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Mr Finlay Carson MSP
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Dear Finlay,

As you may recall from previous updates, during consideration of The Razor Clams (Prohibition on Fishing and Landing) (Scotland) Order 2017 (Scottish Statutory Instrument 2017/419) the then Rural Economy and Connectivity Committee requested updates on the Scottish Government's scientific trial of electrofishing for razor clams. Please find attached the latest report on progress made during the trial's sixth year of operation (2023/2024).

Whilst the trial is managed by my officials in the Marine Directorate, it receives vital support from key public sector partners whose continued productive engagement has underpinned the progress documented. The trial participants continue to operate under bespoke terms and conditions of the trial.

The trial is an exemplar in inshore fisheries management in the way it brings together fishers, scientists, regulators, policy and academia in helping to achieve its objectives. My officials and public sector partners continue to work closely with fishers participating in the trial and the Scottish Razor Clam Association (SRCA). The good working relationship with the SRCA has proved invaluable in ensuring a flow of information between parties to improve standards and help ensure scientists are provided with quality information about fishing practices and grounds.

I will send further information to the Committee later this year, with an update on data analysis for the period 1 February 2024 - 31 January 2025. In the interim, if you have any questions about this report please do not hesitate to be in contact with my office or with the official responsible for policy on this matter [redacted]

Yours sincerely,

MAIRI GOUGEON

Annexe

1. Purpose

The sixth year of the Scottish scientific trial for electrofishing for razor clams ran from 1 February 2023 to 31 January 2024. The information provided in this annual update report is supplementary to the reports previously published:

- Update: Electrofishing for Razor Clams Trial 1 February 2018- 31 January 2019
- Update: Electrofishing for Razor Clams Trial 1 February 2019 - 31 January 2020
- Update: Electrofishing for Razor Clams Trial 1 February 2020- 31 January 2021
- Update: Electrofishing for Razor Clams Trial 1 February 2021- 31 January 2022
- Electrofishing for razor clams: scientific trial update - 1 February 2022 to 31 January 2023 - gov.scot

2. Introduction

The sixth year of the trial continued the inter-agency cooperation in the limited and regulated fishing for razor clams. Participants are authorised to do so by means of a scientific derogation and this is on a voluntary basis. The trial continued in operation around the Scottish coast at the ten pre-designated sites, the catch limit (450kg/day) and effort limit (110 days at sea per year) remained unchanged. A minimum conservation reference size of 100mm is set for landing razor clams, though in practice participants often favour larger size clams in response to market demand.

The trial continued to gather scientific information on the impact of electrofishing for razor clams. The aim of the trial is to provide evidence on how this fishery can be managed effectively, sustainably and continues to gather a range of biological and fisheries data. The main goals of the trial can be divided into four broad categories; biological and ecological goals, economic goals, social goals and best practice and management goals (Annex A).

The Marine Directorate (MD; formerly Marine Scotland) continued to work in collaboration with the Scottish Association for Marine Science (SAMS), Food Standards Scotland (FSS), the Scottish Razor Clam Association (SRCA) (an association comprising many trial participants), other trial participants and the Health and Safety Executive (HSE). This cross-organisational collaborative work resulted in the publication of the 'Scottish scientific electrofishery for razor clams trial - biological and ecological goals: progress report - gov.scot (www.gov.scot)' on 12 September 2024. Under the trial, 5896 live razor clams were dissected and analysed to determine sex, spawning activity, and length-weight relationships data. The progress report was conducted in cooperation with trial participants.

The MD continued to work closely with participants in the trial, including those not affiliated with SRCA and maintained an open forum, ensuring that contact with the Scottish Government was assured to all participants of the trial.

3. Food Standards Scotland (FSS)

Food Standards Scotland (FSS) is the Competent Authority responsible for undertaking Official Controls (OCs) to determine the safety of marine waters used for the harvesting of live bivalve molluscs (LBMs) in Scotland. FSS continued to support the trial by only classifying/monitoring razor clam harvesting areas that sit within MD's designated trial zones.

