

Native Oyster, *Ostrea edulis*, Milford Haven Waterway Survey report. March 2017 Kate Lock



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Introduction

Background to Seasearch

Seasearch is a UK project for volunteer recreational and professional divers. The divers are trained in species and habitat recording and help survey the seabed around the British and Irish coasts. Survey forms are quality checked by experienced marine biologists who enter all data into the UK national database Marine Recorder, managed by the Joint Nature Conservation Committee, which contributes to the National Biodiversity Network.

The main aim is to provide quality assured Seasearch data to partner organisations and the public. However the project also aims to raise public awareness of the diversity of marine life and habitats in Britain and Ireland through the dissemination of information gathered and the identification of issues arising from it.

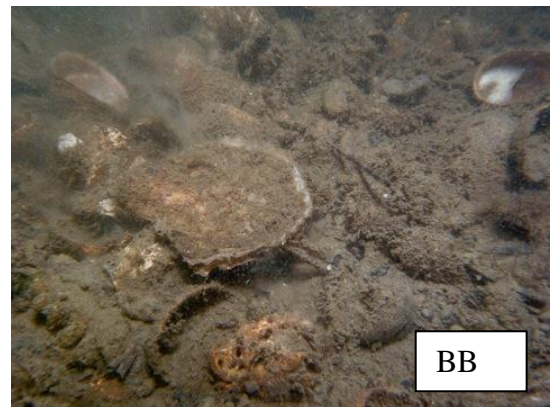
Seasearch surveys record the various types of seabed found in the near-shore zone around the whole of the UK, recording what lives in each area, contribute to establishing the richest sites for marine life, the sites where there are problems and the sites which need protection.

Surveys also target important habitats and species that have been identified by the UK government to need priority conservation action. In Wales this is detailed in the Environment (Wales) Act 2016: Section 7 Biodiversity lists and duty to take steps to maintain and enhance biodiversity. The Section 7 list includes the Native oyster, *Ostrea edulis*.

Previous Milford Haven Native Oyster Diving Surveys

Historically, Milford Haven supported a thriving Native oyster fishery but disease and overexploitation led to population collapses; the same has occurred to Native oyster beds across much of Europe. Although Native oyster numbers are much reduced, the Waterway is the only currently known location for live Native oysters in Pembrokeshire.

The first diving survey to assess the distribution and abundance of the native oyster in the Milford Haven was carried out in 2002 for the Countryside Council for Wales, by Emu Ltd. In 2007 Seasearch divers repeated surveys of two of the survey sites, completing transect counts of Native oysters and general habitat and species recording. Seasearch surveyed a further six sites in 2010 and 2011. At each site low numbers of Native oysters were found and the sediment substrate was dominated by the non-native invasive slipper limpet, *Crepidula fornicata*, which at some sites was found in super abundance.



Milford Haven Native Oyster Regeneration Project 2016-2017

In early 2016 West Wales Shellfishermen's Association (WWSFA) Ltd secured some funds via a competitive fund held by Natural Resources Wales (NRW) to gather evidence to support a local native oyster regeneration programme in Milford Haven (Milford Haven Native oyster regeneration project – stage one (current status and practicalities)). The project aimed to focus on key locations in the Milford Haven Waterway to establish the current state of Native oysters, spat, cultch, habitat and key threats. Outputs were to include a detailed report with the aim of a 'blue print' for an active native oyster regeneration project, a Native oyster local biodiversity action plan, and improved knowledge of the estuaries SAC feature. Partnership working and a management steering group aimed to ensure that all the relevant information and stakeholders could contribute to the project.

The Pembrokeshire Marine Special Area of Conservation (SAC) Officer was brought in to project manage the work which consisted of targeted field work utilising fishermen and survey methods permitted by NRW; these methods were limited to grab sampling and drop down video. Amid concerns that the regeneration project's limited methodology may not provide adequate data, the SAC officer approached Seasearch to help support and enhance the field work data. Seasearch divers were then sought to run a parallel project to supplement the regeneration project by providing additional diver-collected data.

It was proposed that Seasearch would be able to conduct diving surveys to collect the following data:

1. Count numbers of oysters in defined areas to ascertain density.
2. Collect live oysters for size measurements.
3. Record habitat and species found in the targeted areas.
4. Take photographs and video during survey.
5. Collect surface cultch (material including stones and shell upon which spat are able to settle) in defined areas for surface inspection for oyster spat and numbers of the non-native slipper limpet, *Crepidula fornicata*.

The SAC officer sourced additional funding to support the Seasearch diving surveys from Pembrokeshire based Biodiversity Solutions (a non-profit making Social Enterprise company dedicating its income to researching and improving the biodiversity of West Wales).

