Taw Torridge

Cockle Stock Assessment 2023-2024

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Research Report
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Author	**Date**	**Comment**	**Version**
L. Parkhouse	10/01/2025	First draft for review	0.1
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1. Introduction

1.1 The Taw-Torridge Estuary

The Taw-Torridge Estuary is located on the North Devon coast, within the Area of Outstanding Natural Beauty (AONB) and the North Devon UNESCO Biosphere Reserve (Figure 1).

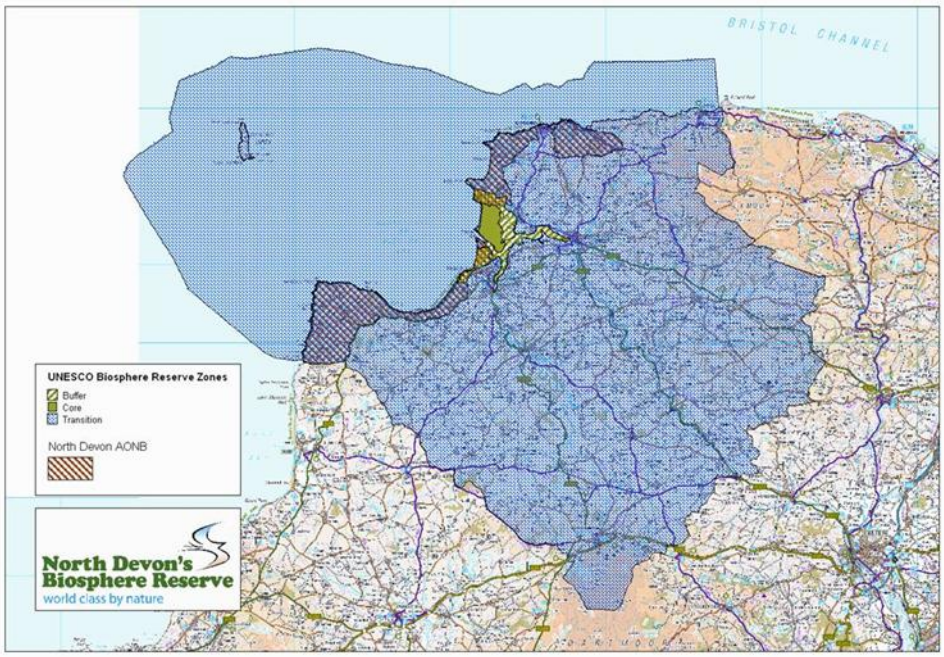

Figure 1 The location of the Taw Torridge Estuary (shown in yellow) within the North Devon Biosphere Reserve and the North Devon Coast AONB. (North Devon AONB and Biosphere Reserve Service, 2010)

The Taw Torridge Estuary is an important site for wildlife and has been designated a Site of Special Scientific Interest (SSSI) (Figure 2) for over-wintering and migratory populations of wading birds, and for the rare plants found on its shores. Parts of the Estuary also lie within the Braunton Burrows Special Area of Conservation (SAC) (Figure 3). The qualifying habitats on the intertidal section of the SAC are mudflats and sandflats not covered by seawater at low tide; intertidal mudflats and sandflats.

Cockles, *Cerastoderma edule,* are present within the estuary and are known to be collected at low levels both historically and to the present day (Edwards, 1987; Cefas, 2013, 2020). Unlike the mussels in the Taw Torridge Estuary which are harvested at a commercial level, the cockle stock has never reached a large enough level to be harvested commercially.

Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) understands the social and ecological importance of these beds and has undertaken survey work to establish the population structure, biomass, and distribution of cockles within the areas of the estuary where cockles are known to be present. The biomass of cockles estimated as a result of these surveys can be fed into a shellfish ecological requirement model developed by Bournemouth University, which allows an estimate to be made of the ecological requirements of wading birds (specifically oystercatchers, *Haematopus ostralegus*) feeding on shellfish in the areas surveyed by D&S IFCA.

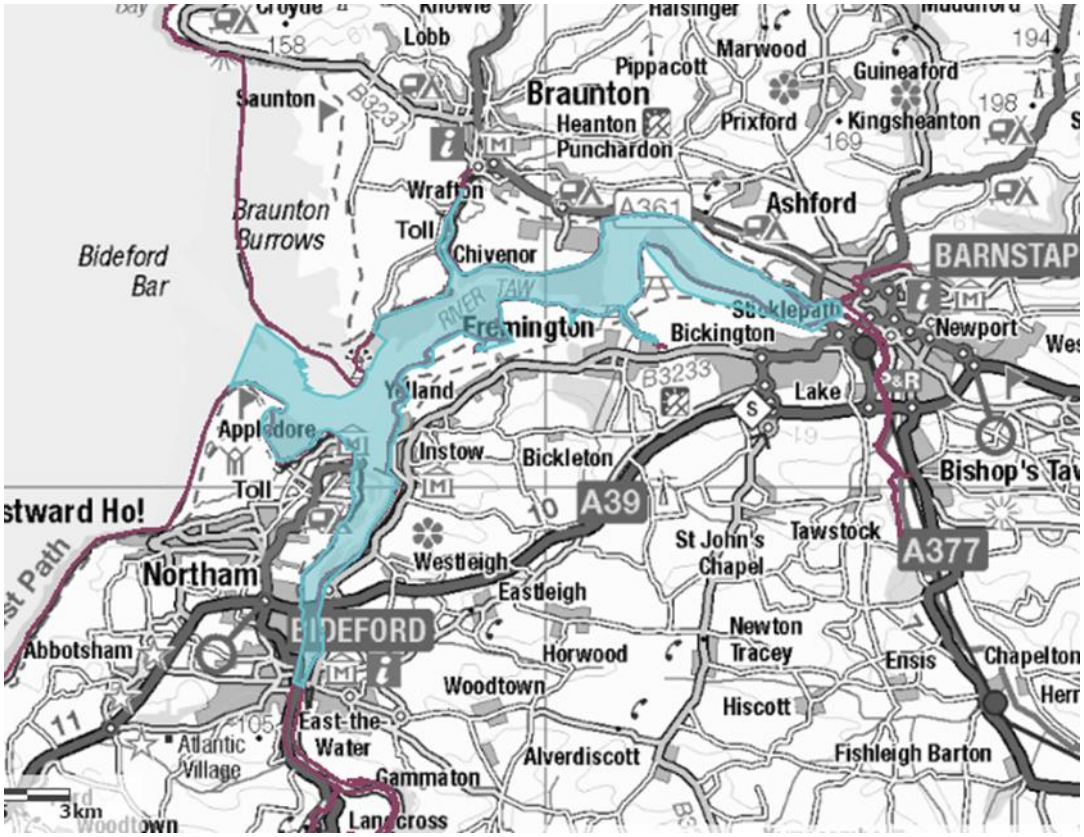

Figure 2 Taw-Torridge Estuary SSSI, shown in blue (Defra, 2020)

