Cumbrian Creel Project 2023: Economic Feasibility and Monitoring

Marine Futures Internship 2023

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Credit: Andy Bell

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Table of abbreviations

Abbreviation	**Meaning**
MCZ	Marine Conservation Zone
WoW	West of Walney
BRUV	Baited Remote Underwater Video

Landings sheets terminology

Terminology/Heading	**Meaning**
Kilos	Total weight caught that haul
WHL	Whole and undamaged
Flea	Very small, only just within landing limit
Dirty	Discoloured, undesirable
Poor	Soft shelled
Dam	Damaged, usually one nipper
Number range (e.g. 10-15)	Number of langoustines to a kilo
Average	Average price (£) per kilo

Chapter 1 Summary

The Cumbrian Creel Project 2023 aimed to assess the long-term viability of using creels as a sustainable alternative method to benthic trawling for burrowing crustacean *Nephrops norvegicus*, more commonly known as Dublin Bay prawn, Norway lobster, scampi or langoustine. This will be done by comparing landings data from 2023 to the 2019 pilot survey, and assessing trends in weight and condition of *N. norvegicus* along with composition of bycatch. Additionally, this project aims to assess the feasibility of using baited remote underwater video (BRUV) surveys to monitor the benthos, by rigging creels with GoPros to use as BRUVs and analysing footage from the West of Walney (WoW) marine conservation zone (MCZ).

Chapter 2 Background

A joint inshore and offshore area in Cumbria was designated as an MCZ in 2016 in order to protect valuable habitats and biodiversity. This site is located around 8km west of Walney Island, in the Irish Sea, and spans approximately 388 km^2 (JNCC, 2023). The MCZ is primarily inshore, with the majority falling between 12 nm and 6 nm, however a small portion sits offshore (Figure 1). The WoW MCZ is designated for its subtidal sand and mud, alongside burrowing megafauna and seapen communities. Larger fauna like mud shrimps and fish burrow into the mud, creating habitats for smaller fauna like brittle stars and worms. Meanwhile, the sand habitats towards the north east of the MCZ provides habitat for camouflaged fish like flatfish and sandeels, along with infaunal worms (Mitchell et al., 2020). Most crucially however, a key feature of the burrowing megafauna community at the WoW MCZ is the presence of *N. norvegicus*, also known as scampi or langoustine, which is a commercially important bioturbator.

Traditionally, fishing for *N. norvegicus* in the MCZ has been undertaken using otter trawls, a commonly used fishing method in which a trawl net is dragged along the seafloor (Broadhurst et al., 2012). Bottom towed trawls scour and damage the benthos, resuspend sediment and catch high bycatch quantities, and as such this was likely hindering the ability of the habitat to effectively recover to favourable condition (Jones, 2018; Hilborn et al., 2023). After consultation and community engagement surrounding the impacts of trawling on its features (subtidal mud and sand, along with associated benthic and infaunal communities), the West of Walney MCZ Bottom Towed Fishing Byelaw 2018 (henceforth referred to as “the byelaw”) came into effect in July 2019 (MMO, 2019). This was met with criticism from pockets of local fishing communities surrounding socioeconomic impact and spatial squeeze, which was already a concern due to local offshore wind projects.

A major feature of the MCZ, as seen in Figure 1, is it’s overlap with the WoW offshore wind array, along with the West of Dudden Sands and Ormonde arrays (MMO, 2018). When the latter wind farms were proposed, concerns were voiced surrounding restriction of fishing grounds, particularly trawling due to subsea cables. These concerns were then greatly amplified when consultation surrounding the MCZ began, and are expected to become more common nationwide as the demand for renewable energy rockets and offshore wind projects to combat climate change become larger and more complex (Jay, 2010; Glasson et al., 2022). As a result, the wind array, MCZ and associated byelaws were co-located to limit the conservation measures to the already inaccessible windfarm area (Tabrizi, 2019).

