50000	1	13995	55	1845	0.10
Moville	0.50001 - 1.00000	0	0	55	0	0.00
Moville	1.00001 - 2.50000	0	0	55	0	0.00
Moville	2.50001 - 5.00000	0	0	55	0	0.00
Peak	0 - 0.01000	2	156189	75	156	0.01
Peak	0.01001 - 0.05000	2	431891	75	17115	1.28
Peak	0.05001 - 0.10000	0	258402	75	12923	0.97
Peak	0.10001 - 0.50000	4	612368	75	177449	13.31
Peak	0.50001 - 1.00000	0	0	75	0	0.00
Peak	1.00001 - 2.50000	0	0	75	0	0.00
Peak	2.50001 - 5.00000	0	0	75	0	0.00
Perch	0 - 0.01000	6	119032	66	119	0.01
Perch	0.01001 - 0.05000	4	663331	66	22558	1.49
Perch	0.05001 - 0.10000	3	356811	66	23688	1.56
Perch	0.10001 - 0.50000	14	1596533	66	398767	26.32
Perch	0.50001 - 1.00000	4	92416	66	56757	3.75
Perch	1.00001 - 2.50000	0	0	66	0	0.00
Perch	2.50001 - 5.00000	0	0	66	0	0.00
Quigley'sPt	0 - 0.01000	9	20751	58	21	0.00
Quigley'sPt	0.01001 - 0.05000	3	71364	58	1795	0.10
Quigley'sPt	0.05001 - 0.10000	1	208786	58	15432	0.90
Quigley'sPt	0.10001 - 0.50000	12	950463	58	321632	18.65
Quigley'sPt	0.50001 - 1.00000	4	139586	58	113003	6.55
Quigley'sPt	1.00001 - 2.50000	0	0	58	0	0.00
Quigley'sPt	2.50001 - 5.00000	0	0	58	0	0.00
Redcastle	0 - 0.01000	9	765753	55	766	0.04
Redcastle	0.01001 - 0.05000	2	281712	55	10098	0.56

Redcastle	0.05001 - 0.10000	2	298806	55	22523	1.24
Redcastle	0.10001 - 0.50000	2	276460	55	60151	3.31
Redcastle	0.50001 - 1.00000	0	0	55	0	0
Redcastle	1.00001 - 2.50000	0	0	55	0	0
Redcastle	2.50001 - 5.00000	0	0	55	0	0
Sandy Ridge	0 - 0.01000	25	3452392	55	3452	0.19
Sandy Ridge	0.01001 - 0.05000	7	735879	55	12955	0.71
Sandy Ridge	0.05001 - 0.10000	2	460532	55	41624	2.29
Sandy Ridge	0.10001 - 0.50000	3	88332	55	11209	0.62
Sandy Ridge	0.50001 - 1.00000	0	0	55	0	0.00
Sandy Ridge	1.00001 - 2.50000	0	0	55	0	0.00
Sandy Ridge	2.50001 - 5.00000	0	0	55	0	0.00
Southside North	0 - 0.01000	6	345748	69	346	0.02
Southside North	0.01001 - 0.05000	13	761600	69	18586	1.28
Southside North	0.05001 - 0.10000	3	549240	69	43172	2.98
Southside North	0.10001 - 0.50000	13	1147205	69	348666	24.06
Southside North	0.50001 - 1.00000	6	284712	69	183099	12.63
Southside North	1.00001 - 2.50000	1	29414	69	33490	2.31
Southside North	2.50001 - 5.00000	0	0	69	0	0.00
Southside South	0 - 0.01000	1	16668	66	17	0.00
Southside South	0.01001 - 0.05000	4	134700	66	3435	0.23
Southside South	0.05001 - 0.10000	1	312874	66	27691	1.83
Southside South	0.10001 - 0.50000	3	1739933	66	586587	38.71
Southside South	0.50001 - 1.00000	3	1002769	66	799491	52.77
Southside South	1.00001 - 2.50000	6	203164	66	297595	19.64
Southside South	2.50001 - 5.00000	0	0	66	0	0

Appendix II Oyster Landings Data 2017/18

Review of the 2017-2018 Native Oyster Fishing Season

Introduction

The 2017-2018 native oyster fishing season started on the 3rd of October 2017. The start of the fishery was delayed from the statutory commencement date of the 19th of September to help encourage survival of oyster spat. The Foyle oyster population would generally have ceased spawning before the start of the fishing season, however on this occasion spawning is still occurring up to the end of September. The period immediately post spawning is a sensitive time when oysters are reconditioning and may still be susceptible to mortality if disturbed, therefore, in order to protect the brood stock/juvenile oysters and thus safeguard the future fishery opening was delayed until the 3rd October 2017. The Loughs Agency also restricted fishing activity to the hours between 6am and 6pm.

