

MARINE SURVEY OF COAST NEAR ST. MADOC CENTRE, BROUGHTON BEACH, GOWER, WALES.

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BACKGROUND

The primary goal of the marine portion of the project is to collect data that will allow evaluation of the beach area adjacent to camp property for biodiversity, threats and potential conservation actions.

- Objective 1: To determine the marine habitats adjacent to camp property
- Objective 2: To assess macrofaunal biodiversity within each habitat
- Objective 3: To assess water quality issues in these habitats

METHODS

HABITAT CLASSIFICATION

The Joint Nature Conservation Commission has developed a classification system for Britain's marine habitats (www.jncc.gov.uk/MarineHabitatClassification). We used this system to identify the marine habitats adjacent to the camp property. We were able to identify most habitats to Level 3. This is a hierarchical system of classification of up to 5 levels. Each level retains the previous level's codes, such that a Level 5 habitat code has 5 sets of acronyms joined by dashes.

MACROFAUNAL BIODIVERSITY

According to Hayward in his book on British seashores (Hayward 2004), there are over 20 phyla occupying British sandy beaches. These include little known groups that need specific taxonomic expertise and interstitial organisms for which a microscope is necessary for identification. For this reason, we focused on the macrofauna of the site.

Once habitats were delineated, we developed a taxonomic list cataloguing biodiversity. We used guide books to identify to the lowest taxonomic unit possible all organisms encountered in each habitat (Hayward and Ryland 1990, Hayward 1994, Hayward et al. 1996, Preston-Mafham 2004). It was necessary to use a

binocular microscope to identify several Crustacean groups such as amphipods, copepods, and isopods.

For the strandline and rockpool habitats, simple observation and collection in plastic trays was used. Once animals or plants were identified and photographed, if necessary, they were returned to their original habitats. On the sandy shore, some specimens were simply collected. As Hayward (1994) puts it “much basic recording work can be achieved on sandy shores simply by collecting and identifying specimens as the tides allow.” In addition, we haphazardly dug into the sand and sifted the sand with commonly available garden sieves. A pushnet was used in shallow water as the water receded. Equipment used included:

- GPS unit
- Waterproof paper
- Clipboards
- Pens/pencils for recording
- Magnifying glasses
- Ziploc bags for collecting specimens
- Camera
- Tide table
- Buckets
- Fork and spade
- Garden sieve
- Laminated aerial photos of site
- JNCC habitat classification
- Guidebooks
- White trays for specimen sorting
- Pushnet
- Binocular microscope

WATER QUALITY

Background to G and I standards for water quality

Bathing water quality is measured by the amount of bacteria within a water sample. Counts are taken throughout the bathing season to see if the water quality meets the EU Bathing Water Directive. In accordance with the Directive, bathing waters must be tested at weekly intervals between 1 May and 30 September, with a minimum of 20 samples tested. There are 2 measurement criteria-a mandatory (I) standard (which member states must meet in order for a bathing area to pass) and a guideline (G) standard (which member states should strive to achieve). The Directive sets limits for a number of microbiological standards and other standards for pollution. For the purposes of this report we shall concentrate on the guideline and mandatory standards for the microbiological parameters which are as follows:

Microbiological parameters	G (Guideline)	I (Mandatory)
Total coliforms /100ml	500	10,000
Faecal coliforms /100ml	100	2,000
Faecal streptococci /100ml	100	-----
Salmonella /litre	----	0
Enteroviruses PFU/10litres	-----.	0

Marine Conservation Society Good Beach Guide

The Marine conservation Society recommends beaches as follows:

MCS recommended beaches (the highest standard water quality)

100% of the test samples passed the European Mandatory water quality standard

80% or more of the test samples passed the European Guideline total & faecal coliform standard

90% or more of the test samples passed the European Guideline faecal streptococci standard

The receiving water is not subject to poorly treated continuous waste water discharge (any continuous local discharge is treated to a minimum of secondary standard)

The Marine Conservation Society is satisfied that these beaches pose a minimal risk of pollution from unsatisfactory continuous waste water discharges and recommends these beaches for bathing (any official 'wet weather waivers' are ignored)

Guideline standard (good water quality)

Guideline is the official European standard for good water quality

95% of the samples passed the European Mandatory water quality standard

80% or more of the samples passed the European Guideline total and faecal coliform standard

90% or more of the samples passed the European Guideline faecal streptococci standard.

There are no criteria for local sewage discharges.

These beaches failed the European Mandatory standard 5% of the time and present a periodic health risk from sewage derived bacteria

Basic pass (minimum water quality)

The basic European legal minimum standard for water quality

95% or more of the samples passed the European Mandatory standard

These beaches pass the minimum legal requirements for water quality. There is sewage derived bacteria present in quantities known to cause illness.

Fail (bad water quality. swimming not advised)

Failed the European legal minimum water quality standard

Less than 95% of the samples passed the European Mandatory standard.

The water at these beaches suffered gross contamination by sewage on at least two occasions in the previous bathing season. MCS advises against swimming and other immersion water sports.

Not tested (no water quality data available)

There is no water quality information available for this beach. No water sample testing was done in the previous bathing season and the beach has therefore not been graded by MCS.

Water quality monitoring

The EC Bathing Waters Directive (76/160/EEC) was intended primarily to safeguard public health and the environment by reducing pollution of bathing waters and protecting bathing waters against further deterioration. Under the Environment Act 1995, the Environment Agency inherited the responsibility for carrying out the necessary monitoring programmes in relation to certain water-related directives, including the Bathing Waters Directive, in England and Wales. The results from these monitoring programmes in Wales are submitted to the Welsh Assembly Government (WAG) and the Department for Environment, Food and Rural Affairs (DEFRA). WAG and DEFRA are responsible for interpreting EC directives in England and Wales, and so only they can assess 'compliance' or otherwise with the directives.

