



Crustaceans, Habitat and Sediment Movement

Introduction

The fishing grounds near Selsey Bill, West Sussex, have traditionally been well managed and productive. Fishing in the area has been shown to date back to the Bronze Age, while individual fishing families can trace their roots back to the 1750's, 1600's and for one family, over 1000 years. The Selsey fishery was first recorded by Bede in 730AD and is of huge cultural significance locally.

Many local fishermen are traditionally potters whose main catch is comprised of crab and lobster, while other species includes fin fish, whelks, and cuttlefish according to season. However, although still productive, huge changes have been seen in the Selsey fishing grounds and they are far less productive than they were ten years ago. Local fishermen feel there has been more change in the last ten years than in the previous one hundred years.

Key observations by fishermen show that crab and lobster catch are now greatly reduced, particularly lobster. Conversely, the quantity of sediment on the seabed and rocks near Selsey and Bracklesham Bay has increased. It has since become apparent that the changes observed locally are not restricted to Selsey but extend along the south coast from the Solent to Kent. Something has affected the marine environment, but it isn't clear what that is. However, several factors are likely to be involved, which may include contaminated sediment, human factors, and climate change.

The CHASM project began in January 2020, as an unfunded, voluntary project, with all time and data being donated by the relevant contributors and institutions.

Two of the key questions identified by CHASM ask whether the sediment load of metals, trace elements and a variety of chemicals are impacting lobsters; and whether interactions between sediment and other marine biota are also affected.

The significance of the Selsey Crab and Lobster fishery

Crabs and lobsters play a wide role economically and environmentally. They are ecosystem engineers, increasing biodiversity and plankton production in the ocean and helping to lock in atmospheric greenhouse gases and carbon.

Economically they add benefits to the local community by contributing towards a resilient local economy. Their role is twofold. Firstly, crabs and lobsters bring in large economic returns considering the small size of the industry. Secondly, the Selsey fishery is a unique selling point for the visitor economy and a focus for the 10,000 people who visit Selsey alone during the summer months, doubling the size of the resident community.

Unlike most other industries fishing is a primary industry. This means the money generated from it, and thus the associated taxes it produces, originate from a source with no production

costs. As such it is a feeder industry to the local economy rather than a service industry which relies on the existence of other activities to facilitate it.

The sea surrounding the peninsula and those who use it, such the fishery and the plants and animals that should thrive in it, are key components of the [blue carbon economy](#) whose significance is increasingly being recognised.

About CHASM

The first CHASM meeting was held in January 2020 to discuss whether a project investigating the changes observed by Selsey fishermen was feasible. Participants were asked to consider how to shed light on the catch and sedimentation problems, and to recommend next steps. The aim of CHASM is to develop and deliver projects to understand the environmental changes affecting the marine environment and the fishing industry, while raising awareness of the issues.