Fishing vessels are licensed by the Agency following payment of a license fee and provided the vessels have appropriate safety certificates and sea fishing licenses. Fishing vessels must adhere to the restrictions as laid down in The Foyle Area (Control of Oyster Fishing) Regulations 2008.

Previous stock surveys have identified poor recruitment into the fishery in 2015, 2016 and 2017 and show a population skewed towards older age classes. Landings data for the period of 2012-2017, submitted to the agency by licence holders, demonstrates a similar trend from year to year with 80% of the total landings being removed from the fishery within the first 8 weeks.

Fishing related stress levels in the oyster population is thought to be linked to fishing effort. This has been found to be highest during the first 8 weeks of the season. Therefore, a reduction in fishing effort may go some way to reducing the potential impact of *Bonamiosis* in the native oyster population. To address the issue of stress, and spawning stock protection, fishing effort was reduced to 2 days per week for a 3 week period from 3rd October to the 18th October at which time it reverted to a 3 day week for 1 week. As a review of the landings to date resulted in a further reduction of effort back to a 2 day week from the 31st October to the 22nd of November. The fishery was suspended for the period from the 22nd November 2017 to 28th January 2018 pending a review of the fishery landings and a post fishery stock assessment. A

further suspension took place from 1st February – 31st March following the outcome of this post fishery review.

Fishing Activity

Figure 1 illustrates the number of vessels fishing per week during the last 3 seasons. The trend are similar with greatest effort at the beginning of the season. There was a greater number of vessels involved in the fishery during 2017/18 than ever before. The increase in landings from the fishery over the past few seasons appears to have attracted new entrants to the fishery and those vessels operating within the fishery are sustaining a more consistent effort during the season (figure 2).
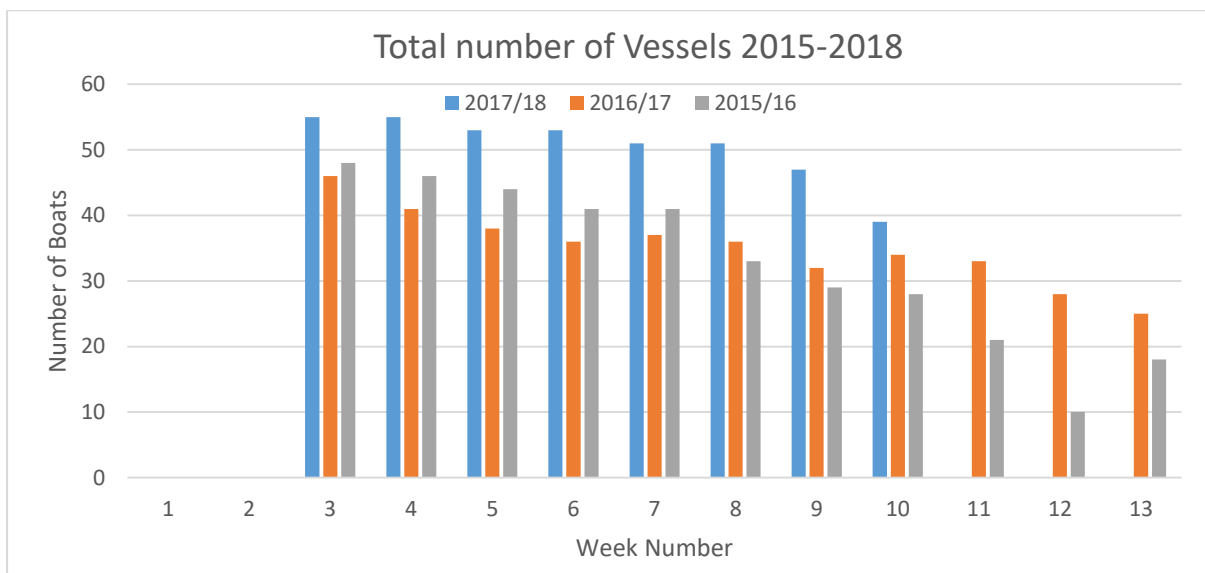