When Directive 76/160/EEC was first adopted, only a limited number of bathing waters were identified by the UK Government. A large number of bathing waters has since been added to the initial list and all these are included in the government's report to the EC. If bathing waters are not included in that report then they do not come within the terms of the directive and so, by definition, cannot be said to comply, or fail to comply, with its

conditions. These beaches are shown on the map in Appendix 4. However, a number of non-identified bathing waters have, in the past, been routinely monitored by one of the Agency's predecessor organisations, the National Rivers Authority (NRA), and the results are included in this report for comparison. These beaches are shown on the map in Appendix 5.

RESULTS

HABITAT CLASSIFICATION

The focus of this study was on the intertidal zone (Figure 1). Consequently two Level 1 habitat types were present, Littoral Rock (LR) and Littoral Sediment (LS). Figure 2 shows the hierarchy of habitats found in this study, removing the other habitat categories for clarity.

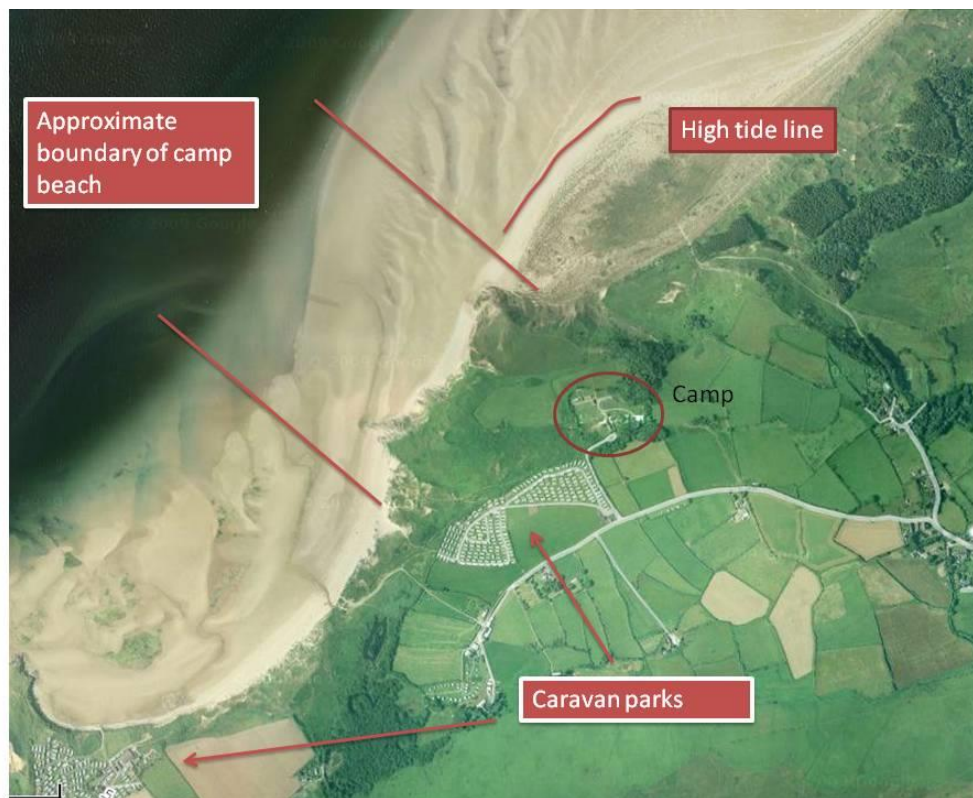


Figure 1. Map of study site.

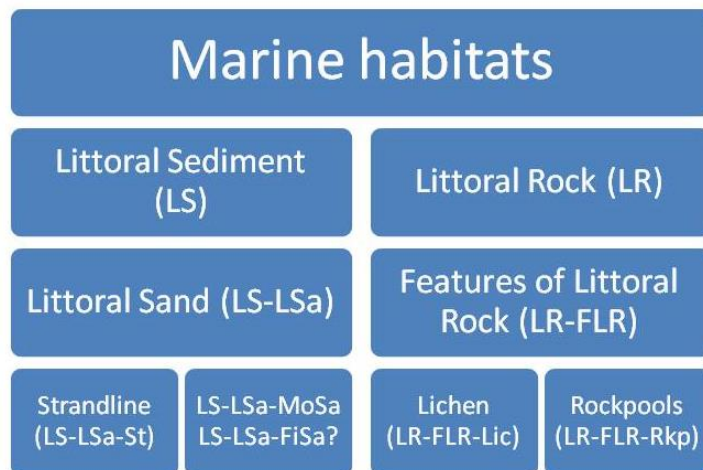


Figure 2: Marine habitats found at Llanmadoc study site. Determination of LS-Lsa-MoSa or LS-Lsa-FiSa uncertain.

