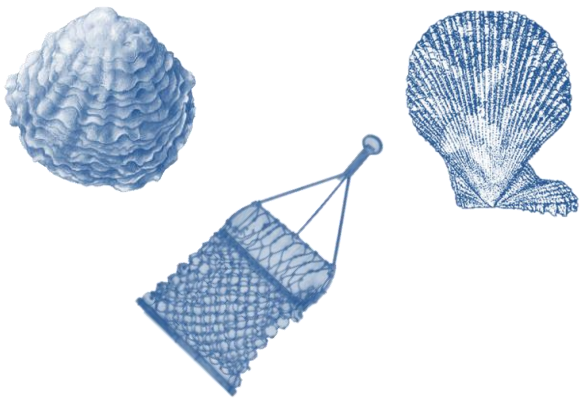
Fal Oyster Survey Summary report 2023



A temporal comparison from 2019 to 2023

Cornwall Inshore Fisheries and Conservation Authority (Cornwall IFCA)

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Cornwall Inshore Fisheries and Conservation Authority

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Introduction and Methodology

Introduction

- Cornwall Inshore Fisheries and Conservation Authority (IFCA) has been responsible for the management of the Fal Oyster Fishery since July 2014.
- Cornwall IFCA initially authorised the fishery under the Closed Areas (European Marine Sites) Byelaw 2 then as Grantee of the Fal Fishery Regulating Order 2016 (Figure 1).
- Cornwall IFCA has continued to monitor the stock of oysters by carrying out yearly surveys of the fishery since 2014.

Aims

- To investigate the temporal changes of the relative abundance and distribution of native oysters, *Ostrea edulis*, within the Fal Oyster Fishery
- To investigate the temporal changes of the relative abundance and distribution of scallops (queen scallop, *Aequipecten opercularis*; variegated scallop, *Mimachlamys varia*) within the Fal Oyster Fishery.
- To investigate the temporal changes of the relative abundance and distribution of slipper limpets (*Crepidula fornicata)* within the Fal Oyster Fishery.
- To investigate the distribution of substrate types across the fishery.
- To investigate the species of bycatch present across the survey area.

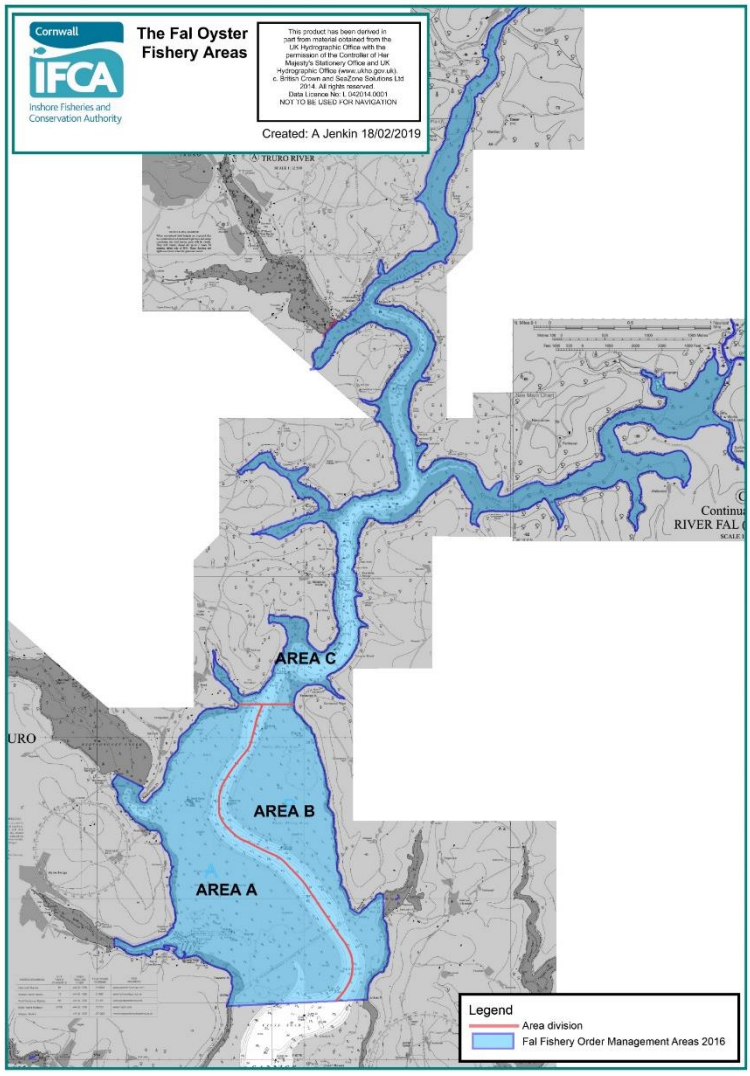

Figure 1: The management areas, Area A, B and C of the Fal oyster fishery and survey.

Figure 2: R/V Tiger Lily VI – Cornwall IFCA's research survey vessel.

Figure 3: Survey setup on R/V Tiger Lily VI

Method

The survey was carried out onboard Research Vessel (R/V) Tiger Lily VI (Figure 2). For all sites, a tow haul method was adopted. At each survey site the survey vessel was anchored and 60 m of anchor line was paid out. The dredge used was a 72 cm blade, Essex-style oyster dredge, rigged with 34 mm diameter steel belly rings and a 45 mm (twin 3 mm nylon twine) mesh back. The dredge was shot by hand and the vessel's slave hauler winch was used to take up 50 m of marked anchor line, resulting in a 50 m dredge tow at a steady 0.5 to 1 knots. The towing warp was run via the A frame mounted hydraulic winch.

A target was created in HYPACK MAX 2019 to indicate the start of line (SOL); this was repeated at the end of line (EOL).

The catch was sorted on a table once onboard (Figure 3) and the native oysters were measured and weighed individually where possible, the scallops were measured and the slipper limpets were counted. Non-natives were removed from the fishery and bycatch species were recorded on a list.

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Data Normalisation

The data from 2021 were normalised to include sites that weren't sampled because of time constraints due to Covid-19. The average from 2018 to 2020 was used for the number of oysters and scallops for the size categories, the average number and the density of oysters. This resulted in an additional 50 sites being included in the analysis for 2021.

Survey positions

A total of 81 sites were surveyed in 2023, 30 in Area A, 35 in Area B and 16 in Area C, as shown in Figure 4. The sites are repeated year on year, where possible, to allow for temporal comparisons.