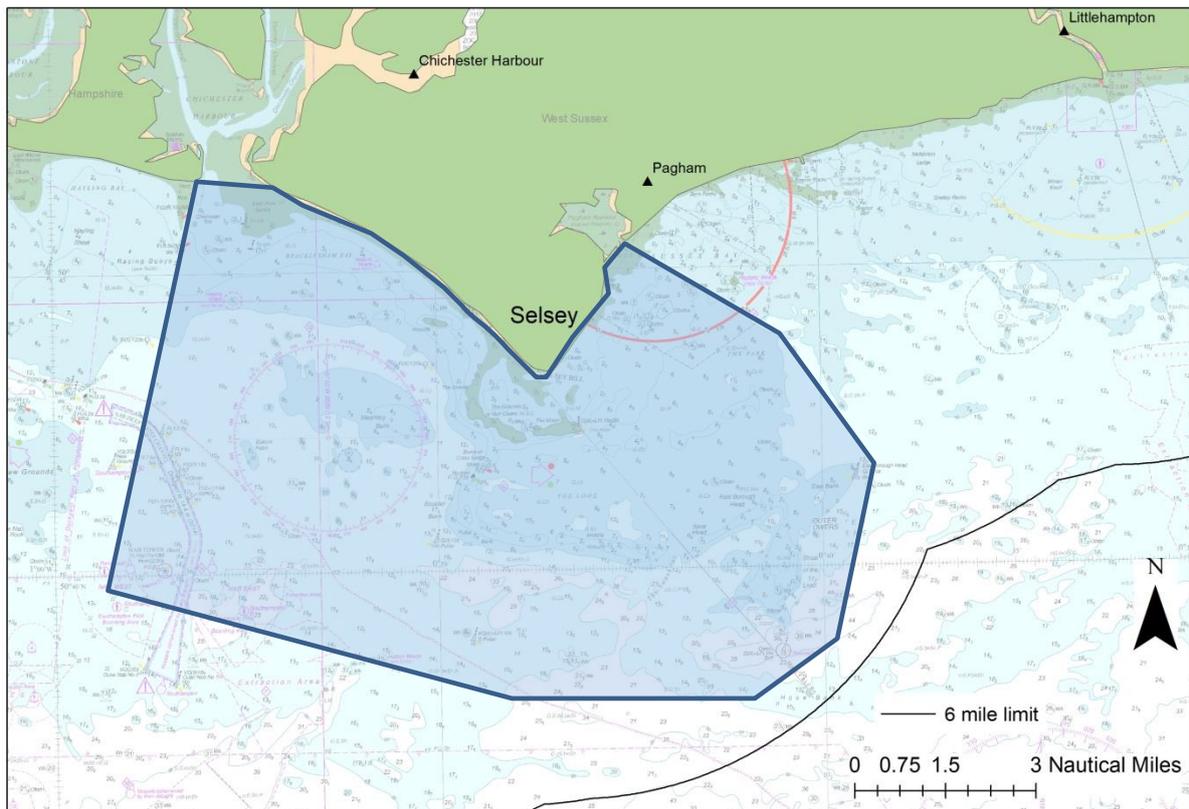
It was felt a good understanding of the nearshore area and associated water column was needed to understand what the changes are, why they happened, and which mitigation measures are appropriate. Partnerships between the fishing industry, academic institutions, local authorities, government agencies, special interest groups and NGOs are essential in order to explore the issues. This is the basis of the CHASM partnership. Improved understanding will also benefit the economic and community perspectives by helping create a more sustainable fishing industry.

The fact that there were issues with reduced catch began to surface during the [Selsey Haven](#) project that looked at whether it was feasible to build a small sustainable harbour in Selsey. The matter had become prominent by the time the cultural and oral history project [Sea's the Day](#) took place shortly after. Funded by the National Lottery Heritage Fund, the aim was to record the stories and memories of the fishermen of Selsey Bill, which provided an opportunity for the recent problems to be articulated by the fishermen.

Key Project Aims:

- **To understand the environmental, physical and climatological changes that have taken place in the Selsey crab and lobster fishing grounds, particularly within the Selsey Bill & Hounds MCZ.**
- **To determine whether the fishing grounds have been impacted by recent environmental inputs including sediment increase, sediment sources, sewage discharge and contaminants in land runoff.**
- **To understand whether the negative effects on the Selsey fishing industry can be mitigated to ensure the sustainability of both the industry and the nearshore marine environment.**
- **To gain greater support and understanding of the marine environment from local communities, visitors and authorities by improving understanding of the benefits and challenges of the open coast through partnerships and education programmes onshore and underwater.**
- **Develop affiliations with other local initiatives including the Sussex Kelp Restoration Project, CHaPRoN and Sussex Bay.**

CHASM Project Area:



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CHASM Project sampling area. Map © Blue Marine Foundation

The area of interest is close to shore and covers the inshore fishing ground where problems were seen originally. Factors affecting the fishing grounds are likely to have originated further afield however, and sediment samples are being collected from the wider area shown on the above map.

Moving from west to east the project area extends from the mouth of Chichester Harbour, round Selsey Bill to Pagham Harbour. The southern extent includes the A1 submarine site in Bracklesham Bay; Hounds Reef; the Grounds; the Mixon; Pullar; Looe Channel; the Owers and Eastborough Head. Sediment samples have been taken from reference sites on the Hooe Bank and NAB Tower.