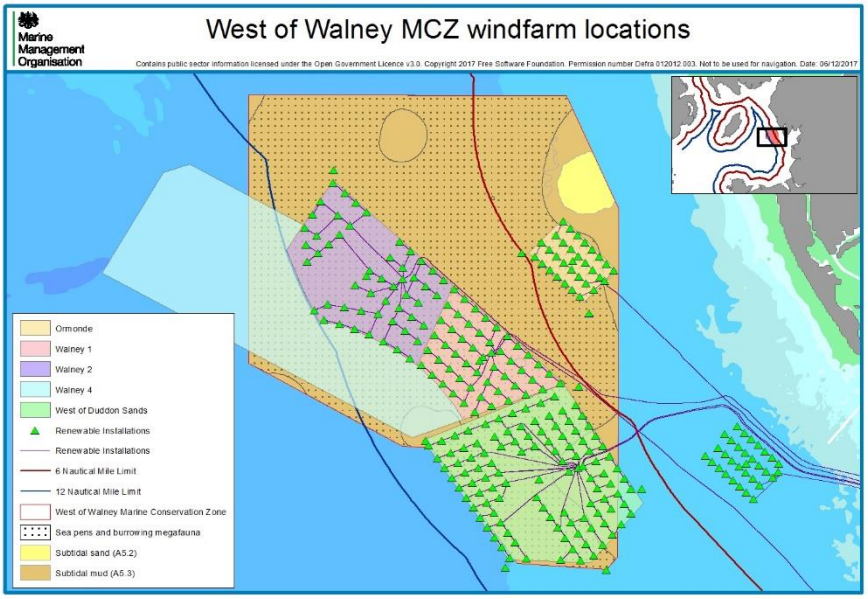

Figure 1: overlap of wind farms with WoW MCZ (MMO 2018). Co-location was important in order to mitigate spatial squeeze on the fishing industry.

A potential alternative to trawling with minimal benthic impact is creeling, which can be used by small scale inshore fishermen to continue to fish for *N. norvegicus* within the MCZ, thus reducing the socio-economic impacts of the MCZ and wind farm. Creels have been successfully used to fish for *N. norvegicus* in other parts of the UK, particularly Scotland, however commercially successful areas are often in sheltered bays or lochs and thus not comparable to the exposed Irish Sea (Marine Analytical Unit, 2017). A pilot study investigated the feasibility of using creels to reduce the socio-economic impacts of the byelaw and to facilitate seabed recovery (Tabrizi, 2019). The results of the study by Tabrizi (2019) indicated that not only do creels yield *N. norvegicus* which can be sold by higher unit price, due to their intact state and larger size, but they also allow bycatch to be return to the sea alive which reduces the impact of fishing on the wider ecosystem. This has substantial sustainability implications; however, the study also highlighted the need for future research to assess long term feasibility of creel fishing and to monitor seabed recovery.

Therefore, with funding from Ørsted and the Maritime Fisheries Fund, a further study was conducted over the summer of 2023. Two fishermen were provided with creels for langoustine fishing at a commercial scale within the WoW MCZ to continue feasibility assessments and compare to the 2019 study.

It has been suggested that cameras could be fitted to creels, and used as BRUVs to monitor seabed biodiversity. BRUV surveys involve rigging bait in close proximity to cameras, in order to attract and record species (Mallet & Pelletier, 2014). BRUV surveys have been conduced for decades, and strategies on how best to utilise them vary. Studies show a minimum soak time of 50-60 minutes is required to capture most species in an area, and that rigging cameras horizontally or vertically in relation to the seafloor results in differing observations of species abundance (Langlois et al., 2006). BRUVs may be useful to assess recovery of the WoW MCZ after the implementation of the byelaw. However, it is unclear whether they would be suitable in the dark, subtidal mud habitat at depths of 30 meters. As such, an assessment must be made on their effectiveness before they can be used for a full seabed biodiversity study.