Method

Diving survey work in the Cleddau waterway is challenging. There is a short slack water period during which diving can take place; this is due to the large tides and strong currents. There is also very low water visibility due to land run off into the rivers. Careful planning is needed to allow safe diving and to gain productive results. Method trials were completed by divers to test laying tape measures to allow collection in a defined area and also to test collection during a drift dive. Following these trials and discussions with the project manager and WWFSA the following methods were agreed:

1. Live oyster collection and measurement:
 - A buoyed shot was set by the fisherman in the target area. A pair of divers descended the shot, attached a tape measure to the bottom, and lay the tape measure out collecting all the live Native oysters found 1 metre either side of the tape as they moved along (one diver each side of the tape providing a

2m search area 'corridor'). The search distance of 1m was set due to visibility constraints, and to focus divers' attention as Native oysters can be difficult to spot. The distance the tape was laid was determined primarily by the strength of the water current (30 metres maximum). Divers then returned to the shot, reeling the tape back in and checking again for live oysters. All oysters were collected into a net bag and brought to the surface for measuring.



- On board the boat, the number of oysters were counted for each transect completed and the area and position recorded.
- All live oysters were measured using a ruler and returned back to the water at the site where they were collected.



2. Surface material (cultch) collection.

- A buoyed shot and weighted ground lines were set by the fisherman in the target area. A pair of divers descended the shot and swam along the ground line. Every few metres a 0.25m² quadrat was laid down randomly along the ground line. A video was taken of the surface material within the quadrat and then all the surface material 'cultch' was collected into a net bag. The net bag was then secured to the ground line using cable ties. The divers then continued along the ground line repeating the method as many times as safely possible (defined by safe diving time and strength of water current).
- Along the ground line the divers additionally and simultaneously collected live Native oysters into a net bag (from within a search area 1m either side of the line as in 1 above). The start point of collection was at the shot and the end point was marked on the ground line with a coloured cable tie. This allowed for the distance covered to be measured on the surface when the lines were retrieved. The net bag containing the collected oysters was brought to the

surface at the end of the dive. These were measured before returning to the water (as in 1).

- The ground line was retrieved after the dive by the fisherman using a winch, including the attached net bags containing cultch samples. The distance between the bags was measured to determine the location of each quadrat along the ground line, and the total distance of the oyster collection search was also measured.



- The volume of the 'cultch' in each bag was measured (by a water displacement method) and then emptied into a container where it was photographed and carefully inspected for the presence of oyster spat. Numbers of slipper limpet, *Crepidula fornicata* were also counted (and then put to one side for subsequent desiccation and disposal; as an invasive non-native species it is not permissible to return live individuals to the water once removed). This work was completed by the fisherman and SAC officer.



3. Seasearch habitat and species recording and photography:

- At each site divers completed recording following Seasearch methods. Details of habitat and species identified were recorded on a writing slate and photographs were taken. On the surface a Seasearch surveyor form (see Appendix 1) was completed with site information and all habitat and species data recorded.

Results

Diving surveys

5 days of diving were completed. Method trails were completed at Site 1a and Site 2 to test laying tapes and completing the survey in a defined area and a drift dive was completed at Site 4. The main survey effort was targeted at Site 1b as directed by WWSFA Ltd. to coincide with work underway on a native oyster regeneration project (see map).

The map and local site names with coordinates have been removed from this redacted version of the report in line with Natural Resources Wales Requirements in dealing with 'sensitive species' which include the native oyster. A full copy of the report is available from Natural Resources Wales under licence.

A summary of the diving surveys completed is as follows:

Date	Site	Recorders	Fieldwork
21/5/2016	Site 1a	RW, KL, LB, StB,	Four 20m transects x 2m width. Moorings used as start points. Oyster counts only, no collection. Counted 10 oysters. Seasearch form completed. Very low visibility <1m
25/6/2016	Site 2	KeL, BB, JP, RW, JM, KL LB, LP, StB, RWh	Four 20m transects x 2m width. Moorings used as start points. Oyster collection. Collected 3 oysters. Seasearch form completed. Low visibility 1m
25/6/2016	Site 4	BB, JM, LP, LB, JP, RW	Drift dive of 218m x 2m Collected 24 oysters. Seasearch form completed. Low visibility 1m.
22/9/2016	Site 1b	BB, KL surface: fisherman, SAC officer	Markers and ground line set by fisherman. Cultch collection completed in 25cm x 25cm quadrats along the ground line, 1 bag per collection. Video taken of each quadrat pre-collection. 6 collection points completed. Oysters collected along the line – total distance of 70 x 3m width (wider search area due to better than average visibility). Visibility satisfactory 3m. Collected 7 oysters
8/10/2016	Site 1b	BB, KL EW, ES, WK, ER, LB, MH surface: fisherman, SAC officer	Markers and ground line set by fisherman. Cultch collection completed in 25cm x 25cm quadrats along the ground line, 1 bag per collection. Video taken of each quadrat pre-collection. 10 collection points completed. Oysters collected along the line – total distance of 63.5 x 2m width. Collected 25 oysters Markers set by fisherman. Three 30m x 2m transects completed with oyster collection. Collected 86 oysters. Seasearch form completed. Visibility satisfactory 2m.
9/10/2016	Site 1b	BB, KM, LB, MH, EW, ES, ER, WK SBo, DK	Markers set in area specified by fisherman. Four 30m x 2m transects completed with live oyster collection. Collected 11 oysters. Comprehensive Seasearch form completed. Visibility satisfactory 2m.