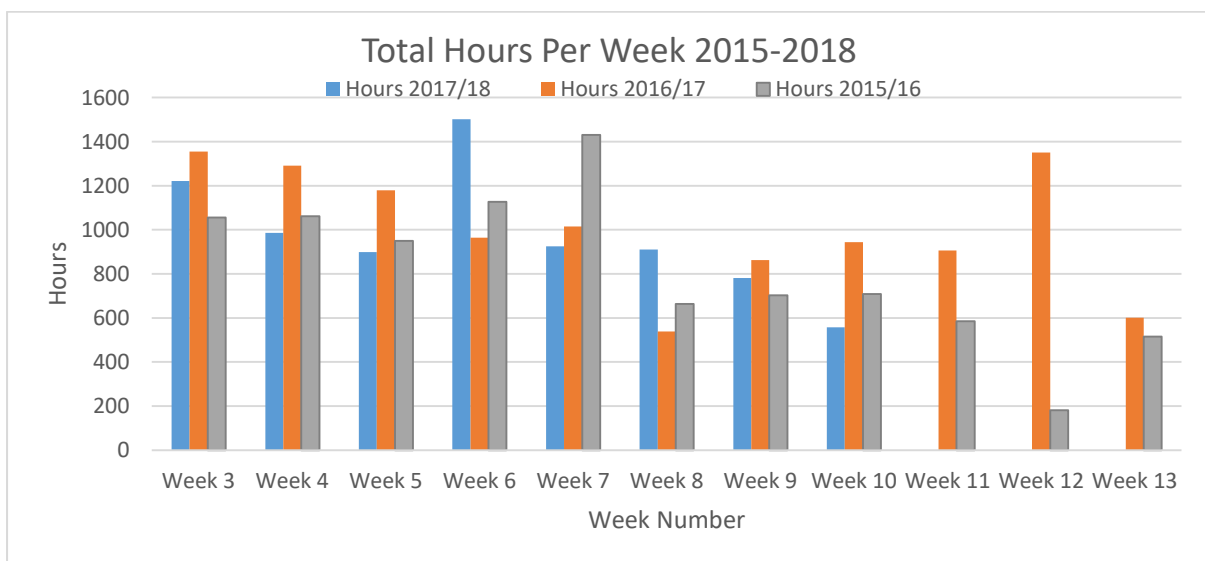Figure 37 Number of vessels fishing during fishing season 2015-2018

Figure 2 Number of hours fished per week 2015-2018

Landings by Oyster Bed

The log books completed and submitted to the Agency have allowed an assessment of the quantities of oysters removed from each oyster bed to be made. Table 1 gives a breakdown of the quantities and the percentage of the total landings represented by each bed. There are some records without positional information and these have been included in this assessment as 'other'.

Table 7 Landings per bed for the 2017/2018 season

Bed	Total Fished (kg)	Total Fished (t)	% of total
Redcastle	0	0	0
Barneys	0	0	0
Drum	450	0.45	0.22
Shooting range	1650	1.65	0.80
Black Ghee	1742	1.742	0.85
Longfield	1840	1.84	0.90
Peak	2238	2.238	1.09
roof Isles	2836	2.836	1.38
Sandy Ridge	3052	3.052	1.49
Moville	5700	5.7	2.78
Mcghee	7285	7.285	3.55
Other	8850	8.85	4.31
Quigley's Point	10970	10.97	5.34
Perch	11964	11.964	5.83
Great Bank	14220	14.22	6.92
Middle Bed	25719	25.719	12.52
Flatground	48619	48.619	23.67
Southside	58234	58.234	28.36
Total	**205369**	**205.369**	**100**