Littoral Rock Biotope description - LR

Littoral rock includes habitats of bedrock, boulders and cobbles which occur in the intertidal zone (the area of the shore between high and low tides) and the splash zone. The upper limit is marked by the top of the lichen zone and the lower limit by the top of the laminarian kelp zone. There are many physical variables affecting rocky shore communities - wave exposure, salinity, temperature and the diurnal emersion and immersion of the shore. Wave exposure is most commonly used to characterise littoral rock, from 'extremely exposed' on the open coast to 'extremely sheltered' in enclosed inlets. Exposed shores tend to support faunal-dominated communities of barnacles and mussels and some robust seaweeds. Sheltered shores are most notable for their dense cover of furoid seaweeds, with distinctive zones occurring down the shore. In between these extremes of wave exposure, on moderately exposed shores, mosaics of seaweeds and barnacles are more typical. (The Marine Habitat Classification for Britain and Ireland. Version 04.05)

Within this Level 1 Biotope, there were two Level 3 habitats, both Features of Littoral Rock (FLR)

Lichen or small green algal communities – LR-FLR-Lic. This habitat was found on rocky areas above the high tide mark at Prissen's Tor.

BIOTOPE DESCRIPTION

Lichen communities typically form a distinct zone or band in a 'splash' zone on most rocky shores. This splash zone occurs above the main intertidal zone (i.e. that subject

to regular covering by the tide) and blends into angiosperm-dominated communities of coastal (terrestrial) habitats at its upper limits. The width of the splash zone varies considerably, depending on the degree of exposure of the shore to wave action. On very exposed coasts the zone is very wide, extending 10s of meters up cliffs, whilst in very sheltered sites it may be only a metre or so high. Several biotopes have been identified. Yellow and grey lichens such as *Xanthoria parietina*, *Caloplaca marina*, *Caloplaca thallincola* or *Ramalina* sp. dominate the supralittoral rock (YG) with the distinctive black band of *Verrucaria maura* occurring below in the littoral fringe (Ver.Ver; Ver.B). Small green seaweeds can sometimes be found in this splash zone, where localised conditions allow growth in what would otherwise be inhospitable conditions for seaweeds. Such an example is the green seaweed *Prasiola stipitata* which occurs in areas of nitrate enrichment from nearby roosting seabirds (Pra). The littoral fringe on soft rock can be characterised by the green seaweed *Blidingia minima* (Bli) while steep and vertical rock influenced by freshwater in the littoral fringe can be dominated by the green seaweeds *Ulothrix flacca*, *Urospora penicilliformis* and *Urospora wormskioldii* (UloUro). The winkle *Littorina saxatilis* is one of the few 'marine' species found in this environment. [Note: in EUNIS, this habitat is placed within Coastal habitats section B, as it strictly speaking occurs above the marine environment. In the UK marine surveys have traditionally included the lichen zone within intertidal surveys, so the habitat is retained here for UK purposes.](
<http://www.jncc.gov.uk/marine/biotopes/biotope.aspx?biotope=JNCCMNCR00000231>
)



Rockpools – LR-FLR-Rkp

BIOTOPE DESCRIPTION

*Rockpools occur where the topography of the shore allows seawater to be retained within depressions in the bedrock producing 'pools' on the retreat of the tide. As these rockpool communities are permanently submerged they are not directly affected by height on the shore and normal rocky shore zonation patterns do not apply. For this reason rockpools have been dealt with as a separate biotope complex, apart from the scheme of wave exposure and shore height. Four main rockpool biotopes have been described, and although it is accepted that an enormous variety of rockpool communities exist, it is hoped that these biotope descriptions are broad enough to adequately encompass most types. It would be meaningless to include the characterising species in a description at the biotope complex level. Rockpools on the upper shore which are subject to rainwater influence and wide fluctuations in temperature are typically dominated by green seaweeds such as *Enteromorpha* spp. and *Cladophora* spp. (G). Shallow rockpools in the mid to upper shore characterised by encrusting coralline algae and *Corallina officinalis* (Cor); several variants of these coralline pools occur in south-west Britain and Ireland (Cor.Par, Cor.Bif and Cor.Cys). Deeper rockpools on the mid to lower shore can support fucoids and some sublittoral species such as kelp (FK). Those rockpools influenced by the presence of sand are characterised by sand-tolerant seaweed such as *Furcellaria lumbricalis* and *Polyides rotundus* (SwSed). Where more stable sand occurs in the base of the rockpool sea-grass beds can occur (SwSed). Shallow rockpools on mixed cobbles, pebbles, gravel and sand may be characterised by hydroids (H). A very rough guideline to the terms "shallow" and "deep" rockpools: "shallow" rockpools do not support kelp, whereas "deep" rockpools do. This rockpool complex (LR.FLR.Rkp) does not include shallow standing water on compacted sediment or mixed substrata.*

<http://www.jncc.gov.uk/marine/biotopes/biotope.aspx?biotope=JNCCMNCR00001520>)



*Note the sandy bottom pool directly adjacent to the rockpool biotope. Also the concentration of activity around this area during summer at low tide. The lichen biotope was observed in the splash zone directly above this habitat. 'A' in map below.



*close up of rockpool biotope.



* Location of second rockpool habitats. 'B' in map below.



* close up of second rockpool habitat.



'A' indicates location of first rockpool habitat and the two circles represented by 'B' the second.

