Agenda item B4

From: Lead Scientific and Conservation Officer

To: Kent and Essex Inshore Fisheries and Conservation Authority – 30 January 2024

Subject: Management of BCRC MCZ native oyster fishery following further declines in native oyster population in 2023.

Classification: **Unrestricted**

Summary:
Surveys show a significant decline (90%) of the native oyster population in 2023 compared to the period between 2016 to 2019 in the Blackwater, Crouch, Roach and Colne Estuaries Marine Conservation Zone (BCRC MCZ). These surveys recorded few small native oysters suggesting an aging population of native oysters with limited recruitment of young native oysters. The BCRC MCZ has shown no signs of recovery of the native oyster population over the monitoring period between 2019 to 2023.

We bring to Members attention the update to the dredge efficiency parameter used in stock calculations from 20% to 10% and discuss the implications for stock estimates.

Furthermore, we report the comparatively high-level of native oyster abundance off the Isle of Sheppey recorded during a recent survey that we carried out with the Zoological Society of London (ZSL).

Recommendation(s):
1. The Authority is asked to **APPROVE** the following management measures:

(a) It is **RECOMMENDED** that the BCRC MCZ Native Oyster Fishery remains closed in 2023/2024 because the requirements for the fishery to open have not been met, namely, a minimum of 800 tonnes biomass (calculated at 20 % dredge efficiency and evidence of sustained levels recovery in native oyster populations are required) in Blackwater, Crouch, Roach and Colne Estuaries (KEIFCA 2019 Oyster Survey Report);

(b) It is **RECOMMENDED** that the Authority continues to review the recommendations regarding the current closure of the native oyster fishery within the BCRC MCZ site on an annual basis, with the next review scheduled for the November 2024 KEIFCA meeting.

(c) Members are asked to **NOTE** the update to dredge efficiency parameter in stock estimates.

1. The 2023 native oyster survey in BCRC MCZ

KEIFCA carried out the annual native oyster survey in the BCRC MCZ during November 2023 which is used to inform our decision-making process for opening the native oyster fishery in the BCRC MCZ.

The native oyster fishery in the BCRC MCZ was closed on 31st May 2015. Subsequently the BCRC MCZ Native Oyster Fishery Flexible Permit Byelaw came into effect in 2019. The purpose of this flexible permit byelaw is to continue the protection afforded to the depleted native oyster stocks in the BCRC MCZ. The byelaw therefore provides the opportunity for native oysters to recover from fishing pressure while retaining the option to open the fishery if stocks are deemed to show a significant and sustained recovery in future. For the BCRC MCZ oyster fishery to be opened, stock levels are required to show a 1) sustained recovery trend and 2) a biomass estimation exceeding 800 tonnes (based on a stock that uses 20% dredge efficiency[1] parameter in the calculation). The process around opening the fishery is shown in (Figure 1). The committee approved the decision to keep the native oyster fishery in the BCRC MCZ closed throughout 2019 - 2022, and will only be considered for re-opening once the stock levels show sustained levels of recovery as per management plan.

[1] Dredge efficiency is used as an estimate of the proportion of oysters that that are caught during a single pass of the ladder dredge relative to the total amount that was on the seabed prior to the dredging. The inverse of this proportion is then used as a multiplier when calculating stock estimates.

