

Marine Directorate Update: Electrofishing for Razor Clams Trial (1 February 2021 - 31 January 2022)

July 2023

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1. Purpose

The fourth year of the Scottish trial for electrofishing for razor clams ran from 1 February 2021 to 31 January 2022. Information provided in this supplementary report builds on the material 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](#)

2. Introduction

The fourth year of the trial (1 February 2021 - 31 January 2022) proceeded during a period in which various restrictions put in place during the COVID-19 pandemic were lifted. Social distancing guidelines were reduced throughout the course of the trial year along with suspension of lockdown and travel restrictions. Trial participants continued to collect data to contribute towards the scientific aims and objectives. However, both Brexit and COVID-19 in general continued to have some impact on businesses and markets by impacting transport links and changes to business models.

Cross-organisational working between Marine Directorate (MD) (Sea Fisheries Division, Compliance and Science) and key public sector partners, including Food Standard Scotland (FSS) and the Health and Safety Executive (HSE) continued to work well. Communication was maintained between the organisations virtually through online communication and with the Scottish Razor Clam Association (SRCA). The SRCA represents participants in the trial and serves as a forum for discussion and as a point of contact with the Scottish Government.

3. Food Standards Scotland (FSS)

Food Standards Scotland classify waters for the fishing of shellfish including razor clams to ensure landed razor clams are safe to eat. Despite the trial continuing in its aims, the ramifications of COVID-19 and the decision to suspend FSS sampling protocols back in 2020 were still apparent. At the height of the pandemic, FSS implemented the 'suspension protocol' to allow all classified waters that could not supply sufficient sample to maintain their classification. However, once this suspension protocol was lifted post-covid, a continued decrease in the number of samples being submitted towards the official control (OC) monitoring programme from certain areas was observed.

As the competent authority responsible for undertaking the OCs to determine the safety of Scotland's marine waters used for harvesting live bivalve molluscs (LMBs), FSS took the decision to declassify a total of 12 razor sites within the wider trial areas at the beginning of 2022 due to the lack of sampling. Fortunately, several trial participants re-applied for classification for these areas throughout the year and sampling recommenced.

4. Health and Safety Executive (HSE)

In November 2021, following consultation, the revised Commercial Shellfish Diving In Inshore Water guidance (*HSE, 2021*) was published. This included a number of amendments and clarifications, with the addition of guidance points specific to electrofishing under the trial. HSE had sought to phase out the recognition of certain previously accepted recreational diving qualifications (to undertake commercial shellfish diving) for many years. Consequently, from November 2021, divers were able to apply to HSE for approval to continue working with their existing qualifications with the intention that from the 1 November 2022 qualifications aimed at recreational divers will cease to be recognised by HSE. It is also intended that from 2022, new divers wishing to work in commercial shellfish diving will be required to hold the minimum diving qualification of HSE SCUBA or approved equivalent.

HSE reviewed previous inspection records for razor clam dive contractors participating in the trial. It is noted that the majority of vessels were inspected during period of May 2018 to November 2019. With the introduction of the revised shellfish diving guidance document and the intervening time frame since initial inspections, HSE intend to undertake another round of dive contractor inspections of all participating razor clam fishing vessels.

Work also continued in the HSE Science Division and reported that the electrofishing research project has proceeded well and is now nearing completion. This scientific work is an analysis of the electrical hazards and risk to divers using electrofishing techniques to harvest razor clams. It is envisaged that the results and analysis of this work will be ready to be presented in 2023.

5. Vessel activity, landings and employment

A total of 26 eligible participants were active during Year 4 of the trial. It is important to note the trial period does not fully match the calendar year. These figures may be subject to changes in future.

Active vessels were estimated to have landed approximately 793 tonnes of razor clams in Year 4 of the trial, with a nominal value of £6.1 million (Figure 1). Compared to the previous year of the trial, landings the nominal value of landings increased by 48% and 51% respectively reflecting the recovery after the COVID-19 pandemic. Landings and nominal value were approximately 10% lower than levels seen in 2019, which is the high point for both landings and value. The last four years of the trial indicate a pattern of higher spring and summer landings before a reduction in autumn and winter, with some increases seen in December or January (Figure 2).