Littoral Sediment Biotope description - LS

*Littoral sediment includes habitats of shingle (mobile cobbles and pebbles), gravel, sand and mud or any combination of these which occur in the intertidal zone. Littoral sediment is defined further using descriptions of particle sizes - mainly gravel (16-4 mm), coarse sand (4-1 mm), medium sand (1-0.25 mm), fine sand (0.25-0.063 mm) and mud (less than 0.063 mm) and various admixtures of these (and coarser) grades - muddy sand, sandy mud and mixed sediment (cobbles, gravel, sand and mud together). Littoral sediments support communities tolerant to some degree of drainage at low tide and often subject to variation in air temperature and reduced salinity in estuarine situations. Very coarse sediments tend to support few macrofaunal species because these sediments tend to be mobile and subject to a high degree of drying when exposed at low tide. Finer sediments tend to be more stable and retain some water between high tides, and therefore support a greater diversity of species. Medium and fine sand shores usually support a range of oligochaetes, polychaetes, and burrowing crustaceans, and even more stable muddy sand shores also support a range of bivalves. Very fine and cohesive sediment (mud) tends to have a lower species diversity, because oxygen cannot penetrate far below the sediment surface. A black, anoxic layer of sediment develops under these circumstances, which may extend to the sediment surface and in which few species can survive. Some intertidal sediments are dominated by angiosperms, e.g. eelgrass (*Zostera noltii*) beds on the mid and upper shore of muddy sand flats, or saltmarshes which*

develop on the extreme upper shore of sheltered fine sediment flats. (The Marine Habitat Classification for Britain and Ireland. Version 04.05)

Within this Level 1 Biotope, there was one Level 2 habitat and one Level 3 habitat.

Littoral Sand biotope description – LS-LSa

Shores comprising clean sands (coarse, medium or fine-grained) and muddy sands with up to 25% silt and clay fraction. Shells and stones may occasionally be present on the surface. The sand may be duned or rippled as a result of wave action or tidal currents. Littoral sands exhibit varying degrees of drying at low tide depending on the steepness of the shore, the sediment grade and the height on the shore. The more mobile sand shores are relatively impoverished (MoSa), with more species-rich communities of amphipods, polychaetes and, on the lower shore, bivalves developing with increasing stability in finer sand habitats (FiSa). Muddy sands (MuSa), the most stable within this habitat complex, contain the highest proportion of bivalves.

(<http://www.jncc.gov.uk/marine/biotopes/biotope.aspx?biotope=JNCCMNCR00000275>)



*notice the vehicle track.

Strandline biotope description – LS-LSa-St

The strandline is the shifting line of decomposing seaweed and debris which is typically left behind on sediment (and some rocky shores) at the upper extreme of the intertidal at each high tide. These ephemeral bands of seaweed often shelter communities of sandhoppers. A fauna of dense juvenile mussels may be found in sheltered firths, attached to algae on shores of pebbles, gravel, sand, mud and shell debris with a strandline of fucoid algae.

(<http://www.jncc.gov.uk/marine/biotopes/biotope.aspx?biotope=JNCCMNCR00001523>)



*specimens from the strandline biotope.

MACROFAUNAL BIODIVERSITY

A total of 55 species were observed, though several could only be identified to higher taxonomic categories (Table 1). This included 13 Phyla.

Table 1. Species list for Broughton Bay.

Common name	Phylum	Genus	Species	Strandline	Rockpool sandpool	Sandy Shore	Muddy ridge rockpool
gut weed	Chlorophyta	Ulva	intestinalis	X	X		X
sea lettuce	Chlorophyta	Ulva	lactuca	X	X		X
egg wrack	Phaeophyta	Ascophyllum	nodosum	X			
brown algae	Phaeophyta	Dictyota	spp	X			
toothed wrack	Phaeophyta	Fucus	serratus	X			X
spiral wrack	Phaeophyta	Fucus	spiralus	X			
bladder wrack	Phaeophyta	Fucus	vesiculosus	X			
oarweed	Phaeophyta	Laminaria	digitata	X			
cuvie	Phaeophyta	Laminaria	hyperborea	X			
japweed	Phaeophyta	Sargassum	muticum	X			
red seaweed	Rhodophyta	Calliblepharis	spp	X			
Irish moss	Rhodophyta	Chondrus	crispus	X			
purple laver	Rhodophyta	Porphyra	umbilicalis				X
sponge	Porifera	??	spp.	X			
beadlet anenome	Cnidaria	Actinia	equina				X
anenome	Cnidaria	Peachia	cylindrica			X	
whiteweed	Cnidaria	Sertularia	cupressina?	X			
flatworm	Platyhelminthes	Procerodes	littoralis				X
blow lug	Annelida	Arinicola	marina?			X	
sandmason worm	Annelida	Lanice	conchilega			X	
catworm	Annelida	Nephtys	spp			X	
edible crab	Crustacea	Cancer	pagurus	X			
green shore crab	Crustacea	Carcinus	maenas	X	X		X
masked crab	Crustacea	Corystes	cassivelaunus			X	
brown shrimp	Crustacea	Crangon	crangon	X	X		
barnacle	Crustacea	Elminius	modestus	X	X		X
isopod	Crustacea	Idotea	linearis	X			
isopod	Crustacea	Idotea	spp	X			
isopod	Crustacea	Idotea	granulosa			X	
prawn	Crustacea	Palaemon	serratus		X		X
prawn	Crustacea	Palaemon	elegans		X		
long-clawed porcelain crab	Crustacea	Pisidia	longicornis				X
swimming crab	Crustacea	Portumnus	latipes			X	
sandhopper	Crustacea	Talitrus	saltator	X			
copepod	Crustacea	Tigriopus	fulvus		X		
prickly cockle	Mollusca	Acanthocardia	echinata	X			
common cockle	Mollusca	Cerastoderma	edule	X		X	
banded wedge shell	Mollusca	Donax	vittatus	X			
razor shell	Mollusca	Ensis	spp	X			
common periwinkle	Mollusca	Littorina	littorea		X		X
rough periwinkle	Mollusca	Littorina	saxatilis		X		X

small periwinkle	Mollusca	Littorina	neritoides		X		
common otter shell	Mollusca	Lutraria	lutraria	X			
rayed trough shell	Mollusca	Mactra	stultorum	X			
common mussel	Mollusca	Mytilus	edulis	X			X
dog whelk	Mollusca	Nucella	lapillus	X			X
common limpet	Mollusca	Patella	vulgata	X			
necklace shell	Mollusca	Polinices	catenus	X			
bryozoan	Bryozoa	Alcyonidium	diaphanum	X			
sea mat	Bryozoa	Membranipora	membranacea	X			
sea potato	Echinodermata	Echinocardium	chordatum	X			
tunicate	Urochordata	solitary	spp	X			
tunicate	Urochordata	compound	spp.	X			
thick-lipped mullet	Chordata	Chelon	labrosus		X		
sand goby	Chordata	Pomatoschistus	minutus		X		X
Total species by habitat				36	13	8	15