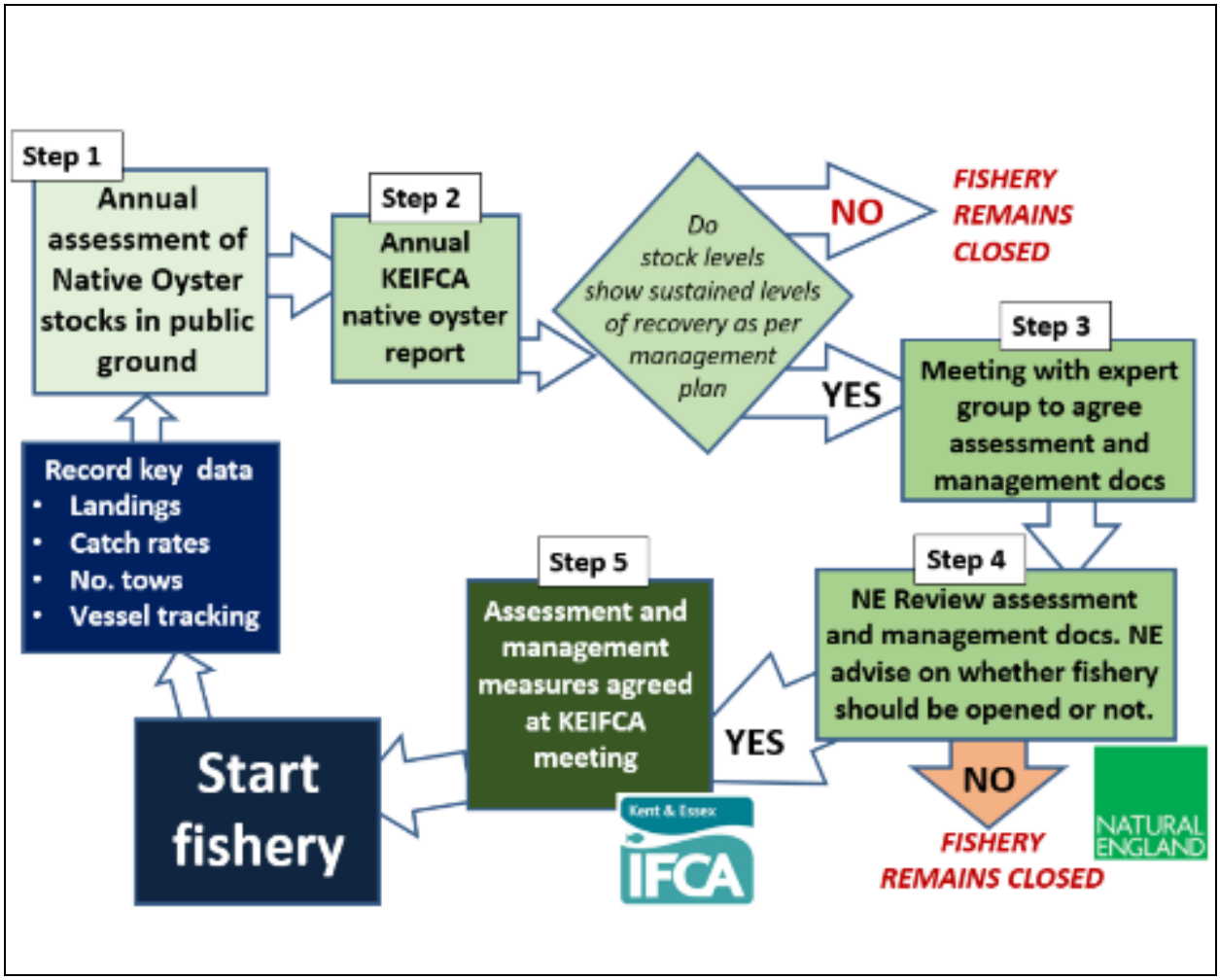

Figure 1. Decision tree describing the process used to open or close the native oyster fishery in the BCRC MCZ.

Survey results

One hundred and thirty four sites were sampled using a ladder dredge towed (100 m/tow) behind FPV Tamesis in the grid-cells where native oysters were found during the 2019 survey. In 2023, as normally during the annual surveys, we collected four additional replicate tows per grid cell, such that each cell was sampled five times.

A total of 81 native oysters were found in 29 of the 134 (21.6%) dredge tows during the 2023 survey. This represents a further decline in the total number and the spatial distribution of native oysters in the MCZ since the previous decline reported last year (2022).

In 2023 we recorded a relatively low number (0.6) of oysters per tow, where previously 2016 to 2019 values ranged between 3.9 and 6 oysters/tow, representing a 90% decline from the 2016 to 2019 mean (5.5 oysters/tow) (see Figure 2). This represents a very significant decline in the native oyster stocks in the BCRC MCZ.