Oyster collection and measurement from diver transects.

The data collected from both Site 1a and Site 2 dives was insufficient to use. The following results are from the data collected at Site 4 (drift dive) and Site 1b (transect dives). 153 oysters were measured.

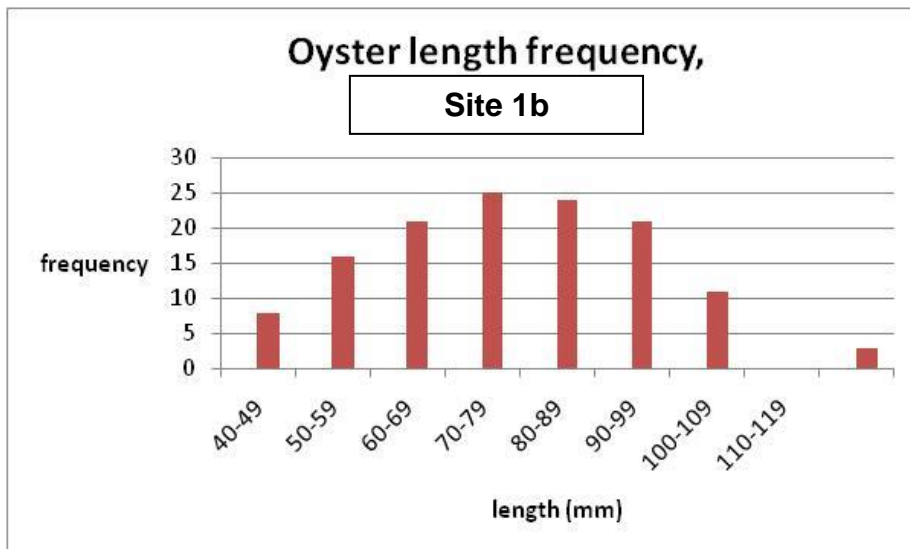
The oyster data including oyster density and size measurements for each transect have been entered into a spreadsheet, Appendix 2. The data is summarised as follows:

Site	Site 1b (measured transects)	Site 4 (estimated distance)
Area surveyed (m ²)	743	432
Number of oysters	129	24
Density/m ²	0.17	0.05
Density/100m ²	17	5.55

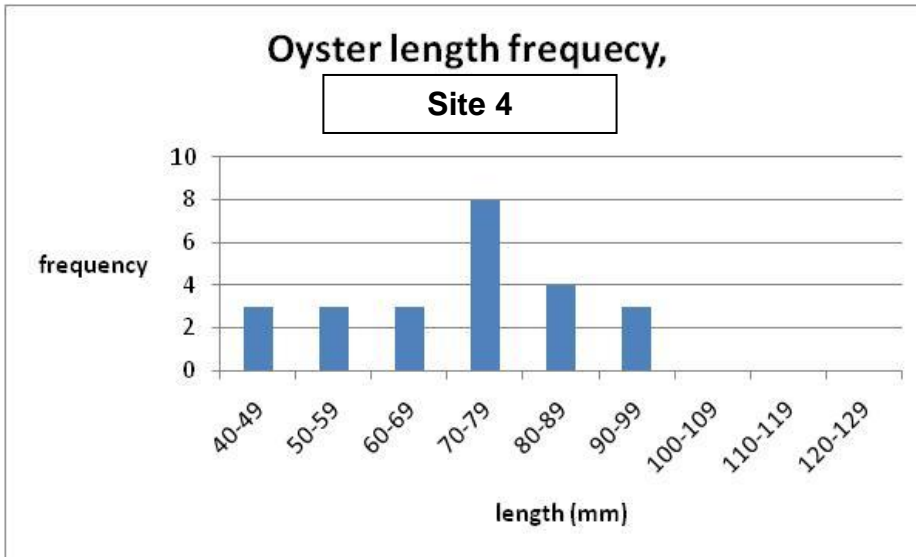
At Site 1b an oyster density of 17/100m² was found whilst at Site 4 it was 5.55/100m².

The oyster lengths have been put into size classes to give oyster length frequency graphs for Site 1b and Site 4.

Length size class (mm)	Site 1b	Site 4
40-49	8	3
50-59	16	3
60-69	21	3
70-79	25	8
80-89	24	4
90-99	21	3
100-109	11	
110-119	0	
120-129	3	



Site 1b:
 Lowest length 41mm
 Highest length 122mm
 Mean length 77mm



Site 4:
 Lowest length 40mm
 Highest length 90mm
 Mean length 70mm

Surface material (cultch)

Cultch collection was completed twice: 22nd September, 6 bags were collected, and 7th October 10 bags were collected. A video was taken of the surface material within each quadrat before the collection took place. This video footage has been provided to the SAC officer and can be used for further analysis.

