Southern IFCA

Inshore Fisheries and Conservation Authority

Poole Harbour Bivalve Stock Assessment 2017




Rosie Nicoll and Sarah Birchenough

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2 EXECUTIVE SUMMARY

This report follows on from the 2016 Poole Harbour Bivalve Stock Assessment. This stock assessment is undertaken annually before the dredge season begins to ensure the fishery is sustainable under the Poole Harbour Dredge Permit Byelaw. The survey used the same methodology developed for the 2016 survey in order to create a time series dataset which can be used for spatial and temporal comparisons between years. Samples of Manila Clam (*Ruditapes philippinarum)* and Common Cockle (*Cerastoderma edule)* were taken at specific Sites throughout the Harbour to gain an accurate picture of the stocks of these commercially important species.

3 INTRODUCTION

3.1 POOLE HARBOUR

Poole Harbour, the second largest natural harbour in the world covering 3600ha is located on the south coast of England (Humphreys and May, 2005). The Harbour is unique in that it has both estuarine and lagoon features, with different habitat types which cause wide ranging diversity in benthic communities (Bennett, 2011). There are 5 islands in the Harbour with several freshwater inputs from rivers and streams and it has a small tidal range of 2m and a stable salinity of 20-30% (Humphreys and May, 2005). The highly productive environment of seaweeds and salt marsh provide a food source for suspension feeding, grazing and deposit feeding species. The Harbour is subjected to anthropogenic activity from fishing and maintenance dredging as well as recreational activities (Bennett, 2011). There are a variety of fisheries operating in the Harbour with fishing effort varying throughout the year depending on factors including the season, weather, the sale price of catch and management measures (Humphreys and May, 2005).

3.2 MANAGEMENT

3.2.1 Southern Inshore Fisheries and Conservation Authority

The Southern Inshore Fisheries and Conservation Authority (IFCA) manages and regulates inshore fishing activity on the South Coast of England covering an area from the Hampshire/Sussex county border to the Devon/Dorset county border, out to 6 nautical miles from the baseline, including the Isle of Wight. Southern IFCA was vested on 1st April 2011 under the Marine and Coastal Act 2009, (2009). One of their roles is to manage the Marine

Protected Areas (MPAs) in the District and ensure that the fishing activities that are taking place are not adversely impacting the environment including, through measures to ensure no illegal activities are taking place and that fishing activity is being carried out sustainably. The shellfish fisheries in Poole Harbour are managed through a combination of measures including the Poole Harbour Dredge Permit byelaw and additional regulations on hand gathering activities. The Poole Harbour Fishery Order 2015 manages aquaculture in the Harbour which has occurred for over 100 years and currently covers approximately 182ha. Southern IFCA manages the leases under the Order for the farming and growing of Pacific Oysters, Clams, Cockles and Mussels (Humphreys and May, 2005; Poole Harbour Fishery Order, 2015).

3.2.2 Conservation Areas

Marine Protected Areas (MPAs) are an important tool for managing the marine environment and the impact of damaging activities. MPAs can be defined as zones with precautionary measures in place to conserve species, habitats, ecosystems, and ecological processes (Rees et al, 2010). Poole Harbour is designated as a Special Protection Area (SPA) under the EU Birds Directive (2009) and a Ramsar Site as it supports nationally and internationally important species of birds as well as an internationally important water bird assemblage. It is also designated as a Site of Special Scientific Interest (SSSI). The SPA designation also makes the Harbour a European Marine Site which forms part of the Natura 2000 Network. The Southern IFCA is a competent Authority under the Conservation of Habitats and Species Regulations (2010). Therefore, in considering management of fishing activity within the Harbour, as an EMS, the Southern IFCA must give consideration to whether the activity is having, or has the potential to have, an adverse impact on the species and supporting habitats for which the Site is designated and must ensure that any management measures introduced will not result in any adverse impacts.

3.2.3 Historical Surveying Effort

During the late 70s and early 80s, there was a pressing need for increased surveying in Poole Harbour due to the poor water quality and the expansion of Poole via land reclamation and port expansion (Humphreys and May, 2005). The planned exploitation of a major oil field also increased the need for greater research into the area. (Humphreys and May, 2005). Surveys completed in 2003 provided a baseline for dredging activities and the ecology of the Harbour. The area is vulnerable to pollution as Poole Harbour has poor flushing which leaves it susceptible to chemical disturbances. (Humphreys and May, 2005). Eutrophication has had potential to become a problem in the Harbour and can suppress the biodiversity or spread disease.

3.2.4 Resources of Poole Harbour

The habitats around the Harbour vary greatly, however, the substrate of the channels is dominated by fine to medium sands with slipper limpets and Cockle shells being most common (Humphreys and May, 2005). Upstream areas have softer sediments which can be a limiting factor for epibenthic communities (Humphreys and May, 2005). The Harbour is a highly productive environment with diverse seaweeds and salt marsh which provided a food source for bivalves (Humphreys and May, 2005).

Poole Harbour has one of the largest chartered fishing fleets in the UK, providing another important economic income (Bennett, 2011). Angling is also supported by 19 clubs in the Poole and District Sea Angling Association and can be influential in decision making (Bennett, 2011). Bait digging is another important activity in the Harbour, which is currently managed through a Memorandum of Agreement for Bait Digging in Poole Harbour.

3.2.5 Poole Harbour Dredge Permit Byelaw

The Poole Harbour Dredge Permit Byelaw manages fishing for shellfish with a dredge and was introduced in 2015 to replace the Poole Fishery Order 1985. A pump scoop dredge is used in Poole to fish for Clams and Cockles which is a unique method to the Harbour. This can be done using either a hand held or trailed dredge method. The legislation regulates the use, retention on board, storage, and transportation of a dredge within Poole Harbour through the issue of annual permits and associated conditions. The permit conditions include certain areas of the Harbour being excluded from fishing year-round to prevent disturbance to vulnerable bird species protected by SPA and Ramsar Sites including Holes Bay, Lytchett Bay and the upper sections of Wych and Middlebere lakes as well as Brownsea lagoon, which is not accessible to fishing vessels. There is a closed season between 23rd December and 25th May to protect species during a vulnerable time, due to reduced food sources and colder weather. Dredging is only permitted between 6 am and 6 pm Monday to Saturday and there are restrictions on the type of dredge that can be used including the horse power of the pump which is limited to 15 to minimise noise and disturbance. During the 2015 season, from 1st July to 24th December, 312 tonnes of Manila Clam and 12.6 tonnes of Cockles were removed from the fishery and during the 2016 season, 160 tonnes of Manila Clam and 10 tonnes of Cockles were removed from the fishery (Southern IFCA, per comm.). Since July 2015 there has been a 75% decline in illegal and unregistered shell fishing in the harbour since the introduction of the byelaw (Southern IFCA, per comm.) which is a testament to the success of the legislation. In order for the fishery to remain sustainable a maximum of 45 permits are currently allocated annually to reflect the current fishing effort.

There are also additional management measures for the fishery under the “Bottom Towed Fishing Gear Byelaw” to prevent damaging activities from taking place in sensitive habitats such as seagrass beds, and regulations on minimum legal sizes for shellfish which come from both European legislation and local Southern IFCA byelaws.

3.2.6 Aquaculture in Poole Harbour

Under the Poole Harbour Fishery Order 2015, 31 defined lease beds are leased out by Southern IFCA. The Several Order covers shellfish species as stated in the Marine and Coastal Access Act 2009 as “crustaceans and molluscs of any kind” and the purpose of the order is to restrict the fishing rights in a specific area for a set period of time (Bennett, 2011). Once a Several Order is granted one has the right to take shellfish from the area, create shellfish beds and collect, move or deposit shellfish within the specified area. It is also an offence for those who do not have the rights to the shellfish beds to remove or injure the shellfish (GOV.UK, 2013).

Natural England provided formal advice on the potential impacts of aquaculture in Poole harbour on natural conservation features. The order falls within the Poole Harbour EMS and SSSI, therefore consideration needed to be given to proposed activities and associated management measures to minimise effects (Bennett, 2011). The Order promotes aquaculture within the district with structured and appropriate management (Bennett, 2011).

3.3 CLAMS AND COCKLES

3.3.1 Manila Clams

Manila Clam, *Ruditapes philippinarum* (Adam and Reeve, 1850) was first introduced to the Harbour during 1989 where it was thought the conditions were unsuitable for breeding (Humphreys et al, 2009). However, by 1992 the Clams had begun to reproduce and successfully grown to a marketable size (Humphreys and May 2005). The Manila clam is found in fine sediments within the intertidal and sub-littoral (Jensen et al, 2005), living buried in the sediment as adults and suspension feeding. The Clams are dredged from the aquaculture beds and wild fishery using gear that has been modified to reduce the impact on the seabed as much as possible (Humphreys and May, 2005). The Clam fishery is an extremely important economic source for the fisheries of Poole has been licenced since 1994 (Humphreys et al, 2007).

3.3.2 Common Cockle

Common Cockle, *Cerastoderma edule* (Linnaeus, 1758) is a native bivalve to the British coast. These suspension feeding organisms are found in sandy and muddy sediments on the intertidal, although individuals can also be found in the subtidal. They can tolerate low

salinities which encourages the development of estuarine populations (Hayward and Ryland, 1995).

3.4 AIMS

The overall aims of the stock assessment are to assess the population structure and stock levels within the Harbour and assess any changes from previous years. This data is used to inform the management of the fishery and is fed into the annual Habitats Regulations Assessment for the Permit byelaw. This is required each year prior to the annual issuing of permits. In addition, the data helps to ensure the fishery continues to be sustainable; this is of particular relevance as the fishery is being assessed under the Marine Stewardship Council's (MSC) sustainability assessment with the aim of having the fishery certified as sustainable in 2018.