Table 1 and figure 3 shows that 71% of the total landings for the season was removed from 4 main beds. The highest percentage of landings was from The Southside (28.36%) showing an improvement in the contribution of this bed to the landings following a reduction in biomass after the mortality event in 2010/11. This was followed by the Flat Ground (23.67%), Middle Bed (12.52%) and the Great Bank (6.92%). 11.17% of the overall landings were removed from Quigley's Point and the Perch Bed. The remaining 17% of landings was removed from the remaining oyster beds.
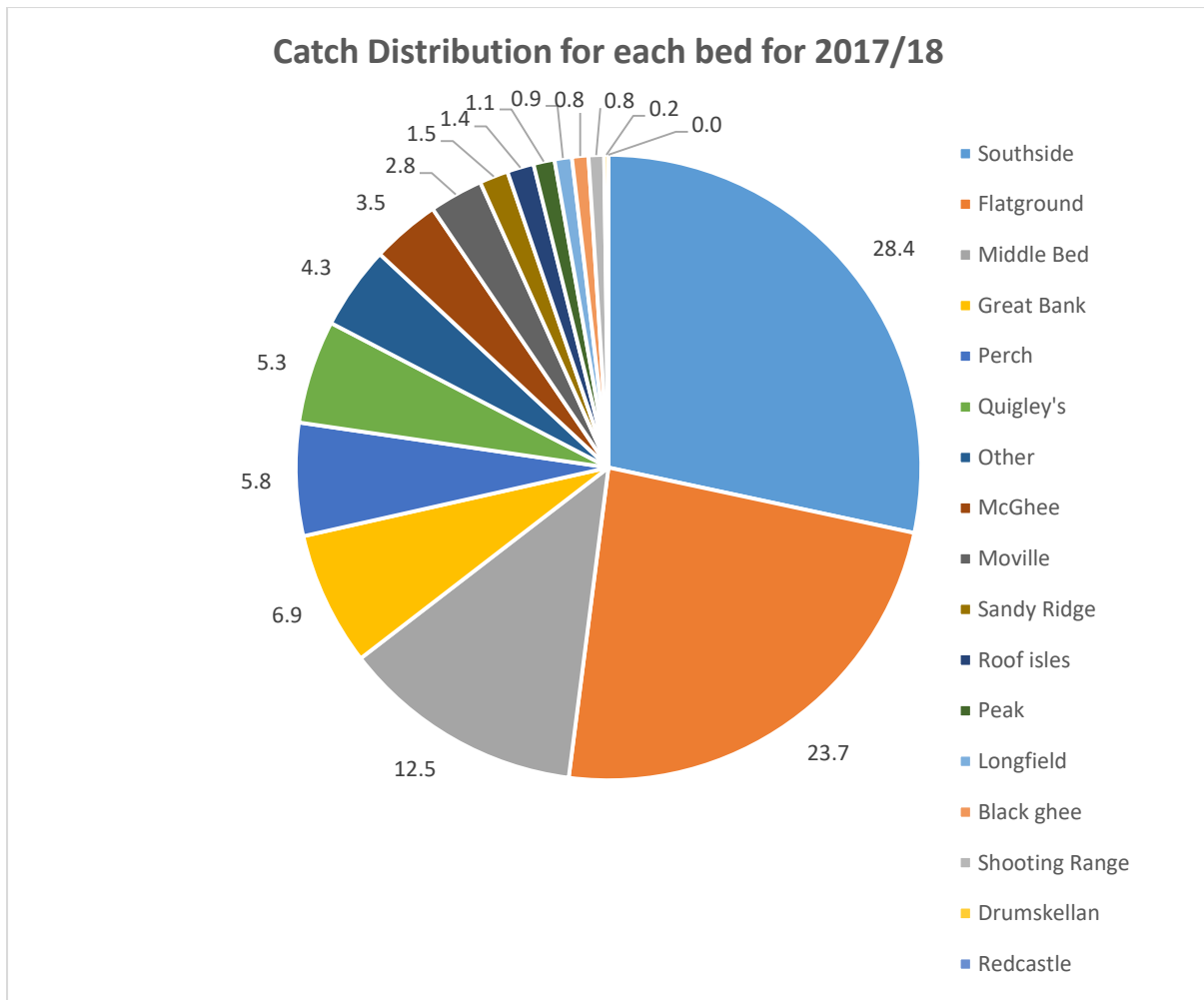
Figure 38 Landings per oyster bed 2017/18 season

Trends are similar to previous years with the highest landings coming from the six beds with the highest density, Middle Bed, Flat Ground, Southside and the Great Bank followed by Quigley's Point and the Perch.

