

Introduction

The Poole Harbour Bivalve Survey contributes to assessing the sustainability of the Poole Harbour clam and cockle fishery by monitoring stocks of commercially important bivalve species in shellfish beds across the Harbour. The survey has been conducted annually since 2016 and surveys 27 shellfish beds. Data is collected on size (length), abundance and Catch Per Unit Effort (CPUE) for the two most commonly harvested species, the Manila clam (*Ruditapes philippinarum*) and the common cockle (*Cerastoderma edule*). Additional size and abundance data is also collected for any other bivalve species retained in the dredge. The Poole Harbour clam and cockle fishery was awarded dual certification under the Marine Stewardship Council's Sustainability Standard and the Seafood Responsible Fishing Scheme in 2018. The annual stock assessment provides data upon which management of the fishery can be assessed and, if necessary, reviewed with the aim of maintaining and further developing the sustainable fishery.



Methodology

The survey took place between 14th – 16th May 2021 using local fishing vessel FV Karen Rose operating a pump-scoop dredge consistent with normal fishing practice (figure 1).

For 2021, the survey needed to be conducted in accordance with Covid-19 policies, resulting in a reduction of participants and social distancing. Due to timing constraints 4 of the most sparsely populated or unfished beds from the 27 regular survey sites were not sampled in 2021.

Therefore, for the 2021 survey, dredge samples were taken from 23 sites (figure 2) using the methodology below.

1. Three dredge tows, timed at two minutes, within a radius of 20m of the central point of each site (pre-determined and consistent across all survey years)
2. After two minutes the dredge was brought inboard, and any bivalves were retained
3. Each bivalve was identified to species and the first 50 individuals of each species were measured along the widest axis (length) to the nearest millimetre
4. Manila clams and cockles were separated into above and below their minimum conservation reference size (MCRS) (35mm and 23.8mm respectively) and then weighed
5. All samples were returned to shellfish production areas with the same classification as that from which they had been taken after measuring



Figure 1. Photo of the pump-scoop dredge used for bivalve sampling.