4 METHODOLOGY

This study conducted in 2017 used the same methodology as the 2016 assessment, consisting of two different parts. The first section conducted on 10th and 11th April 2017 used a trailed pump-scoop dredge as used by the fishers in Poole Harbour to gather samples of bivalves which were measured and weighed. The second part of the survey undertaken on 12th and 13th April used a sediment hand drag which had been modified to take benthic samples at a fine scale. The sediment samples were then sieved to obtain the data on the smaller specimens of Clams and Cockles. 27 Sites were surveyed. In 2016, Site 9 was deemed to be unsuitable for sampling owing to the habitat type and was therefore omitted from this year's survey.

4.1 PUMP SCOOP METHODOLOGY

The survey work was carried out by a chartered fishing vessel 'Jake' using a trailed pump-scoop dredge. Sampling was carried out on 27 defined shellfish beds (Figure 1) with three dredges completed for each bed using the following methodology:

1. A stake was placed at the centre of the shellfish bed at a pre-determined coordinate (Table 1)
2. Three dredges were taken around the centrally marked point within a radius of 20m
3. For each dredge, the start time was recorded and the dredge was deployed for a period of 2 minutes. During these two minutes, the number of rotations made by the vessel was recorded.

4. After 2 minutes, the dredge was brought on board, emptied into a container and labelled with the bed name and number and the dredge number
5. Samples were transferred to FPV Endeavour where they were sorted into Cockle and Clam species with each individual measured along its widest axis. Once measured individuals of Cockle and Manila Clam from each sample were sorted into above and below minimum landing size (35mm for Manila Clam, 23.8mm for Cockle) and weighed.
6. Once measurements had been taken, the samples were returned to the Harbour.

4.2 SEDIMENT DRAG METHODOLOGY

The second part of the survey was conducted using a modified drag which consists of a metal frame with a fixed 30cm wide opening and a fine mesh bag which was dragged across 1m of sediment at a depth of 10-20 cm to obtain a sample. The second part of the survey enabled the collection of smaller size classes of Clam and Cockle species with the aim of providing a fuller picture of the population structure in the Harbour and to give an idea of the potential recruitment to the fishery. Sampling was carried out at the same 27 defined shellfish beds (Figure 1) with three drags completed for each bed according to the following methodology:

1. A stake was placed at the centre of the shellfish bed at a pre-determined coordinate (Table 1).
2. A second stake was placed at a distance of 1m from the first stake to give a defined length of sediment for the drag.
3. The drag was then dragged through the sediment along the 1m distance by hand; the sediment retained in the mesh basket and brought on board the vessel and labelled.
4. This was repeated three times around the stakes to get three distinct samples.
5. The sediment samples were then sieved using a 1mm mesh sieve and any material retained on the sieve was retained and preserved in a 4% Formalin solution with Rose Bengal. The samples were later sorted for Clam and Cockle species with the species identified and individuals measured along the widest axis (width).

4.3 STUDY SITE

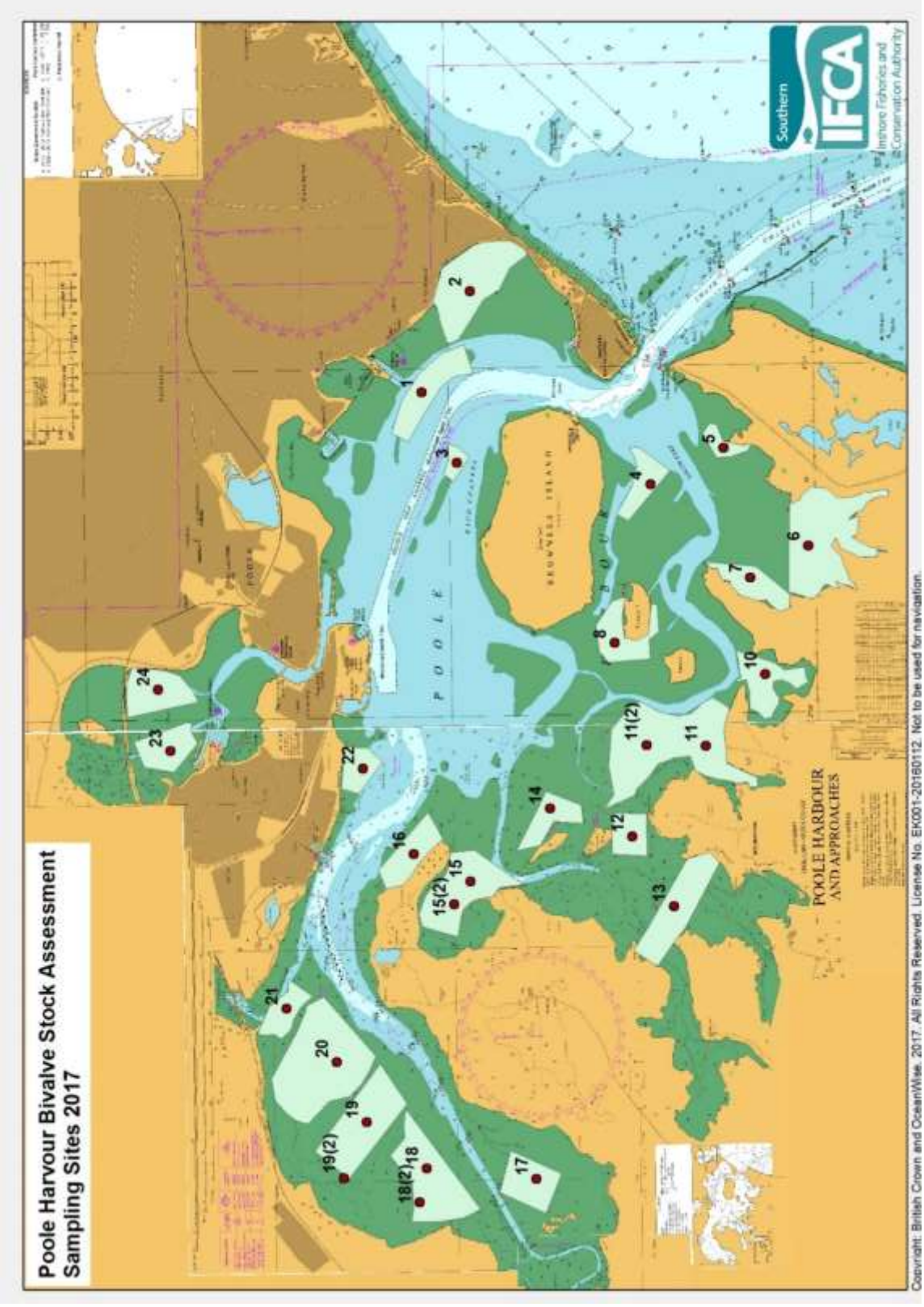

Figure 1 Shellfish beds sampled during survey, numbers correspond to Site names and associated coordinates in Table 1

4.4 SITE NAMES AND CODES

Site No.	Site Name	Location of central mark			
		Latitude		Longitude	
1	Middle Ground	50	42.147	1	57.205
2	Whitley Lake	50	41.875	1	56.337
3	Aunt Betty	50	41.959	1	57.813
4	Blood Alley	50	40.900	1	58.023
5	Jerrys Point	50	40.498	1	57.717
6	Brands Bay South	50	40.040	1	58.569
7	Brands Bay West	50	40.362	1	58.837
8	Furzey Island	50	41.110	1	59.384
10	Newton Bay	50	40.286	1	59.671
11	Wards*	50	40.617	2	00.282
11(2)	Ower Bay*	50	40.943	2	00.272
12	Round Island*	50	41.027	2	01.053
13	Wych and Middlebere Lake	50	40.804	2	01.659
14	Long Island	50	41.475	2	00.803
15	Arne	50	41.914	2	01.425
15(2)	Inner Arne	50	42.006	2	01.621
16	Patchins Point	50	42.224	2	01.180
17	Giggers	50	41.575	2	03.996
18	Keysworth	50	42.175	2	03.894
18(2)	Inner Keysworth	50	42.215	2	04.181
19	Holton Mere	50	42.499	2	03.488
19(2)	Inner Holton Mere	50	42.629	2	03.965
20	Seagull	50	42.660	2	02.964
21	Rockley Spit	50	42.931	2	02.501
22	Hamworthy	50	42.494	2	00.437
23	Upton Lake	50	43.546	2	00.267
24	Creekmoor Lake	50	43.610	1	59.738

Table 1: Coordinates of a central point for each shellfish bed.

*The name of the Site has been changed from 2016 survey to more correctly reflect the area within the Harbour from which the samples are taken, the numbers remain the same so comparisons between years will not be affected.

5 RESULTS AND DISCUSSION

5.1 2017 SURVEY

An initial analysis was carried out on the results from the first two days of the bivalve survey using a trailed pump scoop dredge. Several species were collected during sampling and all were made a note of, however, the main focus was kept on the Manila Clam and Cockle. The Average weights of Manila clams and Cockles have been displayed in bar charts using standard deviation to calculate error bars.