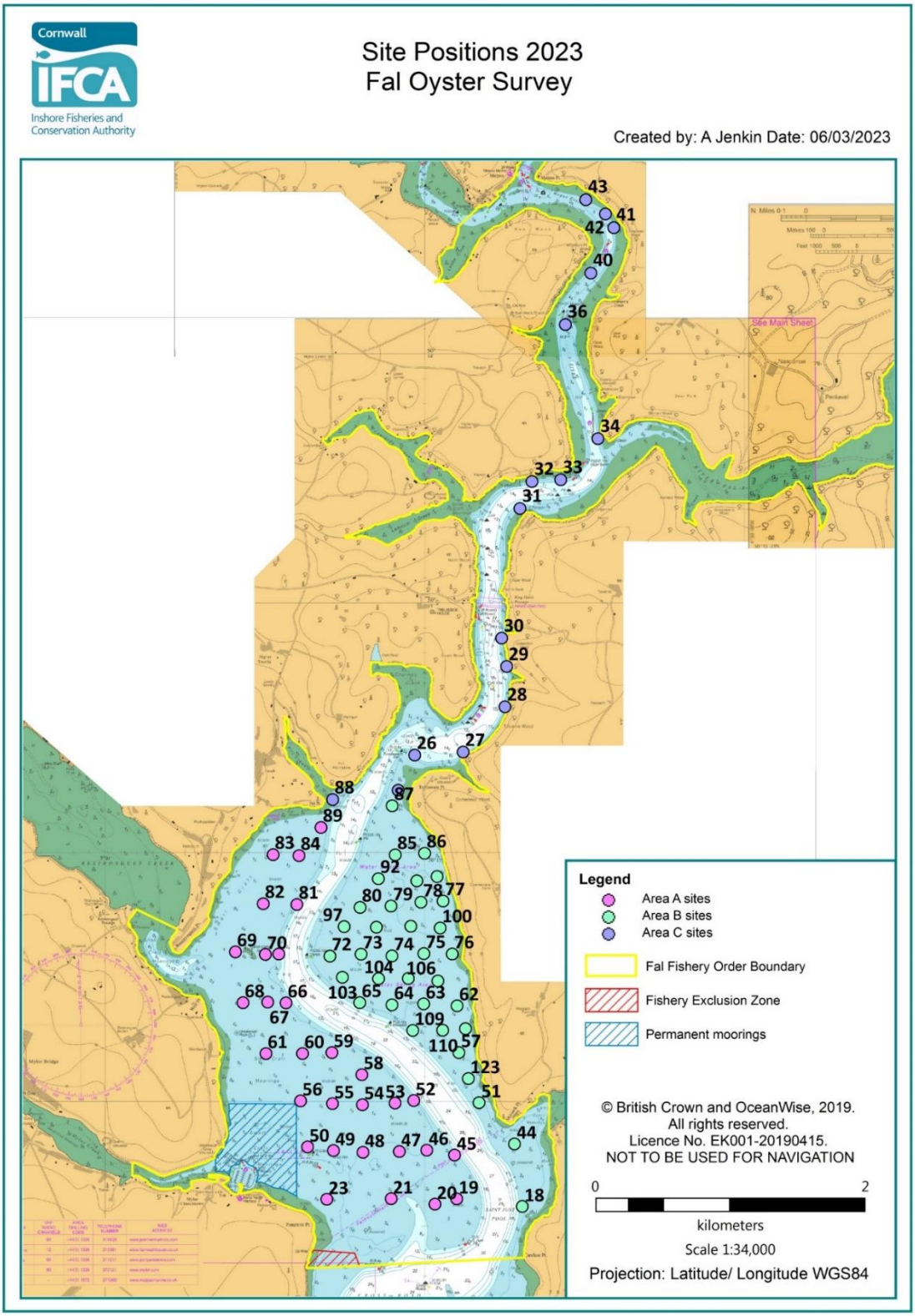

Figure 4: The Fal Oyster Survey area and survey sites in the River Fal, split by management areas A, B and C from the 2023 survey.

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Native oysters (*O. edulis*) – Numbers of Oysters

A summary of the number of sites surveyed, number of native oysters and the differences from 2019 to 2023 are shown in Table 1. The highest number of oysters (2,007) recorded was in 2023.
In 2021, sites were chosen based on previous high counts of oysters, then scallops, which is why the number of oysters appears high for the number of sites sampled and this site selection process in 2021 resulted in a reduction in the volumes of scallops and slipper limpets recorded during the survey.

Table 1: Summary of survey data and the number of native oysters (*Ostrea edulis)* recorded during the Fal oyster survey between 2019 and 2023.

Year	Number of sites	Number of native oysters	Difference from previous year	Percentage difference from previous year
2023	81	2,007	+347	21%
2022	81	1,660	+596	56%
2021	32	1,064	-201	-16%
2020	82	1,265	-445	-26%
2019	83	1,710	+209	14%

The density of oysters per 10 m^2 from 2019 to 2023 for all management areas is shown in Figure 5. The density of oysters was highest in Area C and lowest in Area A with a decline recorded in Area C in 2023 and an increase in 2023 in Areas B and C.

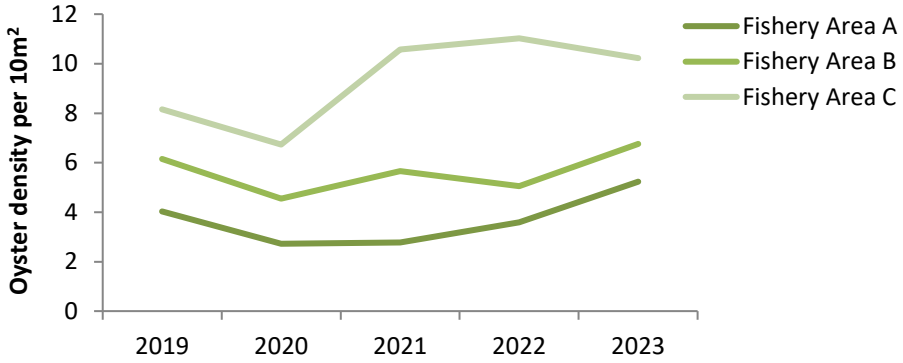

Figure 5: The density of native oysters (*Ostrea edulis)* per 10 m^2 for the three management areas (Area A, B and C) from 2019 to 2023.

The density of oysters per 10 m^2 from 2019 to 2023 separated by the three management areas per size class is shown in Figure 6. The density of oysters was low in Area A for all size classes in 2023 and low across all three areas for small oysters ≤35 mm. In Areas B and C, there was an increase in the number of large oysters ≥67 mm from 2022 to 2023 and a decline in the number of oysters in the 36-≤50 mm size class from 2021 to 2023. The ≥51-≤66 mm size class increased in Area B and decreased in Area C in 2023.

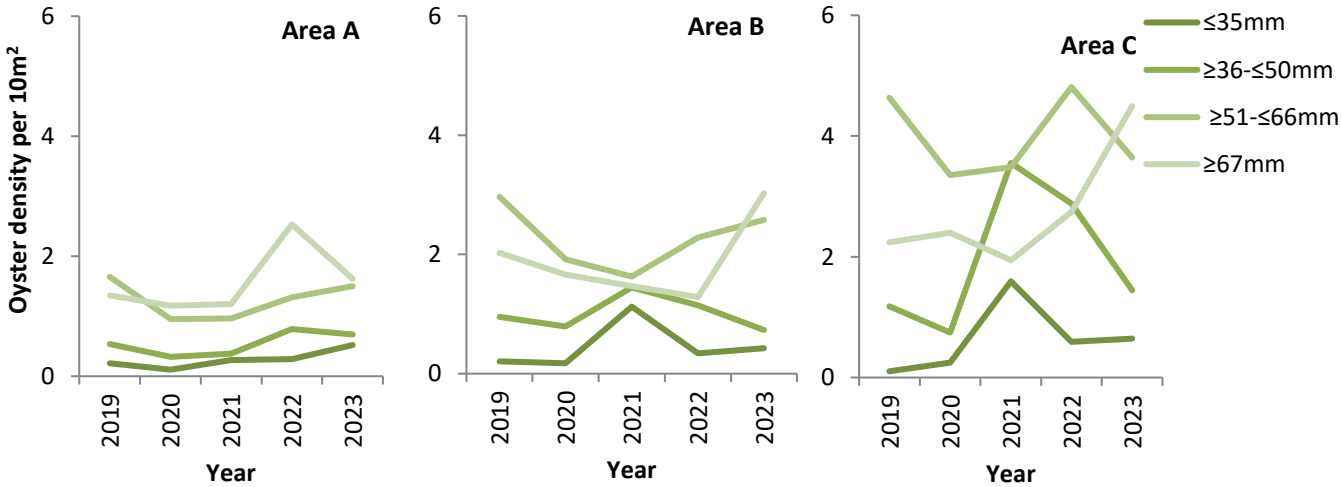

Figure 6: The density of native oysters (*Ostrea edulis)* per 10 m^2 for the three management areas (Area A, B and C) per size class from 2019 to 2023.

Native oysters (*O. edulis*) – Density

Density plots are shown for total number of oysters per 10 m^2 (Figure 7) and the number of native oysters ≥67 mm per 10 m^2 (Figure 8). The distribution of the total number of oysters shows similar patches with higher density of oysters around Turnaware Point, the central part of East Bank and the central part of North Bank across the survey years (Figure 7). The distribution of oysters ≥67 mm was low across most of the fishery but increased since 2022 with scattered patches of higher densities recorded at Turnaware Point, a patch north-east of the moorings at Mylor on North bank and a central part of the East bank (Figure 8). Density plots of Area C, the upper reaches above Turnaware Point, were not mapped by density due to the lack of samples and their scattered distribution which could lead to misleading interpolation.