The volumes of cultch, numbers of spat and numbers of slipper limpet, *Crepidula fornicata* recorded are shown in the tables below. No oyster spat was found. High numbers of slipper limpets were found on the stones, some forming towers as shown in the photo.



22/09/16

Bag number	Volume (litres)	Number of oyster spat	Number of <i>Crepidula</i>
1	1	0	6
2	2.3	0	21
3	2	0	13
4	2.3	0	16
5	2.9	0	19
6	4.2	0	61

7/11/16

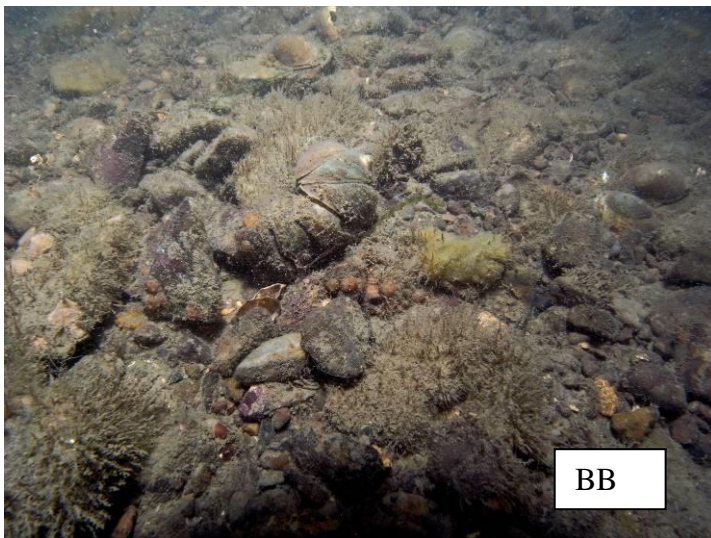
Bag number	Volume (litres)	Number of oyster spat	Number of <i>Crepidula</i>
1	1.1	0	3
2	1.5	0	11
3	0.6	0	30
4	0.9	0	21
5	0.65	0	11
6	0.9	0	22
7	2.0	0	88
8	2.2	0	83
9	1.9	0	32
10	1.5	0	11

Habitat and species survey results

A seasearch surveyors form (Appendix 1) was completed for each site. Habitat and species data was recorded and all data has been entered into Marine Recorder. Species records and abundance for each site has been entered into a spreadsheet (Appendix 3). A total of 76 species were recorded: 10 sponges, 12 cnideria (hydroids and anemones), 5 worms, 10 crustaceans, 10 mollusc, 6 bryozoan, 3 echinoderm, 10 sea squirts, 4 fish and 6 algae species. Site summaries are as follows:

1. Site 1a date: 21/5/2016
depth: 12.5m

Visibility was poor so limited recording. A muddy shell and gravel mixed sediment flat river bed with occasional cobbles. Shells were dominated by slipper limpets, *Crepidula fornicata*. Horse anemones, *Urticina eques*, shore crabs, *Carcinus maenas* were recorded and encrusting sponges were found on cobbles. Native Oysters, *Ostrea edulis*, were rarely recorded.

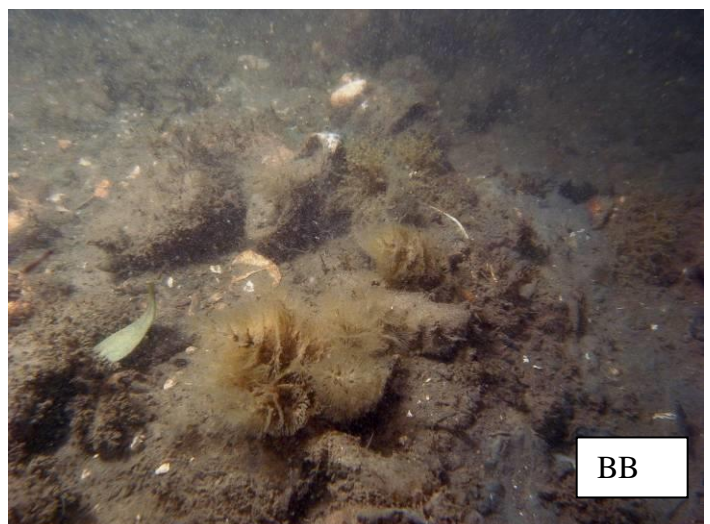


2. Site 2
date: 25/6/2016 depth: 10-11m

Tide swept pebbles and cobbles amongst mooring chains and occasional small boulders. An abundance of slipper limpets, *Crepidula fornicata*, was recorded with up to 20-30 clumps in 1m² area. Occasional shore crabs, *Carcinus maenas* and dahlia anemones, *Urticina felina* were recorded. Native oysters, *Ostrea edulis*, were rarely recorded.