It should be noted that during the year, FSS did receive a couple of requests from harvesters to expand their areas. After review, it was identified that the proposed expansion would have taken the classified area boundary outside of the designated MD trial zones. As per the trial's requirements, these requests were declined by FSS, and the harvesters were directed to liaise with MD to discuss the potential expansion of the zone boundaries.

Looking at the number of areas monitored by FSS, it has been a very stable period of razor classifications this year. As a continuation on the previous year, FSS monitored 19 razor areas, with very few occurrences of fishing out-with the classification area boundaries observed. Any breaches were highlighted in a timely manner, with MD and FSS working together to solve any issues.

4. Health and Safety Executive (HSE)

Over the course of the period stated above, HSE have continued to work in collaboration with key industry stakeholders to ensure that continued compliance of the Diving at Work Regulations 1997 (DWR 1997) has been maintained during any planned diving operations. HSE diving inspectors have continued to conduct proactive inspections of duty holders engaged in the trial at various locations throughout Scotland. On one occasion this resulted in enforcement action being taken against a duty holder in regard to several of breaches of the DWR 1997. The duty holder on this occasion addressed the issues identified and no further action was required.

A joint operation with Marine Directorate's inshore protection programme and HSE diving inspectors was arranged to conduct an unannounced inspection of a duty holder while at sea. This resulted in enforcement action being taken because the diving contractor failed to ensure the standby diver was dressed at immediate readiness to enter the water should an emergency occur. Following the enforcement, the aforesaid issue was addressed immediately, and no further action was required.

As with any enforcement action taken against or issued to the diving contractors engaged in the trial, discussions with the Marine Directorate are always conducted at the time in order to ensure transparency between both parties.

HSE diving inspectors will continue to conduct planned and unannounced inspections of all diving contractors engaged in the electrofishing trial.
Overall, there is a high degree of confidence that diving operations are generally compliant.

5. Vessel Activity, Landings and Employment

2023 represented the start of the razor clam trial's sixth year, which ran from 1 February 2023 to 31 January 2024. However, due to 2024 data being pre-statistical release which has yet to be fully quality assured, January 2024 data has been omitted from the analysis. Instead, analysis has been conducted on the 2023 calendar year (1/1/23 to 31/12/23), with January 2023 data being from the fifth year of the trial. This is in keeping with the approach taken to the trial update published in February 2024 but is different from earlier trial update publications.

In 2023, 25 vessels had derogations allowing them to participate on the trial, down from 27 in 2022. However, during 2023, only 22 trial vessels were active[1], down from 23 in 2022. It is worth noting that not all vessels involved in the electrofishing for razor clam trial are Scottish-registered.

In 2023, active trial vessels landed 647 tonnes of razor clams, at a value of just under £5.5 million. This represents a 13% and 16% decrease in tonnage and landed value, respectively, compared to 2022's annual figures of 743 tonnes and £6.5 million in landed value. The average tonnage caught per active vessel was 29t in 2023, slightly down from 32t per active vessel in 2022. The nominal average landed value per active vessel saw a greater decrease, down from £280,000 in 2022 to £250,000 in 2023. A decrease in the number of active vessels, as well as reduced landings July to December, are primary causes of the reductions in tonnage and landed value seen in 2023 compared to previous years.

The previous four years of the trial indicate a pattern of higher landings in spring and summer, before falling in autumn; some years also saw higher landings in January and December. As evidenced in Figure 1, 2023's tonnage figures follow a similar pattern for the first half of the year, with landings peaking in June. However, the summer of 2023 saw lower tonnages and landed values compared to previous years, with July, August and September representing the lowest months for tonnage in past four years. October and November figures were more in keeping with the trend, although December 2023 saw a marked decrease in tonnage landed. This contrasts with previous years, which either saw tonnages plateau or increase.

Figure 2 shows the monthly landed value figures since 2020, with 2023's monthly landed value figures closely following the trend of monthly tonnages.

[1] 'Active vessels' refers to any vessel that was part of the trial and caught any amount of razor clams during 2023. This includes vessels that left or joined the trial at any point during the 2023 calendar year.