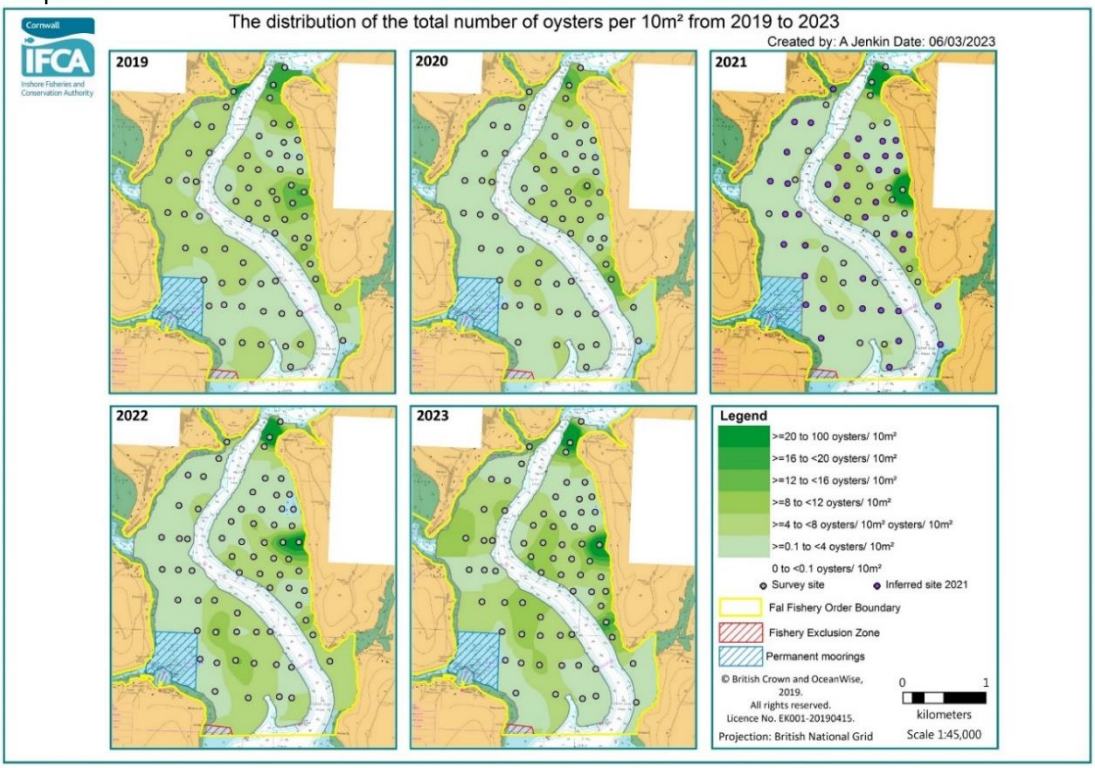

Figure 7: Density map displaying the total number of native oyster (*Ostrea edulis)* per 10 m^2 within Areas A and B from 2019 to 2023.

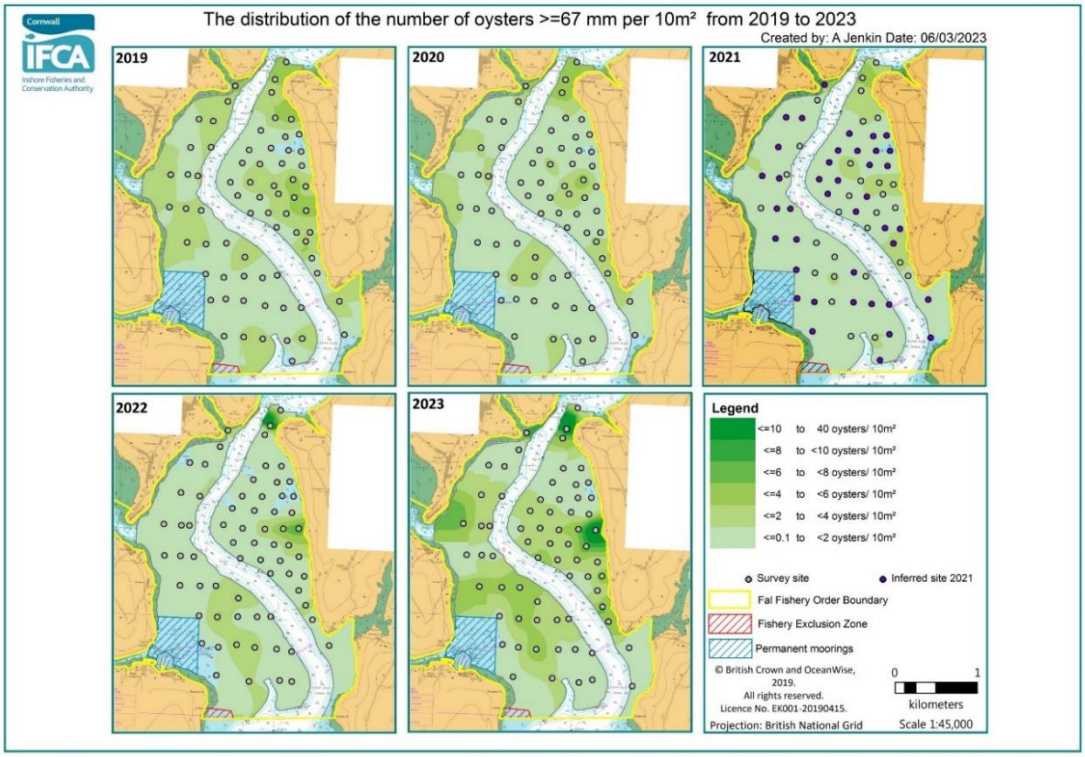

Figure 8: Density map displaying native oyster (*Ostrea edulis)* ≥67 mm per 10 m^2 within Areas A and B from 2019 to 2023.

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Native oysters (*O. edulis*) – Size class distribution

The length distribution plot for all oysters sampled from 2019 to 2023 is shown in Figure 9. The total mean length (cm) has increased since 2021 as well as the spread of oyster sizes.

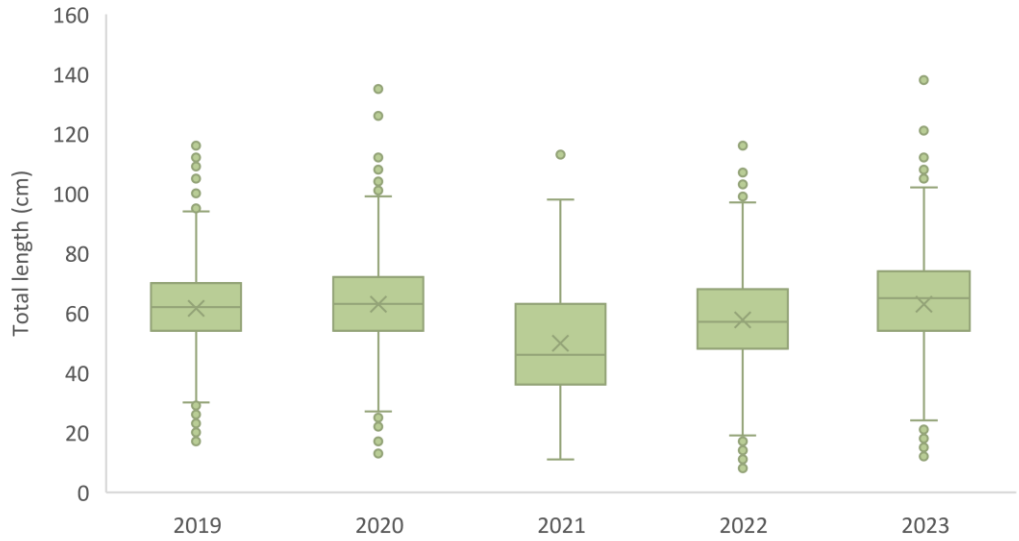

Figure 9: Length distribution plot for all native oysters (*Ostrea edulis)* from 2019 to 2023. Data is grouped by year. X represents the mean, the line represents the median, boxes represent the interquartile range, whiskers represent 1.5* interquartile range, and the filled circles represent outliers.

The percentage of oysters per size class from 2019 to 2023 are shown in Figure 10. A greater percentage of large oysters was recorded in the >=67 mm size class in 2023 which is similar to the distribution in 2020.

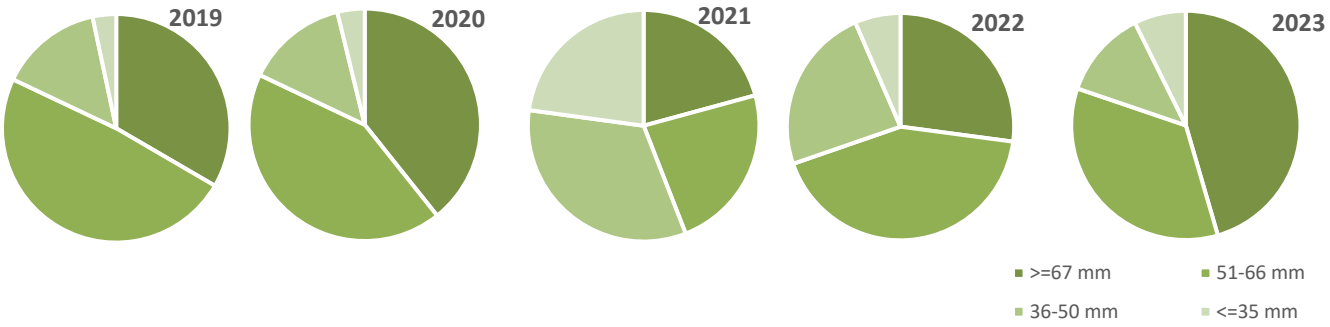

Figure 10: The percentage of native oysters (*Ostrea edulis)* per size class (≥67 mm, ≥51-≤66 mm, ≥36-≤50 mm and ≤35 mm) from 2019 to 2023.