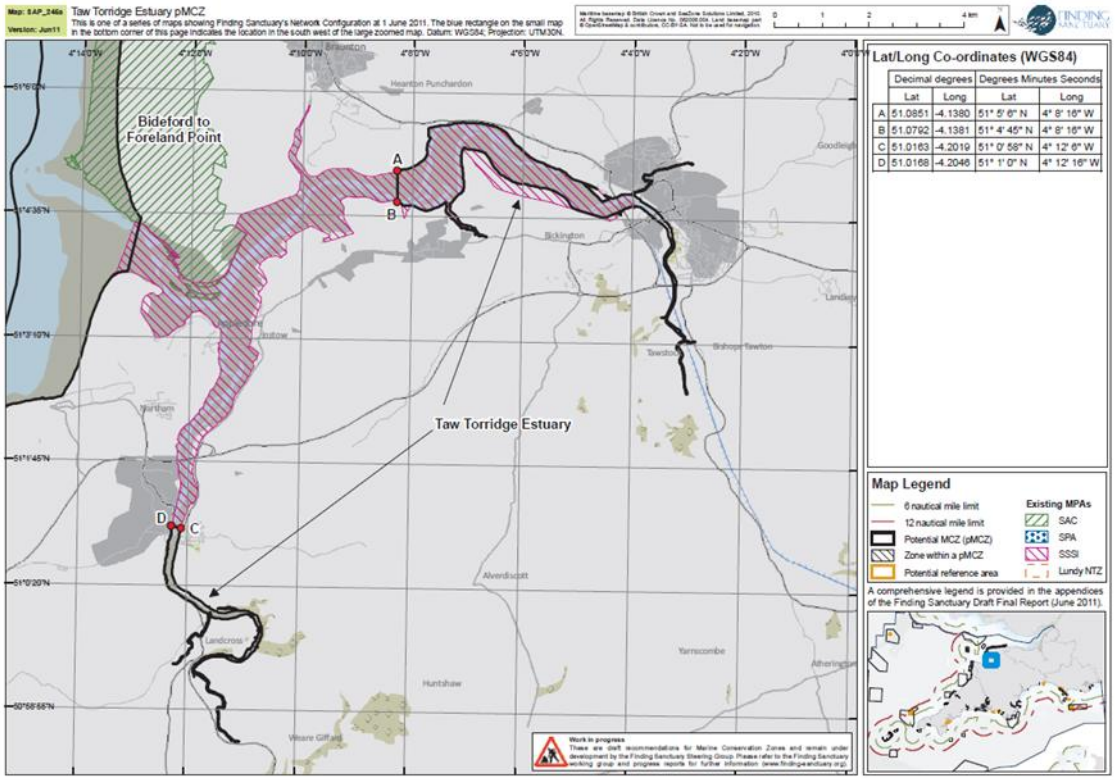

Figure 3 Area of SSSI shown in red hatching, and area of SAC shown in green hatching (Lieberknecht et al., 2011)

2. Methods

2.1 Survey Method

Cockle surveys were carried out at Instow and Old Walls in November in 2023 and August in 2024 (Figure 4). The surveys were carried out at low water spring tides. Survey locations were originally identified for the 2022 survey from anecdotal information of where harvesting was known to be carried out in the past. The Instow survey area remained the same for 2023, however changes were made to the Old Walls survey area due to information gathered in the 2022 survey. The survey stations remained the same for Instow in 2024, however extra survey stations were added to the Old Walls site in 2024.

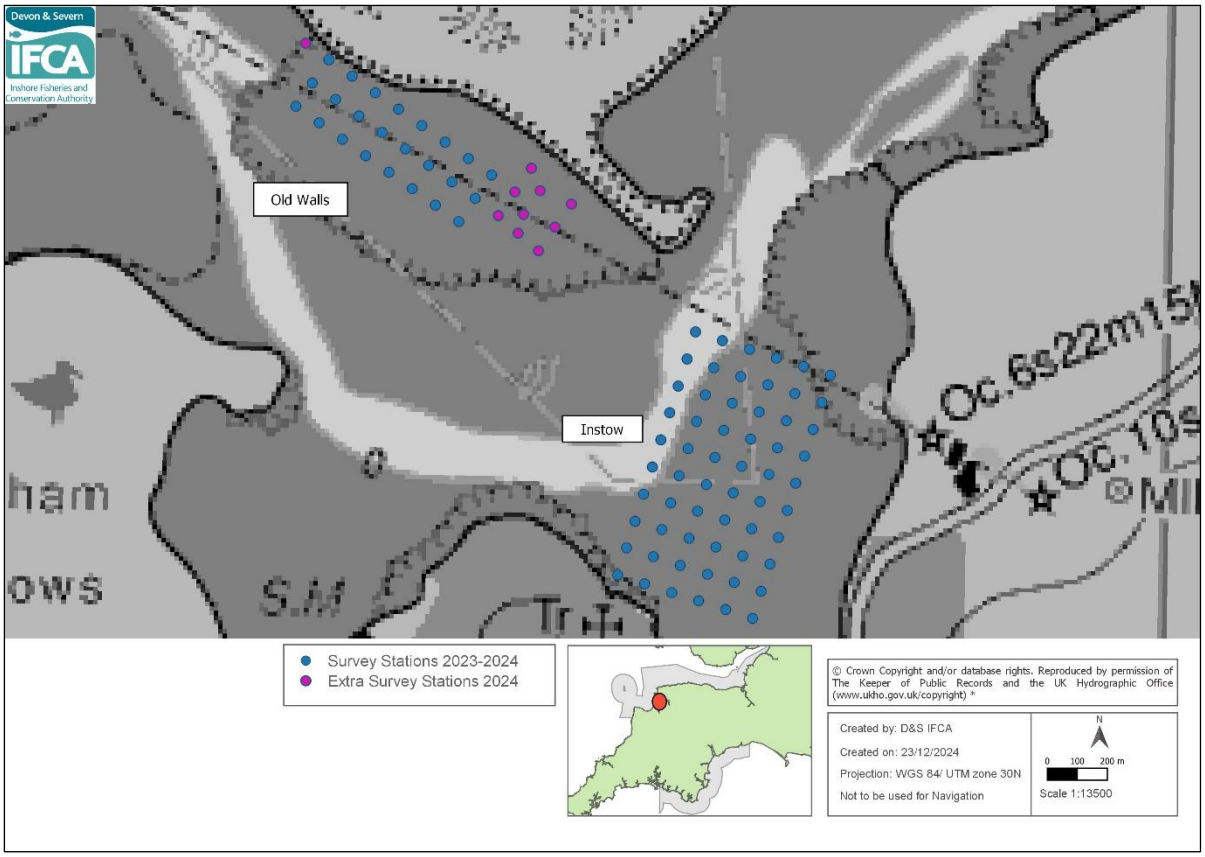

*Figure 4 Survey locations at Instow and Old Walls. Blue stations surveyed 2022-2024 at Instow and 2023-2024 at Old Walls. Pink stations new in 2024. *www.ukho.gov.uk/copyright*

Each survey station was located using a handheld GPS. A 0.1m^2 quadrat was randomly placed within 10m of the target position for the station. Using a trowel, the sediment was removed from the quadrat to approximately the depth of the quadrat (~ 6cm) into a sieve. The contents were then sieved in nearby pools of water (Figure 5). Any cockles in the sample were put into a sample bag with a label of the station name. If no cockles were found or if the station wasn't accessible to be surveyed, it was noted as such.

Figure 5- Photos showing cockle sample method. Images taken from Exe cockle survey

For each station sample collected, each cockle was measured using callipers to the nearest millimetre for length and width (Figure 6).

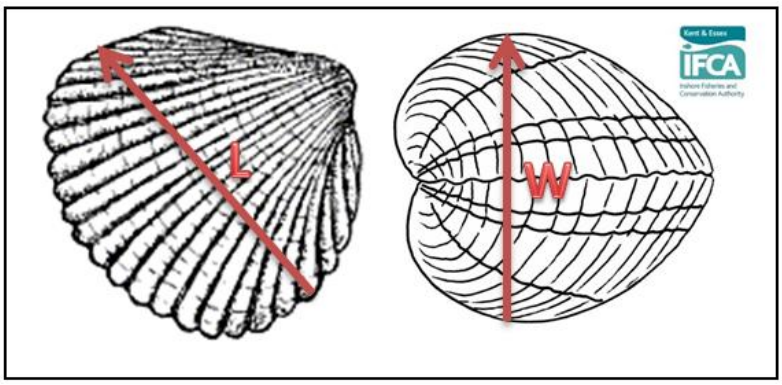

Figure 6 Cockle length (L) and width (W) measurements.

For each station sample, after measuring, cockles were sorted into age classes by determining how many annual growth rings were present on the shall. Growth rings usually appear each winter therefore 0 rings = current year, 1 ring = 1st winter/1 year, 2 rings = second winter/2 years and so on. Each year group, from that station, was weighed separately to the nearest gram and recorded. This was repeated for all station samples and once finished all the cockles were returned to the estuary.

2.2 Data Analysis

R v3.6.1 or later (R Core Team, 2020) and QGIS v3.1 or later (QGIS, 2020) were used for data analyses.

Although there is no minimum size limit applied to cockles in the D&S IFCA's District, the results presented in this report divide the stocks into two size groups (cockles that are 15 mm length and over and those that are under 15 mm length). The suggested minimum size at maturity for cockles is 15mm (Tyler-Walters, 2007). These size groupings are therefore sometimes referred to in the report as "adult" (≥ 15 mm) and "juvenile" (< 15 mm) stocks, but it is important to note that cockle size and maturity can be influenced by several factors

in addition to age. These size categories do, nevertheless, give an indication of the overall condition and structure of the stock.