Amounts of Pacific oysters increased from 2022, returning to an average of 3.5 oysters per tow, similar to levels recorded between 2016 and 2019.

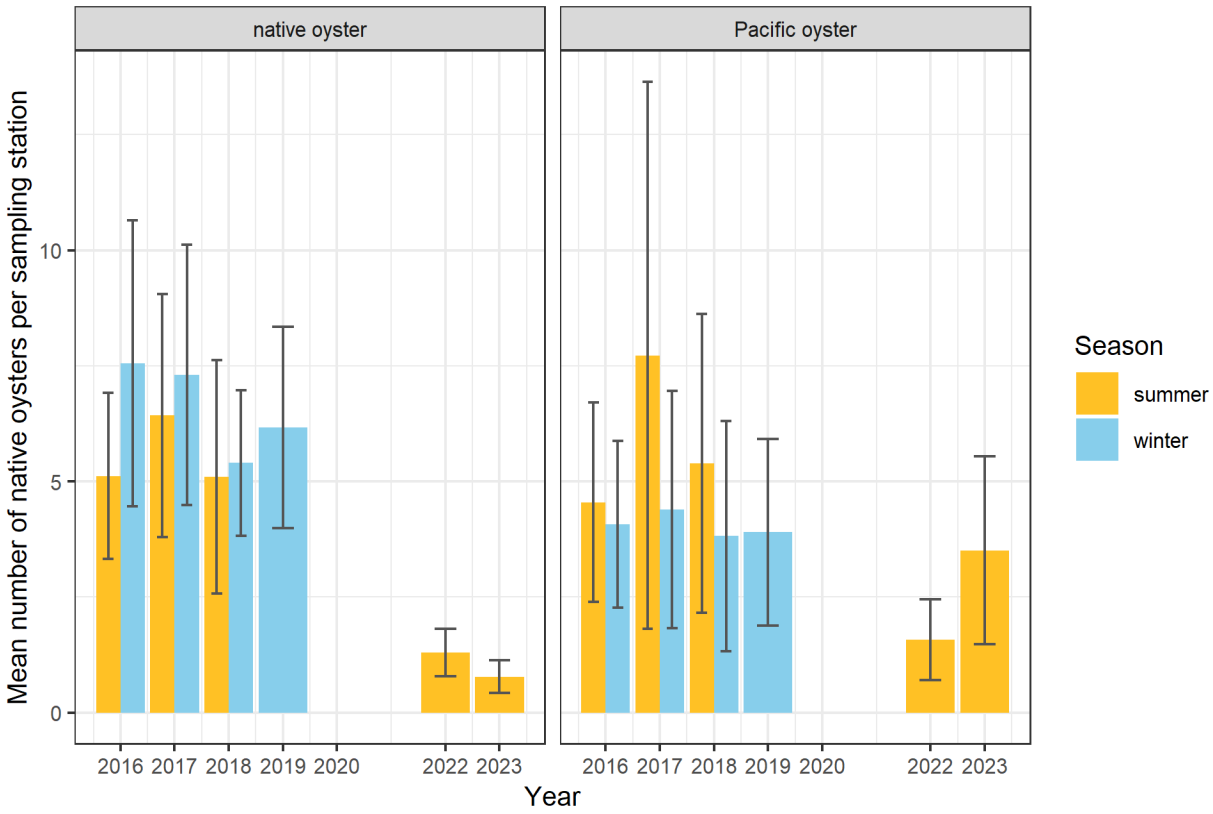

Figure 2. Change in the number of native oysters and Pacific oysters per sample (per tow of the dredge) for years 2016 - 2022 (missing years, 2020 and 2021, are due to no surveys carried out during COVID-19). Wide blue bars represent winter-only survey for a given year (i.e., no survey was carried out in summer of that year.) Large standard error bars indicate high variability of oyster abundances between sites during a survey.