The Minimum Landing Size (MLS) for native oysters from the fishery is 67 mm. The percentage of oysters over and under the MLS for the management areas, A, B and C is shown in Table 2. For all three areas in all years the percentage under the MLS was greater than over the MLS although in 2023 the percentages were more even.

Table 2: The percentage (%) of native oysters (*Ostrea edulis*) over and under the minimum landing size (67 mm) for all three management areas (Area A, B and C) of the Fal Oyster Survey area from 2019 to 2023.

	Area A % under 67 mm	Area A % over 67 mm	Area B % under 67 mm	Area B % over 67 mm	Area C % under 67 mm	Area C % over 67 mm
2023	51.77	48.23	55.28	44.72	56.12	43.88
2022	66.49	33.51	74.57	25.43	75.12	24.88
2021	62.42	37.58	76.88	23.12	88.78	11.22
2020	50.66	49.34	63.53	36.47	64.43	35.57
2019	59.78	40.22	67.10	32.90	72.55	27.45

Native oysters (*O. edulis*) – Size class composition

The composition of size classes of oysters at each site in Areas A, B (Figure 12) and C (Figure 11) has varied from 2019 to 2023 with most sites composed of a range of size classes. A greater proportion of oysters in the ≥67 mm size class were recorded in 2023 across all three areas compared to previous years.

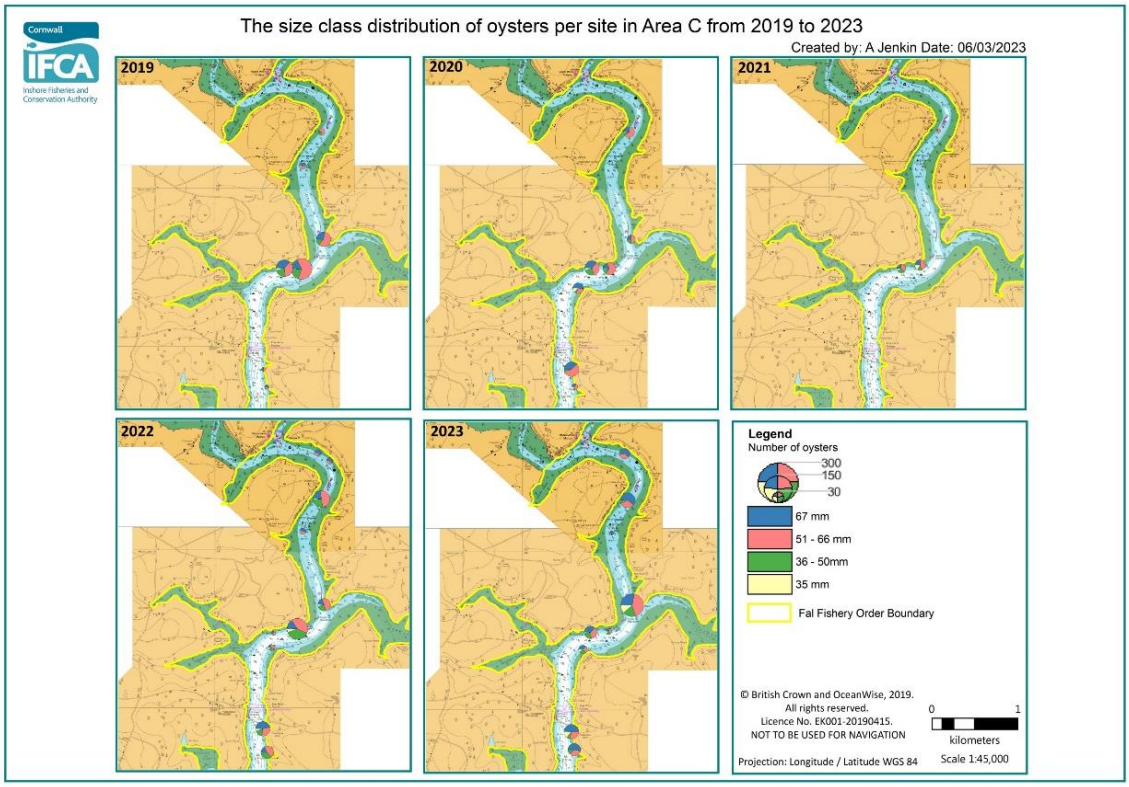

Figure 11: The composition of size classes (≥67 mm, ≥51 to ≤66 mm, ≥36 to ≤50 mm and ≤35 mm) of native oysters (*Ostrea edulis*) per survey station within Area C from 2019 to 2023.

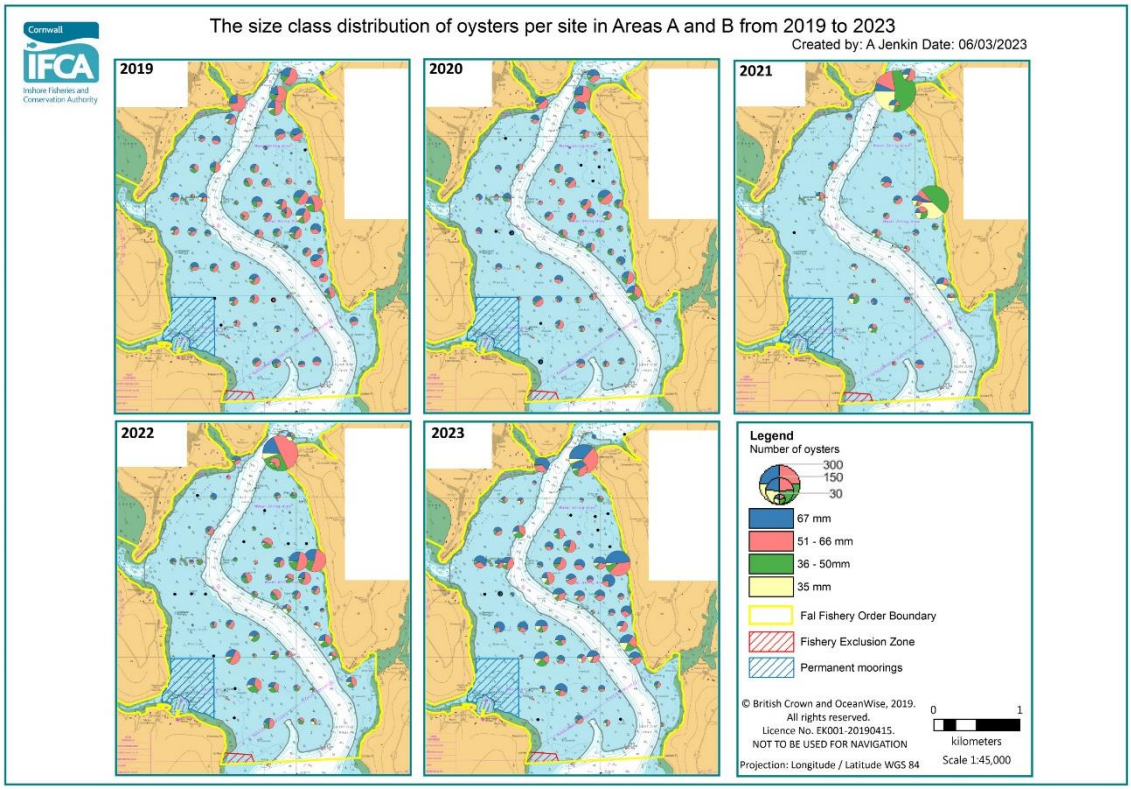

Figure 12: The composition of size classes (≥67 mm, ≥51 to ≤66 mm, ≥36 to ≤50 mm and ≤35 mm) of native oysters (*Ostrea edulis*) per survey station within Areas A and B from 2019 to 2023.

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Native oysters (*O. edulis*) – Weight

The total number of oysters weighed, the average weight of oysters (g), the total number of oysters ≥67 mm weighed and the average weight (g) of oysters ≥67 mm from 2019 to 2023 are shown in Table 7. The average weight of oysters (g) has varied from 2019 with a peak recorded in 2023 and the lowest value recorded in 2021. The decline in 2021 is likely to be due to a smaller size of oyster being recorded at the sites sampled during covid, bringing the average weight down. There was a peak in the weight of oysters >=67 mm with 2021 showing the highest average weight (83.0 g).

