



Crustaceans, Habitat and Sediment Movement

Introduction

The fishing grounds near Selsey Bill have traditionally been well managed and productive. Fishing in Selsey has been dated 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. However huge changes in the fishing ground have been seen in recent years. Selsey fishermen feel there has been more change in the last 10 years than in the previous 100 years. Something has affected the marine environment leading to huge reductions in crab and lobster catch, and a noticeable increase in sand and sediment, but it isn't clear what the causes are. However a number of factors are likely to be involved including human activity and climate change.

The Selsey fishermen, arguably the last hunter gatherers, are traditionally potters whose main catch is comprised of crab and lobster. Other species caught include fin fish, whelks and cuttlefish according to season. The Selsey fishery was first recorded by Bede in 730AD and is of huge cultural significance locally.

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. Their role in benefitting the local community by contributing towards a resilient local economy 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.

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.

The Selsey fishing ground has changed. A good understanding of the nearshore area and associated water column is 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 Project. 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. Improved understanding will also benefit the economic and community perspectives by helping create a more sustainable fishing industry.

Should pollutants be identified, there may be implications for water quality, the visitor economy and the wider community to consider.

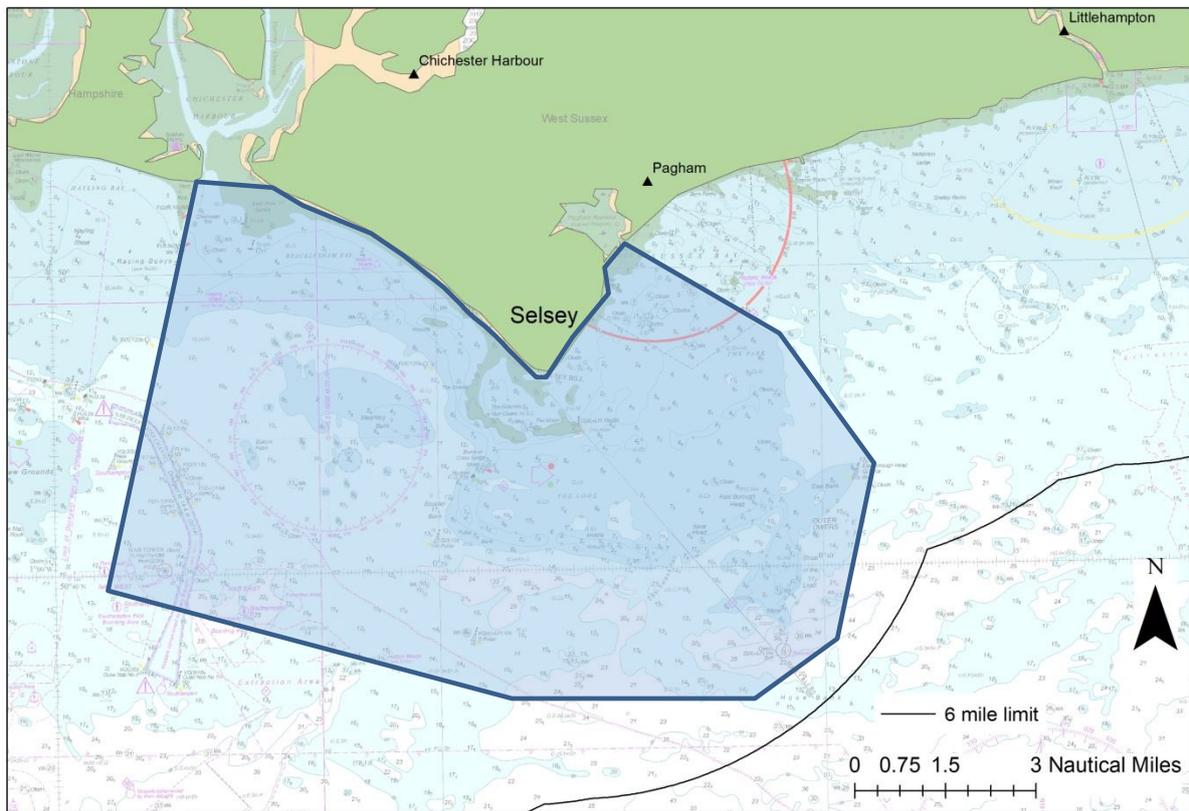
The issues were first raised during [Sea's the Day](#), a cultural and oral history project that recorded the stories and memories of the fishermen of Selsey Bill that was funded by the National Lottery Heritage Fund. Sea's the Day took place following the [Selsey Haven](#) project that investigated the feasibility of building a small sustainable harbour in Selsey. A harbour was found unfeasible on financial grounds, but the subsequent report by Marshall Regen stated that support and promotion was needed to ensure the continuation of the Selsey fishing industry.

The first CHASM meeting was held in January 2020 to discuss whether a project investigating the issues raised 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.

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.**

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.