To visualise the variation in density across the sample sites, the density of cockles at each sample location was plotted on a map using Inverse Distance Weighted interpolation of per-station density (distance coefficient 2, pixel size 0.00005), using an external buffer of half of the distance between sampling points. The size frequency distributions (length and width) of cockles were visualised using a histogram and the median length of cockles at each sample location was plotted on a map to visualise variation in the average size of cockles across survey locations.

Total biomass of cockles across sample area was calculated by scaling the mean cockle weight per station ($0.1m^2$) to the total sampled area for each bed. The sample area is the area surveyed regardless of cockle being present or not. Any points which could not be surveyed were not included in the sample area. The tonnage of prey-sized cockles (>15 mm) for wading birds on the estuary was calculated by multiplying the total tonnage by the proportion of prey sized cockles on the bed.

3. Results

A total of 44 stations at Instow and 21 stations at Old Walls were surveyed in 2023. In 2024 43 stations were surveyed at Instow and 25 at Old Walls. Stations which could not be surveyed were underwater during the survey and therefore inaccessible. Of the 44 stations surveyed at Instow in 2023, 27 had cockles present, and of the 21 stations surveyed at Old Walls, 8 had cockles present. Of the 43 stations surveyed in Instow in 2024, 28 had cockles present, and of the 25 at Old Walls, 11 had cockles present (Figure 7).

The average density of cockles across the Instow area was 6.5 cockles per $0.1m^2$ in 2023 and 5.4 in 2024, and across the Old Walls area it was 4.5 cockles per $0.1m^2$ in 2023 and 2.7 in 2024.

There appears to have been a decline in both adult and juvenile cockle density since the surveys began at both the Instow site (2022) and at the Old Walls site (2023) (Figure 7 & 8). However, there was high variation in total cockle density (error bars on Figure 7 and 8) between survey stations at both Instow and Old Walls (Figure 9 & 10), making it difficult to discern whether a true decline has been detected. It was not possible to fit an appropriate statistical model to these data to quantify the apparent decline in density.

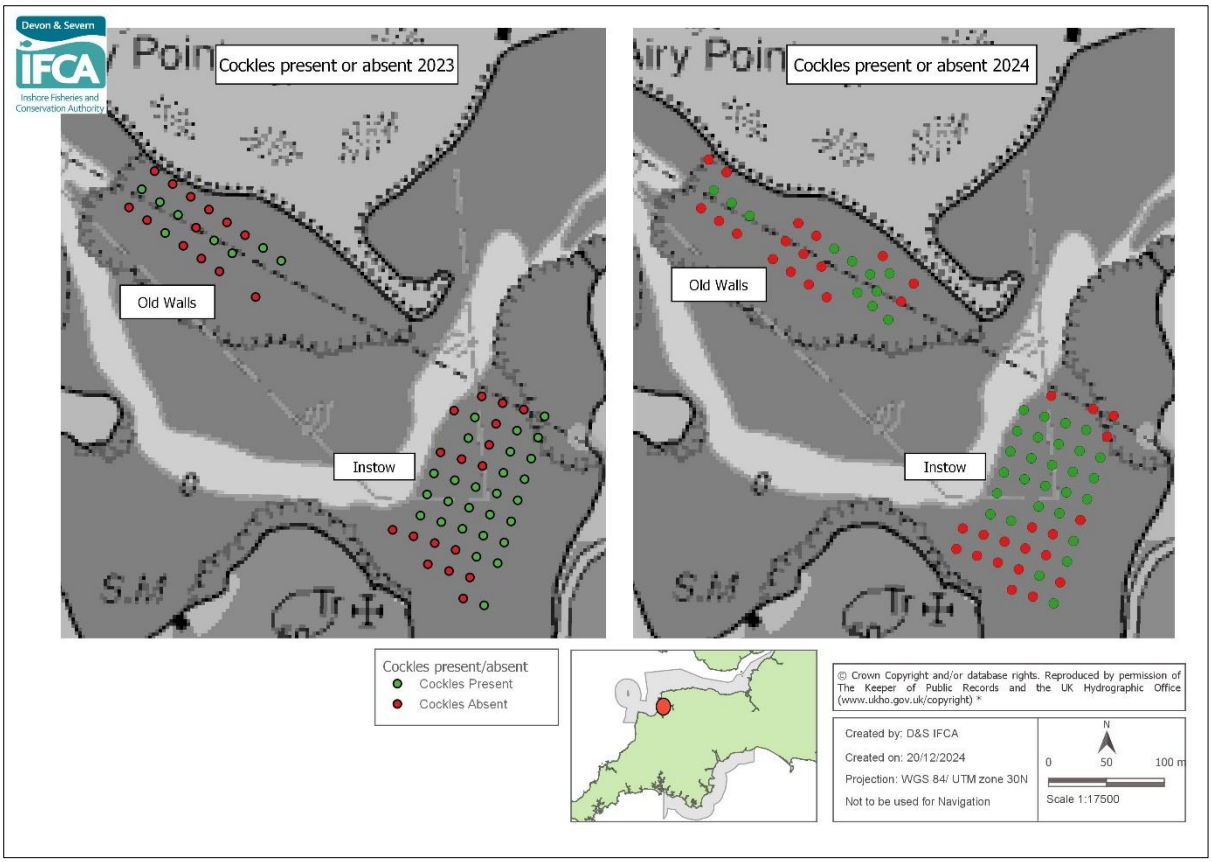

Figure 7 Survey stations from 2023 (left) and 2024 (right) with cockles present (green) or absent (red).

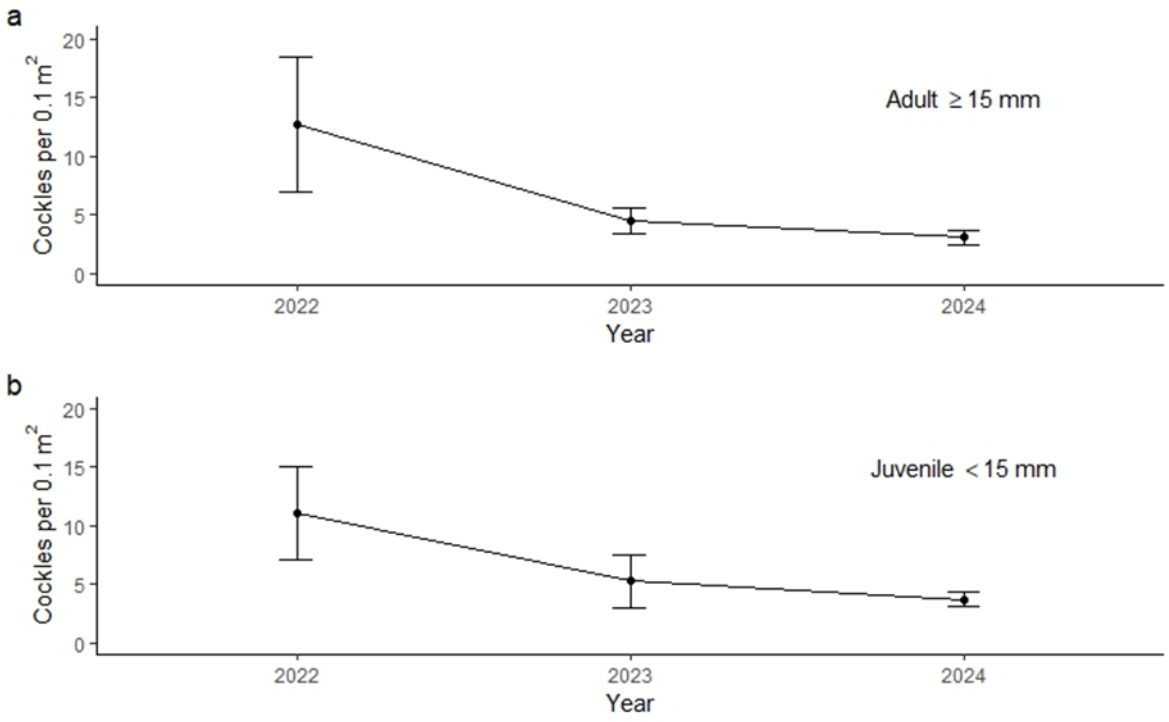

Figure 8 Mean density (± SE) of (a) adult cockles ≥15mm and (b) juvenile cockles <15mm at Instow 2022-2024