Table 3: The number of native oysters (Ostrea edulis) weighed and the average weight of native oysters (g) ± standard error and number of oysters ≥67mm weighed and the average weight of native oysters (g) ≥67mm ± standard error from 2019 to 2023

	Number of native oysters weighed	Average weight (g) of native oysters	Number of oysters ≥67 mm weighed	Average weight (g) of oysters ≥67 mm
2023	1491	55.2 ± 0.9	827	72.7 ± 1.2
2022	1135	45.8 ± 1.1	395	80.61 ± 2.0
2021	810	37.4 ± 1.2	217	83.02 ± 2.2
2020	1107	53.6 ±1.0	465	78.24 ± 1.4
2019	787	51.1 ± 1.0	298	74.74 ± 1.8

A weight distribution plot for all oysters weighed from 2019 to 2023 is shown in Figure 13. There is no obvious trend in total weight mean or distribution over 2019-2023.

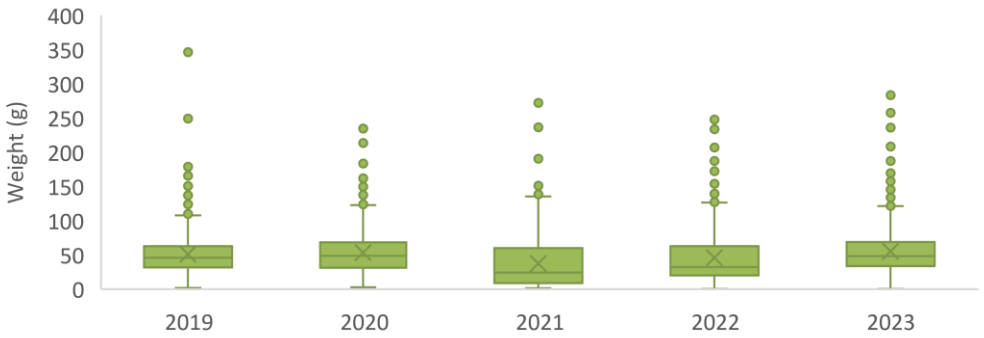

Figure 13: Weight (g) distribution for all native oysters (*Ostrea edulis)* from 2019 to 2023. Data is grouped by year. X represents the mean, the line represents the median, boxes represent the interquartile range, whiskers represent 1.5* interquartile range, and the filled circles represent outliers.

The length weight relationship of oysters from 2019 to 2023 is shown in Figure 14 with polynomial regressions for all years. The polynomial curves for 2019, 2021 and 2022 are similar, but the slopes of the line is smaller in 2020 and 2023 suggesting a lighter weight of oyster for given lengths during these years.

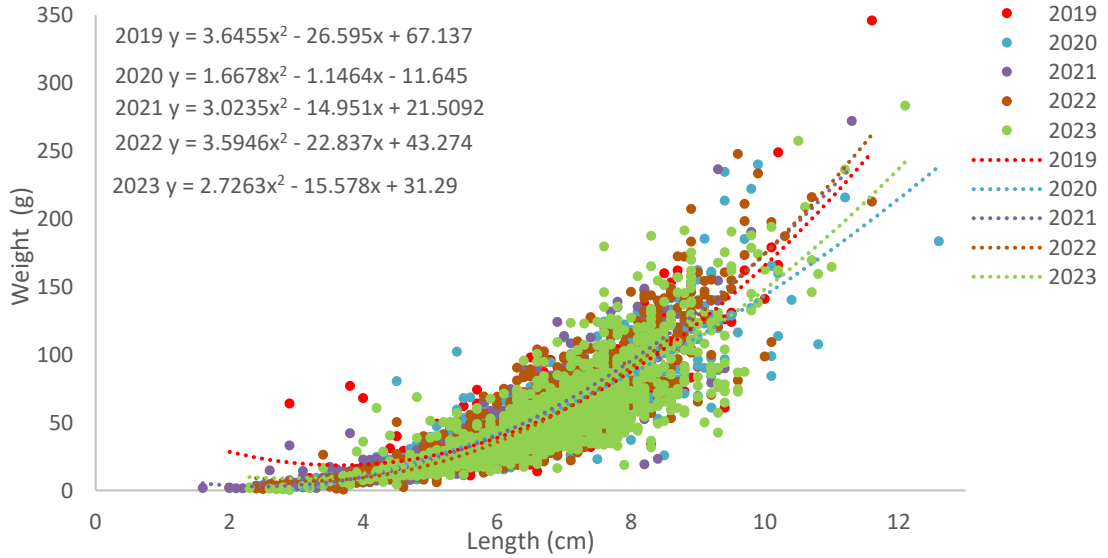

Figure 14: Length (cm) Weight (g) plot for all native oysters (*Ostrea edulis)* from 2019 to 2023. Data is grouped by year. X represents the mean, the line represents the median, boxes represent the interquartile range, whiskers represent 1.5* interquartile range, and the filled circles represent outliers.

In total, 3,165 scallops were measured and recorded. Previous scallop counts including the number of sites sampled, the average number of scallops per site and the difference per year are shown in Table 4. The number of survey sites changed year on year so the total number of scallops recorded across the years are not directly comparable. In 2021, sites were chosen based on previous high counts of oysters and sites with previous high counts of scallops were a secondary factor in site selection.

Table 4: Summary of survey data and the number of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) recorded during the Fal oyster survey between 2019 and 2023

Year	Number of sites sampled	Number of scallops	Average number of scallops per site	Difference from previous year	Percentage difference from previous year
2023	81	3,165	39.1	-543	-14.64%
2022	81	3,708	45.8	+1129	43.78%
2021	32	2,579	80.6	-2398	-48.18%
2020	82	4,977	60.7	-2038	-29.05%
2019	83	7,015	84.5	+2870	69.24%

The density of scallops per 10 m² for all three management areas from 2019 to 2023 is shown in Figure 15. The density of scallops was highest in Area A and lowest in Area C. The density in Areas A and B has shown a marked decrease since levels in 2019 and Area C has remained consistently low.

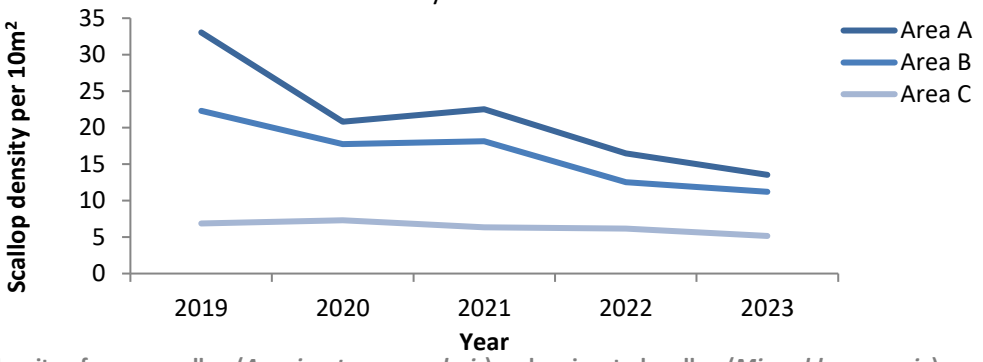

Figure 15: The density of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) per 10 m² for the three management areas (Area A, B and C) from 2019 to 2023.

The density of scallops per 10 m² from 2019 to 2023 for areas A, B and C separated by size class is shown in Figure 16. The density of scallops for all size classes has varied across the years, in all three areas, and remained lowest in Area C. The density of scallops has generally been highest in the larger size classes and lowest in the smaller size classes since 2019. The density of large scallops ≥60 mm has remained steady and a reduction in scallops in the ≥40-≤59 mm size class was seen across all areas. The density of small scallops <40 mm has generally declined since 2021 in areas except scallops ≤19 mm in areas C which have seen a slight increase over the years.