3. Site 4 date: 25/6/2016 depth: 9.5 – 12m

Soft mixed muddy gravel with pebbles, shells and shell fragments. Occasional cobbles and a covering of thick silt. Super abundance of slipper limpets, *Crepidula fornicata* were recorded with shell chains of 8 or more individuals found together. Occasional hydroids and bryozoans were found on the larger stones along with dahlia anemone, *Urticina felina*, and erect and encrusting sponges, *Halichondria spp.* A drift dive was completed covering a large area, native oysters, *Ostrea edulis*, were patchy in distribution with records from rare to occasional.



4. Site 1b date: 7 & 8/10/2016 depth: 6 to 14m

A more detailed habitat and species survey was completed at this site with one pair of divers dedicated to recording and photography.

A relatively flat area of seabed characterised by a poorly sorted mix of small boulders, cobbles, pebbles and broken shell overlying muddy sediment. Slipper limpets, *Crepidula fornicata* were abundant but patchy in areas. Native oysters, *Ostrea edulis* were found with a patchy distribution that varied from rare to frequent, and quantities of empty shell were found. The small boulders and cobbles provided attachment for a variety of filter feeding animals. 12 species of sponges were identified including frequent records of goose bump sponge, *Dysidea fragalis* and *Halichondria bowerbanki* and encrusting orange sponge were common. 7 species of sea squirts were found with frequent records of *Diplosoma listerianum*. Burrowing anemones were found in the soft sediments with the daisy anemone, *Cerus pedunculatus* common and horse anemone, *Urticina eques* frequent. A variety of small crabs were found scuttling about along with numerous black goby, *Gobius niger* and painted goby, *Pomatoschistus pictus*. The silty conditions and turbid waters are not ideal conditions for algae growth but a few species were found with both *Stenogramme interrupta* and *Pterothamion plumula* recorded as common.

The following photos show species found at Sites 1a and 1b taken by David Kipling.



Native Oyster
Ostrea edulis DK



Mud anemone,
Sagartia tryglodes DK



Variegated scallop *Chlamys varia* DK



Nudibranch *Jorruna tomentosa* DK



Painted goby *Pomatoschistus pictus* DK



Painted balloon nudibranch ,
Eubranchus tricolor DK



Spindly spider crab *Macropodia* sp DK



Black goby *Gobius niger* DK

Discussion

The aim of this project was for Seasearch divers to collect supporting quantitative data to enhance the fieldwork being collected by remote drop down video and grab sampling for WWSFA Ltd.'s oyster regeneration study.

Seasearch divers successfully collected a wide range of 'in situ' data and this has been provided to the SAC officer.

There were expected limitations to diving in the Milford Haven: strong tidal currents, low visibility and restricted diving times but with careful planning diving was completed over 5 days, involving 17 volunteer divers. Three different methods were used to collect data and these are discussed:

Oyster collection and measurement from diver transects.

Tape measures were used so that transects of a known distance could be laid and oysters searched and collected in a prescribed width along the tape. This well used method is used to gain density data by divers. The method is not difficult and can be completed by Seasearch divers. To test the method for this survey, moorings at sites were used as start points to allow the divers to lay the tapes. This was a good method but had major limitations as the survey was only completed next to the existing moorings and either no or very low numbers of oysters were found.

Subsequent pre-dive liaison with the fisherman was certainly beneficial as it meant that an agreement could be reached for the fisherman to lay shot lines for the divers to descend and use as transect start points. The advantage of this was that the fisherman could better target the divers at areas of known historical oyster concentrations and also set the shot lines in areas that would also be used for the drop down video and grab sampling fieldwork. Working together in this way improved the quality of the data collected.

A drift dive at Site 4 was also tested with the distance covered by the divers measured using GPS points for the start and end of the dive. This method allows a large area to be covered but it is difficult to gain an accurate estimation of the distance the divers cover and it is likely that oysters would have been missed. This remains a good method for gaining a better understanding of the habitat in areas of high current, but was not the best for oyster data collection for the current study.

Collected oysters were brought to the surface and measured on the boat; this allowed time to complete accurate measurements which would have been difficult and time-consuming to complete underwater. The oysters were all photographed, this allows further inspection of the data if needed for the project.

Surface material (cultch) collection

Seasearch divers, the fishermen and the SAC officer worked together to complete this fieldwork and it was an excellent example of partnership working. The survey was completed in the same general area where the drop down video and grab sampling field work would take place and the aim of the dive work was to provide quantitative data that would support that work. The use of ground lines laid by the fisherman, quadrats to collect the surface material (cultch) in a defined area, and the video of the material before collection provided samples of quality data. A high level of skill was required by the divers so two experienced divers completed the work, collecting 16 samples over 2 dives. The bags of cultch were then processed on the surface by the fisherman and SAC officer allowing time to photograph and inspect it carefully for oyster spat. The method enabled

an awful lot of data collection for a single dive. This method is seen to be an easy one for an experienced diver who is able to confidently and safely multi-task underwater. It does not necessarily require identification skills (beyond targeting Native oysters), so for an experienced diver who is relatively new to Seasearch and yet to gain confidence in biological identification skills, it is a good introduction to collection of very useful biological data.