Chapter 3 Aims & Objectives

This report aims to assess the long-term feasibility of using creels to fish for *N. norvegicus* within the WoW MCZ, and to assess whether BRUVS could be an effective tool for monitoring the seabed to gauge the recovery impact of the byelaw. The objectives are to:

1) Present findings from the 2023 creel survey, including the weight, condition, unit price of catch and bycatch.

2) Compare and contrast findings in 2023 to the 2019 pilot survey, to assess long-term feasibility of using creels.

3) Assess whether BRUVs can be used to monitor seabed recovery.

Chapter 4 Methods

4.1 Creel survey

Cumbria Wildlife Trust provided two fishers with GaelForce (22”x16”x12.5”) creels, fitted with 80mm eyes. The fishers fished between April and June 2023, operating out of Barrow-in-Furness docks. The creels were made of netting with plastic-coated metal frames. These were used to commercially fish for langoustine on a 6.4m vessel, within the WoW MCZ and windfarm (see Tabrizi 2019). Creels were set 6 fathoms apart, with 25 creels per string and 20 strings out per trip, meaning 500 creels were set/hauled per trip. All strings were hauled at the end of every trip.

Creels were baited with salted mackerel and data was recorded on landing sheets upon making port at Fleetwood. Number of langoustines per kilo, condition, unit price of catch, and bycatch were recorded.

The fishers communicated that sometimes it was not possible to set all 500 pots due to weather change. When this was the case, it was more likely that approximately 300 creels were set. It was not recorded how many pots were set on each trip, so for the purposes of analysis it has been assumed 500 creels were used on every trip. While this allows a value for fishing productivity to be calculated, in reality the number is likely higher due to a lower number of creels being used.

The landings sheets were then provided to Cumbria Wildlife Trust. To obtain an estimate of number of langoustines caught per trip, the number of langoustines per kilo for the haul was multiplied by the total weight of the haul (data provided by landing sheets), allowing a low and high estimate to be made. Comparisons were then made between 2019 and 2023 landings, and recovery of langoustine population could be inferred.

4.2 BRUVs

One creel was fitted with a GoPro Hero 7 white and Supertig LED battery powered backlight light. These were fixed to the inside of the creel using plastic clamps from the camera and light frames (Figure 2). The fishers dropped the creel on the 12th October, leaving the GoPro running, and returned to collect it on the same day (providing 124 minutes of footage). Video was analysed by watching closely and recording any species present.