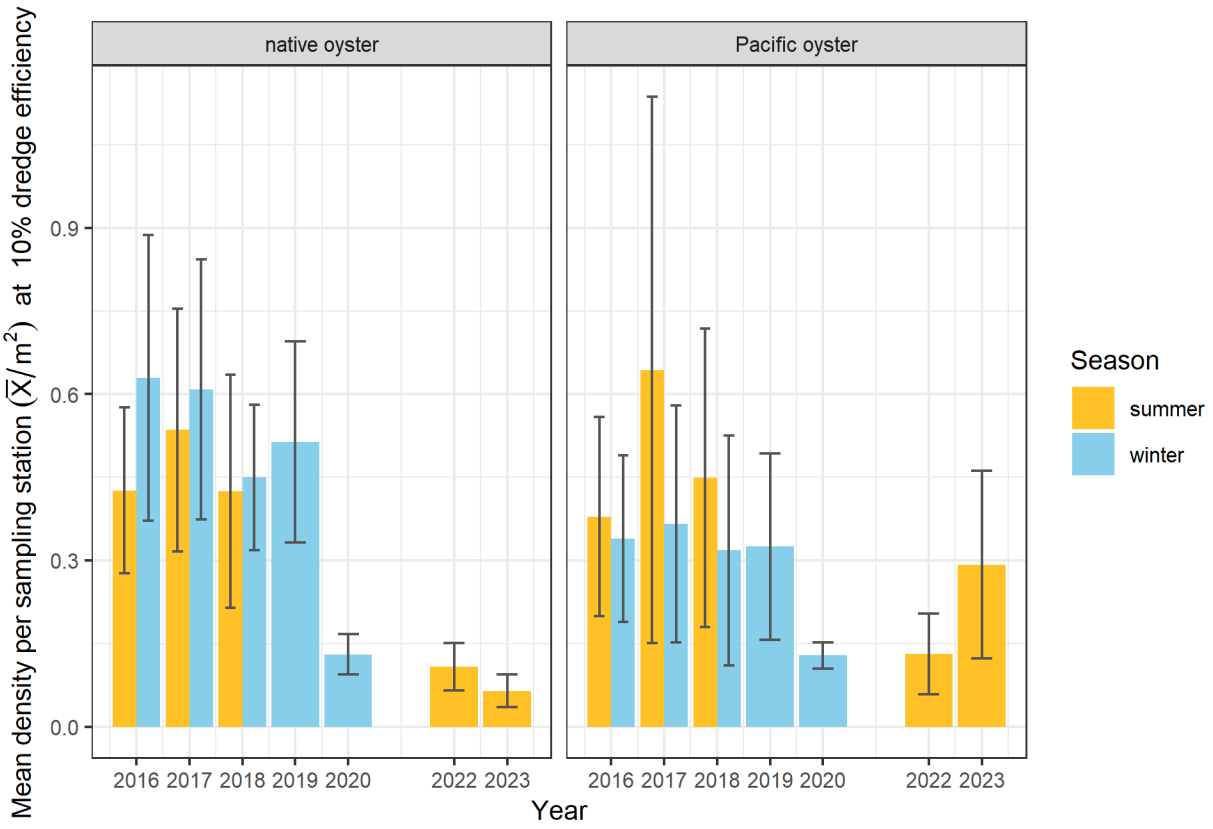

Figure 3. Change in density between seasons and years of native oysters (left) and Pacific oysters (right). Mean values per station presented with standard error bars showing variation among sampling stations during each survey. Dredge efficiency set at 10 % based on new Research.

In 2023, 81 native oysters were recorded from 134 tows.

For comparison:

- in 2016 September, a total of 443 native oysters were recorded from 102 tows,
- in September 2017, a total of 483 native oysters were recorded from 99 tows,
- in September 2018, a total of 385 native oyster were recorded from 99 tows in,
- In March 2019, a total of 596 native oysters were recorded from 99 tows.
- In September 2022, a total of 134 native oysters were recorded from 132 tows.