The Selsey Bill and the Hounds Marine Conservation Zone (MCZ) and the Solent & Dorset Coast Special Protection Area (SPA) are part of the CHASM project area. The features requiring MCZ protection include the High Energy Infralittoral Rock forming the Hounds Reef and rocky outcrops near Selsey Bill, which have traditionally been an important part of the nearshore fishing grounds. A decline in crab and lobster catches indicates that not only are these species suffering, but also raises questions about the health of the marine environment within the MCZ itself.

Neighbouring and overlapping project areas with shared interests include Selsey Bill & The Hounds Marine Conservation Zone; the Sussex Kelp Restoration Project; Medmerry Managed Realignment; Sussex Bay Project and Chichester Harbour CHaPRoN.

Marine Environment

The sandstone seabed off Selsey Bill is a traditional breeding ground for juvenile lobsters where they conceal themselves in the naturally occurring sandstone holes. However, a dramatic increase in sedimentation noted over the last few years has silted up the holes leaving nowhere for juvenile lobsters to take shelter. Sediment, and what it may contain, is one factor thought to have affected lobster catch on the Bill. In addition, kelp beds have been lost from the area, which provided shelter, a nursery ground, and a source of food for many species of fish and crustaceans.

Part of the nearshore Selsey fishing ground is located in the Selsey Bill & The Hounds MCZ and Solent & Dorset Coast SPA. However so much negative change has taken place in recent years that the fishing ground today isn't thought to represent the sustainable ground seen when the MCZ was being considered over ten years ago. Ideally the area should be improved to the standards observed originally rather than be protected in its current state, but much depends on whether the changes have been man made and reversible, or natural. Natural England will review the MCZ Conservation Advice in 2022 and intends to take new evidence into account, including CHASM findings.

A neighbouring project with similar marine environmental interests is the Sussex Kelp Restoration Project that aims to restore kelp beds along the Sussex coast. The Sussex Wildlife Trust, Sussex IFCA and partners are delivering the initial stages of the project. CHASM and the Sussex Kelp Restoration Project are looking for joint areas for research to enable both projects to make more effective progress.

The Selsey fishery is a productive fishery despite the current challenges. The monetary values shown in the annual figures of the Marine Management Organisation (MMO) Landings Data represent the value of catch sold to market and therefore to the Selsey economy. Additional value is added when the catch is sold by restaurants or fishmongers. MMO Landings Data can be found via the following link:
<https://www.gov.uk/government/statistical-data-sets/uk-and-foreign-vessels-landings-by-uk-port-and-uk-vessel-landings-abroad>

It is becoming far harder to maintain these catch levels because of the lack of catch available, particularly lobsters. This is known as an increase in [fishing effort](#), and is one of the causes for the decline seen in small inshore fisheries.

Environmental change:

The key features of environmental change are a decline that has moved from west to east through Bracklesham Bay to Selsey Bill and beyond over the last 5-10 years. The most significant changes for the fishermen are crab and lobster decline, while changes in other species seen in the Selsey and Bracklesham areas have also been noticed. These changes are not restricted to the Selsey area. Similar decline and change have been noted westwards in coastal waters of the Isle of Wight, and east towards Shoreham, Brighton and even Kent. Decline in these locations is typified by fishermen's observations of black 'slime' on the seabed and reductions in catch.

Scuba divers in the waters adjacent to Selsey and Bracklesham provided some interesting observations with respect to changes in the marine environment.

Sea life on the A1 submarine, a protected wreck in Bracklesham Bay, was compromised during one year of particularly poor visibility, when diving proved impossible and marine life on the submarine died off completely. After several years the A1 site is now showing signs of recovery, but elsewhere the seabed is still barren with little weed or kelp, and few lobsters in evidence.

The impact of licenced dredging and land runoff are also considerations. It is unclear whether dredging and spoil disposal has impacted the CHASM project area or the MCZ, but future work will entail trying to identify sediment sources.