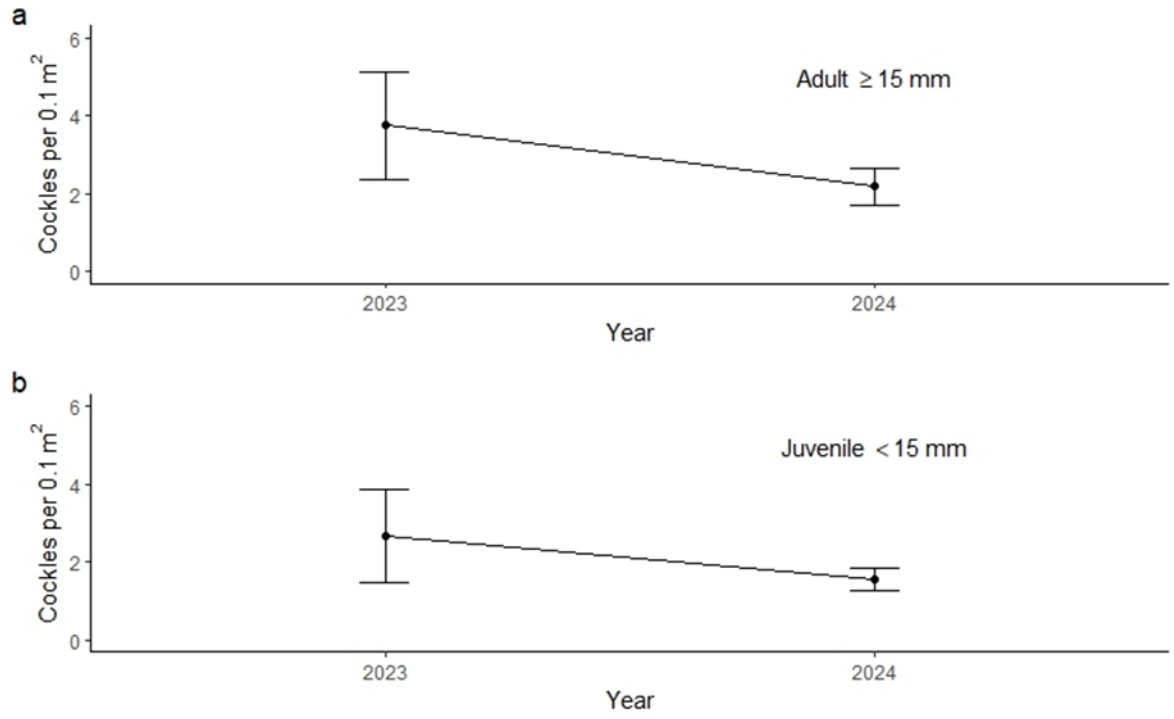

Figure 9 Mean density (± SE) of (a) adult cockles ≥15mm and (b) juvenile cockles <15mm at Old Walls 2023-2024

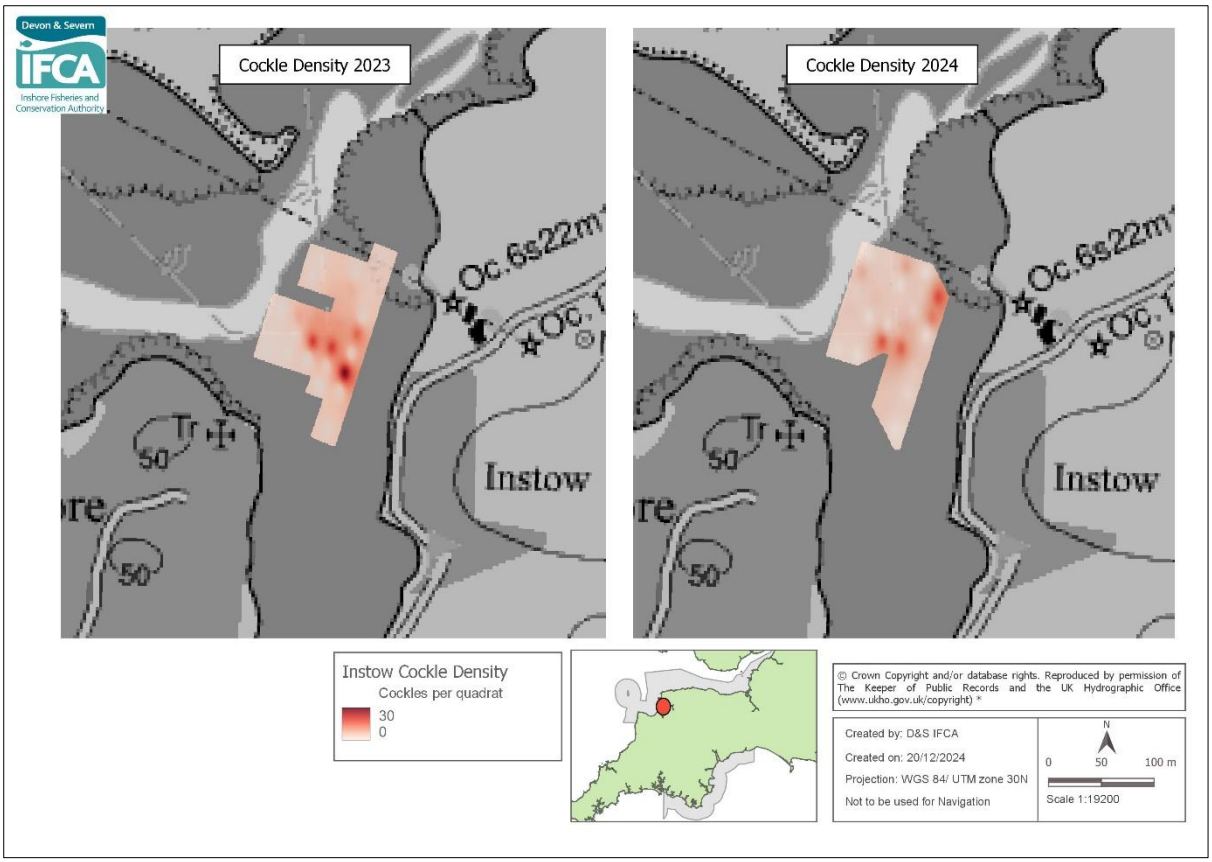

Figure 10 Cockle density (number of cockles per 0.1m^2 quadrat) at Instow in 2023 (left) and 2024 (right) mapped using Inverse Distance Weighted Interpolation.