WATER QUALITY

Data obtained from the Environment Agency October 2009

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The tables below show bacterial counts for Broughton Beach for the years 2006 to 2008

The standards use 2 parameters-Faecal Streptococci (otherwise known as intestinal enterococci) and Escherichia coli (E. coli) which is the organism that implies faecal coliforms.

2006 bathing water samples for Broughton Bay

beach	sample point	Sample Date	Sample Time	E. Coli	Enterococci
Broughton	74025	02/05/2006	10:30	1	2
Broughton	74025	08/05/2006	11:50	3	1
Broughton	74025	15/05/2006	09:30	47	8
Broughton	74025	22/05/2006		39	5
Broughton	74025	30/05/2006	09:15	26	10
Broughton	74025	05/06/2006	11:20	2	2
Broughton	74025	12/06/2006	11:10	9	0
Broughton	74025	19/06/2006	11:30	10	1
Broughton	74025	26/06/2006	12:00:00	22	4
Broughton	74025	03/07/2006	11:05	11	3
Broughton	74025	10/07/2006	10:30	8	4
Broughton	74025	17/07/2006	11:40	90	5
Broughton	74025	24/07/2006	11:40	140	10
Broughton	74025	31/07/2006	10:40	15	0
Broughton	74025	07/08/2006	11:05	3	0
Broughton	74025	14/08/2006	10:30	170	8
Broughton	74025	21/08/2006	12:00	29	1
Broughton	74025	29/08/2006	08:45	7	0
Broughton	74025	04/09/2006	10:20	4	1
Broughton	74025	11/09/2006	09:30	280	12

2007 bathing water samples for Broughton Bay

Sample Point	Bathing Water	NGR	Council	date	Sample Time	E_Coli	Enterococci
74025	Broughton	SS4190093000	Swansea	08/05/2007	09:25:00	0	0
74025	Broughton	SS4190093000	Swansea	14/05/2007	11:00:00	36	6
74025	Broughton	SS4190093000	Swansea	21/05/2007	09:40:00	8	0
74025	Broughton	SS4190093000	Swansea	29/05/2007	10:00:00	0	0
74025	Broughton	SS4190093000	Swansea	04/06/2007	09:45:00	6	1
74025	Broughton	SS4190093000	Swansea	11/06/2007	11:40:00	13	1
74025	Broughton	SS4190093000	Swansea	18/06/2007	11:00:00	67	5
74025	Broughton	SS4190093000	Swansea	25/06/2007	11:05:00	5	12
74025	Broughton	SS4190093000	Swansea	02/07/2007	09:45:00	180	11
74025	Broughton	SS4190093000	Swansea	09/07/2007	12:00:00	1	0
74025	Broughton	SS4190093000	Swansea	16/07/2007	11:30:00	120	3
74025	Broughton	SS4190093000	Swansea	23/07/2007	11:25:00	37	0
74025	Broughton	SS4190093000	Swansea	30/07/2007	11:25:00	120	10
74025	Broughton	SS4190093000	Swansea	06/08/2007	00:00:00	0	0
74025	Broughton	SS4190093000	Swansea	13/08/2007	11:20:00	86	48
74025	Broughton	SS4190093000	Swansea	20/08/2007	11:20:00	310	500
74025	Broughton	SS4190093000	Swansea	28/08/2007	11:20:00	17	0
74025	Broughton	SS4190093000	Swansea	03/09/2007	10:00:00	290	25
74025	Broughton	SS4190093000	Swansea	10/09/2007	11:40:00	64	8
74025	Broughton	SS4190093000	Swansea	17/09/2007	11:40:00	21	18

2008 bathing water samples for Broughton Bay

Spt No	Spt name	NGR	Date	Time	Number E.coli (No./100ml)	Number Faecal Streptococci (No./100ml)
74025	Broughton	SS4190093000	06-May-08	11:15:00	42	1
74025	Broughton	SS4190093000	12-May-08	11:20:00	7	1
74025	Broughton	SS4190093000	19-May-08	08:35:00	18	0
74025	Broughton	SS4190093000	27-May-08	10:40:00	10	1
74025	Broughton	SS4190093000	02-Jun-08	10:00:00	120	5
74025	Broughton	SS4190093000	09-Jun-08	10:45:00	36	9
74025	Broughton	SS4190093000	16-Jun-08	11:30:00	2	0
74025	Broughton	SS4190093000	23-Jun-08	10:00:00	6	1
74025	Broughton	SS4190093000	30-Jun-08	11:15:00	3	0
74025	Broughton	SS4190093000	07-Jul-08	10:50:00	260	9
74025	Broughton	SS4190093000	14-Jul-08	11:10:00	3	0
74025	Broughton	SS4190093000	21-Jul-08	11:35:00	220	4
74025	Broughton	SS4190093000	28-Jul-08	10:10:00	2	1
74025	Broughton	SS4190093000	04-Aug-08	10:20:00	1300	170
74025	Broughton	SS4190093000	11-Aug-08	10:55:00	240	4
74025	Broughton	SS4190093000	18-Aug-08	10:55:00	170	6
74025	Broughton	SS4190093000	26-Aug-08	11:30:00	24	3
74025	Broughton	SS4190093000	01-Sep-08	09:55:00	270	19
74025	Broughton	SS4190093000	08-Sep-08	08:40:00	49	3
74025	Broughton	SS4190093000	15-Sep-08	09:30:00	120	9