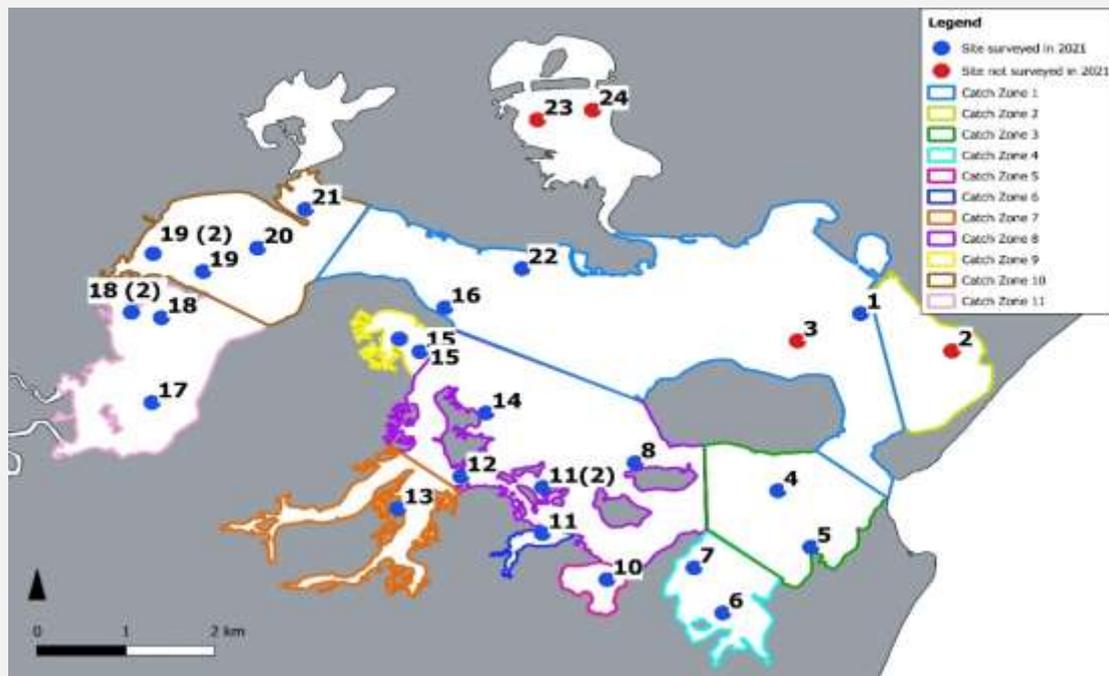


Figure 2. Map of Poole Harbour showing Poole Harbour Bivalve Survey sites, blue marks indicate sites which were sampled during 2021, red sites indicate sites which were not sampled due to changes to survey methodology to align with Covid-19 secure operating procedures. Catch zones are marked by coloured boundaries, the number of the catch zone is provided in the legend next to the corresponding colour.

Results

The results of the survey focus on the two main commercial species, the Manila clam and the common cockle. Other species found during the survey in smaller quantities included the American Hard-Shell clam (*Mercenaria mercenaria*), the Native clam (*Ruditapes decussatus*), the native oyster (*Ostrea edulis*) and the blue mussel (*Mytilus edulis*).

Length Data

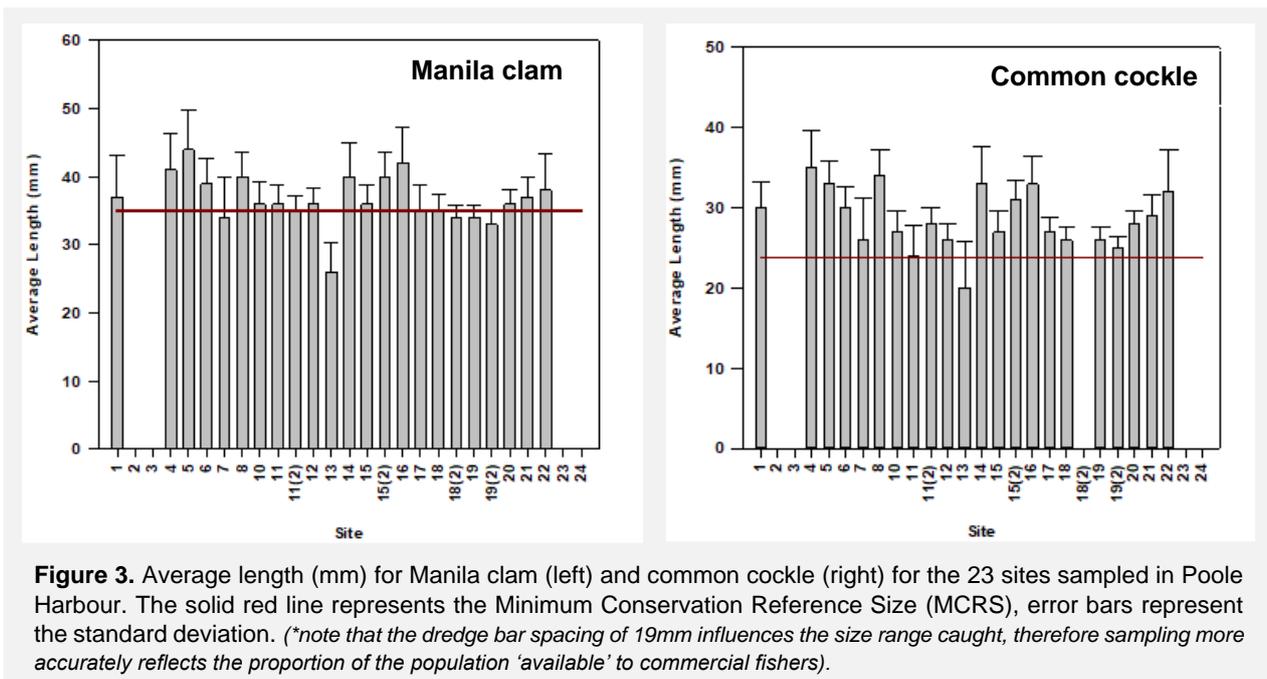
The average length (mm) of Manila clam and common cockle across the three dredges for each site are shown in figure 3.