5.1.1 Weights of Shellfish

5.1.1.1 Cockles

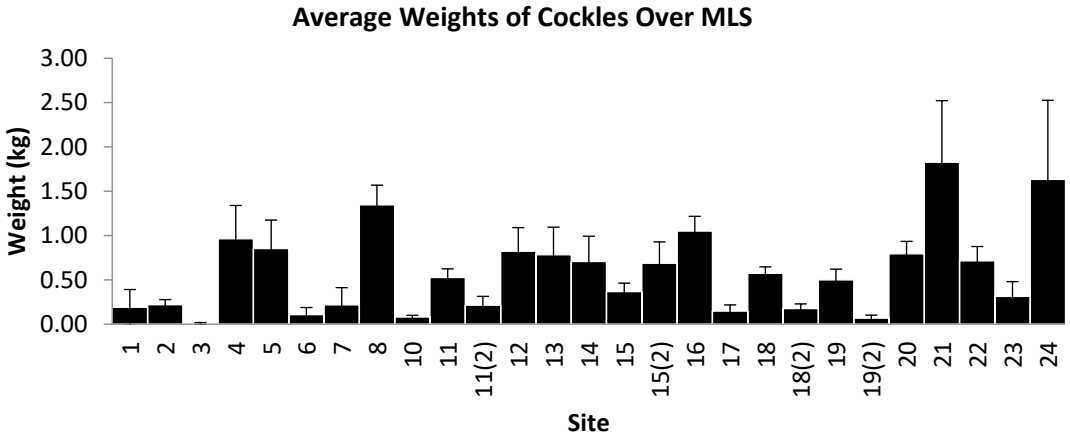

Figure 2: The average weight of Cockles over Minimum Legal Size (MLS) of 23.8mm for each site, error bars refer to standard deviation.

Figure 3: The average weight of Cockles under Minimum Legal Size (MLS) of 23.8mm for each site, the error bars refer to the standard deviation.

The average weight of Cockles over Minimum Legal Size (MLS), as shown in figure 2, varies greatly between Sites with the highest volume dredged from Sites 21 (1.83kg) and 24 (1.63kg). Site 21, at Rockley Spit, is more suitable for Cockles rather than Clams as it is comprised of coarser and sandier type sediments. As the majority of fishing effort from the permit fishery is focused on the more commercially valuable Manila clam, this site tends to be used less often by the dredge fishery (Southern IFCA, per comm.) despite it being open for the entirety of the season, with neighbouring sites in Holton Mere being preferred which may explain the higher volume of oversized cockles at this site. Sites 23 and 24 are closed to fishing at all times due to them being within the prohibited Holes Bay area, therefore the individuals are not removed from the site which may explain the higher volumes seen.

Many of the Sites had fewer individuals below MLS, as shown in Figure 3, excluding Site 15(2) which weighed in, on average, at 0.17kg. This is likely to be due to the site being closed seasonally and difficult to enter and requiring a high tide to fish resulting in lower levels of overall disturbance. The sheltered nature of this site combined with the lower disturbance could make this a suitable site for settlement of larvae which could explain the higher levels of smaller individuals. It is important to note that the method used to obtain the samples, using a pump-scoop dredge, is designed to select for individuals at or above MLS therefore although indicative, the results from this survey need to be used in conjunction with those from the juvenile sampling to get a more robust assessment of the whole population. As seen previously site 24 has a higher average weight which may be due to the area being closed to fishing and therefore not subject to high levels of disturbance.

5.1.1.2 Manila Clams

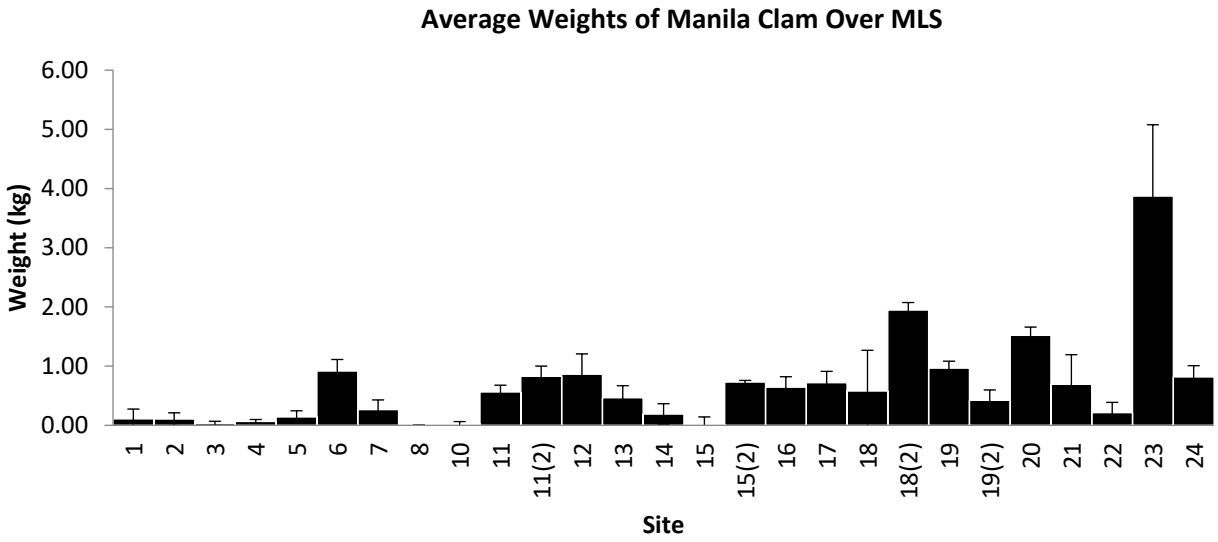

Figure 4: Average weights of Manila Clams over Minimum Legal Size (MLS) of 35mm for each site, the error bars refer to the standard deviation

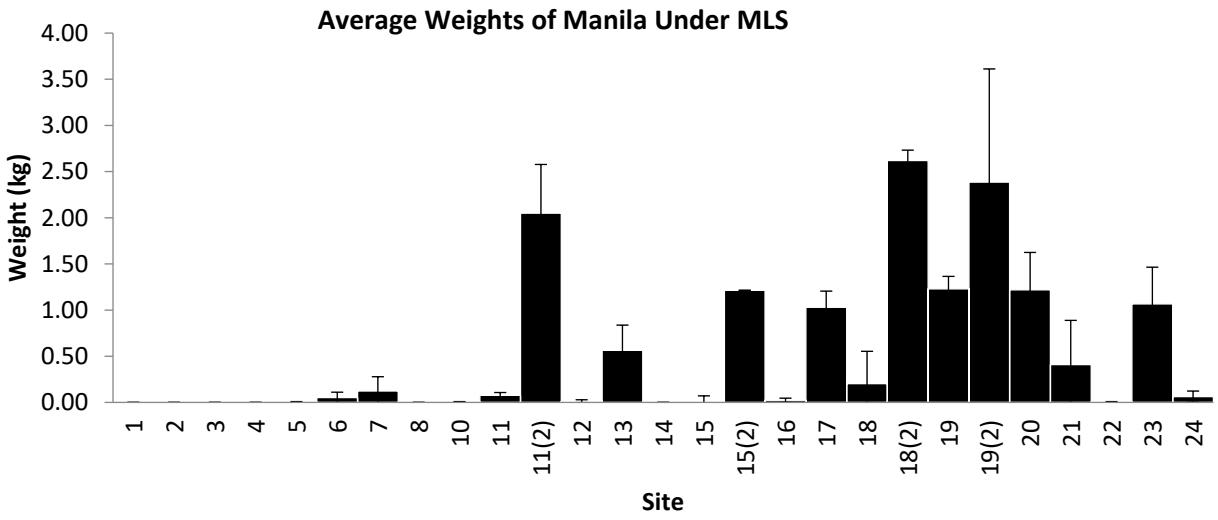

Figure 5: Average weights of Manila Clam under Minimum Legal Size (MLS) of 35mm for each site, the error bars refer to the standard deviation

Figure 4 shows the average weights of the Manila Clams, over MLS, caught in the pump-scoop dredge is variable, like the catches of Cockles seen in figure 2. The highest catch was found in Site 23 (3.87kg), one of the sites which is permanently closed to dredging activity explaining the greater weight of manila clam shown here as they are not being removed by the fishery. Site 18(2) is also closed seasonally, meaning that the site will have been closed

since 1st Nov 2016 giving at least five months where the site hasn't been fished prior to this survey, which may explain the higher average weight found on this Site of 1.95kg.

Sites 10 and 15 showed some of the lowest quantities of Manila clam above MLS at 0.02kg for each. Sites 15 and 10 are within more sheltered bays, namely Arne Bay and Newton Bay respectively. These areas are not the most popular areas for dredging but have historically been susceptible to large amounts of weed gathering in the spring and summer. When conducting the survey for 2017 there were quantities of weed present in the Harbour particularly in areas like Newton Bay where the sheltered nature allows the weed to accumulate. The build-up of weed did hinder the progression of the dredge in some areas and it could be the reduced efficiency of the dredge that led to the lower weights of Manila clam seen in the results.

Figure 5 shows the areas with the highest average weight of Clams under MLS was at Sites 11(2) (2.05kg), 18(2) (2.62kg) and 19(2) (2.39kg) which suggests the fishers have removed the larger individuals over MLS and left the undersized population. This is also reflected in Figure 4 with lower weights of Clams above MLS found in areas 11(2) and 19(2). These areas are all fished regularly (Southern IFCA, per comm.), with only site 18(2) subject to any seasonal closure; therefore it would not be unexpected to find fewer individuals over MLS. In addition, site 18(2) at Inner Keysworth is a more sheltered area of the Harbour. The shallow and more sheltered nature of the area, combined with it being seasonally closed, may result in more larval settlement in this area which has been given the opportunity to grow, relatively undisturbed, for at least five months prior to the survey which may explain the higher proportion of smaller Manila clams at this site. The high levels of undersized Manila clam in these sites that are subject to greater fishing pressure is encouraging in terms of examining the success of the current management measures as it would suggest that the undersized clams are not being removed from the fishery illegally.

The smallest weights of Manila clam under MLS were found at sites 1-5, 10, 14, 15 and 22 where no Manila clam under MLS were recorded. Sites 1-5 and 22 comprise of coarser, sandier sediment types which would be less suitable for clam settlement. Sites 10, 14 and 15 are more suitable in terms of sediment type but may be more susceptible to weed settlement which, as discussed above, may have affected the efficiency of the dredge meaning that some of the smaller individuals may have been missed.