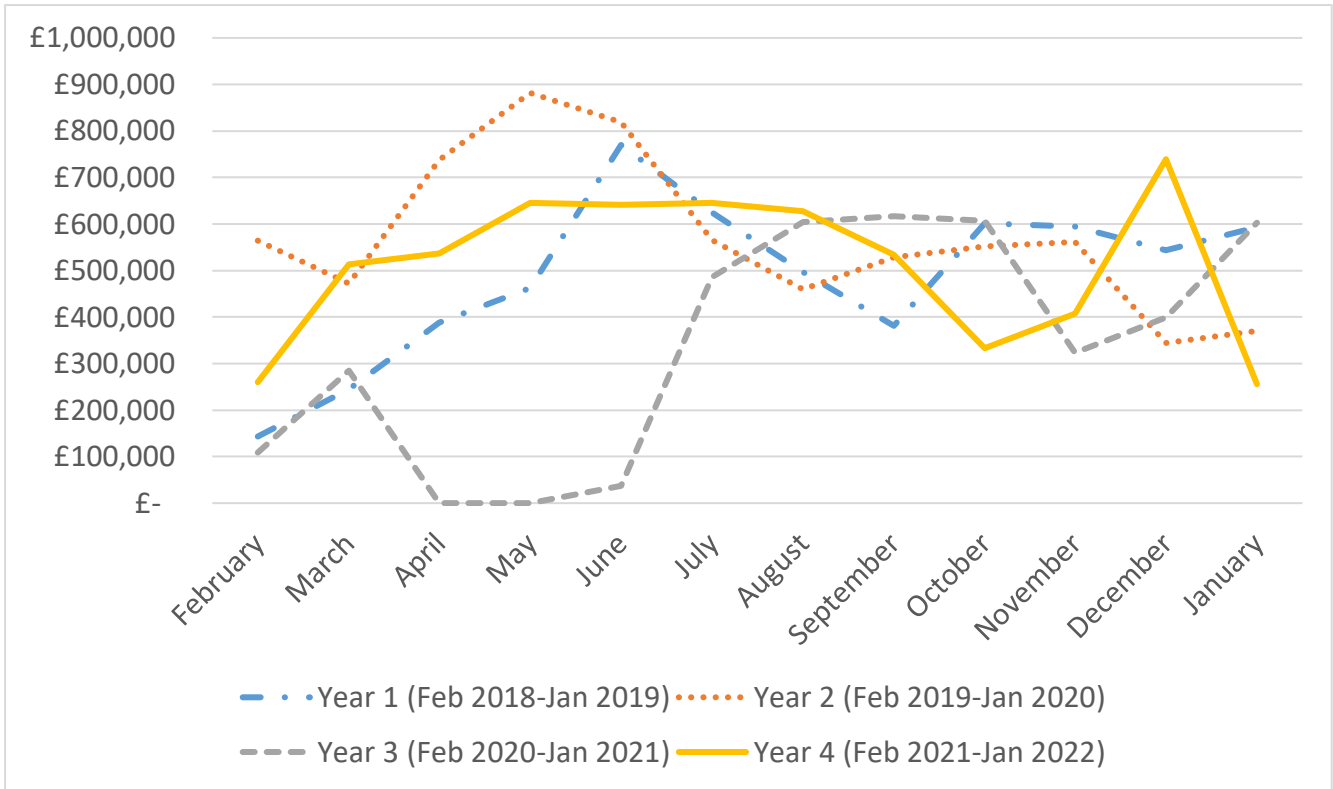


Figure 1: Monthly £ value of razor clams landed by trial vessels, February 2018 to January 2022.