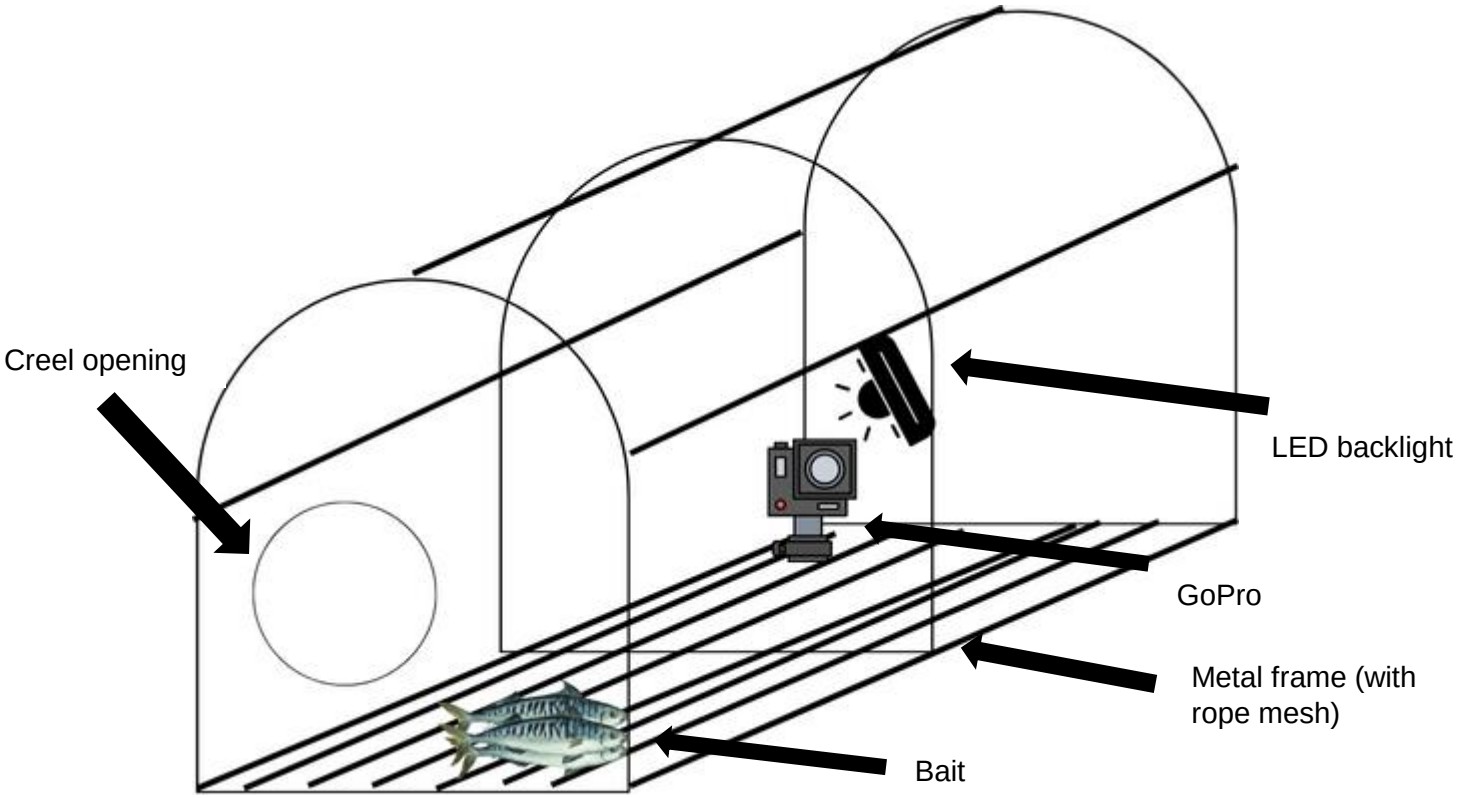

Figure 2: creel with GoPro and LED backlight attached within the creel, overlooking the entrance and bait.

Chapter 5 Results

4.1 Landings sheet data

Between the 18th of April and 21st of June 2023, 7 creel fishing trips were recorded. In total, 3157-4430 langoustines (weighing 265kg) were hauled from ~3500 creels. This was sold for £2474.46 at the live fish market. Of the 265kg of langoustine hauled, only 13.5kg was not suitable for sale (due to being small, discoloured or damaged). Overall, the number of langoustines caught and earnings per trip was good and fishing was moderately successful (Figure 3, Table 1).