5.1.2 Size of Shellfish

5.1.2.1 Manila Clams

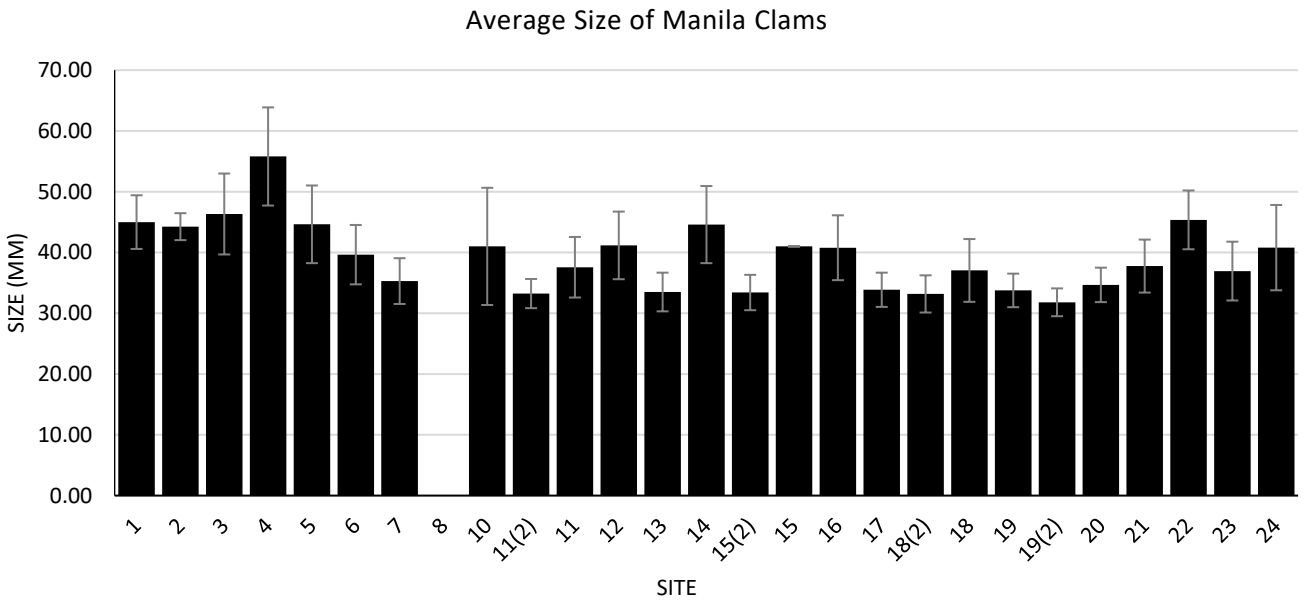

Figure 6 Average Size of Manila Clams (mm for each site, the error bars refer to the standard deviation

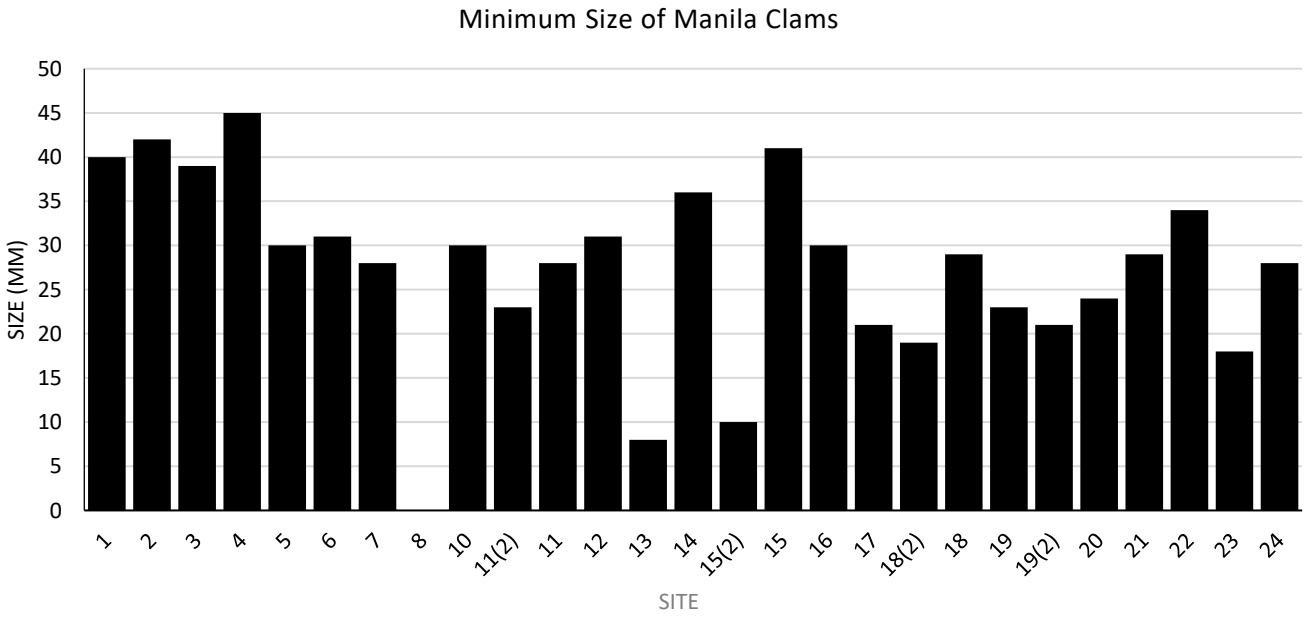

Figure 7 Minimum Size of Manila Clams caught (mm) at each site

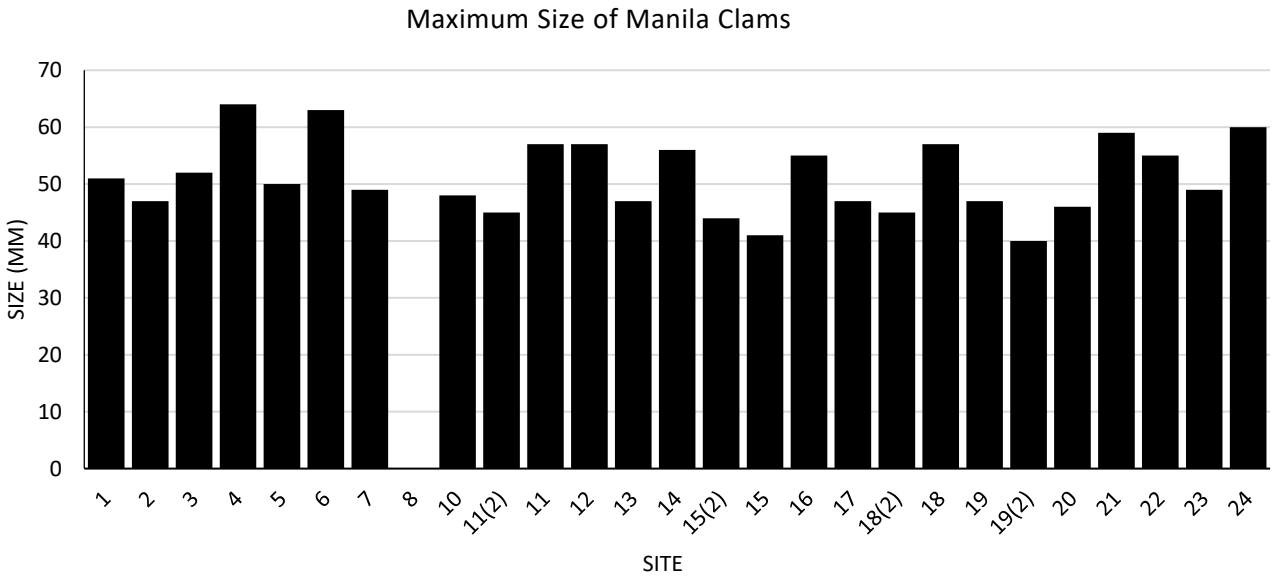

Figure 8 Maximum size of Manila Clams caught (mm) at each site

The average size of Manila Clams appears to be consistent between 30-45mm, excluding Site 8 where no Clams were found, as shown in Figure 6. This result would be expected due to the MLS for Clams being 35mm and above this individuals would generally be fished out. Figure 7 demonstrates how the minimum size of the Clams varies greatly across the Harbour, with the smallest individuals being found in Sites 13 and 15(2) below 10mm. However, Sites 2, 4 and 15 all had smallest individuals of larger than 40mm. It is important to note that there were few Manila Clams caught at these sites; site 2 total count of 4, site 4 total count of 5 and site 15 total count of 2 therefore it is difficult to conclude that the large minimum size of Manila clam seen at these sites is indicative of the population in these areas. The maximum size of Manila Clam is shown in Figure 8 and displays variations between 40mm and 64mm which is well over the MLS showing that there is a good spread in sizes. Although the number of Clams varies considerably at each site and it is important to note that the survey was undertaken at a time when the fishery had been closed for nearly 4 months, therefore no recent exploitation had taken place.

The sizes of the Manila clam varied between 55.8mm (Site 4) and 31.8mm (Site 19(2)) which is comparable with previous work where similar size ranges were found (Humphreys et al., 2007) although there the top end of the range is greater in this study. The smallest Manila Clam found at each site varied between 45mm (Site 4) and 8mm (Site 13). The smaller individual found in site 13 may be as a result of this site being sheltered and also subject to seasonal closure which may, as with other similar sites showing increased

quantities under MLS, make it a suitable site for the settlement of spat. Finally, the largest Manila clam found at each site varied between 64mm (Site 4) and 40mm (19(2)). This showed that Site 4 had the highest average size, highest maximum size and the highest minimum size across the sites, therefore it could be assumed Site 4 had a good range of population, however, there were only 5 individuals found Which gives less confidence to the pattern seen representing the whole of this site area.