Manila clam

- The average length varied between 44mm at site 5 (Jerry's Point) (n=60) and 26mm at site 13 (Wych and Middlebere Lake) (n=112).
- The average length was above the MCRS of 35mm at all but five sites. Three of these sites (18(2), 19, 19(2)) are located in the Wareham Channel and showed an average length of 34mm (n=452), 34mm (n=1157) and 33mm (n=250) respectively. The average length for Manila clam was smallest at site 13 at 26mm (n=112), this site is located in the outer Wych and Middlebere Lake area. For the final site (7), located in Brands Bay, the average length was 34mm, however there were only five individuals measured across all three dredges.

Common cockle

- The average length varied between 35mm at site 4 (Blood Alley) (n=196) and 20 at site 13 (Wych and Middlebere Lake) (n=36).
- The average length was above the MCRS of 23.8mm at all sites except site 13.



CPUE Data

A measure of Catch Per Unit Effort (CPUE) was calculated as weight of shellfish (kg) per metre of dredge per hour both above and below the MCRS for each of the two species. The Harbour is divided into 11 catch reporting zones under the Poole Harbour Dredge Permit Byelaw (figure 2) therefore CPUE data from the survey has been grouped according to the zone in which the survey site is located (figure 4). Data has been analysed for 2021 and also in comparison to data from the previous two surveys in 2018 and 2019 (there was no survey in 2020 due to the Covid-19 pandemic). Statistical analyses were performed using a non-parametric Kruskal-Wallis test with subsequent Dunn's method.

Manila clam

- For the 2021 survey, zones 8 (The Islands), 9 (Arne Bay), 10 (Seagull) and 11 (Keyworth and Giggers) showed the highest average CPUE (above and below MCRS combined) at 87.7, 85.1, 99.5 and 112.8 kg per metre of dredge per hour respectively.
- For zones 8, 9 and 11 the CPUE was greater for Manila clam over MCRS at 50.4, 67.1 and 57.1 kg per metre of dredge per hour respectively. For site 10, the CPUE was greater for Manila clam under MCRS at 68.5 kg per metre of dredge per hour.
- The only statistically significant result when comparing total CPUE between catch zones for 2021 was between zone 11 (Keyworth and Giggers) (average 112.8 kg per metre of dredge per hour) and zone 4 (Brands Bay) (average 17.4 kg per metre of dredge per hour) ($P < 0.05$).
- Statistical comparisons between survey years for each zone showed that for zones 1 (Poole Town), 3 (Blood Alley) and 8 (The Islands), CPUE for 2021 was significantly higher than in 2018 ($P < 0.05$). For zone 6 (Ower Bay), CPUE was significantly higher in 2018 than 2019 and 2021 ($P < 0.05$) and was also significantly higher in 2018 than 2019 for zone 11 (Keyworth and Giggers) ($P < 0.05$) (zones which were not sampled during 2021 have not been included in the analysis for this report). There were no statistically significant differences between data for 2019 and 2021 in any zone.