Also see Appendix 2 & 3 which show the overall compliance with the I and G standards for Faecal and Total Coliforms and Faecal Streptococci for Broughton Bay in the years 1998-2005 and comparison data (pass/fail) for the other relevant beaches mentioned in the report.

Significance of the results for Broughton Bay

The 3 year samples tested for E.coli passed the mandatory (I) standard.

The following samples (marked in red) did not meet the guideline (G) standard for E. coli:

- 3 samples in 2006
- 5 samples in 2007
- 8 samples in 2008

The following samples (marked in red) did not meet the guideline (G) standard for Faecal Streptococci:

- 1 sample in 2007
- 1 sample in 2008

These findings suggest that there is contamination from sewage at Broughton Bay which therefore does not meet the designated bathing standard. See The Marine Conservation Society's (MCS) Good Beach Guide (GBG) extracts following.

Marine Conservation Society Good Beach Guide

As stated in the Good Beach Guide, Broughton Bay is a large sandy bay situated on the North West tip of the Gower Peninsula. It has been awarded a basic pass for water quality by the MCS.



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GOOD BEACH GUIDE 2009

...because clean seas mean great beaches

Broughton Bay

Nearest town: Llangennith, Swansea

Description:

A large sandy bay on the North West tip of the Gower Peninsula. This beach is popular with surfers.

Water quality: Basic Pass

Lifeguarded: No

Nearest sewage outflow: No current information

Beach type: Sand

[Photo](#)

[Map](#)



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The following extracts from the GBC are beaches that show the impact of pollution in the Loughor Estuary:

- Rhossili Bay at Hillend
- Llanelli and Loughor Estuary
- Burry Port Beach
- Pembrey Beach-Llanelli

Rhossilli Bay - Hillend

Nearest town: Swansea, Swansea

Description:

A superb beach owned by the National Trust with excellent bathing and beautiful scenery. Spectacular views of Worms Head promontory. One of the most photographed landmarks in Wales. The Worms Head is accessible at low tide via a rock causeway, but the incoming tide rises quickly and walkers should be aware of getting trapped.

Water quality: MCS Recommended

Lifeguarded: No

Nearest sewage outflow: No current information

Beach type: Sand

[Photo](#)

[Map](#)



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Llanelli & Loughor Estuary (Fourth Groyne)

Nearest town: Llanelli, Carmarthenshire

Description:

A sandy beach with groynes, situated in the Loughor estuary and close to Llanelli docks. There is a water park with a boating lake nearby.

Water quality: Fail (swimming not advised)

Lifeguarded: No

Nearest sewage outflow: Tertiary discharge, Combined Sewer Overflows, Emergency Outfall

Beach type: Sand

[Photo](#)

[Map](#)

Sorry, we currently have no image for this beach. However other members may have uploaded photographs which you can see by click below here [Click here for your own photos and comments](#)

Burry Port Beach - East

Nearest town: Burry Port, Carmarthenshire

Description:

Small attractive marina favoured by small yachts and fishing vessels with a high tidal range. Local yacht club, pub and shops. Big boats can only access the port at high tide.

Water quality: Fail (swimming not advised)

Lifeguarded: No

Nearest sewage outflow: Combined Sewer Overflow

Beach type: Marina

[Photo](#)

[Map](#)



[Click here for your own photos and comments](#)

Pembrey Beach - Llanelli (Cefn Sidan)

Nearest town: Carmarthen, Carmarthenshire

Description:

An 8 mile long stretch of sand edged by a belt of sand dunes along the entire length. The beach falls within Pembrey Country Park. Visitors can enjoy clear views across Carmarthen Bay to Tenby and the Gower.

Water quality: Basic Pass

Lifeguarded: RNLI

Nearest sewage outflow: Secondary discharge

Beach type: Sand

[Photo](#)

[Map](#)



[Click here for your own photos and comments](#)

Additional water quality data

Table 1 (Appendix 6) shows compliance of EC identified bathing waters with the faecal and total coliforms I and G standards, and with faecal streptococci G standards as reported by Welsh Assembly Government/DEFRA in 2008. The number of samples taken at each beach, the number of exceedences against I and G standards and the compliance** are given for each determinand at each beach. As well as compliance with each determinand, the table shows the overall compliance of the beach. The table also shows a summary of salmonella and enterovirus sampling, including the number of samples taken, the number of positive salmonella results and the minimum and maximum enterovirus values in Plaque Forming Units per 10 litres (PFU/10L). At beaches where salmonella and enteroviruses have been sampled the reasons for sampling are indicated.

Table 2 (Appendix 7) shows compliance of EC identified bathing waters with I standards for faecal and total coliforms from 1992 to 2008 (see Rhossili and Pembrey entries)

Table 3 (Appendix 8) shows compliance of EC identified bathing waters with G standards for faecal and total coliforms, and faecal streptococci, from 1992 to 2008. This is the water quality standard required for Blue Flag and Green Coast beach awards (Appendix 10).