Finally, Site 19(2) is interesting because it has a high weight of Manila clam but individuals have on the whole been leaning towards the lower than MLS. This indicates that there are lots of small individuals in this site. This site is one of the most popular fishing sites in the Harbour, along with site 19; this would result in the large individuals above the MLS being removed during the fishing season leaving a greater proportion of undersized individuals. Again, this is encouraging as it would suggest that only the legal portion of the population i.e. that which is sizeable, is being removed. The large quantity of small individuals in this site may suggest it is a preferred settlement site for larvae, comparisons with the data from the juvenile part of the survey would provide more evidence to support this.

5.1.2.2 Cockles

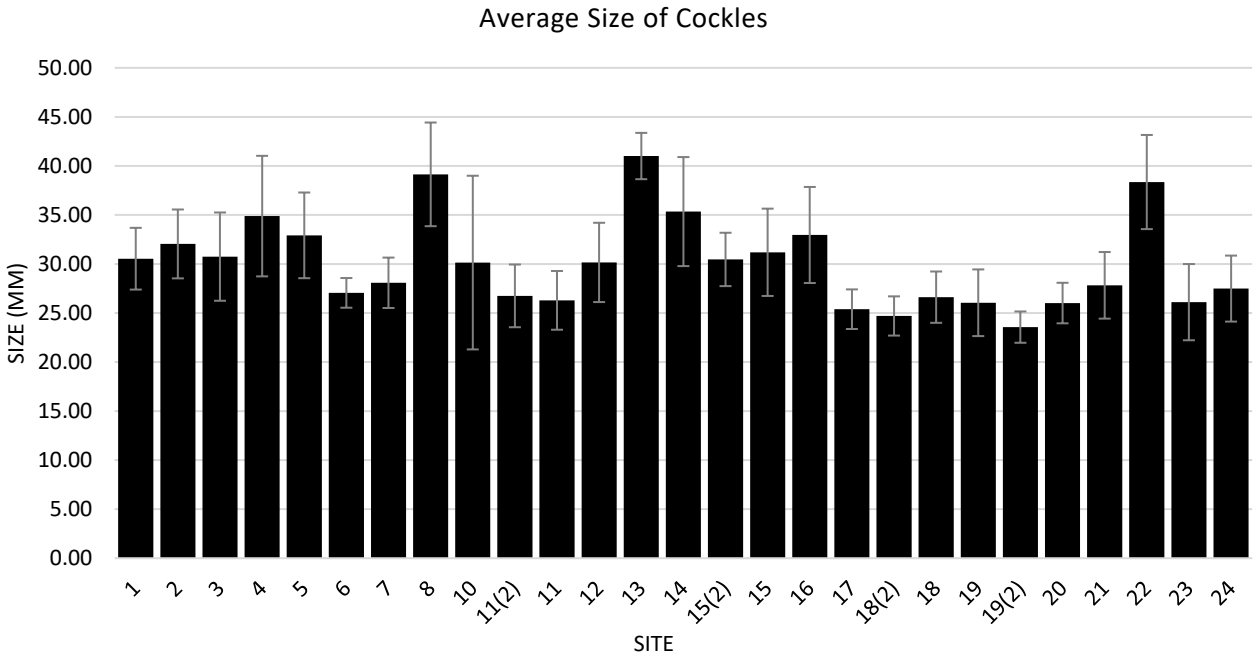

Figure 9 Average size of Cockles (mm) for each site, the error bars refer to the standard deviation

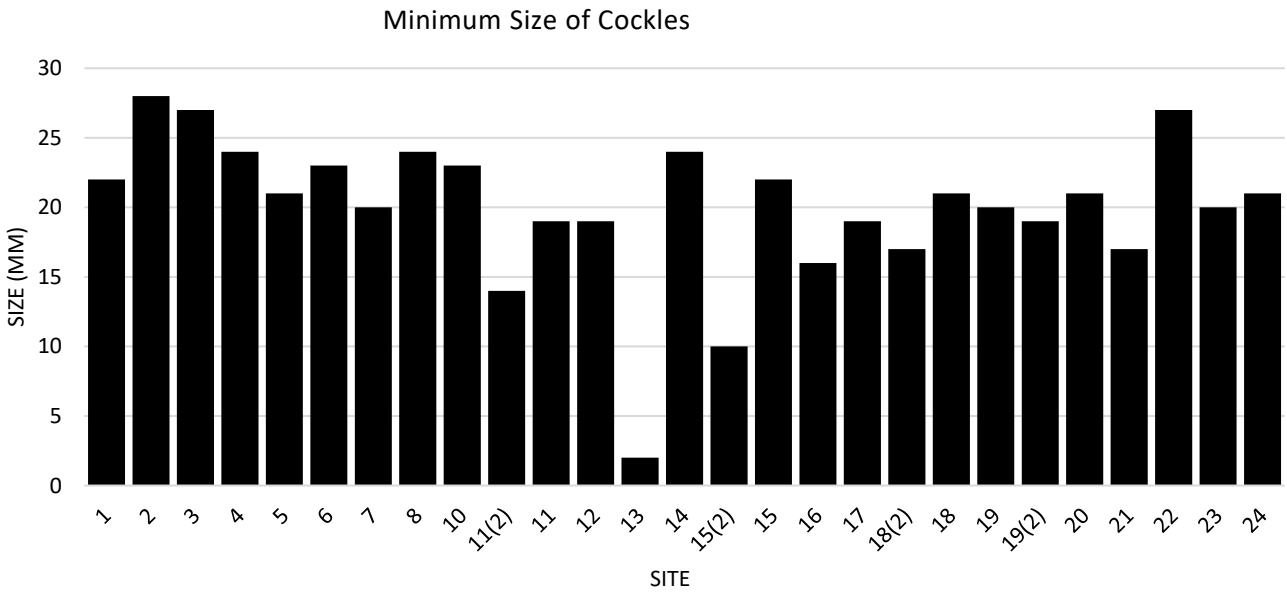

Figure 10 Minimum size of Cockles (mm) caught at each site

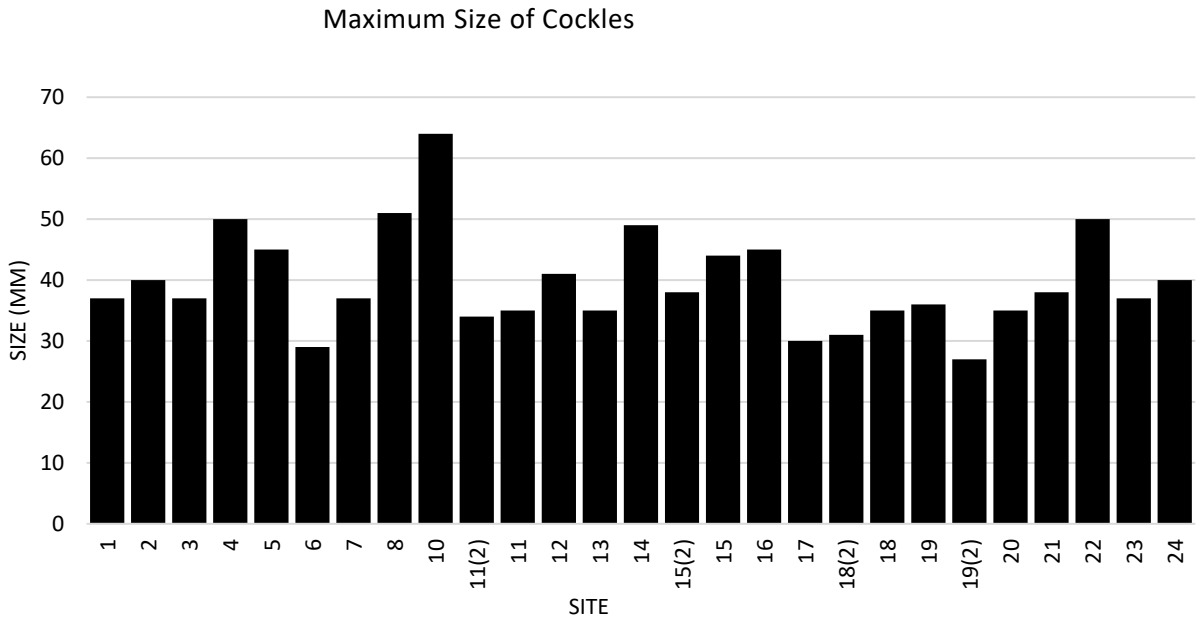

Figure 11 Maximum size of Cockles (mm) caught at each site

The average size of the Cockles varies between 23mm and 41mm as shown in Figure 9. Again, this concurs with the MLS of 23.8mm and shows the average Cockle size is at or

above the MLS, indicating good growth. The highest average sizes for cockles were found at sites 8 (39.1mm) and 13 (49.2mm).

The smallest individuals for cockle varied between 28mm in Site 2 and 2mm in Site 13 as shown in Figure 10. Site 13 interestingly had the highest average size of individuals and the smallest individual as well as also having the smallest recorded Manila clam. The largest recorded individuals of Cockle (Figure 11) were measured at 64mm in site 10 and 50mm in Sites 4 and 22. Sites 4 and 22 have a sandy sediment type suited to the growth of cockles and are generally fished less frequently than other sites in the west of the Harbour (Southern IFCA, per comm.). Site 10, although comprised of a finer mud sediment is also fished infrequently which may explain why the cockles were able to grow to a larger size. Sites 23 and 24 showed a smaller average size of cockle however they showed some of the greatest overall numbers of cockles, site 23 at 560 and site 24 at 562 most likely due to these sites being permanently closed to dredging so no individuals should be being removed.