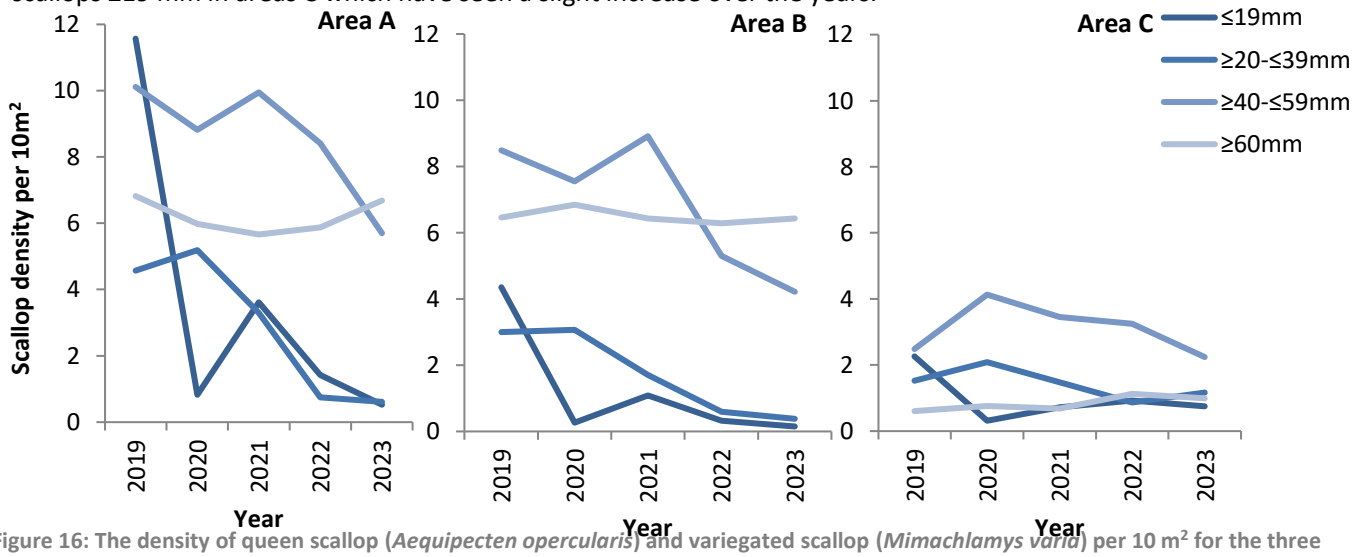

Figure 16: The density of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) per 10 m² for the three management areas (Area A, B and C) per size class from 2019 to 2023.

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Queen scallop (*A. opercularis and M. varia)* – Density

Density plots are shown for the total number of scallops per 10 m^2 (Figure 17) the number of scallops ≥60 mm per 10 m^2 (Figure 18) for Areas A and B. The distribution of the total number of scallops shows that density has declined since 2019. The distribution of scallops ≥60 mm has remained relatively similar since 2019 with patches of high density recorded either side of the channel on the East bank and North bank throughout the survey years but more markedly in 2022 and 2023. The density in the remainder of the survey area was low, between 0.1 to 12 scallops per 10 m^2.

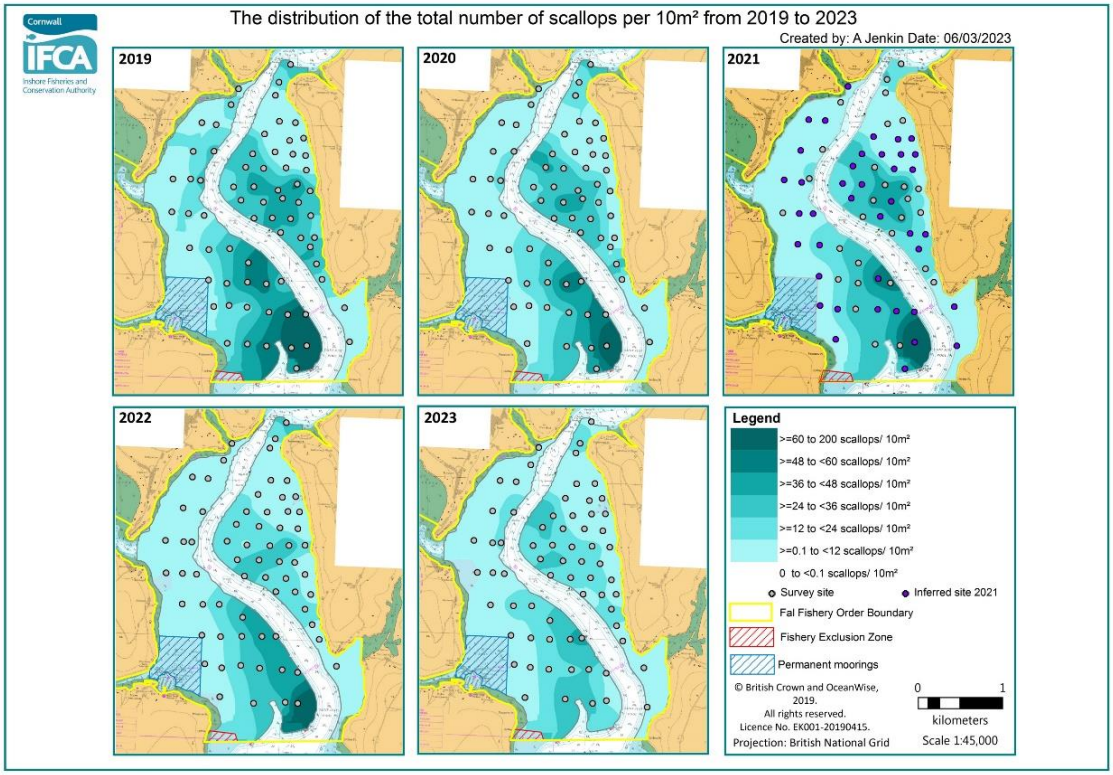

Figure 17: Density map displaying the total number of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) per 10 m^2 recorded within Areas A and B from 2019 to 2023.

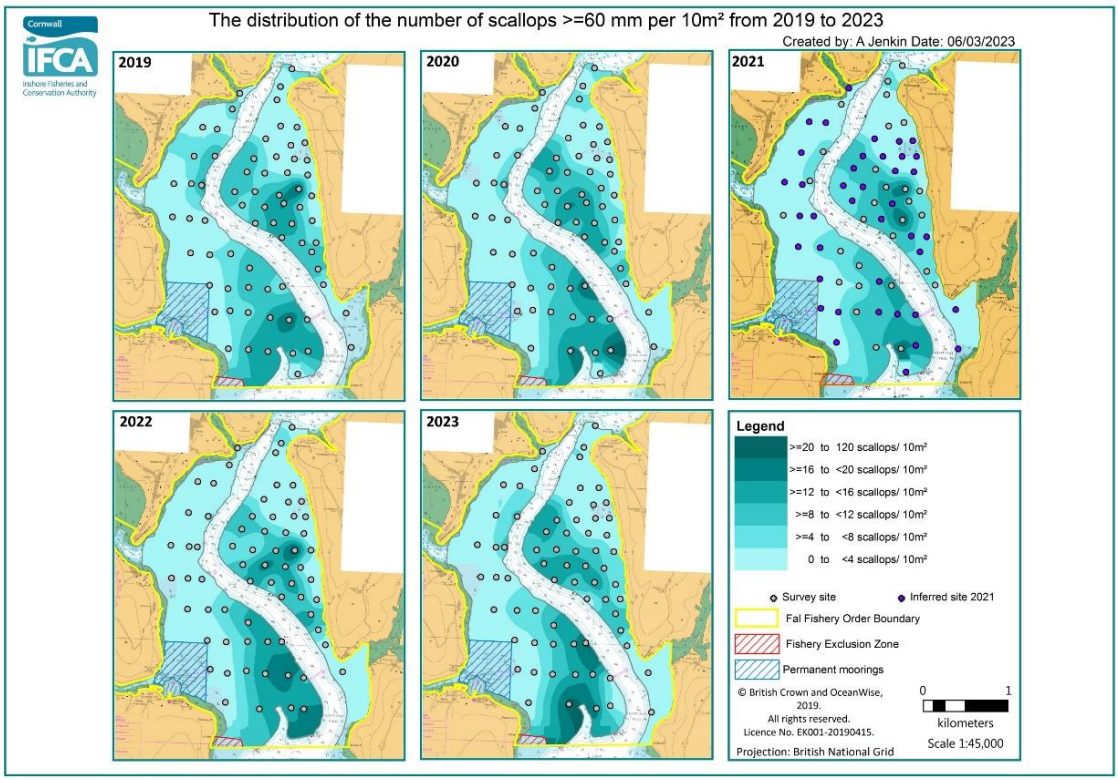

Figure 18: Density map displaying queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) ≥60 mm per 10 m^2 recorded within Areas A and B from 2019 to 2023.

Queen scallop (*A. opercularis and M. varia)* – Size class distribution

The length distribution plot for all scallops sampled from 2019 to 2023 is shown in Figure 19. The total mean length (cm) has increased since 2019 and the spread of scallop sizes has decreased.