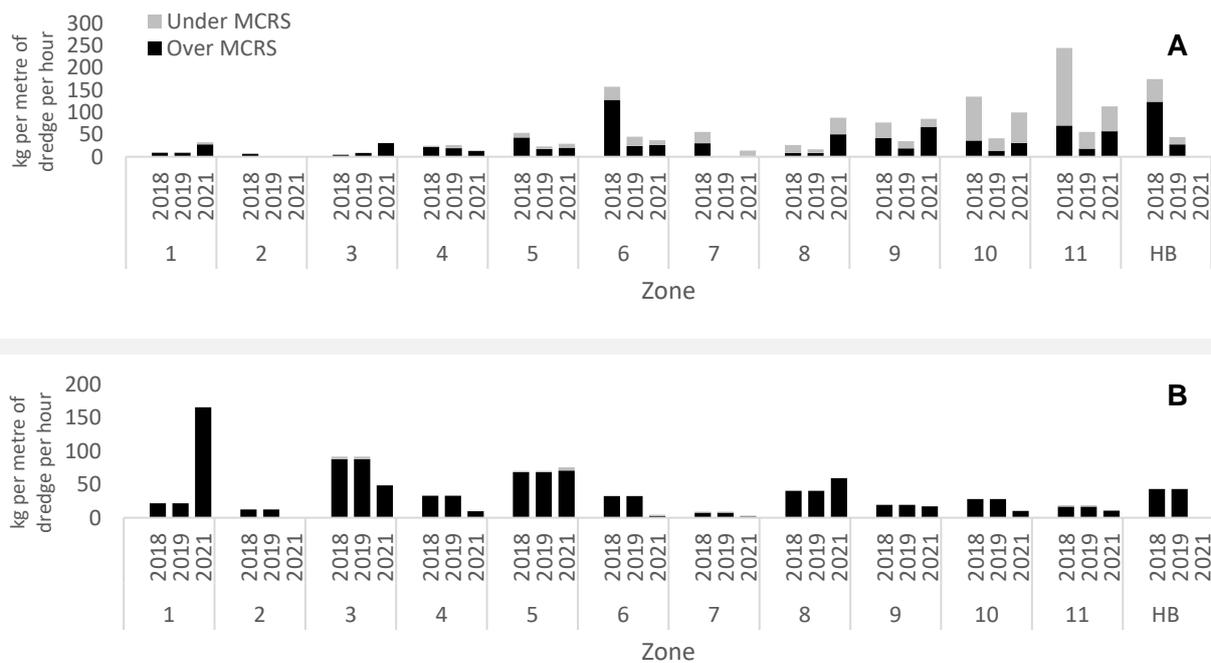


Figure 4. Catch per unit effort (CPUE) expressed as kg of shellfish per metre of dredge per hour for A) Manila clam and B) Common cockle, black bars represent shellfish above the MCRS and grey bars represent shellfish under the MCRS. Data has been grouped into 11 catch zones under the Poole Harbour Dredge Permit Byelaw and is shown for survey years 2018, 2019 and 2021. Note that for 2021, due to the amended methodology there is no data for zone 2 (Whitley Lake) or zone HB (Holes Bay).

Common Cockle

- For the 2021 survey, zone 1 (Poole Town) showed the highest average CPUE (above and below MCRS combined) at 165.5 kg per metre of dredge per hour. Sites 5 (Newton Bay) and 8 (The Islands) showed the next highest average CPUE values at 75.5 and 59.5 kg per metre of dredge per hour respectively.
- All sites were dominated by cockles over the MCRS, only zone 5 showed a CPUE value above 1.5 at 4.9 kg per metre of dredge per hour, however this still only accounted for 7% of the total CPUE value.
- A statistical comparison of CPUE between catch zones for 2021 showed no significant difference between sites.
- Statistical comparisons between survey years for each zone showed that for zone 1 (Poole Town), the CPUE for 2021 was significantly higher than in 2018 ($P < 0.05$) and for zone 10 (Seagull), the CPUE was significantly higher in 2018 than 2019 ($P < 0.05$). There were no statistically significant differences between survey years for all other zones.

Fishing Catch Data from the 2020-21 Season

The permit conditions under the Poole Harbour Dredge Permit Byelaw require permit holders to provide monthly catch data, which is analysed at the end of each fishing season to provide an indication of spatial and temporal patterns of fishing activity. This information can then be related to the survey data to provide an indication of whether the fishery is operating sustainably. Quantities of Manila clam and common cockle caught each month by the fishery for the 2018, 2019 and 2020 fishing seasons are shown in figure 5. The fishing season runs from 25th May to 23rd December each year.

Manila clam

- The quantity of Manila clam (kg) caught across the fishing season for 2020 was significantly higher than both 2018 and 2019 ($P < 0.05$).