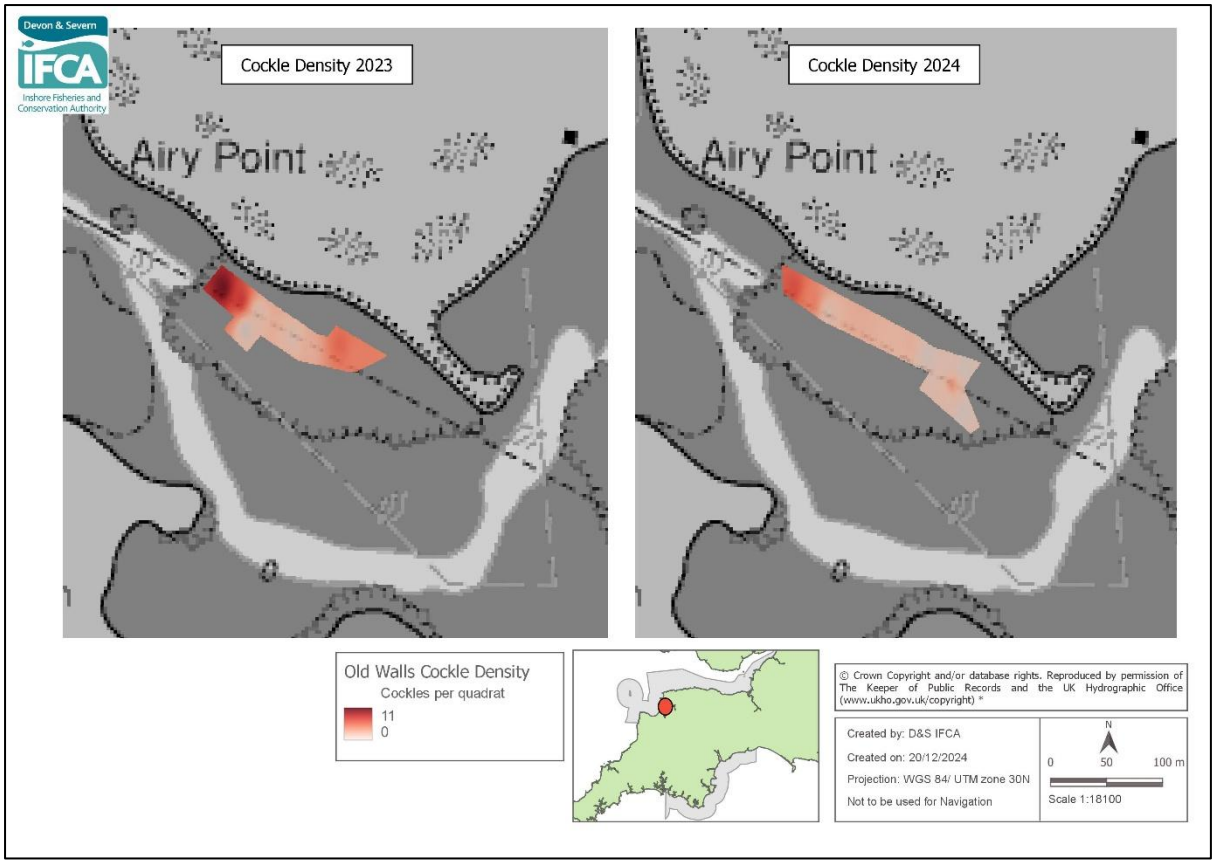

Figure 11 Cockle density (number of cockles per 0.1m^2 quadrat) at Old Walls in 2023 (left) and 2024 (right) mapped using Inverse Distance Weighted Interpolation.

The largest cockle found at Instow was 36mm in length and the smallest was 4mm in 2023 and 39mm and 6mm respectively in 2024 (Figure 12). The largest cockle at Old Walls was 41mm and the smallest was 5mm in 2023; 42mm and 6mm respectively in 2024 (Figure 13).

The average length of cockles has varied across survey stations and years (Figure 14). The average length of cockles at Instow has varied from 2022 to 2024 (Figure 15) and there has been a slight decrease in cockles measured from Old Walls over the two survey years (Figure 16).