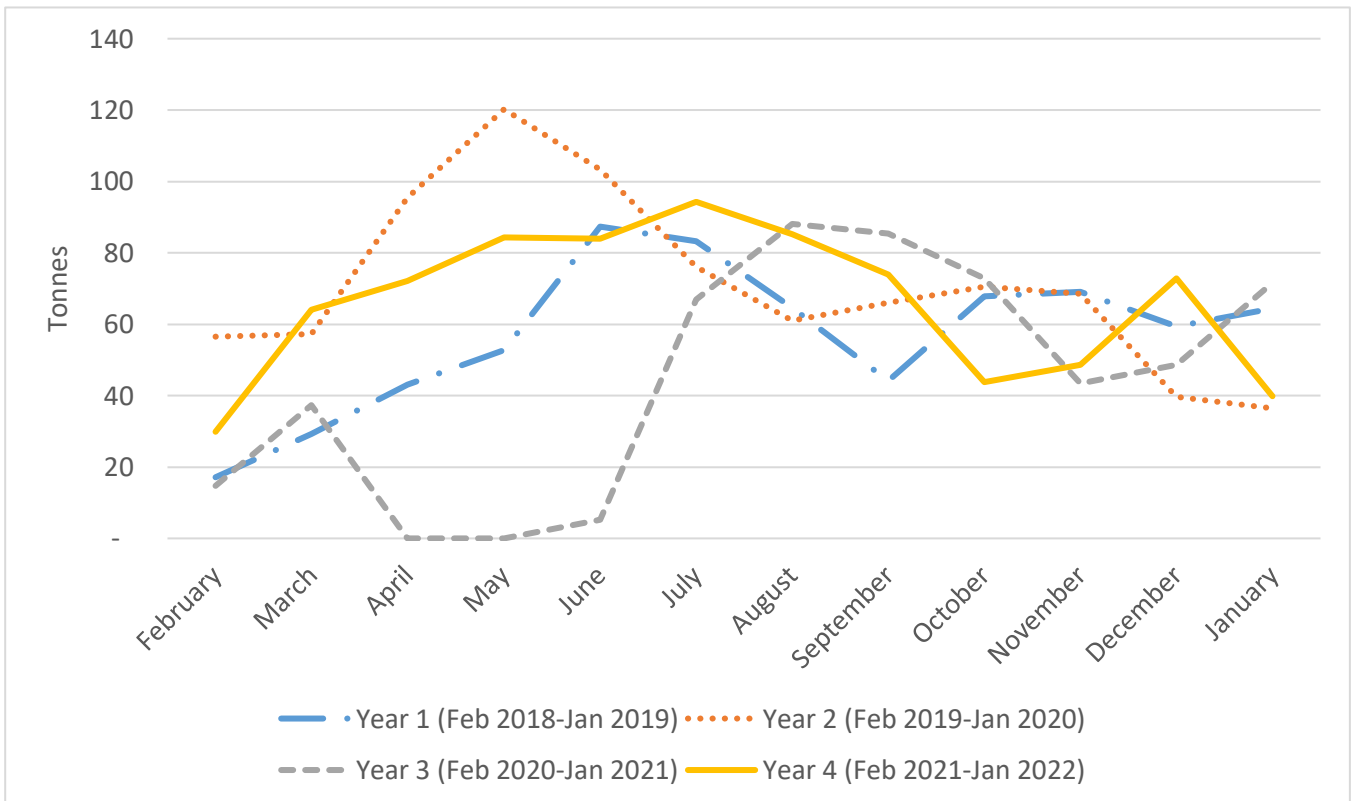


Figure 2: Monthly tonnage of razor clams landed by trial vessels, February 2018 to January 2022.

While prices fluctuate between vessels, buyers, and months the highest prices are achieved over winter (Figure 3). The average price per kilogram (kg) achieved by the trial vessels during the fourth year of the trial was estimated to be £7.80. This is slightly higher than the price achieved in Year 3 but lower than Years 1 and 2. The lowest monthly average prices were seen in July when landings were at their annual peak¹.