Highest landings were made from the Southside Bed at 58 tonnes, 48 tonnes landed from the Flat Ground, 25 tonnes landed from the Middle Bed and 14 tonnes from the Great Bank (Figure 4).
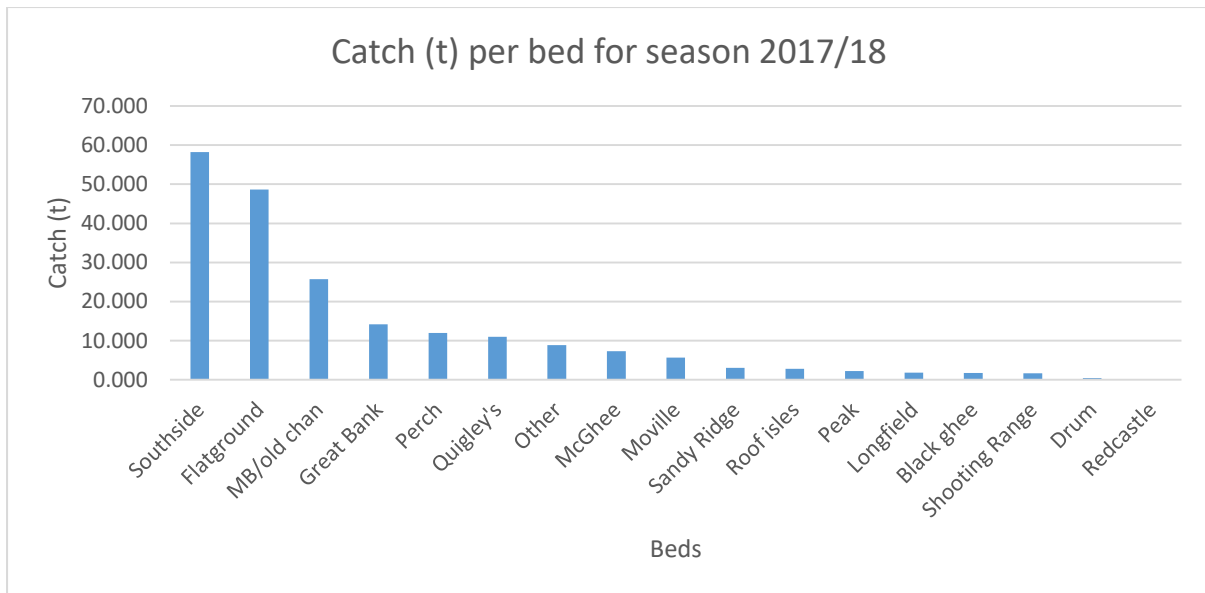
Figure 4 Total oysters fished (t) across all Lough Foyle Oyster beds 2016/17 Season

The trend in cumulative catch curves since 2012 (figure 5) shows that almost 80% of the landings were historically removed before week 15 (Christmas). This fact lead to a reduction in the season length and fishing has taken place for between 8-11 weeks from the beginning of October to mid-December since the 2015/16 season.
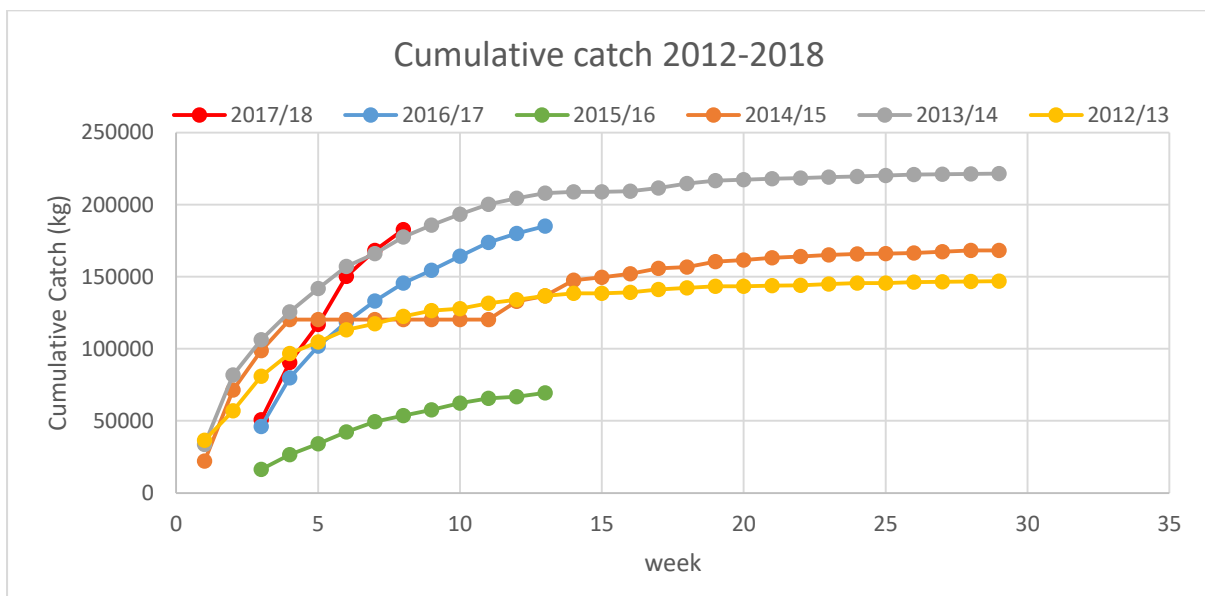