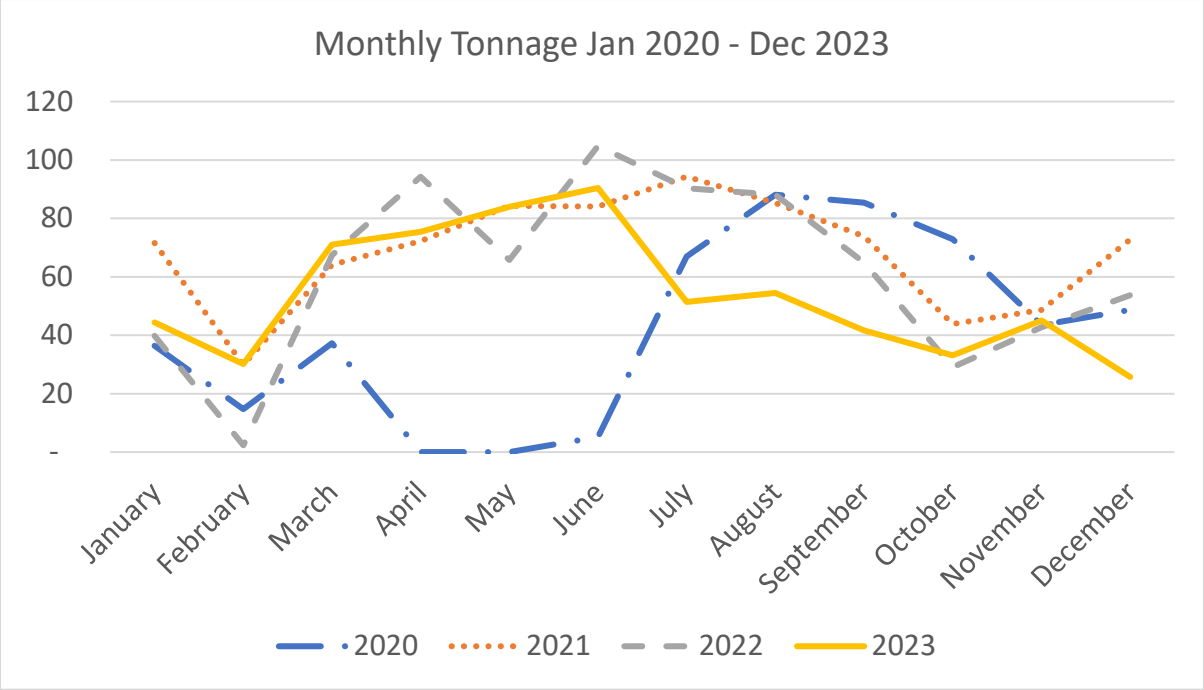

Figure 1. Monthly tonnage of razor clams landed by trial vessels, January 2020 – December 2023