Habitat and species survey

Seasearch divers are trained and experienced in completing habitat and species recording. Most of the divers that took part were experienced in completing surveys in the Milford Haven waterway and have a good knowledge of the local species, this experience is particularly important in this area where the low visibility makes recording difficult. Many of the divers were also excellent underwater photographers and were able to provide photographs of the habitat and species found supporting the data recorded. The advantage of this photographic record is the ability to go back and interrogate imagery for further information.

Conclusion

The use of Seasearch divers to collect quantitative data to support the Milford Haven Native oyster regeneration project was a success and all survey aims were met.

Seasearch divers, fishermen and the SAC Officer worked closely together and this partnership working provided data above and beyond that which could have been gathered individually for this project.

A wide range of data can be collected by Seasearch divers and their experience of diving in the Milford Haven waterway can be usefully used to complete cost-effective surveys. Diving conditions in the area are difficult and methods need to be appropriate for the conditions and the skills of the divers.

Acknowledgements

Seasearch diving volunteers: Blaise Bullimore (BB), Steve Bound (StB), Richard West (RW), Louise Bebb (LB), Lucy Philips (LP), Kerry Lewis (KeL), Emily Williams (EW), Erin Smyth (ES), Richard White (RW), Jon Moore (JM), Josie Pegg (JP), Sarah Bowen (SBo), David Kipling (DK), William Kay (WK), Edward Rickard (ER), Karl Mason (KM), Mark Harrison (MH).

Dive Charter skippers: Andy Truelove (Atlantic Blue), Mike Jones and Timmy (Eva Ann).

Fishermen: WWSFA Ltd., Pembrokeshire Marine SAC officer: Sue Burton (SB).

Photography: Underwater: David Kipling (DK) and Blaise Bullimore (BB), Surface photos by Kate Lock and Sue Burton.

The boat charter for the Seasearch surveys was funded by Biodiversity Solutions and Seasearch is supported by Natural Resources Wales.

Appendix 1 Seasearch surveyor form.

SEASEARCH SURVEY FORM

Form No (leave blank)

- If anything is unclear please refer to the Guidance Notes
- Each pair of divers should complete a form between them
- Please complete all parts of the form. Where there is a * only fill in the information if you know it.



Validated by	Date	Entered by	Date	MR Reference
Recorder leave blank - for Seasearch use				

Your details

Name	Tel No:	hm/wk
Address	Email:	
	Buddy's Name	
	Name of group or survey	
Postcode		

Dive/Site details

Site name				Date of dive: dd / mm / yy	
General location				Start of dive: : (24hr)	
				Dive duration: (mins)	
				Sea temperature: °C	
Position (degrees and decimal minutes – state if in any other format)				Underwater visibility: m	
	Latitude	Longitude	W or E	Drift dive? yes / no	
Centre of site	° -	° -		Night dive? yes / no	
For drift dives				Did you or your buddy take any of the following?	
From	° -	° -			
To	° -	° -			
Or OS Grid Reference <input type="text"/> <input type="text"/>				photographs yes / no	
Position derived from: (circle) GPS Datum (circle)				video footage yes / no	
GPS Chart OS map Web mapping WGS84 OSGB98				specimens yes / no	
Exposure of site: extremely exposed <input type="checkbox"/> v exposed <input type="checkbox"/> exposed <input type="checkbox"/>				seaweeds for pressing yes / no	
mod exposed <input type="checkbox"/> sheltered <input type="checkbox"/> v sheltered <input type="checkbox"/> ext sheltered <input type="checkbox"/>				For the area surveyed, what was	
Max tidal stream:				the shallowest depth? (m) <input type="text"/> bal <input type="text"/> bcd	
>6kt <input type="checkbox"/> 3-6kt <input type="checkbox"/> 1-3kt <input type="checkbox"/> <1kt <input type="checkbox"/> v. weak <input type="checkbox"/>				the deepest depth? (m) <input type="text"/> bal <input type="text"/> bcd	
				Tidal correction to chart datum <input type="text"/> m*	

Seabed summary

Summarise: a. The main features of the site, b. Any unusual features or species, c. Any human activities or impacts at the site

Habitat descriptions

Complete a box below for each habitat you found on your dive. Normally the shallowest habitat is No. 1 even if you have done the dive deepest first. Each written description should tally with the information entered in the columns and diagrams on the next page. If you found more than 3 habitats, continue your descriptions on another form. Tick boxes where shown, and insert percentages (they must add up to 100%) or assign a score from 1-5 as appropriate. If you are uncertain leave the box blank. The biotope code will be assigned later from your description.