Figure 5 Cumulative catch (kg) per week in Lough Foyle 2012-2018

CPUE (Catch per Unit Effort)

The Catch per Unit Effort (CPUE) has been derived from log sheet records kept by the oyster fishermen per boat per week and also using the hours fished and the quantities landed. The CPUE is generally higher at the beginning of the season due to the availability of the marketable size oysters.

Figure 6 illustrates the trends for CPUE from 2012/13- 2017/18 season. As seen by the chart, the trend is the same each year with the CPUE highest at the beginning of the season and then declining as the season progresses. There was a notable increase in CPUE during the last 2 seasons compared to previous seasons.   It is thought that this is linked to higher water temperatures during the fishing season and a strong cohort of market sized stocks resulting from the heavy spatfall in 2014 and good survival and retention of this age class in the fishery as a result of the restriction in fishing effort over the past 4 seasons. The apparent increase in the CPUE was noted during the pre-season stock assessment conducted in autumn 2017 and it is interesting to note that it was reflected in the catches when the season began.
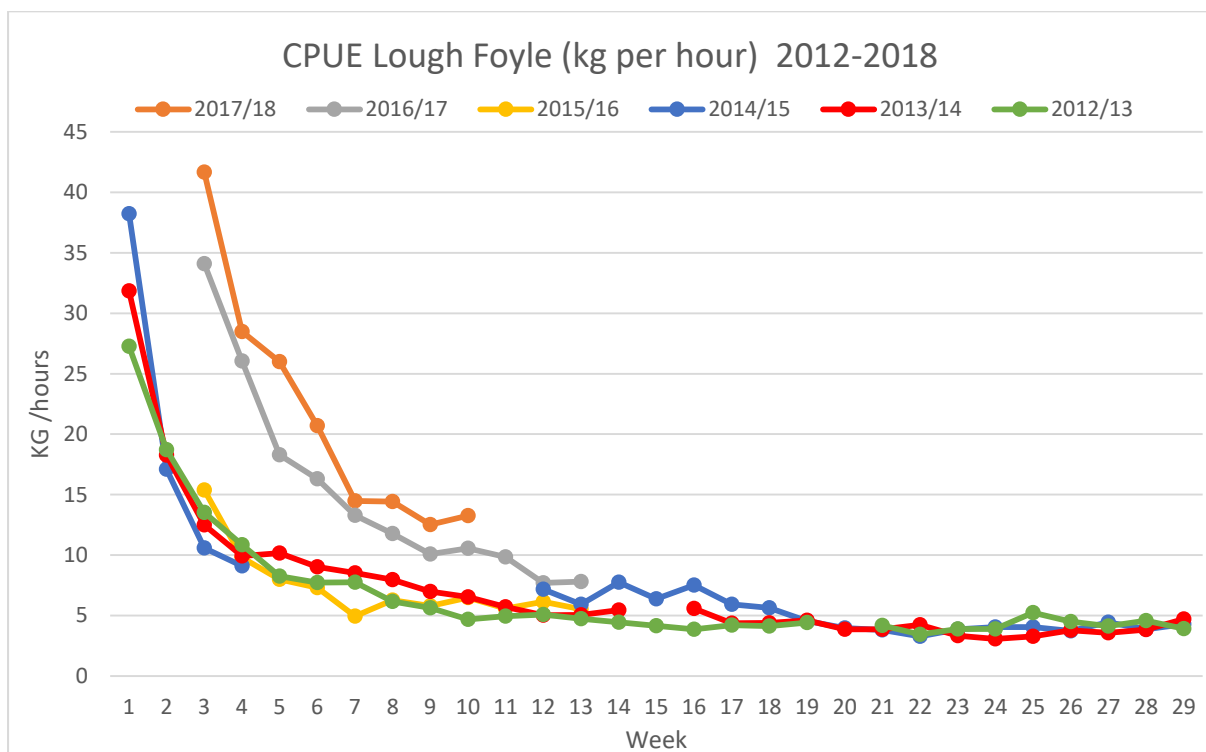