As in 2022, the loss of native oysters was spread throughout the sub-populations in the BCRC MCZ previously defined by Dr Alice Lown in her PhD work with KEIFCA. Native oysters were absent from the following areas, which formerly (2016 – 2019) had native oysters: Wallet Spitway, Whitaker Channel, the Outer Colne, The Eagle, No oysters were recorded in the sites outside the named sub-populations and a single oyster was recorded in the Blackwater (Figure 5). The 2023-survey results reinforces the findings from the 2022-survey results: The spatial distribution of native oyster sub-populations in the BCRC MCZ have largely been reduced to the

Crouch and Ray Sand Channel. These two sub-populations were formerly the most important areas in the BCRC for native oysters (2016 – 2019). However, here too there have been further substantial reductions since 2022. Mean abundance of native oysters per site in the Crouch has fallen to 3.4 individuals per sample from the 5.9 individuals reported in 2022; historically we recorded between 18 and 38 native oysters per sample from these same sites. In the Ray Sand Channel, the mean number of native oysters fell from one oyster to 0.6 per sample.

Size & weight distribution

In 2023, the mean native oyster size was 73.5 mm (compared to 78.5 mm in 2022), and 57% of native oysters recorded were larger than 70 mm (minimum landing size). There was a decline in the average weight of native oysters, from 96g in 2022 to 87g in 2023. Successive years of low numbers of small native oysters, following the same lack of small oysters in 2016 – 2019 reported by Lown, suggests that there is no obvious sign of a successful recent recruitment event, of which the ramifications are that there is limited potential for the population to recover over the short-term.