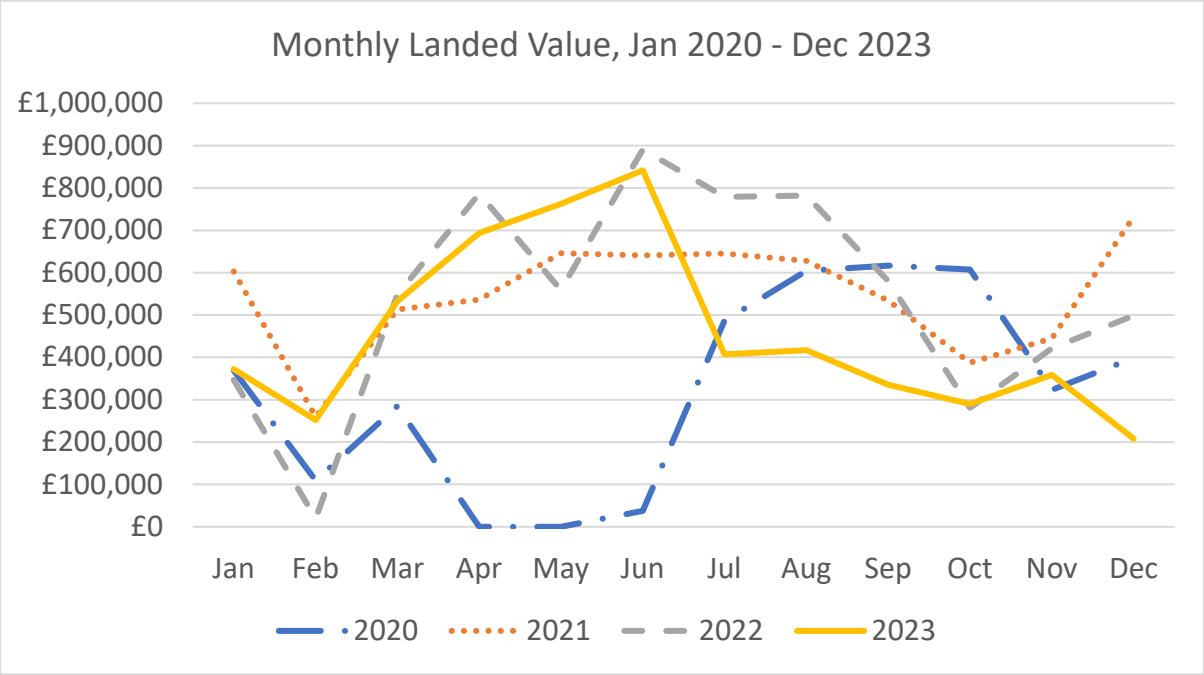

Figure 2. Monthly value (£) of razor clams landed by trial vessels, January 2020 - December 2023

The average price per kilogram (£/Kg) for 2023 was £8.49 (Figure 3), down 3% from 2022's £8.77. The price per kilogram remained constant throughout 2023, apart from a brief spike to over £9.00 / Kg from April until June. The price rise of April – June corresponds with an increase in tonnage, suggesting that there is ample demand to fully accommodate any increases in supply. In the second half of 2023, prices did not follow the usual trend of increasing towards the end of the year. The average

nominal price per Kg for November and December 2023 was £8.03 / Kg, compared to nominal values of £9.60 / Kg in 2021 and £9.57 / Kg in 2022.