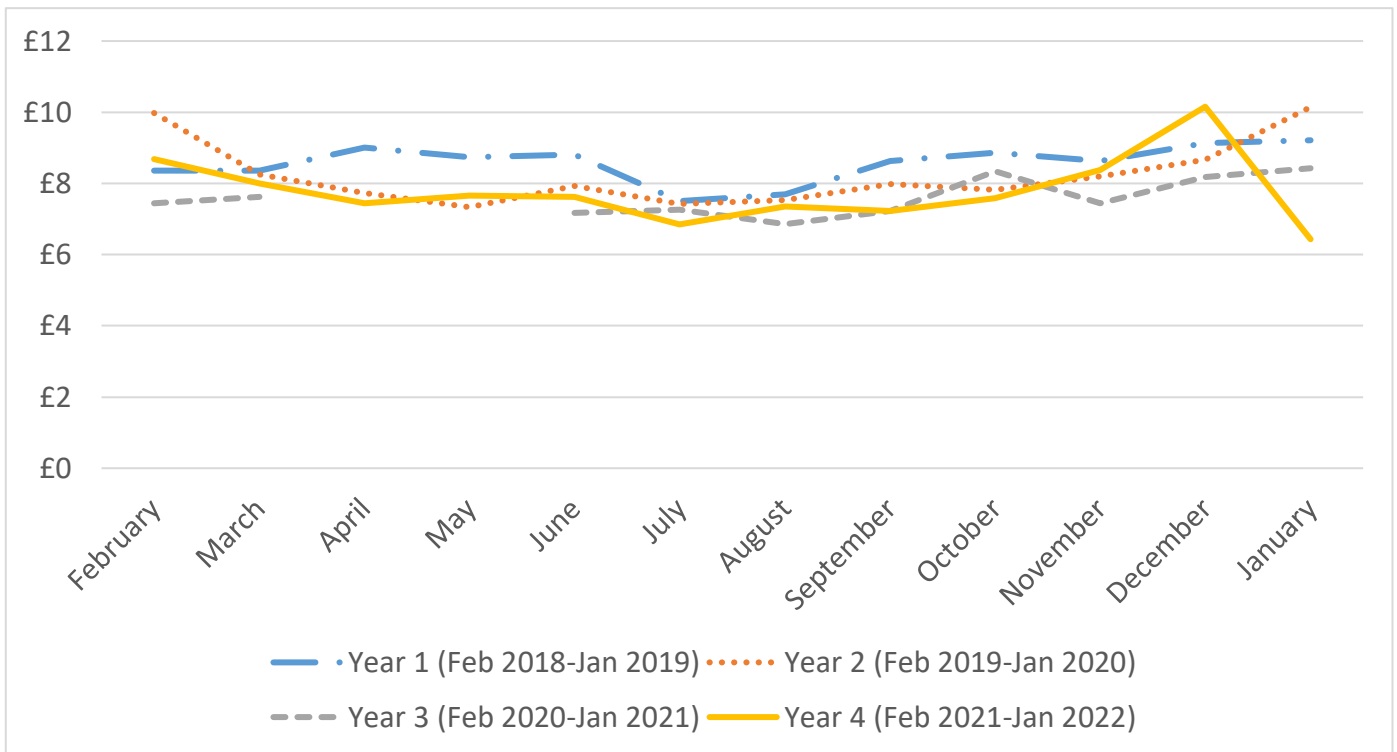


Figure 3: Monthly average £ per kilogram price received for razor clams landed by trial vessels, February 2018 to January 2022.

The trial also supports further economic activity and employment for people in the wider supply chain supporting these vessels in Scotland, this includes processing and transportation of the product to market. The vessels active during the fourth year of the trial provide employment for around 101 people, of which 97 were regularly employed.

6. Marine Directorate Compliance: Inspections and Monitoring

MD Compliance 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. During most of the Year 4 of the trial, compliance officers were working within COVID-19 restrictions which reduced their operational capability. Despite the restrictions in place, 105 inspections were carried out both by inspectors on land and at sea where compliance was found to be good. Twenty-six weight checks were undertaken at landing ports with no infringements found.