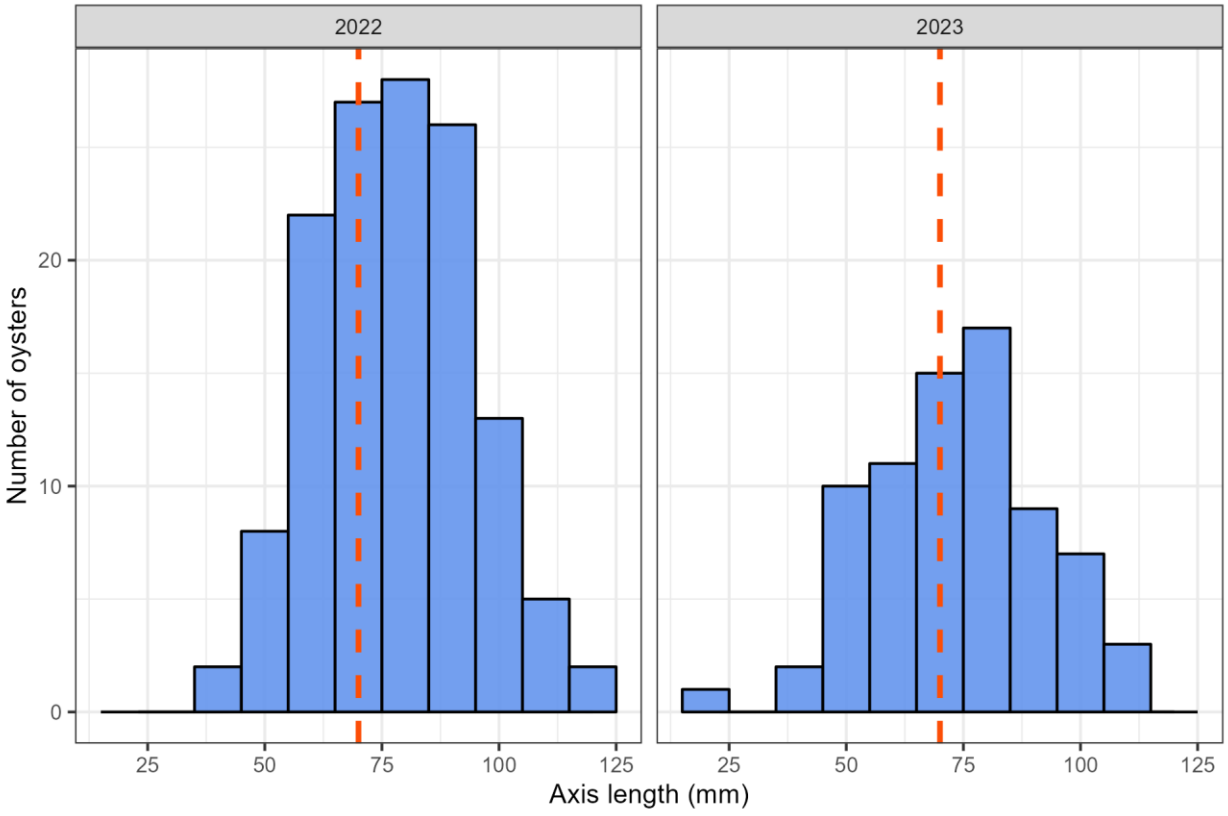

Figure 4. Native oyster size distribution frequency plot.