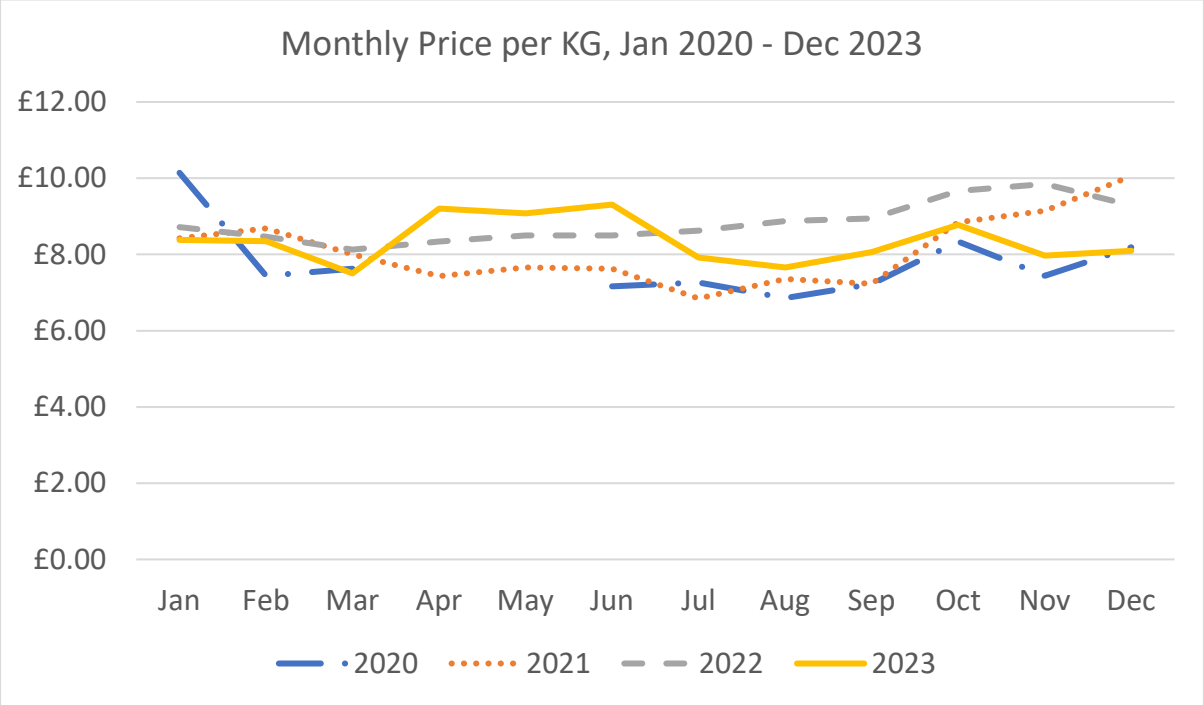

Figure 3. Monthly average nominal price (£) per kilogram (Kg) received for razor clams landed by trial vessels, January 2020 - December 2023

Throughout 2023, around 90 people were employed by vessels enrolled and active, at any point, in the trial. Of which, the majority were regularly employed (regularly employed being those whose fishing was their primary occupation). This is down from 97 in 2022, due to two vessels leaving the trial as well as other vessels being replaced by vessels with different crewing figures. Employment levels will differ at various times during the year due to vessels leaving the trial or being replaced by other vessels. The trial also supports further economic activity and employment for people in the wider supply chain supporting these vessels in Scotland, and in the transportation of the product to market.

6. Marine Directorate Coastal Operations

MD Coastal Operations continued to employ a risk-based approach to the inspection of vessels participating in the trial and deployed land and sea-based resources to monitor these vessels.

As per the trial terms and conditions, the owner of each vessel participating in the trial is entirely responsible for the purchase, installation and maintenance costs of all fishing apparatus, generating gear, and monitoring equipment specified by MD as necessary to participate in the trial. This includes a bespoke Remote Electronic Monitoring (REM) device which is proving a highly valuable tool for both scientific data collection purposes and compliance management. All MD coastal offices and the Marine Protection Vessel fleet have access to live positional data of the vessels to aid inspections (subject to the 3G coverage in a vessel's area of operation).

In trial year 2023 – 2024 Officers undertook 53 inspections both by inspectors on land and at sea where compliance was found to be good. In relation to daily landed catch limits, a total of 38 landings were weighed at the landing port, with one infringement found.

The REM data is received at the Fully Documented Fishery Unit (FDF), from where it is analysed remotely and verified for compliance. During the 2023 -24 year, 1777 voyages were analysed. Compliance with the requirements of the trial's Terms and Conditions was found to be high. Post landing checks by the FDF unit identified a total of 12 minor breaches of terms and conditions of the trial and these were dealt with by way of a verbal rebrief, email and advisory letter. One owner failed to renew the subscription with the REM provider and their two boats had their derogations suspended. This was a result of the owner failing to notify a change of contact details and was resolved within 48 hrs and the suspension lifted. One minor breach relating to statutory returns was identified by a Coastal Office following post landings checks.

7. MD Evidence Data and Digital

The Science, Evidence, Data and Digital (SEDD) Portfolio of the Marine Directorate of the Scottish Government continue to take responsibility for the biological and ecological goals of the razor clam trial;

- to gather local level information on razor clam populations and stocks, including accurate data gathered by trial participants to supplement stock survey work;
- to ensure sustainable harvesting levels; and,
- to gather further information about the impacts of the electrofishing method on target and non-target species.