Changing weather patterns and increased storms mean sediment movement is likely to become more frequent. Sediment can come and go over long time periods and has its origin in many sources. As part of ongoing research, Brighton University is in the process of analysing sediment and how it moves in and around Medmerry. Channel Coast Observatory is analysing information on coastal change held in existing reports, data sets and satellite imagery. Interviews with fishermen have recorded their observations.

Observed changes:

- Reduced crab and lobster catch, particularly lobster.
- Increased crab \ lobster mortality while still in in pots and shortly after being caught.
- Changes in marine species
- Reduced water depth in the mooring area of the Selsey fishing fleet.
- Increased sediment and gravel deposits on the key crab and lobster fishing grounds both nearshore and up to 6 nautical miles offshore
- Loss of kelp from the littoral and sub littoral zone round Selsey Bill
- Divers noted reduced numbers of species and poor visibility off East Beach, Selsey
- Divers noted the lack of marine life on the A1 submarine in Bracklesham Bay, west of Selsey Bill.
- Aerial photography shows a new sand spit being generated south of Selsey Bill.

Project Partners and funding

The CHASM project began in January 2020, as an unfunded, voluntary project, with all time and data being donated by the relevant contributors and institutions. This is still the case.

CHASM has been fortunate because the problems presented by the reducing lobster and crab numbers has gained the interest and participation of several commercial, academic and government organisations. A key set of partners has shown the interest and determination to pursue the project despite the lack of external funding.

Channel Coast Observatory regularly accepts a university placement student, an Intern Coastal Process Scientist. During 2021 the task was to collate and investigate existing data sources in the CHASM project area such as bathymetry, storm data and satellite imagery.

Brighton University successfully acquired [Santander funding](#) to finance a student dedicated to working on sedimentation within Medmerry and the CHASM project. More recently Brighton worked with the Coastal Explorer intern at Kent Wildlife Trust to develop an interactive GIS for the CHASM project.

Preliminary observations and reports:

Channel Coast Observatory (CCO) has released a report summarising existing research held by CCO, and includes all research conducted between June 2020 and June 2021 by CCO and University of Brighton. Research into environmental factors was slow due to covid restrictions but is now underway.

Factors affecting the Selsey fishery are a more complex issue than sediment simply washing out of Medmerry and depositing on the adjacent seabed. Further investigation is needed before conclusions are reached. Should conclusions indicate pollution is responsible for the changes, there are implications for water quality, the visitor economy, and the wider community to consider.

Project Developments 2022:

- CHASM and the Sussex Kelp Restoration Project have a mutual interest in the role of sediment in the marine environment. The two projects are interested in acquiring similar environmental data and intend to work together in future.
- Blue Marine Foundation (BLUE) worked with local fishermen to establish a species baseline following the introduction of the No Trawling By Law in 2021. In future there may be the option to create a project like the [Lyme Bay Project](#) in Selsey waters.
- University of Portsmouth is increasingly involved with CHASM. The University is the scientific lead on the Sussex Kelp Restoration Project and the Sussex Bay Scientific Partnership and is keen to sustain links between all three projects.
- The Environment Agency National Water Quality Instrumentation Service is installing sonde and telemetry equipment outside Chichester Harbour to determine the feasibility of using the instrumentation in the marine environment. Measurements of oxygen, chlorophyll and turbidity will also benefit CHASM.
- Funding

Project Partners:

Key partners in CHASM, who also make up the Steering Group, are:

- Channel Coast Observatory
- Chichester District Council
- Mulberry Marine Experiences
- Southsea Sub-Aqua Club, Historic England licence holder on A1 submarine
- University of Brighton Engineering Department

The CHASM project works closely with other local and national projects and organisations, sharing similar environmental and monitoring aims in the marine environment:

- Sussex Kelp Restoration Project (formerly Help Our Kelp)
- CHaPRoN - Chichester Harbour Conservancy, Natural England
- Sussex Bay - Adur & Worthing, Arun DC

Project Stakeholders:

Stakeholder contributors:

Blue Marine Foundation

Cefas

Environment Agency National Water Quality Instrumentation Service

Kent Wildlife Trust

National Lobster Hatchery, Padstow
Sea Search, Sussex Wildlife Trust
Selsey fishermen
Sussex IFCA

Stakeholder observers:

Agents of Change, Marine Conservation Society
Chichester District Council, Senior Coastal Engineer
Environment Agency Regional Strategic Team
Marine Management Organisation
Monteum Lobsters
National Federation of Fisheries Organisations
Natural England
Seafish
Selsea Fish and Lobster (processor)
Selsey Town Council
Shoreham Port
Sussex Kelp Restoration Project (formerly Help Our Kelp)
University of Portsmouth

The project is led by Jane Cunningham, MPP Project Officer, Chichester District Council

Appendix 1: Research summary 2021/22:

- Fishermen's observations have been recorded in interviews. Observations noted the changes seen, the location of observed changes, and the timescales.
- Observations have also been gathered from other sea users regarding changes seen in the nearshore marine environment.
- Suitable sites for sediment collection based on fishermen's observations have been identified and mapped.
- Sediment samples are being acquired by scuba divers and Sussex IFCA for processing by CCO and University of Brighton.
- CCO has collated Topographic and nearshore data from existing data sources, and related to a timeline showing major storms and dredging. Existing data includes topographic profiles; shore change; beach volume; bathymetry; habitat and seabed mapping; wave data and sea surface temperature data.
- Shoreline changes are being investigated by CCO via the BLUECO Project. The information is being derived from a range of satellites that include Sentinel 1, Sentinel 2 and Landsat, all of which measure slightly different parameters but provide high resolution measurements in the coastal zone. The BLUECO Project is using Chichester and Pagham Harbours, and the peninsula shoreline as test sites for remote shoreline monitoring (<https://www.noc.ac.uk/projects/blueco>)
- Work by Brighton University on sediment pathways connected with Medmerry is underway. Geochemical analysis of sediment samples will be undertaken once covid restrictions lift.
- Brighton University has dedicated a further two students to the project for the 2021/2022 academic year.
- Kent Wildlife Trust secured funding for a Coastal Explorer Internship programme to work on CHASM and other projects for 6 months in association with Brighton

University. Outputs include an interactive GIS based map using data from Channel Coast Observatory, University of Brighton and other CHASM sources.

- Discussions concerning the lobster decline have been held with:
 - the Head of Production, Science and Development, National Lobster Hatchery, Padstow, Cornwall (<https://www.nationallobsterhatchery.co.uk/>)
 - The Crustacean Health Theme Lead, Cefas (<https://www.cefas.co.uk/>)
- Cefas collected crab samples from the Selsey fishermen in Dec 2020 and lobster samples in March 2021. Analysis to date shows the presence of a novel pathogen, Paramoebiasis, not seen previously in edible crabs (*Cancer pagurus*). This is not harmful to human health and is not found in lobsters (*Homarus gammarus*). Sediment analysis is also being undertaken to determine whether the paramoeba is present in the surrounding environment. An academic paper on the subject is being produced by Cefas.
- Seasearch completed dives assessing existing biota and seascape to the east of Selsey Bill in association with the Sussex Kelp Restoration Project. The findings will be compared with baseline data used to establish the Selsey Bill and the Hounds MCZ to determine changes.
- The Environment Agency provided CHASM with a sonde unit for measuring temperature, conductivity, turbidity, and dissolved oxygen on a site outside Chichester Harbour. East Wittering and West Wittering parish councils commissioned two more units to be deployed in Bracklesham Bay and outside Pagham Harbour.

Outreach 2021

- Mulberry ME (Mulberry Marine Experiences), the home of scuba diving, snorkelling and free diving in Selsey took on the task of developing a new CHASM logo. This took place during the after school clubs run by Mulberry ME during the summer term 2021. Students submitted ideas that were developed into the new CHASM logo. The winner was delighted to be awarded a snorkelling course by Mulberry ME. (<https://www.mulberry-me.co.uk/>)