5.1.2.3 Histograms of Clams and Cockles Sizes

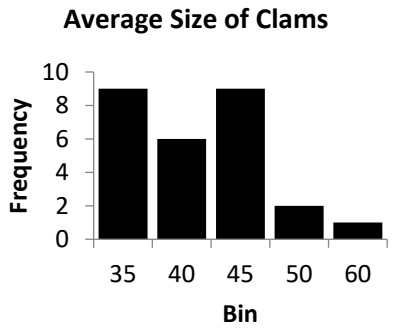

Figure 13

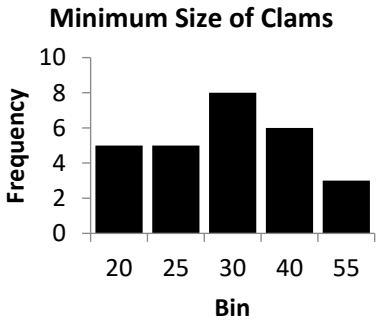

Figure 14

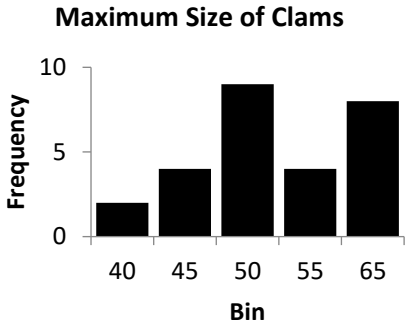

Figure 12

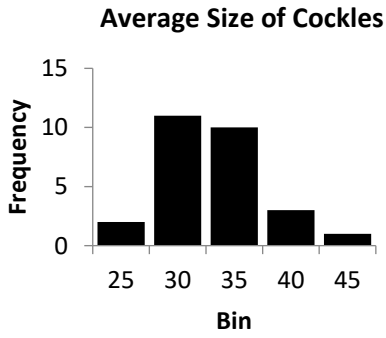

Figure 15

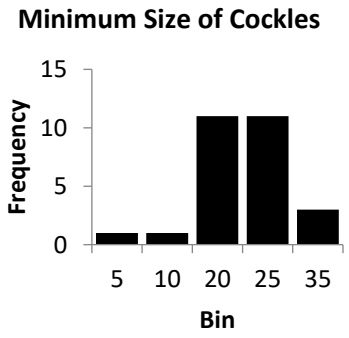

Figure 16

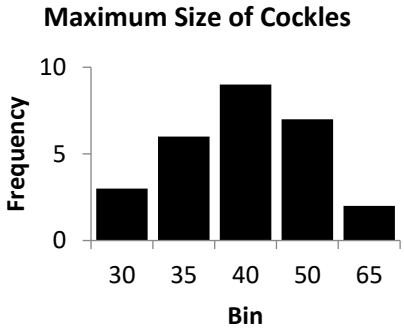

Figure 17

Figures 12 -14 show the frequency of individuals found in each size class of Manila Clam across all sites. Many of the Clams are on average found to be between 0 and 40mm with a rapid decline between 50 and 70mm. The minimum size of the Clams found at each site appears to be stable across the classes with the majority being just under the minimum legal size of 35mm. The maximum size of the Clams found at each site appears to be more inconsistent but there are higher numbers of individuals reaching sizes of 65mm.

Figures 15-17 show the frequency of individuals found in each size class of Cockle. The Cockles on average look to have most of the individuals between 25-40mm. The minimum size of the Cockles found at each site tends to be more frequent between 11-34mm which overlaps the MLS. The Maximum size of the Cockles found at each site shows a more consistent breakdown over the different classes, with the most frequent class being 36-49mm. This shows that not all the larger individuals are fished out and there is a good level of growth.

5.2 2016 OBSERVATIONS

The data was compared with the results from the 2016 bivalve survey and there does appear to be changes in some sites (Poole Harbour Bivalve Stock Assessment 2016).

5.2.1 2016 Summary

5.2.1.1 Manila Clams

In 2016, the average size of the Clams fluctuates across the sites, generally between 35mm and 50mm with an extreme of 55mm in the case of Site 1. Sites 1, 4 and 12 have a larger average size, 55.0mm, 48.5mm and 48.6mm respectively, sites 1 and 4 are generally subject to lower levels of fishing activity (Southern IFCA, per comm.) which would allow the individuals to grow to larger sizes, although it is important to note that the overall number of clams found at these sites was low. Site 12 exhibits quite muddy sediments and is therefore well suited to the Manila clam. There is a great difference between the minimum size of Clams found across the sites, however, the sites which are subject to higher levels of fishing activity such as sites 18(2), 19 and 19(2) tend to have smaller individuals present and a lower average size overall which would correspond to the higher fishing pressures in these areas. In 2016, the maximum size of the Clams appears to show the largest individuals are found in Sites 2, 5, 12, however, it is important to note that the graphs do not show how many individuals of each Site are large or small and there may be only one of a particularly large size. Site 19(2) has a smaller maximum size of Clam but this site is regularly fished and is expected.

The average size of the Manila Clams shows the highest frequency of size is found between 0 and 49mm and rapidly declining after 59mm. The frequency of the minimum size of Clams interestingly shows that the lowest frequencies are found on the MLS mark but it has a higher number either side. It is expected to find higher numbers below the MLS but not necessarily above the MLS as these individuals would be removed from the fishery. The maximum size of Manila Clams is well over MLS and large individuals are found frequently across the Harbour.

5.2.1.2 Cockles

The average Cockle size across the sites around the Harbour varies again but indicates that certain sites have larger individuals than others. Site 4, 8, 14 and 22 are shown to have the largest specimens on average. All of these sites are subject to lower levels of fishing pressure which would allow the individuals to grow to a larger size, particularly when coupled with the fact that prior to surveying the dredge season had been closed for at least 3 months. The minimum size of Cockles across the Harbour has less variation with most of the measurements falling between 15 and 20mm. This is just under the MLS of 23.8mm. As shown in Site 11, with the smallest cockle recorded at 9mm, the sites more regularly fished generally have lower minimum sizes of Cockles. The Sites with the largest maximum size of Cockles are 4, 8, and 14 which correspond to the larger average sizes for these sites and is likely due to the lower fishing pressures in these areas.

The average size of Cockles varies and the frequency of individuals in each size class appears to be most frequent at 26-34mm. The minimum size of the Cockles tends to be over 25mm which shows many of the smallest Cockles are still over MLS. Lastly, the maximum size of the Cockles is also over the MLS, across the Harbour.

5.3 COMPARISONS OF 2016 AND 2017 DATA

5.3.1 Manila Clams

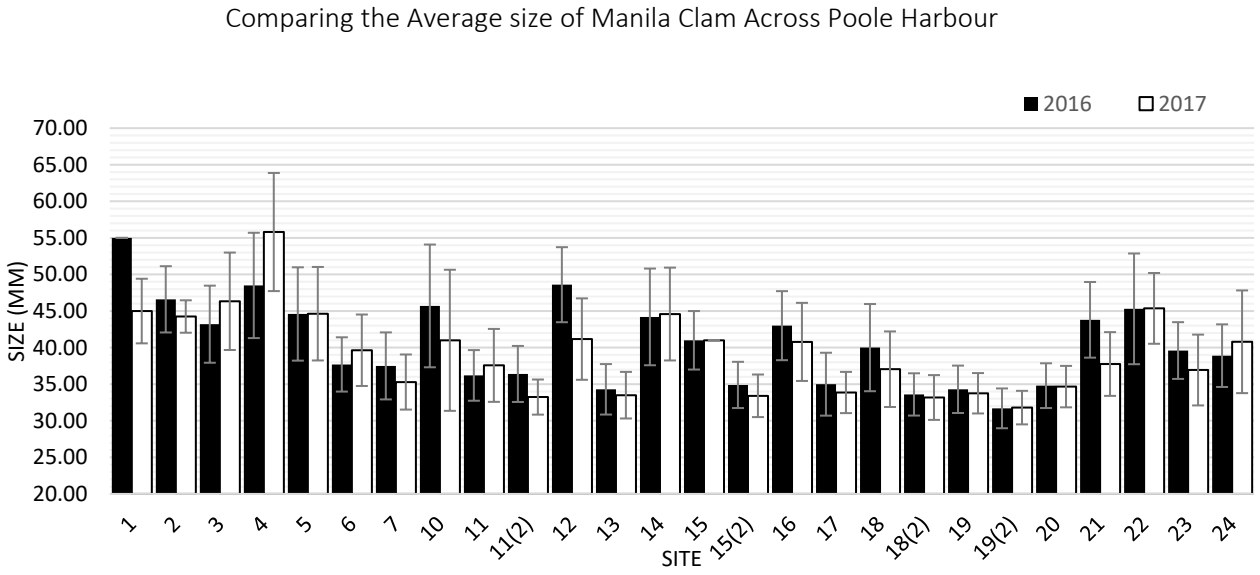

Figure 18 Average size of Manila Clams in 2016 and 2017 for each site, the error bars refer to the standard deviation