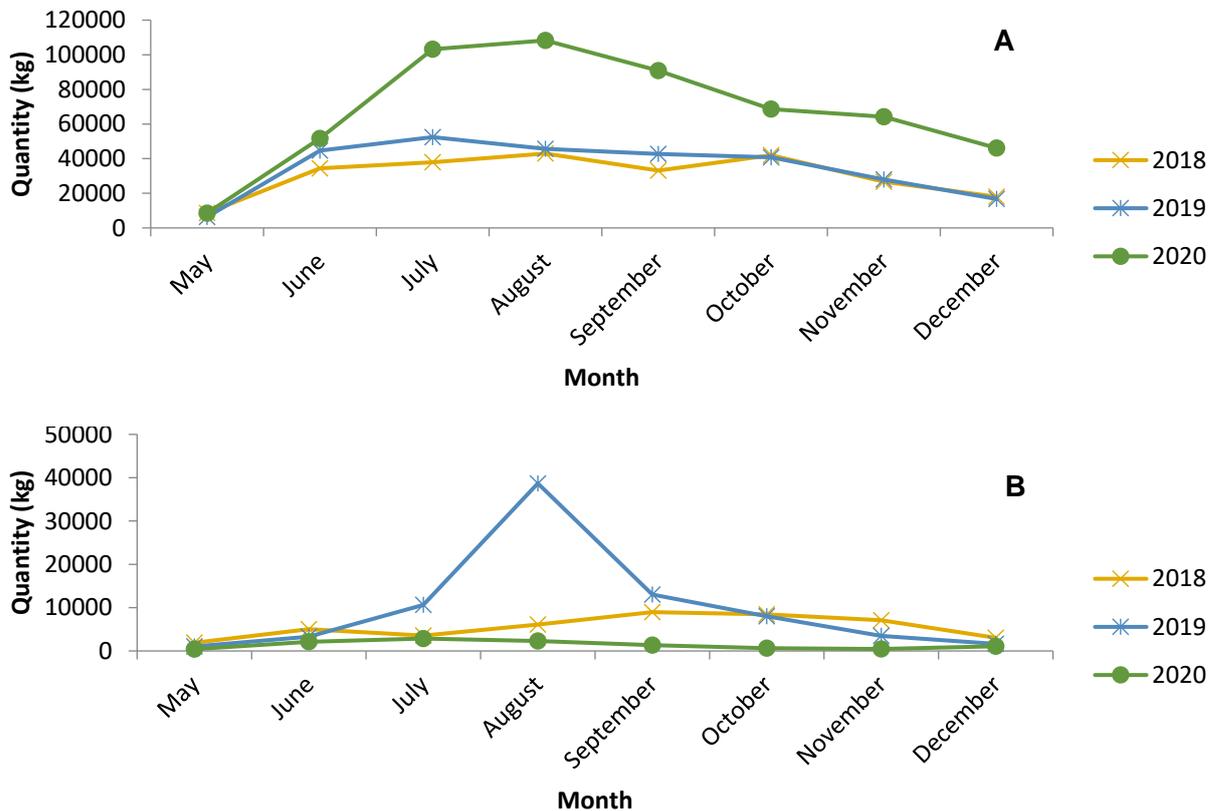


Figure 5. Quantities of A) Manila clam and B) common cockle recorded on the monthly catch return forms submitted by permit holders under the Poole Harbour Dredge Permit Byelaw for the 2018, 2019 and 2020 fishing seasons.

- The peak quantity of catch was seen in August 2020 at 108,288 kg. This is the highest catch recorded for a single month since the Poole Harbour Dredge Permit Byelaw was introduced in 2015.

Common Cockle

- Despite an outlying peak in cockle catches for August 2019 (38,686 kg), there was no significant difference in fishing season catches between years.

Hours fished by permit holders (encompassing both species) also showed no significant difference between the three years.

Discussion

- Sites 18(2), 19 and 19(2), with an average size below MCRS for Manila clam, fall within the preferred fishing location in the Harbour, the Wareham Channel. The proportion of Manila clams over MCRS will have been greatly reduced during the 2020 fishing season (May to December) and the period between this and the 2021 survey is likely to have seen temperatures below the threshold for active growth. It is expected that by early-mid summer there would be a greater proportion of Manila clam over MCRS at these sites.
- Quantities of cockle harvested by the fishery are consistently lower than Manila clam therefore it is likely that a proportion of stock above MCRS was maintained after the fishing season.
- Higher CPUE values for both Manila clam and cockle are consistent with popular fishing areas for each species and reflects a habitat driven distribution with Manila clam showing a higher CPUE in muddy, fine-grained sediments and cockle showing a higher CPUE in sandy, coarse-grained sediments.
- The consistency in CPUE for both species between 2019 and 2021 indicates that the population has remained stable during this period despite fishing pressure. There was a large increase in the quantity of Manila clam caught during the 2020 season, however this does not appear to have caused a negative impact on the commercially available stock.