Rhossili Beach was awarded the Green Coast Award in 2008

Table 4 (Appendix 9) shows compliance of non-EC Identified bathing waters with I and G standards in 2008 for Faecal and Total Coliforms and Faecal Streptococci (see Llanelli & Loughor Estuary and Burry Port entries)

DISCUSSION

Habitat and species biodiversity

The predominant habitat in our study site was Littoral Sand (LS-Lsa). While accurate mapping was not attempted, it is likely that this biotope occupies >99% of the littoral marine substrate. A small rockpool was found at Prissen's Tor. This rockpool was at the upper limit of the beach. Midway down the beach another area of rockpool was observed, but outside the study area. We did sample this area and results are shown in Table 1. The strandline habitat is mobile and will change in size and location depending upon the prevailing tides, currents and weather patterns. The rockpools are not well developed. The large rockpool at Prissen's Tor was at the upper limit of the beach and therefore exposed for the entire duration outside of high tide. This exposes the animals to extremes of temperature and possibly salinity if there were rain or high evaporation.

Across all habitats, there were 13 phyla represented. However within each Phyla usually a small number of species. Molluscs and Crustaceans were the most diverse animal groups and the brown seaweeds (Phaeophyta) the most diverse plant group. There was little time to extensively sample the Littoral Sand habitat. With more extensive and systematic digging, one would likely find a greater number of species. Most notably absent from our samples were nemertean worms. Should sampling be extended to meiofauna, those species which pass through a 1 mm sieve but are retained in a sieve of 0.05mm (Haywood 1994), several lesser known Phyla would likely be encountered.

The marine biodiversity catalogued to date, therefore, suggest a typical sandy beach habitat. Several of the common biotypes can be encountered, mostly notably the rockpool and strandline habitats. The former being relatively species poor. The lichen zone is not well developed, though could yield more interesting results to a lichen expert. So while there are clearly other areas of the Gower peninsula that would be better suited for a trip to explore marine biodiversity, the habitats and species available at St. Madoc Christian Camp are very useful as an addition to a land-based educational program. As there is still very little known about this beach, additional research needs to be completed to gain a more complete picture of its marine biodiversity.

Why should there be a difference in the bathing water quality in adjacent bays?

On the strandline of the beach next to Llanmadoc Camp at Broughton Bay there was a small amount of rubbish that had been washed up e.g. drinks cans, crisp packets, plastic bottles and the like. We did find one cotton bud and one panty liner which could indicate pollution from sewage, but this is very marginal evidence. The sand itself looked very clean. There were vehicle tracks in the sand which suggested that there was human activity on the beach over and above surfers and holiday makers. In conversation with a local resident, she had observed large flatbed lorries going over the beach to the lighthouse at Whiteford sands where mussels are harvested commercially. She reported 10 tons a day being removed after very low tides. She also observed that there were not so many sea bass being caught this year. We were told that the local farmer at Delvid Farm is very concerned with the local environment.

A caravan site at Lagadranta adjacent to the beach at Broughton had a small stream which ran through a reed bed to the beach. It looked clear and clean. A small pond had formed which we sampled for fresh water indicator species. The species included lots of whirligig beetles, freshwater snails and freshwater shrimps which are indicators of good levels of dissolved oxygen and therefore clean water.



Beach showing Lagadranta Caravan Site



Outlet of stream to the beach



Reed Bed with static caravan site beyond



Some debris that collected at the outlet to the beach

Around the corner to the east at Landimore Marsh is a large area of salt marsh where animals graze-horses could be seen on the weekend of our visit. Sheep also graze here and the salt lamb that is produced is very much prized and sold in this

area of the Gower and beyond. Some of the faecal contamination of the beach could be due to the impact of sheep grazing on the salt marsh, especially during heavy rains. In the last 2 years there has been very heavy rainfall in the summer months in the Gower which would add to this problem.



Marshland grazing for sheep

Further round the estuary eastwards, the area of Llanridian Sands was famous for its cockles, but in Jan 2009 it was reported that cockles around the Burry Inlet were dying in large numbers (The South Wales Evening Post 30 Jan 2009).

There had previously been a ban on cockling in 2002 because of toxins found in the cockles. In June 2008 the Environment Agency were asked to lead a coordinated investigation into the mass cockle mortalities in the Burry Inlet by the Minister for Rural Affairs and the Minister for Environment, Sustainability and Housing of the Welsh Assembly. In February 2009 a surveillance report was carried out by Moody Marine Ltd. about the sustainability of the Burry Inlet cockle industry.

The cockle mortality project can be found on the Marine Stewardship Council website www.msc.org

Across the estuary from Llanmadoc are Llanelli & Loughor Estuary, Burry Port and Pembrey Beach. The MCS awarded Pembrey Beach a basic pass in the GBG, but failed Llanelli & Loughor Estuary and Burry Port Beach. Both Llanelli & Loughor Estuary and Burry Port Beaches have combined sewer overflows, as well as tertiary discharges and emergency outfall in the Llanelli & Loughor Estuary. Pembrey Beach further along the estuary received a basic pass like Broughton Bay, although it had a secondary discharge for sewage.

The Llanelli area is heavily industrialised and so it is possible that pollution from pollutants other than sewage could be carried over from there, thus reducing the

water quality of Broughton Bay. The area around Llanelli is home to a number of manufacturing companies including a steel works. Although heavy industry has declined over the years and the mining of coal is no longer carried out in the area, it is still industrialised. The population of the Llanelli urban was recorded as 36,358 in the 2001 census.