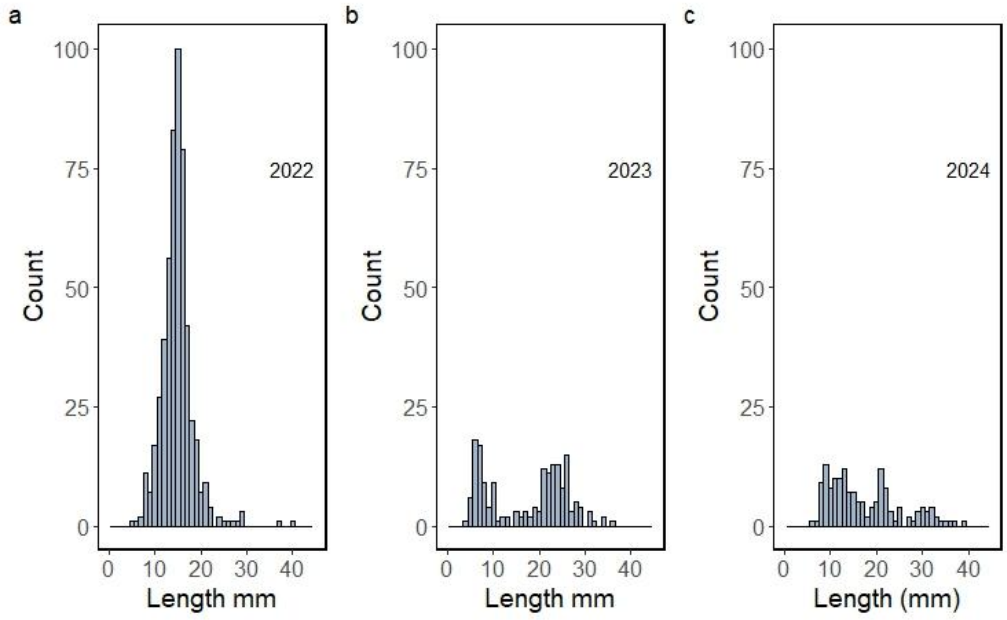

Figure 12 Frequency of cockle lengths (mm) at Instow 2022-2024

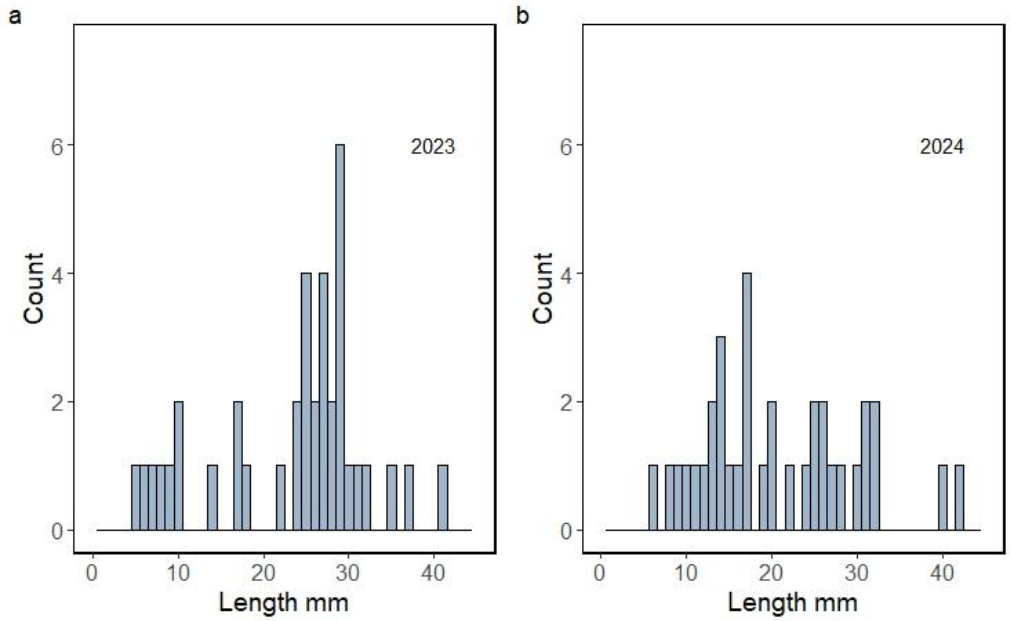

Figure 13 Frequency of cockle lengths (mm) at Old Walls 2023-2024

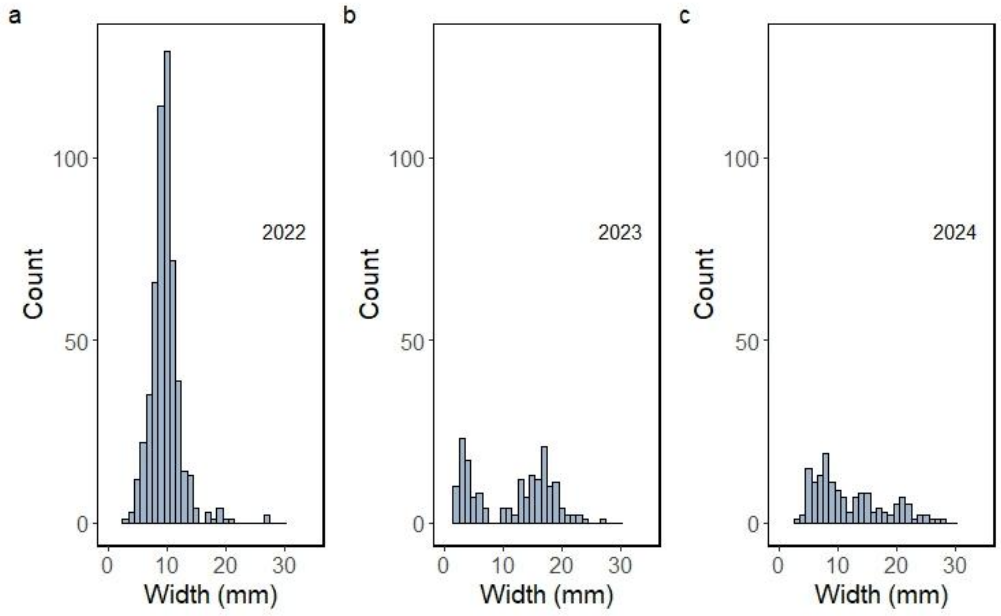

Figure 14 Frequency of cockle widths (mm) at Instow 2022-2023

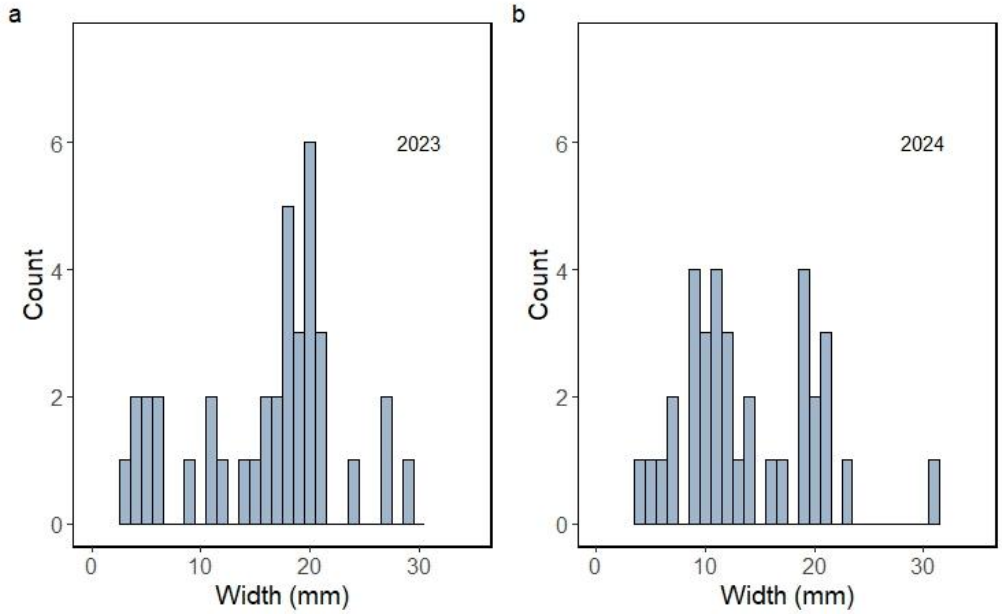

Figure 15 Frequency of cockle widths (mm) at Old Walls 2023-2024

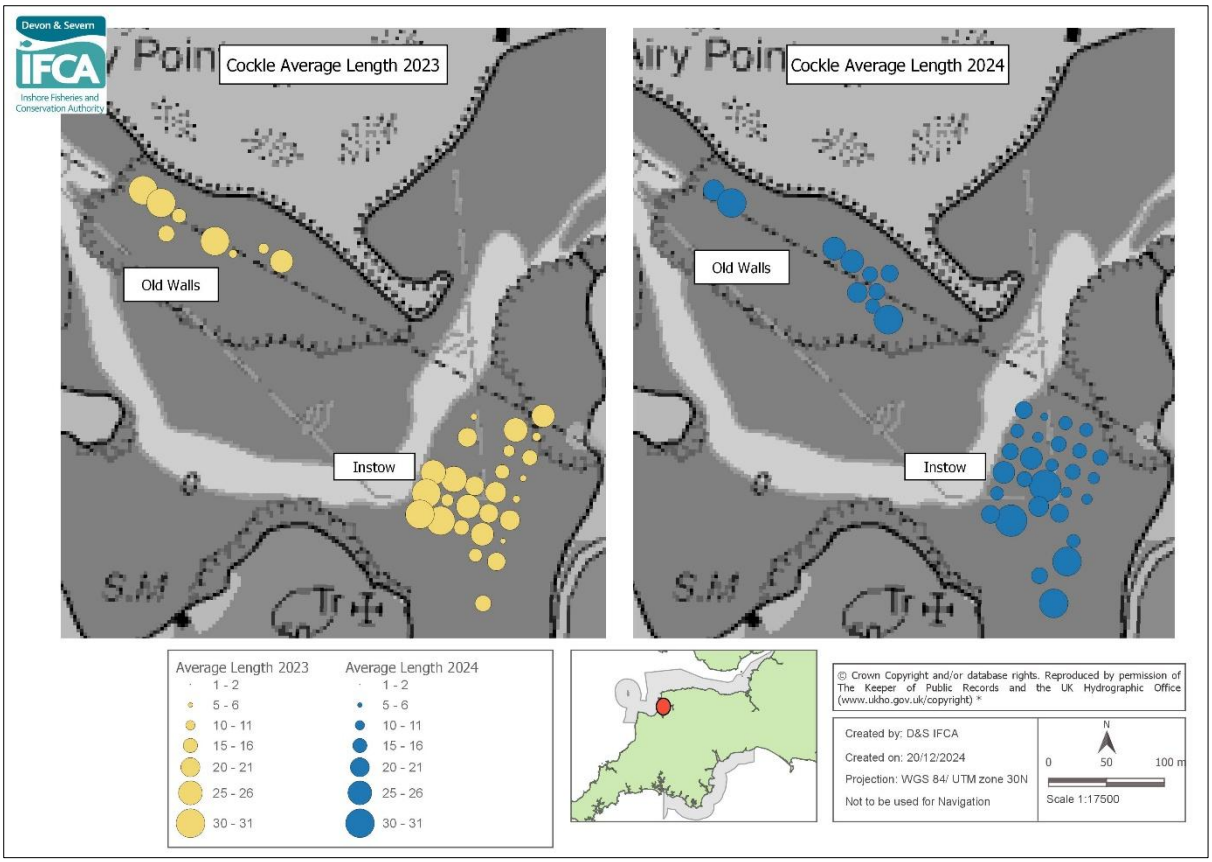

Figure 16 Median cockle size (mm) at each sampling station at Instow and Old Walls in 2023 (left/yellow) and 2024 (right/blue)

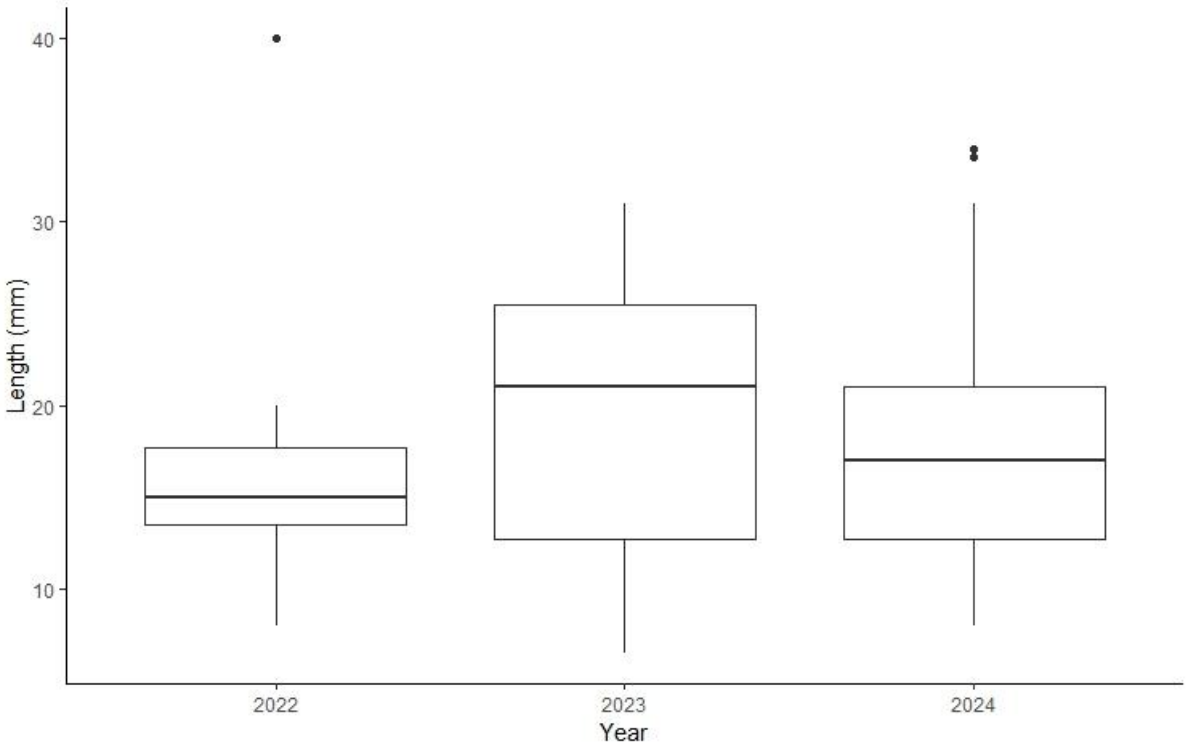

Figure 17 Length (mm) (median, inter-quartile range and range) of cockles at Instow 2022-2024