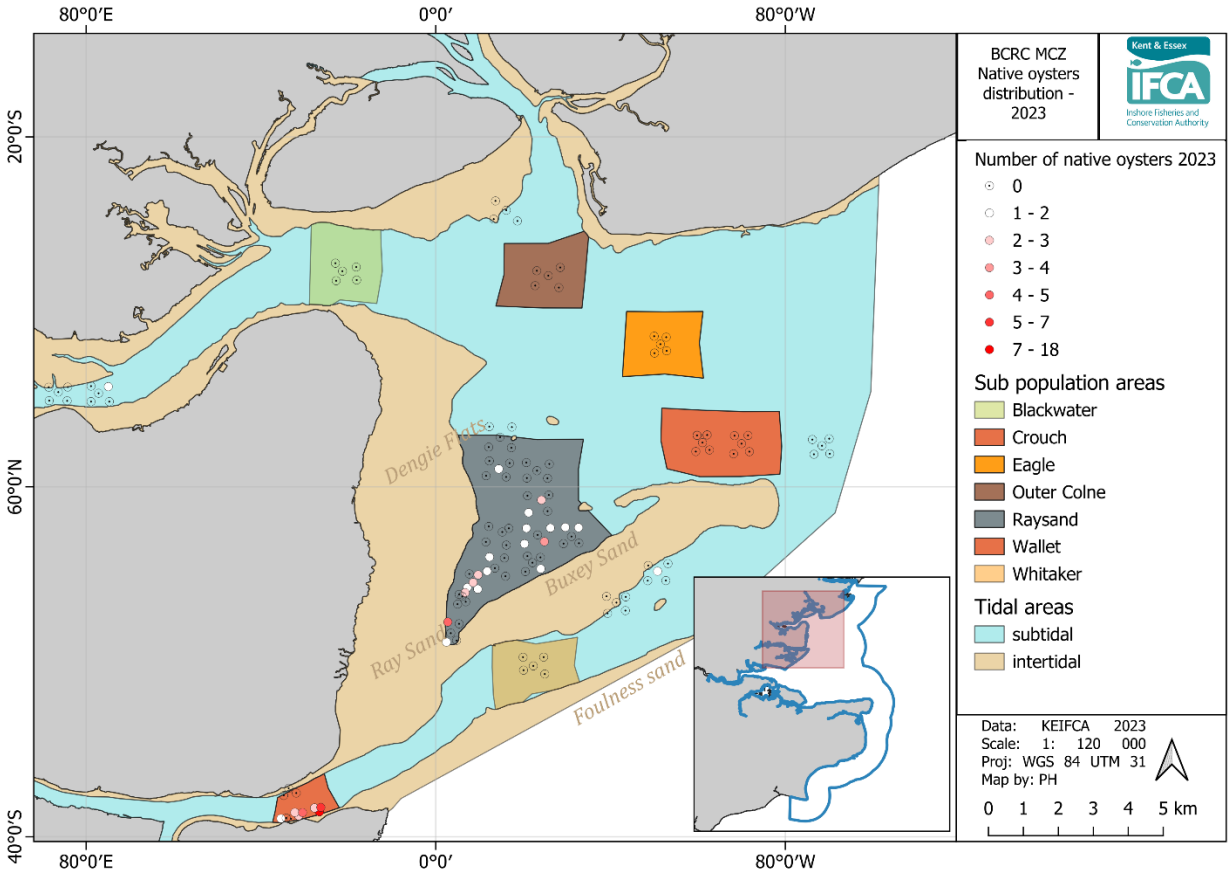

Figure 5. Number of native oysters recorded at each sampling station in 2023 Nov KEIFCA survey in the Blackwater Colne Roach and Crouch Marine Conservation Zone (BCRC MCZ).

Biomass estimations

Dr Lown's PhD study with the University of Essex in the BCRC MCZ estimated that the mean native oyster biomass ranged between 134 to 412.5 tonnes between 2016 and 2018, and was based on the 20% dredge efficiency parameter. Consequently, the significant decline of the current population from 5.5 native oyster to 0.6, would suggest the biomass is well below the 800-ton requirement, derived using Inverse Weighted Distance (IWD) models to project a biomass from the abundances recorded during surveys. Consequently, no Habitat Regulations Assessment (HRA) or MCZ equivalent were carried out and under the byelaw it was therefore determined that the fishery should remain closed. We discuss the implications of adjusting the predicted biomass estimations based on new dredge efficiency parameters below.

Implications of under-estimating dredge efficiency

Prof. Thomas Cameron's research group at the University of Essex, who helped to develop our first stock estimates in 2019, published a study in August 2023 showing that the dredge efficiency parameter was lower than previously thought down from 20% to a more realistic value ranging between 7 to 10%, depending on

the spatial distribution (clumped versus uniform) of oysters and with the hardness of the ground.

This suggests that these earlier biomass estimations have under-estimated the total biomass of native oysters in the BCRC MCZ. For example, in 2019 the estimated stock was 800 tonnes which was based on the 20% dredge efficiency parameter. Now, adjusting that to 10% would mean that there was about 1600 tonnes of stock. While this represents a substantial difference, it is important to bear the following in mind: 1) The raw number of oysters that were captured/recorded during that same 100-meter tow did not change, 2) the trends that we are observing over time did not change – the stock-levels have dropped significantly in recent years. The update of the calculation parameter does not mean that fishers would be able to land more oysters – it simply means that there were 10 – 13 % more oysters on the seabed that did not get caught than previously accounted for when making stock calculations. Specifically, the research suggests that about 90% of the oysters over which a ladder dredge passes will stay behind on the seabed (and not caught), which was previously estimated at 80% - consequently known as the dredge efficiency. In the models used for estimating total stocks, changing from 20 to 10 % dredge efficiency therefore results in interpreting the stock on the ground being about twice as much as previously thought. As said though, this also would apply to historical estimates, and consequently the message of concerning levels of declines does not change.

In conclusion, the management implications remain unchanged regardless of the change in the dredge efficiency parameter. However, it calls for an update in the way that stock is calculated and the new thresholds; Previously 800 tonnes at 20 % dredge efficiency, now 1600 tonnes at 10 % dredge efficiency.

Essex Officers have spoken with local fishers (hand gathers and dredgers) in the Blackwater to understand their views on what is happening with oysters (both species) in the BCRC MCZ. The feedback that we received is that fishers are aware and agree that the populations of both species are declining – so much so that some fishers are looking into different fisheries and are having to fish further afield.

Reasons for declines

Reasons for the declines are likely to be environmentally driven because the declines observed were widespread throughout the entire study area. Shellfish mortality is a common phenomenon, and could be a combination of factors, such as the combination of more frequent and intense marine heatwaves and disease and parasites, such as *Bonamia*. The native oyster population in the Ray Sands channel is vulnerable to sedimentation population, but no data has been collected on what the probable causes might be driving observed declines of native oyster stocks. There is also a lack of clarity on how well native oysters in the BCRC MCZ have been able to support a self-sustaining population without the intervention of man-made processes and structures, such as in the private grounds.