1. DESCRIPTION (physical + community)

Biotope Code

Seabed type: rock boulders cobbles pebbles gravel sand mud wreckage other

Communities: kelp forest kelp park mixed seaweeds seagrass bed enc pink algae

animal turf animal bed sediment with life barren sediment

2. DESCRIPTION (physical + community)

Biotope Code

Seabed type: rock boulders cobbles pebbles gravel sand mud wreckage other

Communities: kelp forest kelp park mixed seaweeds seagrass bed enc pink algae

animal turf animal bed sediment with life barren sediment

3. DESCRIPTION (physical + community)

Biotope Code

Seabed type: rock boulders cobbles pebbles gravel sand mud wreckage other

Communities: kelp forest kelp park mixed seaweeds seagrass bed enc pink algae

animal turf animal bed sediment with life barren sediment

1	2	3
m		
DEPTH LIMITS		
		Upper (from sea level) (i.e. minimum)
		Lower (from sea level) (i.e. maximum)
		Upper (from chart datum) *
		Lower (from chart datum) *
%		
SUBSTRATUM		
		Bedrock type?:
		Boulders - very large > 1.0 m
		- large 0.5 - 1.0 m
		- small 0.25 - 0.5 m
		Cobbles (flat - head size)
		Pebbles (50p - fist size)
		Gravel - stone
		- shell fragments
		Sand - coarse
		- medium
		- fine
		Mud
		Shells (empty - or as large pieces)
		Shells (living - eg mussels, limpets)
		Artificial - metal
		- concrete
		- wood
		Other (state)
100	100	100
		Total

1	2	3
1-5		
FEATURES - ROCK (all categories)		
		Relief of habitat (even - rugged)
		Texture (smooth - pitted)
		Stability (stable - mobile)
		Scour (none - scoured)
		Silt (none - silted)
		Fissures > 10 mm (none - many)
		Crevices < 10 mm (none - many)
		Boulder/cobble/pebble shape (rounded - angular)
		Sediment on rock? (tick if present)

✓		
FEATURES - SEDIMENT (1)		
		Mounds / casts
		Burrows / holes
		Vegetation (>10 cm high)
		Ripples (< 10 cm high)
		Subsurface coarse layer?
		Subsurface anoxic (black) layer?

1-5		
FEATURES - SEDIMENT (2)		
		Firmness (firm - soft)
		Stability (stable - mobile)
		Sorting (well - poor)

Sketches and plans

Draw a profile and/or plan of the sea bed you encountered on your dive in the space below. Mark (5 number) the different habitats, corresponding to the written descriptions on p.2. Indicate conspicuous and/or characteristic species. Make sure you include depth(s) (vertical axis) and a distance scale (horizontal axis) for a profile and scale and north point for a plan. Indicate the direction of the profile or plan and the direction of any current.

Species List

Score the abundance of each group of animals and plants in each habitat alongside the name. In the blank spaces list the seaweeds & animals which you were able to identify positively from the different habitats. Use Latin names if possible, but if you don't know them, common or descriptive names are acceptable. If you are not 100% sure about any, add a question mark. Do not enter names as guesses - it's better to exclude them than to include incorrect identifications. Give abundances in the columns: Super abundant, Abundant, Common, Frequent, Occasional & Rare. If you did not note abundances, simply enter a P for Present. Continue on a separate sheet, if necessary. If you have a photograph of the species tick the pH column.

	ph	1	2	3		ph	1	2	3
sponges					echinoderms				
cnidarians: hydroids, anemones, corals,					sea squirts				
worms					fishes				
crustaceans					seaweeds				
molluscs					other or continuations				
bryozoans									
					Continue on a separate sheet if you need to				

Once completed return the form to the Dive Organiser or to Seasearch, Marine Conservation Society, Over Ross House, Ross Park, Ross-on-Wye, Herefordshire, HR9 7QQ.

Your contact details will be included on the Seasearch database and those of partner organisations and will be used to send you information about Seasearch and associated projects. They will not be passed to third parties without your consent. The location, dive details, habitats and species information and the name of the recorder will be entered into a database and made available to the participating organisations and the general public through the Seasearch and NSN websites. If you do not agree with this use of the data do not submit the form.

Appendix 2. Native Oyster raw data files

Site 4			Site 4	
25/6/2016			Length size class (mm)	
JM & BB	Length (mm)	width (mm)	40-49	3
218m x 2m	90	80	50-59	3
432m2 area	90	80	60-69	3
Total: 24	70	50	70-79	8
	80	60	80-89	4
	60	70	90-99	3
	80	70	100-109	
	70	90	110-119	
	50	60	120-129	
	45	45	Total	24
	70	70	Area	432m2
	40	50	Density/m2	0.05/m2
	70	80	Density/100m2	5.32/100m2
	70	70		
	70	70		
	40	60		
	70	80		
	80	85		
	60	50		
	60	60		
	50	60		
	70	80		
	50	70		
	80	70		
	90	90		
Site 1b			Site 1b	
22/9/2016	120	110	Length size class (mm)	
KL & BB	90	85	40-49	8
70m x 3m	60	80	50-59	16
Total: 7	85	70	60-69	21
	85	100	70-79	25
	105	90	80-89	24
	80	85	90-99	21
			100-109	11
08/10/16			110-119	0
KL & BB	101	110	120-129	3
63.5m x 2m	60	70	Total	129
127m2	62	60	Total area	743m2
Total: 25	94	94	density/m2	0.17/m2
	101	87	Density/100m2	17/100m2
	96	110		
	98	92		
	91	77		
	104	92		
	88	81		