During the sixth year of the trial (1 February 2023 to 31 January 2024) work was focussed on collating available information, completing analyses, progressing long term data storage options (internal database) and writing the report (covering trial years 1 to 5) to document the progress on the biological and ecological goals of the razor clam trial. This report is now published:

Scottish scientific electrofishery for razor clams trial - biological and ecological goals: progress report - gov.scot (www.gov.scot)

With further information on the razor clam trial available through an online dashboard:

RazorClamTrial (shinyapps.io)

All data collected as part of the razor clam trial are collated in an internal database and work is underway to produce publicly available data layers through the National Marine Plan platform (Marine Scotland - National Marine Plan Interactive (atkinsgeospatial.com))

Fishers continue to send monthly self-samples which provides information on the length of landed razor clams. As a minimum, vessels submit one sample per month when fishing. Between August 2018 and January 2024, a total of 549 razor clams sample sheets were submitted to the Marine Directorate (Table 1).

Table 1. Number of razor clam self-samples (measured by trial participants, entered and collated by Marine Directorate) across trial years 1 – 6 as part of the Scottish razor clam electrofishery trial.

Month	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Feb	n/a	8	5	9	n/a	7
Mar	n/a	7	4	19	14	12
Apr	n/a	4	n/a	10	24	14
May	n/a	5	n/a	9	10	14
Jun	n/a	4	n/a	20	13	10
Jul	n/a	8	13	5	10	6
Aug	n/a	4	24	17	10	5
Sep	2	5	22	11	13	7
Oct	1	7	12	8	4	6
Nov	5	7	12	11	12	8
Dec	1	3	10	4	11	3
Jan	4	4	12	7	11	3
Total	**13**	**66**	**114**	**130**	**132**	**94**

All vessels participating in the trial carry Remote Electronic Monitoring (REM) systems which record details of vessel position, speed, and the current (amperes) output of the generator used to power the electrofishing gear at 10 second intervals. Official Scottish landings and effort data are collated by Marine Directorate Operations from fishers' logbooks and sales notes. These data are utilised for several purposes including in combination with information on vessel activity (as detected by on-board REM systems) to monitor fishing activity, in the calculation of landings per unit effort (LPUE) and in stock assessments. Further details are available in the published report and dashboard listed above.

In year six of the trial, REM recorded 22 vessels fishing across the four trial zones, in six trial areas (Table 2). The highest number of vessels are in the West Coast SW zone, with 10 vessels fishing within the Firth of Clyde trial area. In total across year six there were 1,517 days of fishing activity. The zone with the highest number of days of fishing activity was West Coast SW with 789 days, with fishing activity highest in the Firth of Clyde trial area (687 days). On average across all areas vessels were fishing for 366.7 minutes (~6 hours) each trip (Table 2).

Table 2. Showing by Zone and Trial Area the number of vessels fishing (targeting razor clams), average fishing duration and number of days with fishing activity for the period of trial year 6 (1st February 2023 – 31st January 2024).

Zone	Trial Area	Number of vessels fishing	Average fishing duration (mins)	Number of days with fishing activity
Firth of Forth	Firth of Forth	4	304	343
Outer Hebrides	Broad Bay	1	373	66
West Coast NW	Colonsay	4	359	319
West Coast SW	Firth of Clyde	10	439	687
West Coast SW	Gigha	2	374	59
West Coast SW	Wigtown Bay	1	351	43
Total	All Areas	**22**	**366.7**	**1517**

A PhD project is on-going (in collaboration with the Scottish Association for Marine Science (SAMS)) to assess the ecological sustainability of a well-controlled electro fishery for razor clams in Scottish coastal seas. Further details can be found in the report detailed above.

Marine Directorate continue to work in collaboration with SAMS and trial participants to undertake surveys for razor clams. Surveys to determine razor clam densities were conducted in the Sound of Harris and Firth of Clyde in 2017 (prior to the trial commencing) (Fox, 2018). This work established the application of electrofishing with towed video as a new survey method for razor clams (Fox et al., 2019). Using this methodology, a survey of the Tarbert Bank was completed in February-March 2023 (Report on razor clam surveys on Tarbert Bank - gov.scot (www.gov.scot)) and the Clyde trial area (October 2023).