2. Isle of Sheppey survey with ZSL

KEIFCA's FPV vessel Tamesis and crew, was chartered by the Zoological Society of London (ZSL) to carry out a native oyster survey of the subtidal beds off the Isle of Sheppey in October 2023 as part of a study to identify sites for potential restoration projects in future. This work built on the collaborative work we carried out in 2022 when we surveyed the Medway Estuary. The study group was made up of 3 – 4 KEIFCA staff and a visiting scientist from ZSL on a rotational basis. The survey was carried out from Queenborough Harbour and was completed over 4 days during which 57 samples (100 m tows of the dredge) were collected using the same methods that KEIFCA use in its BCRC MCZ native oyster surveys. We recorded 593 native oysters and 397 Pacific oysters, clearly showing far greater abundance and higher densities than in the BCRC MCZ or as reported for Medway in 2022, for both species. The survey yielded important insights into the distribution of important areas for native oysters in the Kent and Essex IFCA district beyond what we normally monitor. The site had good representation throughout all size classes with abundance of both small and large native oysters. We hope to continue this fruitful collaboration with the ZSL in their pursuit of identifying important areas for native oysters.

3. ENORI

In summary, the gravel and cultch laid in the ENORI box (grounds) initially showed good signs of spat settling, recruitment and growth of young oysters to 3.5 – 4 cm. The box was then smothered by sediment and few oysters survived. The cultch and gravel material is still present at the site. The harrowing projects in recent years have shown limited success. Some ENORI members maintain that the biggest limitation to success is the small spatial scale over which the efforts are focused, however there are limited opportunities to expand this given the multitude of river users and MPA designations. ENORI launched a detailed benthic (seabed) survey in September 2022 documenting native oyster and other benthic infauna population in the ENORI box, which will be written up as part of an MSc thesis which commenced in 2022. We await feedback from these surveys and remain committed to ENORI.

4. Wider picture

Recent studies carried out by Exeter University and ENORI members in the wider seas have documented the historic oyster reef beds, size, densities and provided a better understanding of what oyster reefs used to be in the Thames Estuary. The work has reinforced former notions that the species has suffered a very substantial contraction in range in population size and density throughout the Thames, as in most of UK waters. However, the work also suggests that there may be more widespread opportunity for restoration projects than previously thought.

5. Planned work for 2024

We are committed to and will continue the long-term monitoring of the native oyster population to provide important information for making decisions about this potential fishery.

In 2024, the quintennial spring survey is to take place in March, or later in Autumn if the Essex Office has sufficient and trained crew by then. This survey is aimed at re-assessing the overall spread of native oysters throughout the site, many which were last surveyed in 2019. The outcomes of this survey will inform the next five years' annual survey plans, and moreover the bigger picture of what is happening with native oyster stocks in the BCRC MCZ.

Furthermore, it would be sensible to carry out multiple pass surveys in the Ray sand to better understand dredge efficiency which might reveal whether oysters are buried deeper or have been lost to recent sediment deposition in this area. Increased surveillance of the Crouch by IFCA officers may be required to identify causes of population loss from this area which is less well understood.

6. 2023/2024 Fishery Management Recommendations to KEIFCA Members

1. The Authority is asked to **APPROVE** the following management measures:

(a) It is **RECOMMENDED** that the BCRC MCZ Native Oyster Fishery remains closed in 2023/2024 because the requirements for the fishery to open have not been met, namely, a minimum of 800 tonnes biomass (calculated at 20 % dredge efficiency, or 1600 tonnes at 10% and evidence of sustained levels recovery in native oyster populations are required) in Blackwater, Crouch, Roach and Colne Estuaries (KEIFCA 2019 Oyster Survey Report);

(b) It is **RECOMMENDED** that the Authority continues to review the recommendations regarding the current closure of the native oyster fishery within the BCRC MCZ site on an annual basis, with the next review scheduled for the November 2024 KEIFCA meeting.

(c) Members are asked to **NOTE** the update to recommended minimum population size based on updated dredge efficiency parameter.