	79	80		
	77	70		
	105	84		
	65	66		
	67	70		
	96	94		
	84	74		
	77	77		
	55	61		
	80	86		
	85	92		
	74	67		
	98	92		
	74	71		
	68	57		
08/10/16				
ES & EW	61			
30m x 2m	67			
60m2 area	87			
Total: 75	56			
	77			
	74			
	100			
	47			
	71			
	73			
	79			
	87			
	50			
	77			
	50			
	69			
	86			
	100			
	57			
	88			
	44			
	75			
	85			
	67			
	92			
	73			
	82			
	77			
	43			
	70			
	77			
	95			
	47			
	83			
	67			
	81			
	56			

	84			
	87			
	67			
	66			
	57			
	67			
	96			
	60			
	65			
	72			
	57			
	53			
	105			
	83			
	87			
	56			
	54			
	82			
	97			
	68			
	55			
	94			
	46			
	77			
	47			
	93			
	92			
	87			
	66			
	71			
	52			
	93			
	52			
	66			
	79			
	66			
	42			
	50			
08/10/16				
LB & MH	90			
30m x 2m	77			
60m2 area	65			
Total: 8	90			
	85			
	59			
	120			
	72			
08/10/16				
WK & ER	70			
23m x 2m	41			
46m2 area	75			
Total: 3				

09/10/16					
Bag 10	122				
30m x 2m	82				
60m2 area	90				
Total: 5	73				
	100				
09/10/16					
Bag 1	91				
30m x 2m	80				
60m2 area					
Total: 2					
09/10/16					
Bag 9	100				
30m x 2m	100				
60m2 area	90				
Total: 4	90				
09/10/16					
WS & ER					
30m x 2m					
60m2 area					
Total: 0					

Appendix 3 Site species lists

Species	Site 1a	Site 1b	Site 2	Site 4
Sponges				
Halichondria panicea		O	R	F
Raspalia ramosa		R		R
Dysidea fragilis		O	O	
Cliona celata	O	O		
Haliclona oculata	R	O	F	
Amphilectus fucorum		O		
Halicondria bowerbanki		O		
Scypha ciliata		R		
Clathria atrasanguinea		R		
Hymeniacion perlevis	R	F		
Cnidaria				
Urticina felina		O	O	O
Urticina eques	O	F	O	
Sagartia troglodytes	O	R	R	O
Actinothoe sphyrodeta	O	F		
Cerianthus lloydii				
Sertularia argentea				F
Hydrallmania falcata		R	F	O
Cereus pedunculatus		C		
Anemonia viridis		R		
Plumularia setacea		R		
Tubularia indivisa	C		R	
Nemertesia antennina	O			
Worms				
Pomatoceros triqueter			F	O
Lineus longissimus	O			
Lanice conchielega			R	
Eupolymnia nebulosa			R	
Terribellidae sp			O	
Crustaceans				
Carcinus maenas	O	O	O	F
Balanus crenatus		SA	F	F
Pagurus bernhardus	O	O	F	
Palaemon serratus				R
Cancer pagarus		O	O	
Necora puber		O		
Macropodia sp		O		
Inachus sp		O		
Liocarcinus depurator		R	R	
Homarus gammarus			R	
Mollusc				
Crepidula fornicata	F	A	A	SA
Ostrea edulis	O	O	R	O
Buccinum undatum		O		

Chlamys varia		R		
Callistoma zizyphinum		R		
Gibbula cineraria		R	F	
Doris pseudoargus		R	O	
Jorunna tomentosa		R		
Janolus cristatus		R		
Mytilus edulis	O			
Bryozoan				
Bugula plumosa		O	O	O
Bowerbankia sp				R
Bugula turbinata			O	O
Alcyonidium diaphanum		O		
Bicellaria ciliata		F		
Flustra foliacea	R			
Echinoderm				
Asterias rubens		O		
Antedon bifida		F		
Crossaster papposus			R	
Ascidians				
Dendrodoa grossularia		O	O	O
Styela clava			O	O
Botrylloides leachii		O		
Botryllus schlosseri		R	R	
Diplosoma listerianum		F		
Botrylloides sp (spangly)		O		
Ascidiella aspersa		O		
Perophora listeri		R		
Ciona intestinalis			R	
Corella parallelogramma			R	
Fishes				
Gobius niger		F	R	
Gobies indet		F	O	
Pomatoschistus pictus		C	R	
Platichthys flesus	R			
Algae				
Stenogramme interrupta		C		
Calliblepharis ciliata		O		
Heterosiphonia plumosa		O		
Halurus flosculosus		F		
Pterothamnion plumula		C		
Cladophora rupestris		O		