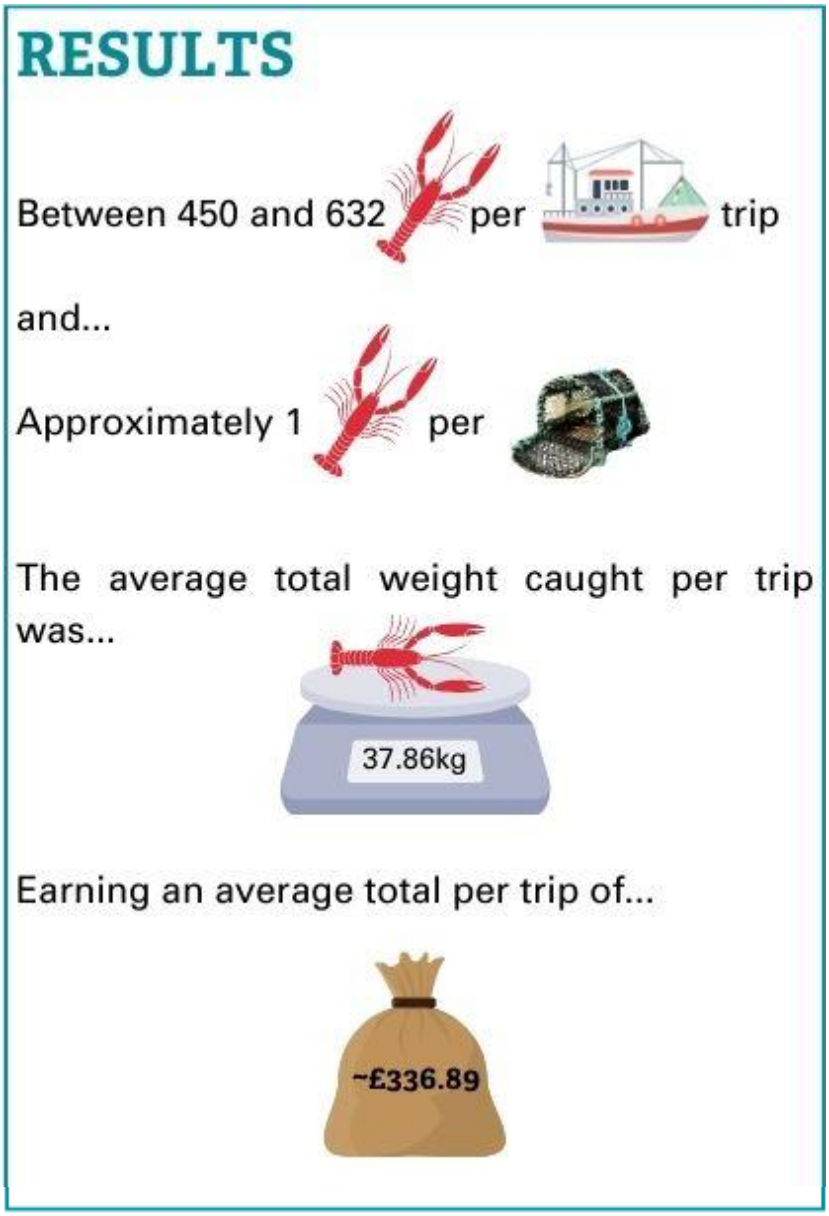

Figure 3: Summarised landings data of langoustine caught by creel between the 18th of April and 21st of June, 2023.

Table 1: Number of langoustines, total weight, and earnings per trip for fishing trips conducted between 18th of April and 21st of June, 2023.

Haul Info				
Trip	Total langoustines hauled (low estimate)	Total langoustines hauled (high estimate)	Total weight (kg)	Total earnings for day (£)
1	217.5	290	15.25	132.23
2	460.00	750.00	38	468.4
3	332.25	520.00	33	205.1
4	801.50	1062.25	65.25	583.65
5	597.50	818.75	51.75	465
6	342.50	465.00	32.5	318

Bycatch was not recorded on landing sheets. However, fishermen noted that common bycatch species included hermit crabs, small lobsters (Figure 4), dover soles, and whiting. These were all alive, and so were returned safely.

Figure 4: example of a small lobster caught as bycatch, returned alive to the seabed. Credit: Andy Bell.

4.2 BRUV footage

Backlit GoPro footage provided clear video footage of the entirety of the inside of the creel, along with some visibility into the surrounding area. In total, three species were captured using this method: two whiting (*Merlangius merlangus*, Figure 5), a hermit crab (tentatively identified as *Pagarus bernhardus*, Figure 6), and a lesser spotted catshark (*Scyliorhinus canicular*, Figure 7). These were clearly visible and occurred on camera multiple times.

Figure 5: two whiting, in the top of the image (also seen in Figure 2) and in the creel entrance. The individual in the creel was brought up as bycatch and so was expected to appear in the footage.

Figure 6: hermit crab tentatively identified as *Pagarus bernhardus* spotted feeding on bait. This individual was brought up as bycatch and so was expected to be in the footage.

Figure 7: lesser spotted catshark easily visible in the entrance of the creel. Catsharks were visible multiple times in a short time span, and this study assumes this was one individual. However, fixing the GoPro to the outside of the creel would confirm this.