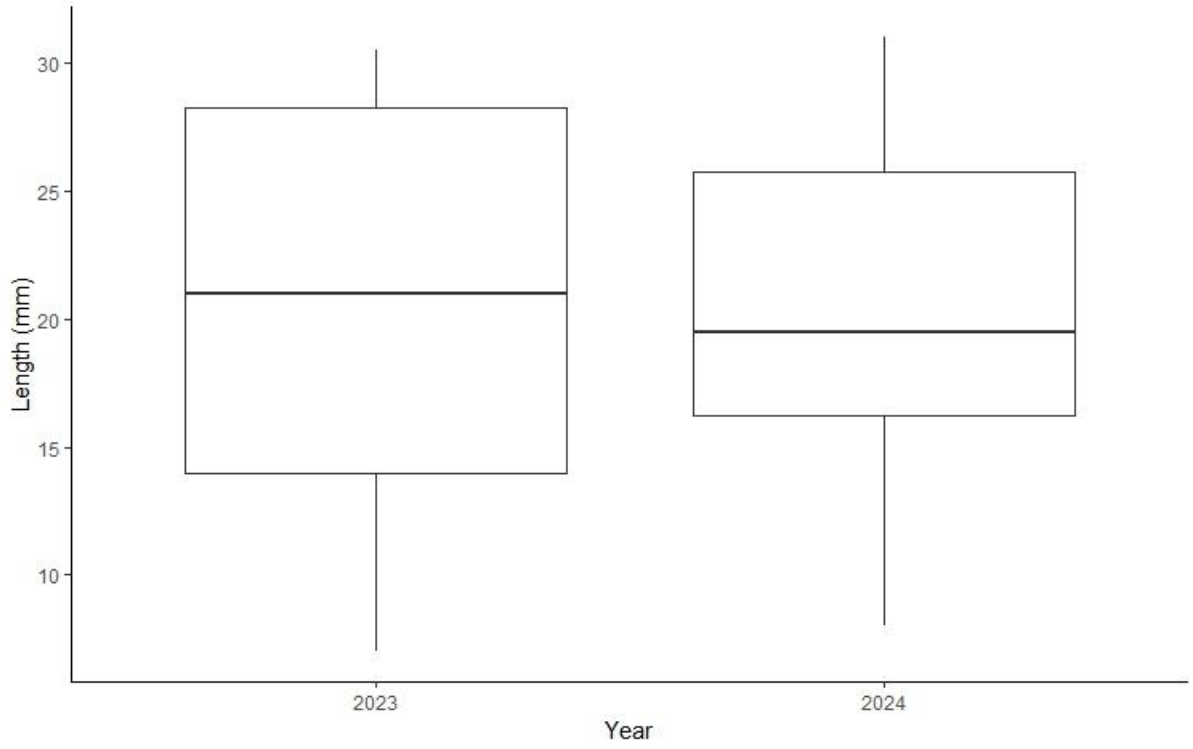

Figure 18 Length (mm) (median, inter-quartile range and range) of cockles at Old Walls 2023-2024

There has been a decrease in estimated tonnage of cockles across the surveyed areas at both Instow and Old Walls (Figure 19). At the Instow site there was 28.2 tonnes in 2022, 10.1 tonnes of which was >15mm, in 2023 there was 26.82 tonnes, 16.4 tonnes of which was >15 mm, and 2024 there were 21.56 tonnes, 19.70 tonnes of which was >15mm. The estimated tonnage of cockles across the surveyed area at Old Walls in 2023 was 11.62 tonnes, 9.2 of which was >15 mm, and in 2024 total estimated tonnage was 4.64 tonnes, 3.183 tonnes of which was > 15mm.

There was interannual variation in year class size at both the Instow (Figure 20) and Old Walls (Figure 21) sites, with a general decline across most year classes.