¹ In Year 4 value data are missing for some landings and this may affect prices more in some months than others. This affects <2% of all tonnage landed but may have an outsized effect on certain months.

As per the terms and conditions of the trial, the owner of each participating vessel is entirely responsible for the purchase, installation and maintenance costs of all fishing apparatus, generating gear, and monitoring equipment specified by MD as necessary for participation. This includes a bespoke Remote Electronic Monitoring (REM) device which proves 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).

The REM data is received at MD's Fully Documented Fishery Unit (FDF), where it is analysed and verified for compliance. During Year 4 there were 1982 voyages analysed. Compliance with the requirements of the trial's terms and conditions was high. Post landing checks by the FDF unit identified 50 minor breaches of terms and conditions and these were addressed by verbal rebriefs, emails and advisory letters. These breaches were mostly clusters of issues with REM equipment associated with a small number of vessels. However, one warning letter was issued to a vessel for REM non-compliance.

7. Marine Directorate Science

MD Science continues to collect a range of biological and fisheries data under the trial and are still focussed on the biological and ecological goals:

- 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.

From August 2018, samples of live razor clams have been sent to MD Science on an approximately monthly basis. At the start of the trial, MD Science requested monthly samples of approximately 200 animals from each trial area. These are dissected and a sub-sample undergo further histological examination. Sampling was suspended from April 2020 to March 2021 due to COVID-19 pandemic but resumed on a reduced basis from April 2021. Restrictions at the Marine Laboratory regarding staff access and safe work practices meant that sampling was reduced to focus on four trial areas (Firth of Clyde, Firth of Forth, Gigha and Broad Bay) and the number of live razor clams reduced from 200 to 30 individuals, the maximum processing capacity of the laboratory under the controls in place at the time. New laboratory space was sourced and sampling conducted by one scientist to accommodate physical distancing guidelines in place. A total of 5,616 live razor clams have been sampled from August 2018 to January 2022 (Table 1), with 807 razor clams further examined by histology for maturity staging and spawning activity.

Table 1. Number of live razor clams sampled by zone and trial area (August 2018 to January 2022).

Zone	Trial Area	2018*	2019	2020	2021	2022**
Outer Hebrides	Broad Bay	118	431		55	
	West coast NW		153			
	Coll and Tiree	51	118			
	Colonsay	82		165	53	
West coast SW	Gigha	301	484			
	Firth of Clyde	565	635	89	221	31
	Wigtown Bay	102	301			
Firth of Forth	Firth of Forth	560	649	215	237	

*August-December only

**January only

Trial participants also provide length measurements of a sample of the razor clams landed from each trial area. Between August 2018 and January 2022, a total of 32,461 razor clams were measured by fishers (and processors) and data collated by MD Science (Table 2). For two trial areas (Firth of Forth and Firth of Clyde) for which sufficient sample data are available, length frequency data obtained from self-sampling were combined with official landings data to provide a raised annual landings-at-length distribution. These data were averaged over a four-year period (2018 – 2021) and aggregated for use in Length Cohort Analysis (LCA). A detailed assessment of progress towards the biological and ecological objectives of the trial is in the course of completion. This will include an assessment whether these data indicate trial controls ensure harvesting at sustainable.

Table 2. Number of razor clam self-samples (measured by trial participants, entered and collated by MD Science) by zone and trial area (August 2018 to January 2022).

Zone	Trial Area	2018*	2019	2020	2021	2022**
Outer Hebrides	Broad Bay		217	331	798	15
	West coast NW					
	Sound of Sleat	786	79	32		
	Coll and Tiree		675		253	
	Colonsay		97	698	1537	
West coast SW	Gigha	817	2445	105	631	
	Firth of Clyde	306	2177	8792	5728	65
	Wigtown Bay		1242	576	126	
Firth of Forth	Firth of Forth	260	251	1784	1628	10

*August-December only

**January only

In addition, MD Science analysed REM data to study the spatial distribution of catches and combine fishing effort and landings data to monitor landings per unit effort. Analyses of REM data have been developed further through the Scottish Government Data Science Accelerator Programme (DSAP) which allowed MD Science analysts to learn new data

science skills. This program incorporated the use of analytical tools required to work with the new sources of fisheries data generated by tracking and monitoring technologies.