8. Other Work Streams

8.1 Report on the Survey the razor clam grounds in the Firth of Clyde and in the Solway in 2023/24

Razor clam surveys - Firth of Clyde and Solway: report - gov.scot (www.gov.scot)

The Executive Summary from the report is as follows: -

This report describes surveys carried out in the Firth of Clyde in the autumn of 2023, and in Fleet Bay (Solway) in January 2024. The purpose of the surveys was to estimate the densities and sizes of razor clams, *Ensis siliqua* and *Ensis. magnus*. This data will contribute to the evidence base for the Scottish Government's scientific trial of electrofishing for razor clams (Scottish Government, 2017). A combination of an electrofishing rig and a towed video sled was deployed from two fishing vessels

and the video recordings subsequently analysed to estimate the sizes and abundance of razor clams which had emerged onto the seabed.

8.1.1 Firth of Clyde: Method

Ninety-eight video tows were completed in the main areas along the Ayrshire coast where razor clams have been harvested in the scientific trial, namely Irvine, Ayr, Culzean and Turnberry Bays. For comparison three areas outside of the permitted electrofishing areas were also investigated with thirty-one video tows completed in Machrie, Carradale and Saddell Bays. From the videos recorded along the Ayrshire coast, 2,581 individual *E. siliqua* were identified and measured, and an additional 1,053 razors were measured from tows conducted outside the trial fishery area.

8.1.2 Firth of Clyde: Findings

Shell length distributions across all the Firth of Clyde tows suggested the presence of three modes at around 100 – 110, 140 – 150, and 200 – 210 mm shell length. The average density within the permitted fishing area (for all size classes) was 0.47 ± 0.03 m^{-2} (mean ± SE) with a maximum of 1.4 m^{-2}, whilst for tows outside the permitted fishing area the average and maximum were slightly higher at 0.72 ± 0.09 m^{-2} (mean ± SE) and 2.6 m^{-2} respectively.

Comparing data from 2017 and 2023 suggests that recruitment has occurred in recent years. For the large and medium size categories there were declines in densities in Irvine, Ayr and Turnberry Bays, but an increase in Culzean Bay.

Only 209 *E. magnus* (formerly *E. arcuatus*) were identified from all the video tows in the Firth of Clyde and this species was generally recorded in areas of coarser sediment with the majority being found in Machrie Bay. This species is of less commercial interest because of its smaller size.

8.1.3 Solway Firth: Method

Sixteen video tows were completed in Fleet Bay (Solway). Poor weather and reduced water visibility due to freshwater run-off meant that further survey work planned for the Solway could not be completed under the current project funding.

8.1.4 Solway Firth: Findings

Data collected in Fleet Bay indicated four length modes, one at around 40 – 50 mm; a second around 90 – 100 mm; a third around 120 – 130 mm, and a fourth around 170 – 180 mm. The mean density considering all the size classes was 1.32 ± 0.11 m^{-2} (mean ± SE) with the median density being 1.34 m^{-2}. All records were assumed to be *E. siliqua* although the reduced video quality means that this should be confirmed in a future survey.

Analysis of growth rates on samples of *E. siliqua* from 5 sites within the trial area has been completed. As well as the preliminary results being included in a policy brief provided to Marine Directorate, the data has been written up as a paper. Following

receipt of final edits from the co-authors the plan is to submit the manuscript to the Fisheries Research journal for peer review.