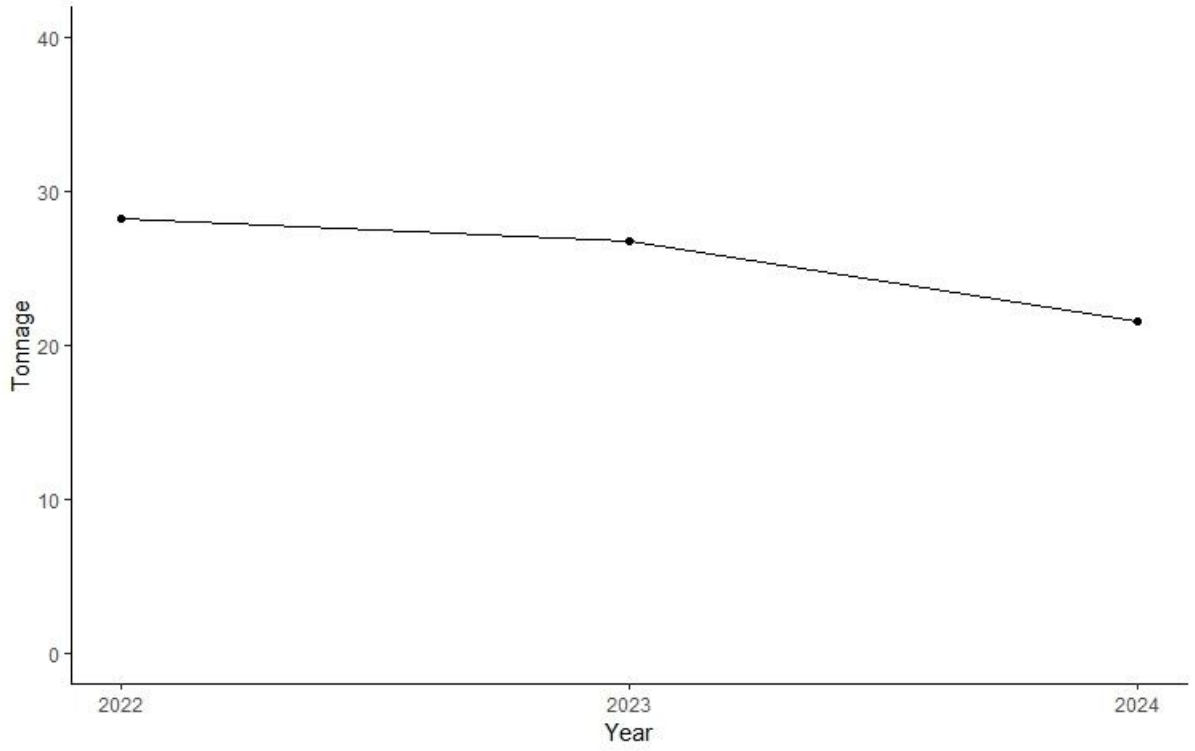

Figure 19 Total tonnage of cockles across survey area at Instow 2022-2024

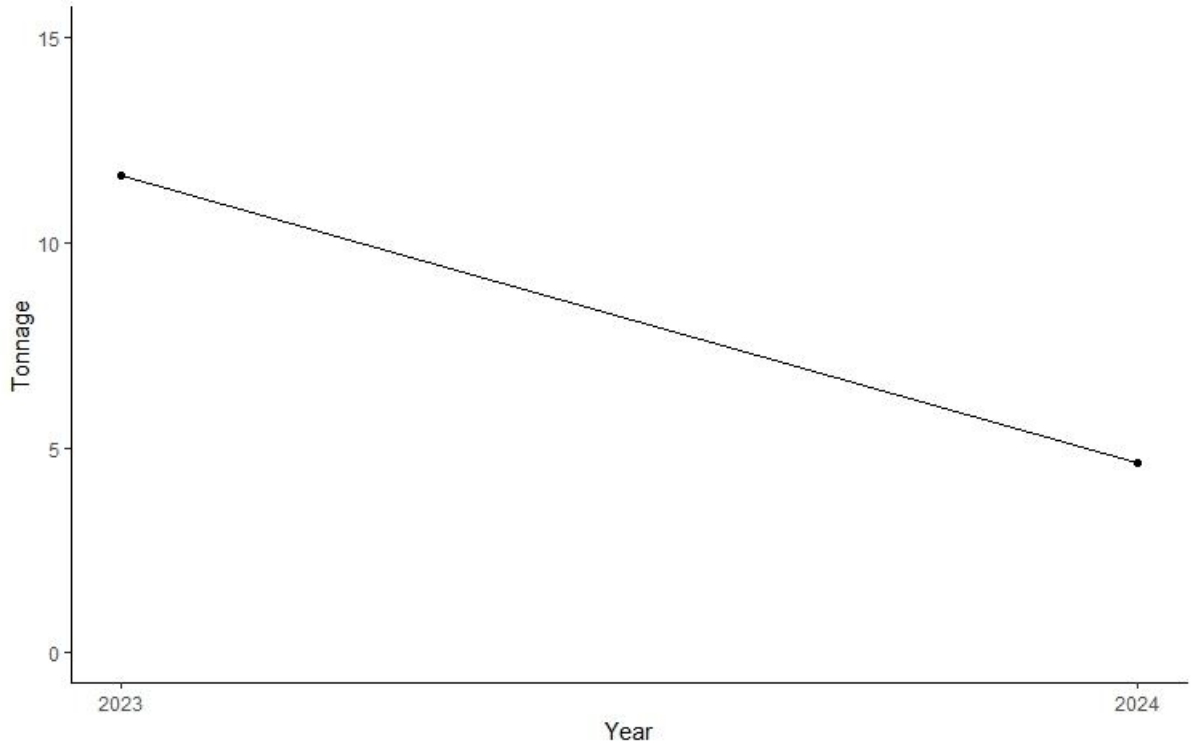

Figure 20 Total tonnage of cockles across survey area at Old Walls 2023-2024

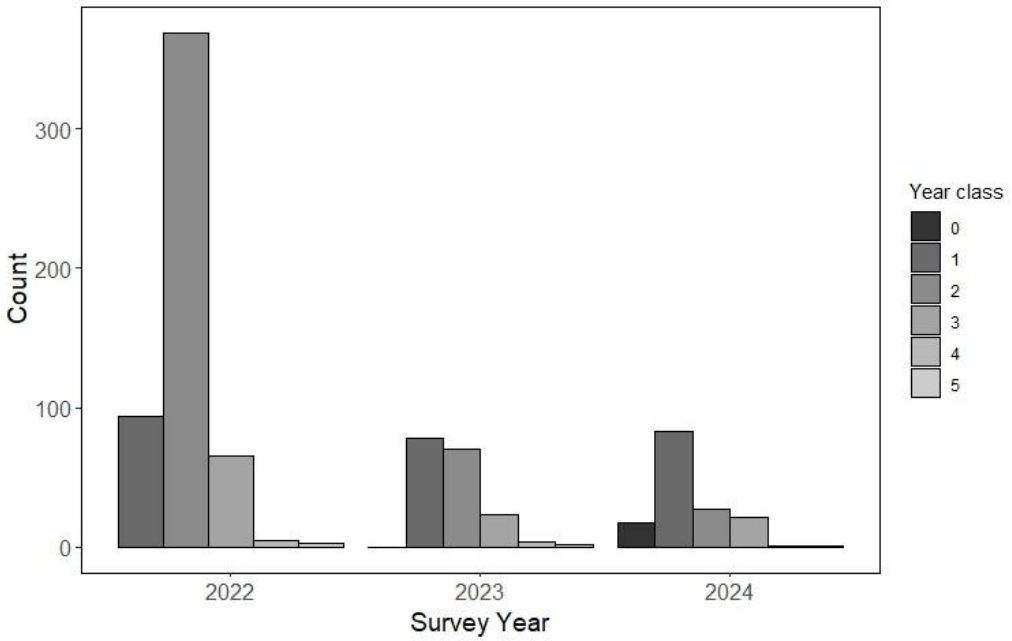

Figure 21 Number of cockles in each year class for each survey year at Instow 2022-2024

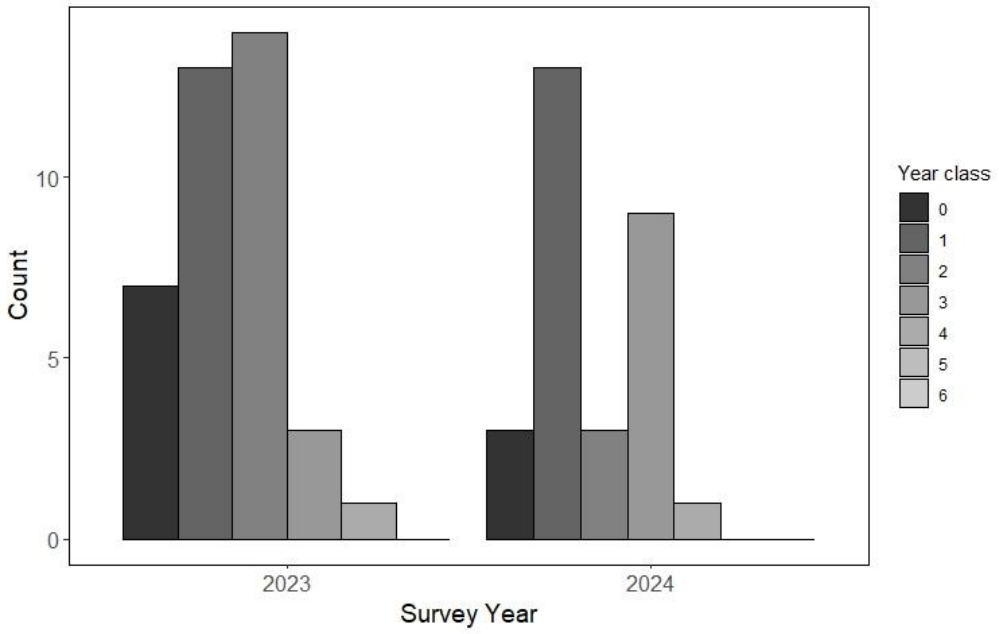

Figure 22 Number of cockles in each year for each survey year at Old Walls 2023-2024

4. Discussion

D&S IFCA has carried out cockle surveys on the Taw-Torridge Estuary since 2022. The survey stations at Instow have been consistent since 2022 however, due to a lack of cockles

found at the Old Walls survey stations in 2022 the survey stations were repositioned in 2023. Therefore, only data from 2023 and 2024 is available for Old Walls.

There appears to have been a decline in both adult and juvenile density of cockles at Instow and Old Walls since the surveys began. There has also been an apparent decrease in total tonnage at both sites across the survey years. However, cockle populations are naturally subject to high levels of variation, which is considered a normal feature of *Cerastoderma edule* populations. Therefore, two and three years of survey data may not give an accurate understanding of the cockle beds on the Taw-Torridge; furthermore, it was not possible to fit an appropriate statistical model to the observed data, but this will be attempted with additional years of future survey data. Observing the long-term population trends is vital to understand the population dynamics of any given cockle population (Jensen, 1992; Whitton *et al*., 2015).

Although there is currently no commercial fishery for cockles on the Taw-Torridge Estuary, D&S IFCA will continue to conduct annual surveys to monitor the cockle stocks on the estuary, with data being used as part of the annual assessment of the shellfish available for use as a prey resource by the overwintering birds on of the Taw-Torridge SSSI.

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