8. Other Work Streams

A PhD project (in collaboration with the Scottish Association of Marine Science - SAMS) which studies the organism and ecological impacts of electrofishing in Scottish shallow coastal habitats continued into its second year. Initial progress was severely impeded by the COVID-19 pandemic, making access to laboratories and other resources particularly difficult. However, progress resumed following the easing of restrictions. The project seeks to advance understanding in three areas:

- examining the long-term physiological performance of organisms exposed to electrical fields
- investigating whether there are any detectable adverse effects of experimental electrofishing on benthic communities in the field
- analysing background data on the trial electrofishery

Data gathered for this PhD project came from razor clams sent to SAMS by fishers. Age was determined by counting the number of visible annual growth rings on the external surface of the shell, then the internal rings are counted from shell cross-sections using a microscope. These aging counts will be validated using oxygen isotope analysis to ensure the correct ring structures are being identified and counted. Future work will include combining age and size data to generate growth curves for each site sampled. Fitting growth curves using mixed models will allow razor clam growth rates to be compared between different fishery areas around the Scottish coast.

Shore crabs (*Carcinus maenas*) are currently the model organism being used in experiments looking at long term effects on physiology on non-target fauna. An electrical fishing rig has been set up in aquaria for use in tank-based experiments using both razor clams and shore crabs. After an approximate two-minute exposure period to the electric field, physiological metrics of stunned and control animals are tracked over time in order to assess the medium- to long-term impact of stunning upon organism functioning. This includes tracking metabolic rate using custom built flow through respirometry apparatus.

Alongside lab-based work, plans are being developed, subject to available funding, for field work to study the benthic and infaunal communities which have been electrofished in order to gain a better understanding of the effects of the current trial electrofishery upon seabed habitats.

9. Conclusion

During the fourth trial year, efforts continued to gather and analyse scientific data on a range of biological and fisheries data to achieve the aims of the trial. Analysed data will ultimately provide data for razor clam stock information, harvesting levels and a greater understanding of the electrofishing methods.

The electrofishing for razor clam scientific trial is authorised to continue until 31 January 2024, subject to scientific advice. The derogations authorising the same specific vessels to participate until January 2024 were issued on the 1 February 2022. The terms and conditions of the trial were updated to reflect the new HSE commercial shellfish diving guidance and issued to all participants. Participating vessels in the trial are still subjected to a catch limit (450kg), effort limit (110 days at sea per year) and are required to maintain REM equipment onboard the vessel at all times. Fishers are also required to gather accurate scientific data and to contribute to future monitoring, research and stock assessments when required. This includes the continued live sampling of razors which are sent to MD Science for dissection and analysis and to conduct self-sampling of razor clam length measurements collected at sea or at processors.

10. References

(*Marine Scotland, 2019*) Marine Scotland, Update: Electrofishing for razor clams trial (1 February 2018- 31 January 2019) [\[ARCHIVED CONTENT\] \(nrscotland.gov.uk\)](#)

(*Marine Scotland, 2020*) Marine Scotland, Update: Electrofishing for razor clams trial (1 February 2019- 31 January 2020) [Update: Electrofishing for razor clams trial \(1 February 2019 - 31 January 2020\) - gov.scot \(www.gov.scot\)](#)

(*Marine Scotland, 2021*) Marine Scotland, Update: Electrofishing for razor clams trial (1 February 2020- 31 January 2021) [Marine Scotland Update: Electrofishing for razor clams trial \(1 February 2020 – 31 January 2021\) \(www.gov.scot\)](#)

(*HSE, 2021*) Commercial Shellfish Diving in Inshore Water, Diving at Work Regulations 1997 (revised November 2021), the Health and Safety Executive [Commercial shellfish diving Diving at Work Regulations 1997 in inshore water \(hse.gov.uk\)](#)



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