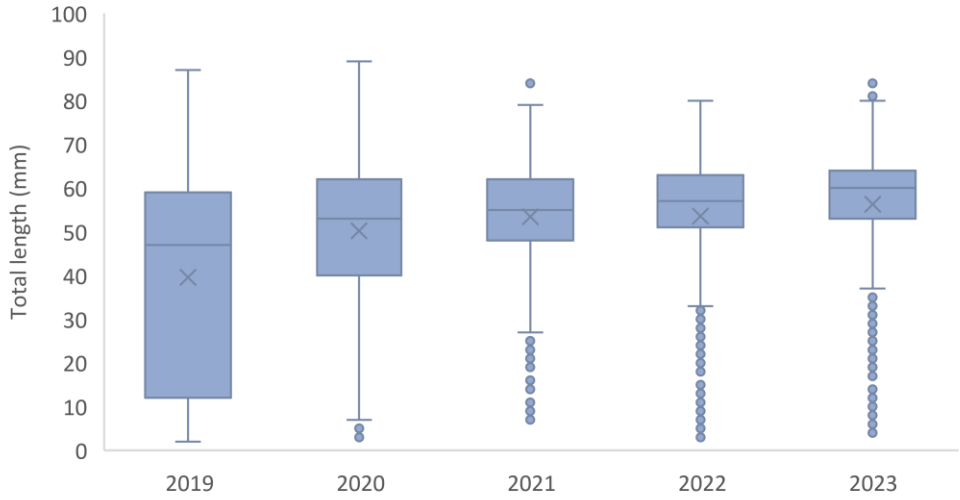

Figure 19: Length distribution plot for all queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) from 2019 to 2023. Data is grouped by year. X represents the mean, the line represents the median, boxes represent the interquartile range, whiskers represent 1.5* interquartile range, and the filled circles represent outliers.

The percentage of scallops per size class from 2019 to 2023 are shown in Figure 20. The percentage of large scallops (>=60 mm) has increased across the survey years.

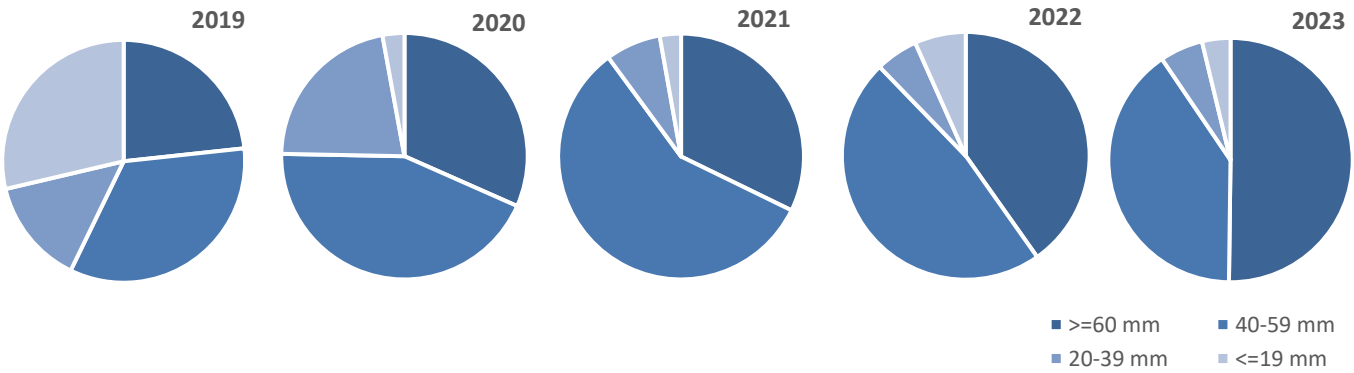

Figure 20: The percentage of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) per size class (≥60 mm, ≥40-≤59 mm, ≥20-≤39 mm and ≤19 mm) from 2019 to 2023.

The Minimum Conservation Reference Size (MCRS) for queen scallops (*Chlamys* spp.) is 40 mm . Despite this not applying to vessels targeting the fishery, it was felt that it was appropriate to analyse the data in respect of the MCRS. The percentage of scallops over and under the MCRS is shown in Table 5. For all three areas in all years the percentage over the MCRS was greater than under the MCRS except for Area C in 2019.

Table 5: The percentage (%) of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) over and under the minimum conservation reference size (40 mm) for all three management areas (Area A, B and C) of the Fal oyster survey area from 2019 to 2023.

	Area A % <40 mm	Area A % >=40 mm	Area B % < 40 mm	Area B % >=40 mm	Area C % <40 mm	Area C % >=40 mm
2023	8.42	91.58	4.76	95.24	37.16	62.84
2022	13.22	86.78	7.36	92.64	29.01	70.99
2021	9.80	90.20	7.93	92.07	25.76	74.24
2020	28.90	71.10	18.79	81.21	32.86	67.14
2019	48.79	51.21	32.98	67.02	55.05	44.95

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Queen scallop (*A. opercularis and M. varia)* – Size class composition

The size composition and distribution of size classes (≥60 mm, ≥40-≤59 mm, ≥20-≤39 mm and ≤19 mm) of scallops for each site is shown in Figure 21 (Area C) and Figure 22 (Area A and B). The plots show that for Areas A and B there is a reduction in the smaller size classes over time and an increase in larger size classes >40 mm which have dominated since 2021.

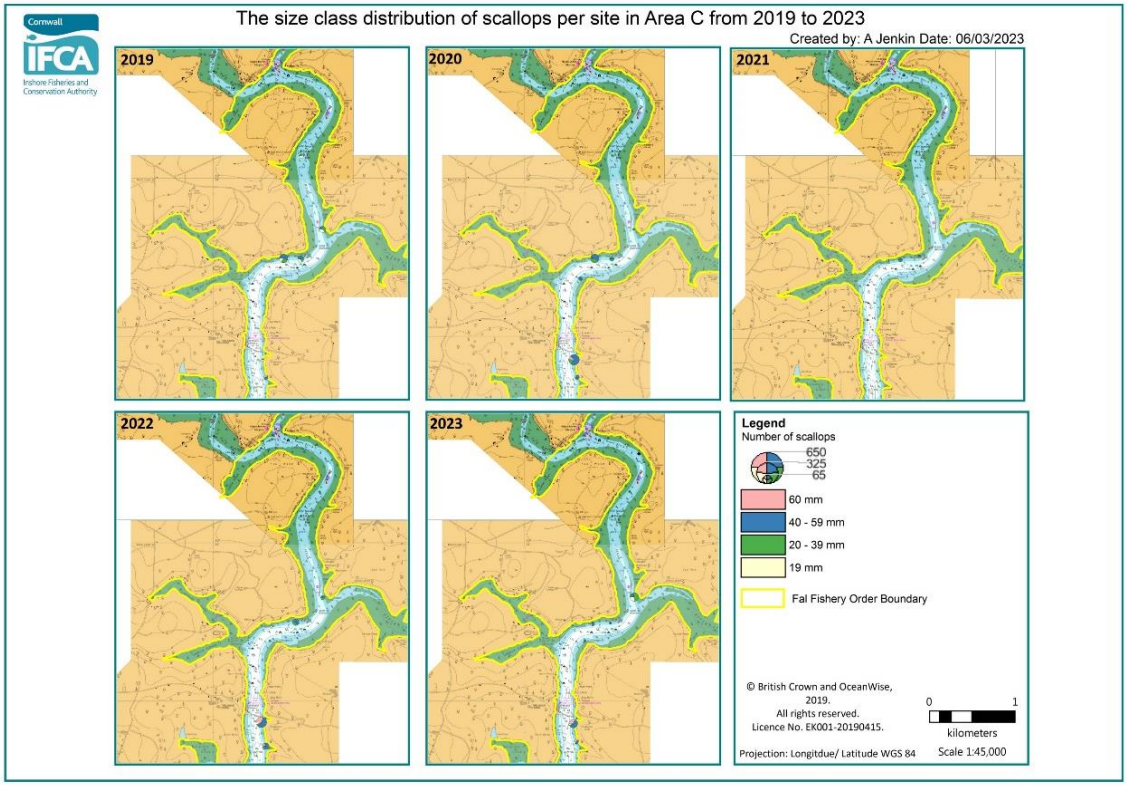

Figure 21: The size composition and distribution of size classes (≥60 mm, ≥40-≤59 mm, ≥20-≤39 mm and ≤19 mm) of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) for each site within Area C from the 2019 to 2023.