Chapter 6 Discussion

6.1 Results of 2023 study

This supplementary study was conducted on a much larger scale than that of the pilot by Tabrizi (2019), and verifies the belief that creeling is an economically viable and environmentally sustainable langoustine fishing method. In April alone, over three trips, 113.5kg of langoustine were caught which fetched £1085.08 at live market. This was similar in May, with 136.25kg of langoustine landed, which sold for £1257.15. The fishermen involved remarked that during this period, creeling for langoustines within the MCZ was economically viable and each trip out was producing some profit (Figure 7).

Figure 7: example of a successful langoustine haul. Credit: Andy Bell.

However, between the ends of May and June, the fishermen reported a sharp drop-off in the number of langoustines caught within the MCZ. Throughout the remainder of the fishing season, landings earnings remained low, and at this point it was costing more in fuel than fishers were making in landings. While the definitive cause of the decline is unknown, it coincided with a marine heatwave that began at the end of May, which boosted some seas around the UK and Ireland by 4 to 5 degrees (Hobday et al., 2023). This was likely to have

an impact on benthic communities (Smale et al., 2017; Monteiro et al., 2023; Shalders et al., 2023), however the long-term impact on creeling remains to be seen.

Additionally, the fishermen remarked there were only a small range of species commonly found within bycatch (e.g. small lobsters as seen in Figure 4, hermit crabs, whiting and dover sole) and that these were frequently found alive and returned wherever possible. These species were all found in the pilot study, and so this was entirely expected (Tabrizi, 2019). However, as a full bycatch list was not recorded, full comparison is not possible.

6.2 Comparison with 2019 study results

It was indicated in the pilot study by Tabrizi (2019) that creel fishing could be scaled up from 200 pots to 1000, and that this would boost income from £182 per trip to £912 pound per trip. This study has verified this, demonstrating that using 500 pots per day rather than 200 brings almost double the earnings. While one could argue this should be higher, the gap between what might be expected and the actual earnings could be attributed to the aforementioned tail off in landings seen in the second half of the fishing season.

Furthermore, fishing on 2.5x the scale of the pilot study yielded similar numbers of langoustines per pot as the pilot study (0.9-1.27 compared to 1.68). The average weight was also similar, with the majority of langoustine falling between 66.7 and 100 grams, compared to 51.7 grams reported in Tabrizi (2019). This verifies that the population of langoustines found within the WoW MCZ is substantial and may have experienced recovery since the byelaw designation. However, more research would be required to clarify the extent to which langoustine populations may have recovered.

6.3 Recommendations for future BRUV studies

This study proves creels can be used effectively as BRUVs in the WoW MCZ as there is clear video footage, despite it being a muddy environment at 30m depth. However to improve its use, it would be more beneficial to attach the GoPro on the exterior of the creel in order to capture fauna around the outside of the creel. Furthermore, identification of the hermit crab was difficult as footage quality was insufficient to assess fine details. This may make identification of smaller fauna, in particular invertebrates, difficult in a larger project. As such, in a larger project to accurately assess biodiversity within the WoW MCZ, better quality cameras would be required. In order to address these concerns, further trialling of using creels as BRUVs is recommended.

Chapter 7 Opportunities for further research

This supplementary study verified the theorised economic scale-up of creeling suggested in Tabrizi (2019), and confirmed that the langoustine population within the WoW MCZ is substantial enough to support larger scale fishing. However, the data on landing sheets does not provide information on length, sex, or definitive numbers of individuals. If a thoroughly accurate assessment of the condition of the langoustine population within the WoW MCZ is to be conducted, this data is needed, and thus future supplementary studies are required.

Additionally, while the marine heatwave seen between March and July has been theorised as the cause of the decline in landings, this is unverified, and there may be other possible causes. If the ongoing impact of the heatwave (and its likelihood as the sole reason for declining catch) is to be inferred, more studies must be conducted.

Chapter 8 Acknowledgements

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