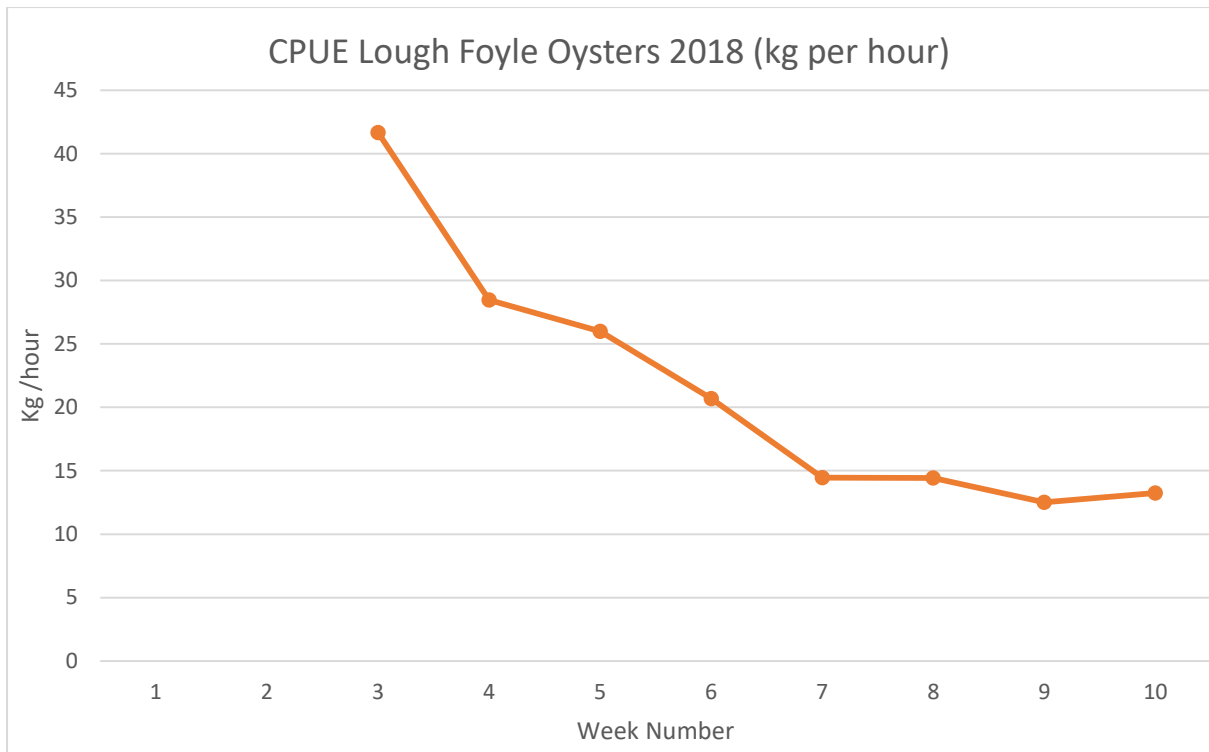
Figure 6 Catch Per Unit Effort (kg/hour) from 2012-2018

Figure 39 Oyster Catch Per Unit Effort (kg/hour) 2017/18 season