Background

The sandstone seabed off Selsey Bill used to be a breeding ground for juvenile lobsters that would conceal themselves in the naturally occurring sandstone holes. A dramatic increase in sedimentation noted over the last few years has silted up the holes leaving nowhere for juvenile lobsters to take shelter. This is one factor thought to have almost eliminated lobster catch from the Bill. In addition kelp beds have been lost from the Bill, which provided shelter and a source of food for many animals.

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 over the last 10 years that the fishing ground today isn't thought to represent the sustainable ground seen when the MCZ was being considered originally, or existed for centuries previously. Ideally the area should be improved to the standards observed 10 years ago 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.

Sussex IFCA and Sussex Wildlife Trust are in the initial stages of a project to restore kelp beds along the Sussex coast, this is the Sussex Kelp Restoration Project (formerly Help Our Kelp). Most kelp research is outside the MCZ, but it is hoped CHASM and the Kelp Restoration Project will be able to find joint areas for research.

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. It is not the added value when 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 has been noted westwards in coastal waters of the Isle of Wight, and east towards Shoreham and Brighton. Decline in these locations is typified by a layer 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 four 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:

- Loss of kelp from the littoral and sub littoral zone round Selsey Bill
- Reduced water depth in the mooring area of the Selsey fishing fleet.
- Reduced crab and lobster catch, particularly lobster.
- Increased crab lobster mortality in pots and shortly after being caught.
- Changes in marine species
- Increased sediment and gravel deposits on the key crab and lobster fishing grounds both nearshore and up to 6 nautical miles offshore
- Divers noted reduced numbers of species and poor visibility off East Beach
- Divers have noted reduced water depth on Kirk Arrow Spit.
- A period of nil visibility on the A1 submarine in Bracklesham Bay destroyed marine life on the wreck for about 3 years. Although there were some signs of recovery in 2020, this was slight and the surface of the submarine is still barren.
- Aerial photography appears to show a new sand spit being generated south of Selsey Bill.

Project Partners and funding

CHASM has been fortunate because the problems presented by the reducing lobster and crab numbers has gained the interest and participation of a number of 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 has started working with Kent Wildlife Trust whose Coastal Explorer intern is developing an interactive GIS for the CHASM project. More details can be found below.

Research summary 2021:

- 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 has secured an intern from the 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 have loaned CHASM a sonde unit for measuring temperature, conductivity, turbidity, and dissolved oxygen on a site outside Chichester Harbour. East Wittering and West Wittering parish councils have paid for two more units to be deployed in Bracklesham Bay and outside Pagham Harbour. Results are expected towards the end of 2021.

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 at two local schools. Students were asked to submit ideas for a logo that were developed into the new CHASM logo below. The winner was delighted to be awarded a snorkelling course by Mulberry ME.



For more about Mulberry ME see their website:

<https://www.mulberry-me.co.uk/>

Other developments 2021:

- 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 closely together in future.
- A private fish and lobster processing company based in Shoreham, is considering opening a lobster hatchery in Shoreham that would benefit fisheries along the south coast including Selsey. The owner has expressed concerns about the local decline in the crab and lobster fishery, and is awaiting the research results from CHASM and other local projects before taking the matter further.
- Blue Marine Foundation (BLUE) worked with local fishermen to establish a species baseline following the introduction of the No Trawling By Law that came into force in 2021. In future there may be the option to create a project similar to the [Lyme Bay Project](#) in Selsey waters.
- More recently the University of Portsmouth has also expressed interest and their involvement is being discussed. Portsmouth University are also the scientific lead on the Sussex Kelp Restoration Project and are keen to sustain the links between the projects. A PhD student specifically to research CHASM issues is being discussed.

Preliminary observations and reports:

CCO is producing a report on all research conducted between June 2020 and June 2021 for release later in 2021. Sedimentation affecting the Selsey fishery is a more complex issue than sediment simply washing out of Medmerry and depositing on the adjacent seabed.

It hasn't been possible to investigate environmental factors in detail yet other than the analysis by Cefas due to covid restrictions, and the lack of both available laboratories and funding.

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.

Partners:

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) – Sussex Wildlife Trust, Sussex IFCA, Blue Marine Foundation, Big Wave Productions
- CHaPRoN - Chichester Harbour Conservancy, Natural England
- Sussex Bay - Adur & Worthing, Arun DC

Huge thanks must be extended to the Selsey fishermen, Channel Coast Observatory, University of Brighton, Mulberry Marine Experiences, Southsea SAC, Seasearch (Sussex Wildlife Trust), and University of Portsmouth for taking such an active interest in the project, and to Sussex IFCA for the loan of their research vessel to acquire sediment samples in 2020.

Project Stakeholders:**Steering Group:**

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

Stakeholders - contributors:

Selsey fishermen
Cefas
Environment Agency National Water Quality Instrumentation Service
Sea Search, Sussex Wildlife Trust
Sussex IFCA
National Lobster Hatchery, Padstow
Blue Marine Foundation

Stakeholders – observers:

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

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