The abstract from the manuscript is as follows: -

Global landings of razor clams have increased by around 15 times since the turn of the century. Harvesting techniques range from hand-picking and use of brine solutions to force the clams to emerge to more intensive mechanical and hydraulic dredging. In Scotland, use of electrofishing has become popular for harvesting the pod razor (*Ensis siliqua*) and this fishery is presently the focus of a government scientific trial to explore its long-term sustainability. Growth estimates are an important component of fisheries management contributing to yield-per-recruit and natural mortality estimation which can be especially useful for data-poor stocks. However, growth rate estimates should be periodically re-evaluated, particularly when harvesting practices have changed. Interpretation of external shell growth increments alongside validation by oxygen isotope analyses was used to generate length-at-age data for *E. siliqua* collected from five sites within the scientific trial. Von Bertalanffy growth curves were then fitted to these data using a hierarchical Bayesian approach. Across all five sites the mean of the asymptotic length ($L\infty$) was estimated to be 191 mm and the mean of the Brody coefficient (k) estimated at 0.27 y-1. The 95% credible intervals for $L\infty$ were from 182 to 206 mm, and for k were between 0.17 and 0.33 y-1. These new estimates are consistent with previous published results from Scottish sites suggesting that recent changes to harvesting practices have not led to substantial changes in E. siliqua growth rates.

8.2 Further Solway Survey

An application was submitted to the Scottish Marine Fund to support a repeat of the survey in the Solway which was undertaken in early 2023. The 2023 survey was affected by poor water clarity and as a result only covered part of the grounds being fished within the trial. It was hoped to repeat the work under more favourable conditions during the summer months. Although the grant was awarded, formal notification of contract along with a requirement to tender for a survey vessel again delayed the start of the actual work well beyond the desirable start-date. At present we are waiting for a spell of calm weather and are in regular discussions with the skipper of the vessel in the Solway. As the survey must be completed before the end of January 2025 we are in a similar position to last year and results will be dependent on environmental conditions. As previously communicated, the timing and restrictions around the Scottish Marine Fund continue to cause logistical problems for surveys of the razor clam grounds which would ideally be conducted during the summer months.

8.3 PhD on effects of electrofishing on non-target organisms

The student undertaking this PhD decided to take a suspension of studies until Jan 2025 due to their beginning a job with JNCC. This delays their planned thesis submission date until later in 2025. However, the data from the experiments they undertook into the recovery of non-target organisms from electrical exposure have already been included in the policy brief written for Marine Directorate, while the *E.*

siliqua growth rate work has been written up as a manuscript for which is nearly ready for submission (see manuscript abstract above).

9. Conclusion

The sixth year of the trial continued to gather scientific information on the impact of electrofishing for razor clams. A landmark progress report indicates that fishing activity in the trial can be managed sustainably and confirmed spawning periods. Further collection of data and analysis has been conducted on a range of biological and fisheries information to progress in achieving the trials aims and objectives.

The derogations authorising the same specific vessels to participate until January 2025 were issued on the 1 February 2024. Fishers authorised to be part of the trial are required to continue to gather scientific data and to provide help and assistance towards future monitoring, research and stock assessments when required.

10. References

Fox, C. J. 2018. Report on razor clam surveys in the Sound of Harris and the Ayrshire coast of the Clyde (Girvan to North Bay). Scottish Marine and Freshwater Science Report Vol 9 No 3.

Fox, C.J., McLay, A and Dickens, S. 2019. Development and application of electrofishing with towed video as a new survey method for razor clams (Ensis spp.). *Journal of Fisheries Research* 214: 76-84

11. Annex A

Main objectives of the trial

The main goals of the trial can be divided into four broad categories:

Biological and Ecological Goals:

i. to gather local level information on razor clam populations and stocks, including accurate data gathered by trial participants to supplement stock survey work;

ii. to ensure sustainable harvesting levels; and,

iii. to gather further information about the impacts of the electrofishing method on target and non-target species.

Economic Goals:

i. to develop understanding of the economic benefits that can be achieved for Scotland and its local coastal communities through an electro fishery for razor clams;

ii. to support the Scottish inshore fishing sector, in particular diversification opportunities for the sector; and,

iii. to support Scottish based businesses associated with the inshore fishing sector.

Social Goals:

i. to support economic activity in Scottish coastal communities with benefits of the trial delivered locally.

Best Practice and Management Goals:

i. to develop the operational measures required for a sustainable fishery;

ii. to ensure that trial participants are always compliant with its terms and conditions at all times;

iii. to ensure that shellfish harvesting is safe and compliant with all relevant regulations; and,

iv. to encourage good stewardship amongst trial participants.