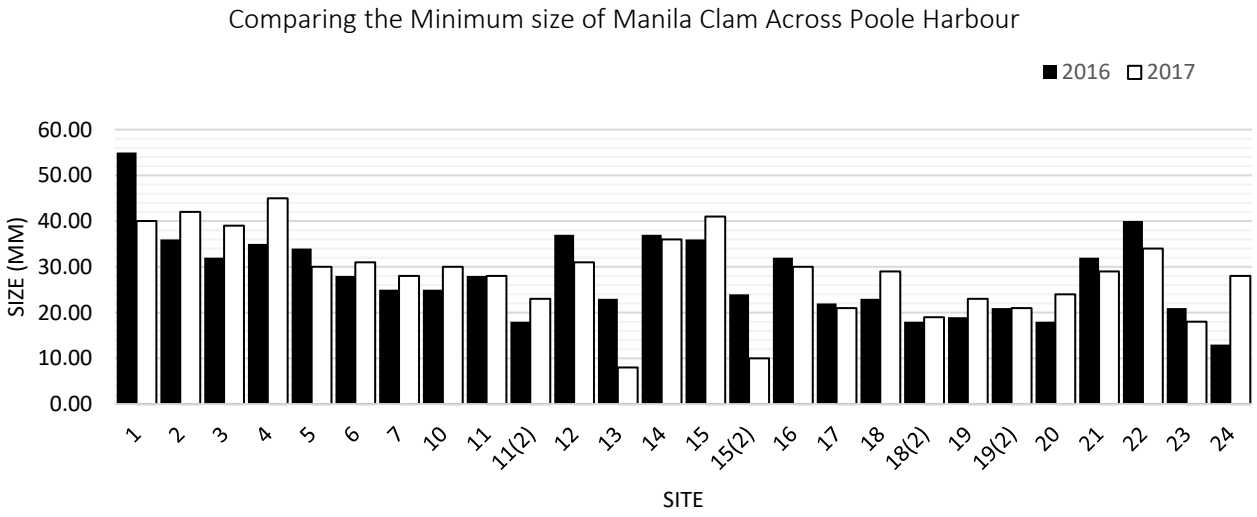

Figure 19 Minimum size of Manila Clams in 2016 and 2017 for each site

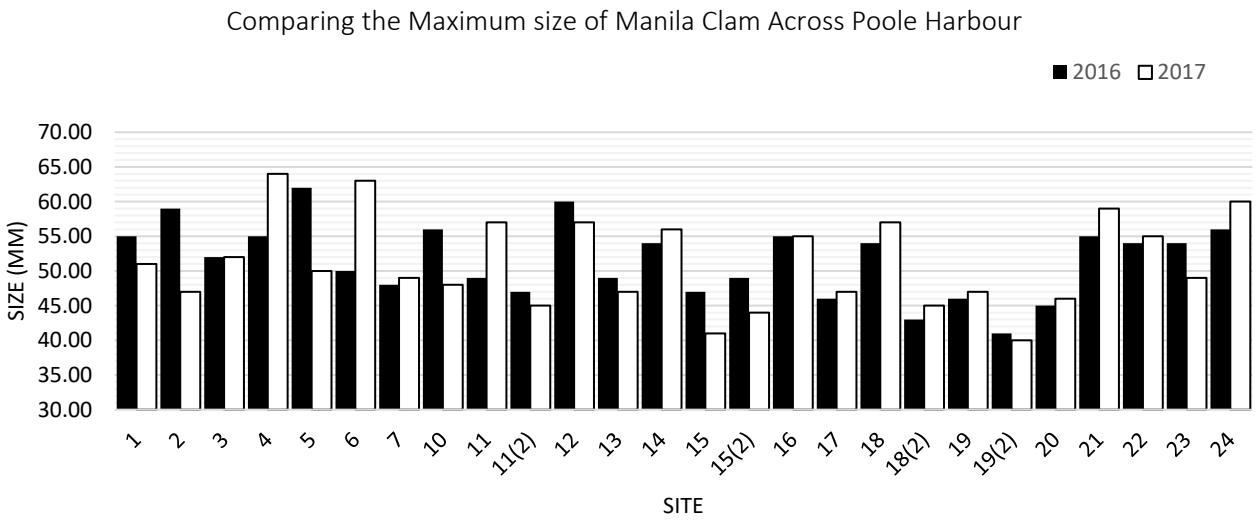

Figure 20 Maximum size of Manila Clam in 2016 and 2017 for each site

The population appears to have maintained their sizes consistently between 2016 and 2017 the majority of sites, although some sites have shown improvements and declines in average size. For example, there has been an improvement in the average size of individuals of Site 4 but a decline in Sites 1 and 12 and 21. The maximum size of the Clams found at each site appears to fluctuate across the sites when compared year on year with certain sites increasing in size in 2017, such as sites 4, 6, 11, 21 and 24. However, some sites have also seen declines in maximum Clam size across the two years with Sites 1, 2, 5, 10 and 15(2) showing larger individuals in 2016.

5.3.2 Cockles

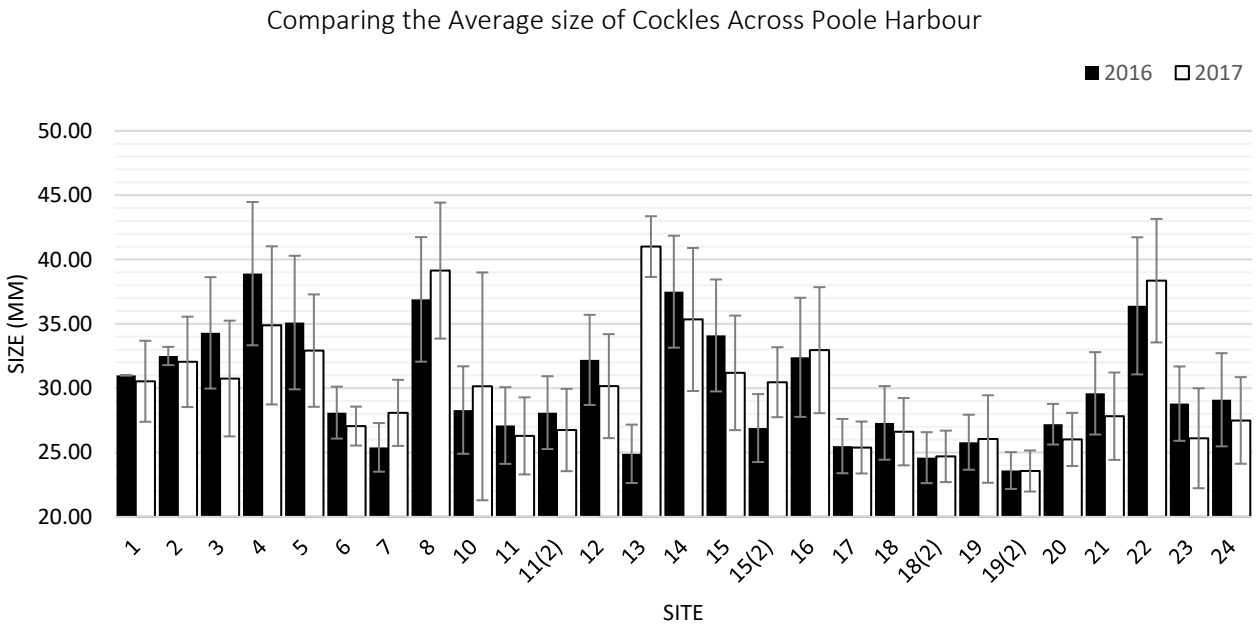

Figure 21 Average size of Cockles in 2016 and 2017 for each site, the error bars refer to the standard deviation