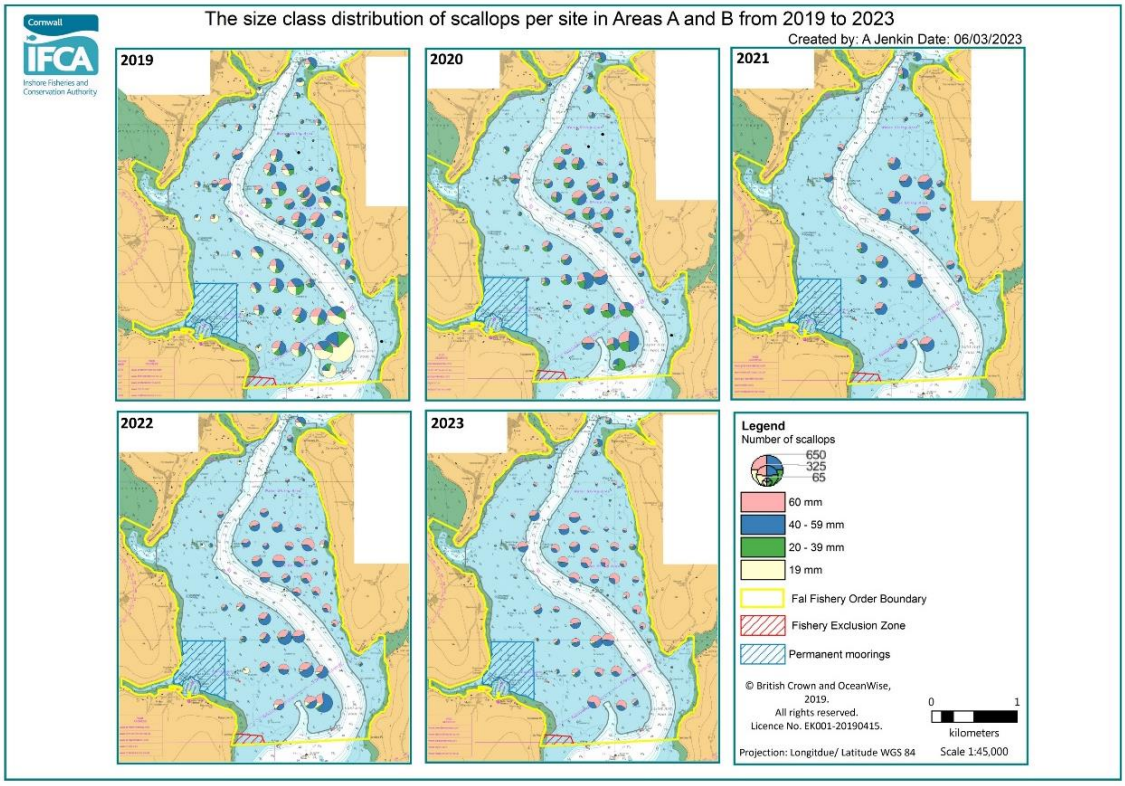

Figure 22: The size composition and distribution of size classes (≥60 mm, ≥40-≤59 mm, ≥20-≤39 mm and ≤19 mm) of queen scallop (*Aequipecten opercularis*) and variegated scallop (*Mimachlamys varia*) for each site within Areas A and B from 2019 to 2023.

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Non-natives, Bycatch and Dredge Composition

Non-native species

Three non-native species were recorded during the 2023 survey, slipper limpets (Table 6), six leathery sea squirts and one pacific oyster . The number of slipper limpets has decreased since 2019. All non-native species recorded during the survey were kept onboard and removed from the fishery and were collected by a biological waste company from Mylor.

Table 6: Summary of survey data and the number of slipper limpets (*Crepidula fornicata*) recorded during the Fal oyster survey between 2019 and 2023

Year	Number of sites	Number of slipper limpets	Area A	Area B	Area C
2023	81	3,410	1,542	1,068	800
2022	81	4,507	1,459	991	2,057
2021	32	1,879	980	661	238
2020	82	8,753	3,929	2,313	2,511
2019	83	11,412	6,364	3,166	1,882

Dredge composition

The percentage volume of each dredge and the distribution of mud, shell (live and dead), weed, gravel, vegetation (sticks and leaves), dead maerl and stone is shown for Areas A, B and C in 2023 (Figure 23).

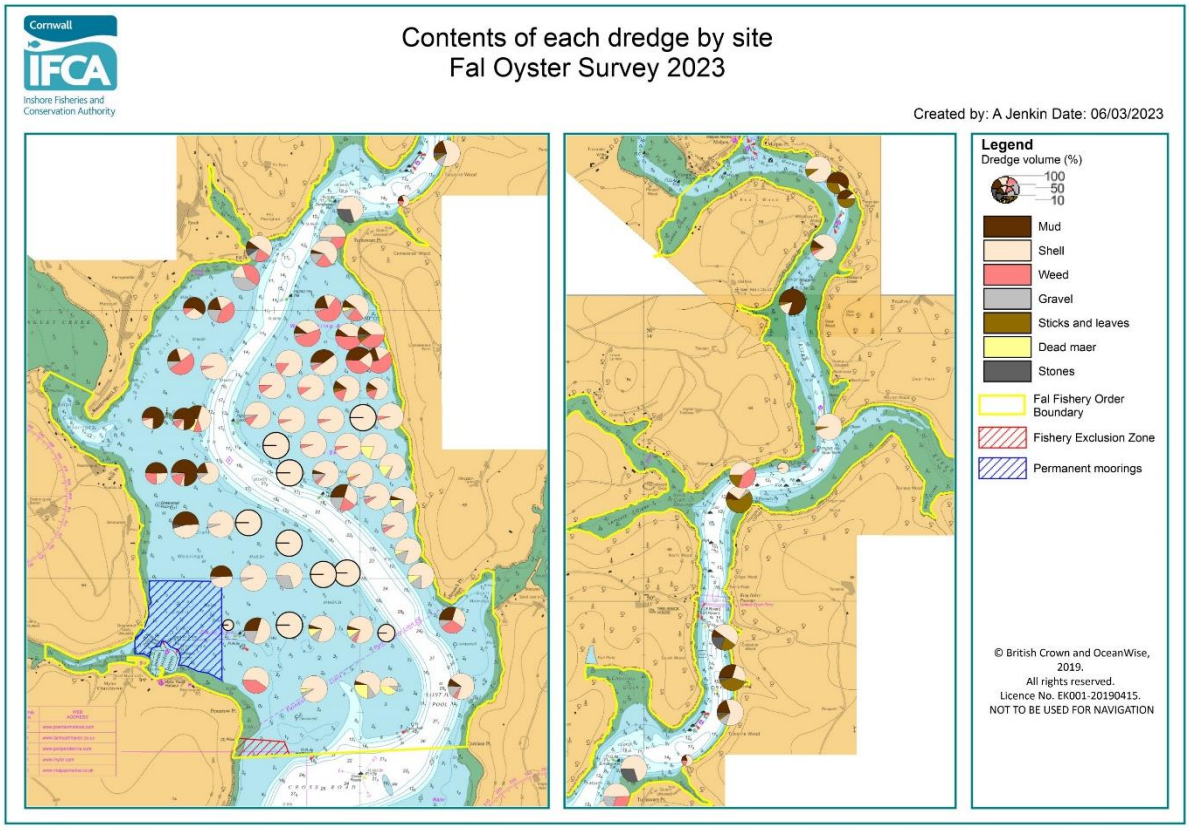

Figure 23: The dredge volume and the contents of each dredge per site recorded during the Fal oyster survey 2023.

Maerl

- Live maerl – none recorded
- Dead maerl – recorded at 13 sites

Bycatch

Species caught as bycatch were present in all 81 dredge samples and included algae, Annelida, Arthropoda, Bryozoa, Chordata, Cnidaria, Echinoderms, Hydroida, Mollusca, Porifera and Tunicata. Due to the light footprint of the dredge and short tow durations bycatch species were good condition and returned alive to the water straight away (unless a non-native species).

Similar to previous years, the species of red algae, *Solieria chordalis* was recorded in abundance at many sites (Figure 24), with a high abundance of red weed in a basin in the central part of East Bank but it was also recorded in scattered samples across the survey area.

Figure 24: A species of red weed (*Solieria chordalis)* in a recovered sample during the Fal oyster survey 2023.

Cornwall Inshore Fisheries and Conservation Authority

Fal Oyster Survey 2023 Summary Report

Key Points

- A total of 81 sites completed.

Oysters

- Highest number of oysters recorded in 2023.
- Highest proportion of large oysters (>=67 mm).
- Highest average weight of oysters recorded in 2023.
- The density of oysters per 10 m^2 has increased across the survey site since 2020.

Scallops

- A decline in the proportion of small scallops (<40mm) since 2019.
- An increase in the proportion of large scallops (>40mm) since 2019.
- Highest proportion of scallops >=60 mm in 2023.
- The density of scallops per 10 m^2 has decreased since 2019 in Areas A, B and C.

Non-natives

- Decline in the number of slipper limpets since 2019.
- Three non-native species identified, all specimens removed from the fishery.

Bycatch

- No live maerl recorded.
- Large number of bycatch species returned unharmed.

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Cited as:
Jenkin, A., Sturgeon, S., Trundle C., Daniels, C. and Street, K. 2023. Fal Oyster Survey 2023 Summary Report. Cornwall Inshore Fisheries and Conservation Authority (Cornwall IFCA, Hayle).