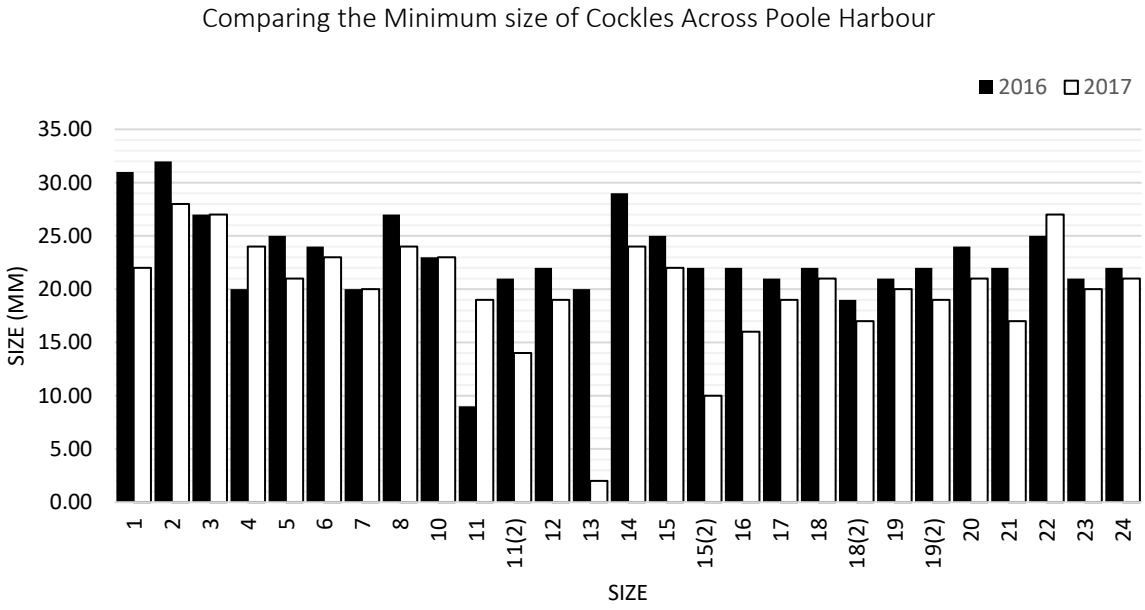

Figure 22 Minimum size of Cockles in 2016 and 2017 for each site

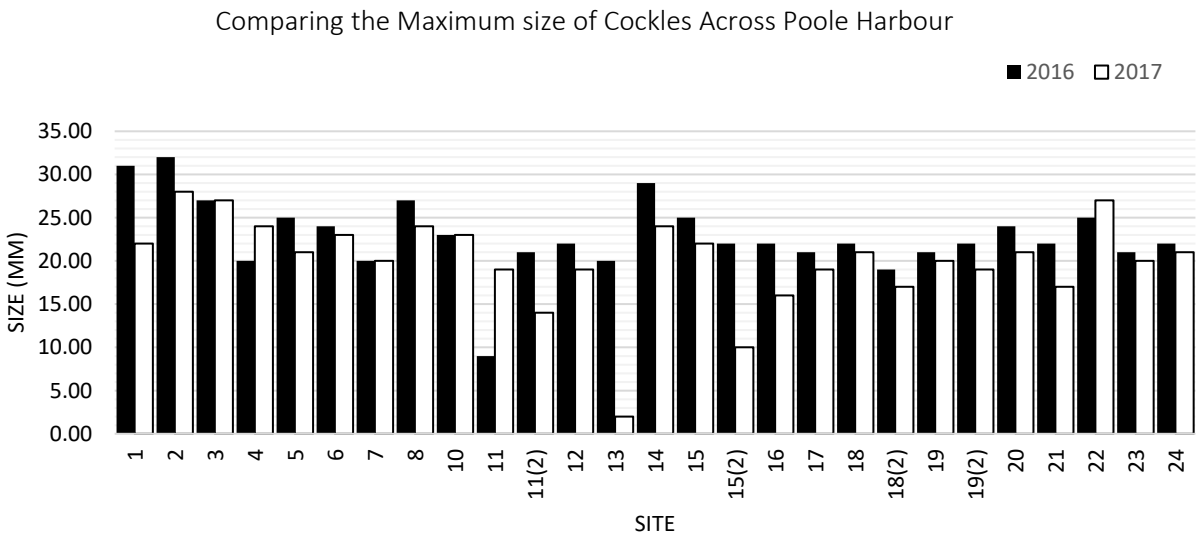

Figure 23 Maximum size of Cockles in 2016 and 2017 for each site

The average size of the Cockles has decreased across the sites excluding 7, 8, 10, 13 and 22 and the minimum size of the Cockles found at each site remains relatively stable aside from Site 11 which has seen a big increase, and Site 13 which has seen a big decline. The maximum size of the Cockles found at each site has again remained constant with big changes only occurring in Site 11 where there has been a substantial increase in size and Site 13 where there has been a decrease from 20mm to 2mm. On the whole, the population appears to remain stable but further analysis would be needed to clarify this further.

5.3.3 Number of Individuals fished

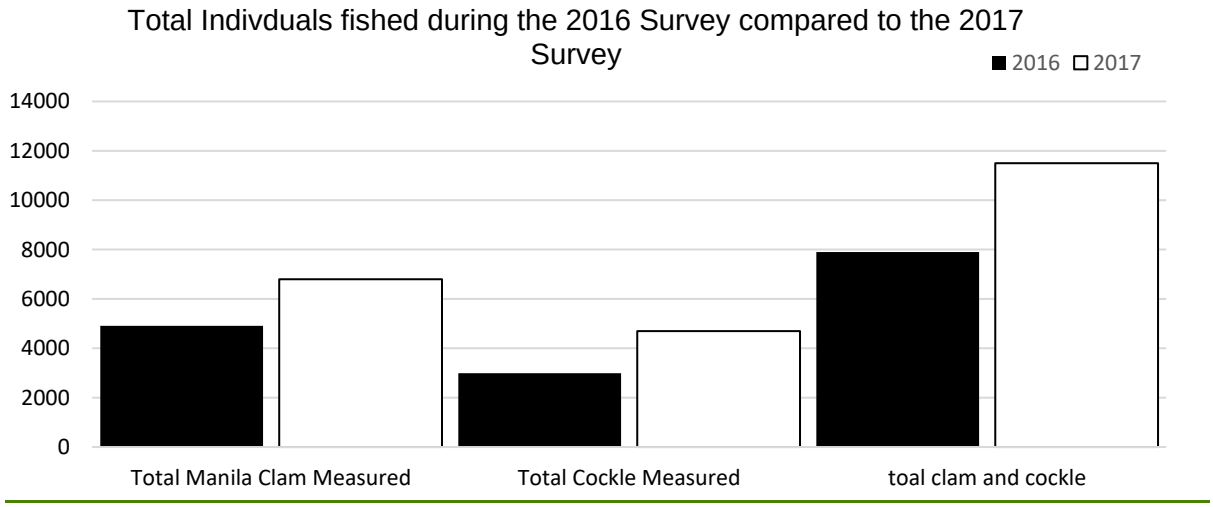

Figure 24 Comparison of individuals fished between 2016 and 2017

There has been a much greater catch in the 2017 survey when compared to 2016 which could be indicative of success of the new management measures resulting in a more stable population of Manila clam and cockle across the Harbour as the more stringent regulations have cut down on the removal of undersized shellfish and the decline in illegal activity meaning that there is likely to be little to no activity during the closed season preserving the population. It is important to note that this increase could also partially reflect a greater familiarity and efficiency with the method used by those undertaking the survey. The second part of the survey looking at the juvenile stock will add to these results and allow estimates to be made about the position of the fishery in relation to Maximum Sustainable Yield (MSY) by combining this data with catch and growth data. This will contribute toward the potential MSC accreditation and allow for future assessments of the sustainability of the fishery to ensure that, if certified, it continues to meet the requirements of that certification.

The aims of this study were to assess the population structure of the shellfish fishery in Poole Harbour, paying close attention to the Manila Clam, *Ruditapes philippinarum* and Cockle, *Cerastoderma edule.* The study so far has shown that whilst there has been a variation in weights and sizes of shellfish across the Harbour certain sites are showing similar patterns with those that are fished more regularly showing smaller average sizes.

5.4 Comparison of Research

5.4.1 Cockles

Cockles are marketed across Britain and one paper that looks at the variation and studies the growth rate was Cole, (1956). Cole agrees that Poole Harbour is a favoured environment for fishing Cockle due to warmer waters and sheltered habitat (1956). The cockles can be found living in the roots of the salt marshes Cord Grass, *Spartina townsendii*. However, this limits the time spent feeding but does not significantly impact upon their growth and they still reach lengths of 42mm and 54mm outside of the saltmarsh (Cole, 1956). This is similar the sizes that were recorded in this study in 2017 in sites outside of the salt marsh. In Poole Harbour, a variety of habitats are suitable for growing Cockle including soft mud and hard gravel, (Cole, 1956). This is also similar to the results of this study where Cockle appear to grow well across the entire Harbour. The diversity of habitats across the Harbour provide a wide range of areas with suitable habitat to support cockle populations.

5.4.2 Manila Clam

Studies into the naturalisation of Manila Clams have been conducted frequently and one such study that was undertaken in Poole Harbour by Humphreys et al, 2007 who considered the population dynamics of the naturalised Clams. The growth patterns, recruitment and

mortality were studied and sustainability of the fishery was assessed. It is considered that 75% of the clams were removed by the previously licenced winter fishery, under the old management scheme, which reduces the maximum age and size achieved by the clams due to MLS imposed by management regulations, (Humphreys et al, 2007). The study by Humphreys et al (2007) ascertained the mean lengths of the clams peaked between 21.24mm and 41.58mm which is similar when compared to the stock assessment data which achieved lengths of between 31.8mm and 55.8mm.

Similar work on Manila clam sizes in the Holton Mere area (sites 19 and 19(2)) was compiled by Harris (2016) who looked at the change in sizes over the period 2003 to 2012 and found that the average size in this area declined from 32.9mm in 2003 to a minimum of 20.1mm by 2010. Although some improvement was noted in 2011 and 2012, the average size for this area remained just above 25mm. This study concluded that the average clam size had decreased as a result of the change in MLS and increased removal of clams as a result of illegal activity which was removing large levels of clams from the fishery. The data from the 2016 and 2017 stock assessments shows that for this same area, the average size for Manila clam was between 31.7mm to 34.3mm for 2016 and 31.8mm to 33.mm for 2017 showing an increase in average size from 2012. This may be an indication that the new, more stringent management measures are having a positive effect on the population in one of the most commonly fished areas in the Harbour. The increase in average size indicates that there are a greater proportion of clams on the ground which are able to grown to around the MLS indicating that less clam just under the MLS is being removed as a result of the reduction in illegal activity. The minimum size has remained the same at 35mm, therefore the change in average size can be attributed to other factors such as a reduction in illegal activity. Humphreys et al, (2007) suggested that the MLS requirement is a suitable management technique for ensuring the long term sustainability of the fishery and these results help support that as the population across the Harbour appears to be stable whilst the fishery is operating to this minimum size. However MLS as a management tool is probably not sufficient in isolation to ensure complete sustainability of the population and a suite of management measures that cumulatively allow for tighter regulation on illegal activity, such as permitting the fishery and introducing seasonal and temporal closures, are required to ensure that the undersized remains on the ground and is given the opportunity to grow both to a size at which individuals are sexually mature and that at which they can legally be removed from the fishery.

5.5 FURTHER STUDY

The second part of the survey using the modified sediment drag to collect benthic samples is still in progress and will provide evidence of juvenile populations and give a complete picture of the stock assemblage as well give an idea of the recruitment rate to the fishery. There is a greater need for a more recent study into Cockles across the UK. Finally, it will be important to carry out further assessment annually in order to evaluate any changes the population. As more years are assessed it will be possible for trends in the population to become more apparent.

6 CONCLUSION

The aims of this study were to assess the population of shellfish with particular focus on Manila Clam and Common Cockle in Poole Harbour. By carrying out this study, impacts of fishing and exploitation of the sea bed can be compared with the populations to decide whether a negative relationship is occurring or whether the fishery has potential for an MSC accreditation. There was variation across the sites on the whole over the Harbour however, the shellfish population appears to be stable. Nevertheless, it is important to carry on further study to analysis this further over coming years as well as link the data from these initial findings to the juvenile data from the sediment samples.

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