Threats

Defoe et al. (2008) review the threats to sandy beach ecosystems. They divide what they call “stressors” into nine categories:

- Recreation

This beach is used by visitors apparently much less than others in the Gower peninsular. However, residents of the caravan parks directly adjacent to the beach obviously use the beach extensively. According to the camp staff, there are generally few on the beach at any one time. The tide leaves a large sandy pool directly next to the rockpool at Prissen’s Tor. This was observed to be used extensively during a summer trip to the site (RDS pers obs). Previous studies have shown impacts of tourism on beach fauna (Gheskiere et al. 2005). A study would have to be done to examine faunal patterns at this site. However, we did observe significant numbers of the green shore crab, fish, and crustaceans within the sandy pool.



- Cleaning or grooming (used especially in high tourism areas)

Cleaning or grooming of this beach is not known, but unlikely.

- Nourishment (to prevent or mitigate erosion)

To our knowledge there is no beach nourishment program on this beach. However, erosion and changing current patterns are causing erosion in the estuary as a whole and this may become an issue in the future.

- Pollution

Marine habitats and associated biodiversity are often threatened more by land-based than ocean-based activities (Halpern et al. 2007). These include threats such as nutrient and pollution input, coastal engineering, development, and tourism. Based upon the Environment Agency data for Broughton Bay, we concluded that there was sewage contamination. This is possibly due to the influence of the caravan parks, though especially directly opposite the saltmarshes, this could also be due to the influence of sheep grazing. Beaches further in the inlet did not pass basic good beach water quality measure due to the heavy industrialisation of the area. Broughton Bay could also be influenced by these factors. Clearly, more research would be necessary to determine the cause(s) of the pollution.

Nothing is known about the nature of the pollution washed ashore. By cataloguing items during cleaning sessions, something of the nature of these as threats could be assessed. The history and potential for oil spills is unknown.

- Exploitation

We noticed that there was vehicle access to the beach. Though few vehicles were observed, each day there appeared to be tyre tracks along the beach. One resident expressed that flat bed trucks are used to access cockle grounds further down the beach. It is unlikely that vehicular traffic is having a major impact on the beach fauna. But should it be observed that access increases, it would be worth examining with a research project. Tyler-Walters & Arnold (2008) reviewed over 200 articles on the impact of tramping by vehicles and foot traffic on intertidal biodiversity. Much of the study is relevant, but a few points suffice:

- “Trampling has been relatively well studied on the intertidal rocky shores but relatively poorly studied on sedimentary shores. “
- “There are very few studies of the effects of vehicles in the intertidal; none of which were directly relevant to access to fishing grounds.”
- “Trampling impacts resulted from physical contact and wear and were dependant on the intensity, duration, and frequency of trampling, and even the type of footwear used.”

- “Vehicles are generally considered to do more damage than walking (ca 5- 30 fold) due their greater weight and power but the level of damage varies with the vehicles used, how they are driven and the nature of the receiving habitat. “
- “Also, it is clear that un-managed access to the intertidal can have detrimental effects on intertidal communities. “

The Bury inlet is well known for its cockle (*Cerastoderma edule*) fishery (Mullard 2006). The main extraction location is further in the inlet. However, during a summer trip to the site, at least one family was observed collecting cockles on the beach offshore of the camp (R Sluka, pers obs). It is unlikely that the level of recreational extraction at the beach is significantly impacting biodiversity. However, the level of exploitation is currently unknown and could be enumerated.

- Biological invasions

One of the species observed was the barnacle *Elminius modestus*, an Australia invasive species. This species is now quite common throughout Britain. According to the Joint Nature Conservation Committee website (<http://www.jncc.gov.uk/page-1704>, accessed 1 Dec 2009)) “In northern areas, such as the British Isles, *Elminius modestus* competes with *Semibalanus balanoides* (Crisp 1958), whereas in southern Europe it competes with *Chthamalus* species as well. *E. modestus* is, however, also found in low or variable salinity habitats where native *S. balanoides* does not survive. *Balanus improvisus* seems to be retreating where it is in competition with *E. modestus* (Crisp 1958; Hayward & Ryland 1990). *Balanus improvisus* may have been displaced from the Tamar estuary, Devon and Cornwall, and become extremely rare in the Dart, Devon, as a result of competition from *E. modestus* (A. Southward pers. comm.). It has been suggested that since it produces a larger number of larval stages in the summer than *S. balanoides*, it may be in direct competition with other components of the zooplankton, notably the larval stages of other benthic species (Crisp 1958; Farnham 1980).” According to the Marine Life Information Network (<http://www.marlin.ac.uk/speciesinformation.php?speciesID=3252>, accessed 1 Dec 2009) “*Elminius modestus* not only competes with endemic British species, particularly *Balanus balanoides*, but has colonized some sheltered and estuarine habitats not previously inhabited by them (Bassingdale, 1964).”



Sargassum muticum, a brown seaweed, is another invasive species found at this site. Native to Japan (http://www.marlin.ac.uk/marine_alien/species.asp?SpID=16, accessed 1 Dec 2009), this is a subtidal species that was found in the strandline habitat at our study site. The extent of its abundance is unknown at this site and would need to be studied using underwater surveys.

- Coastal development and engineering

The main coastal development at this site is the caravan parks. There does not appear to be any direct impact or encroachment on the sandy beach from this development. Potential impacts are reviewed under recreation and pollution categories.



- Mining

To our knowledge, there is no mining on this beach.

- Climate change

There are no direct studies of the potential impact of climate change on sandy beaches, so Defoe et al. (2008) inferred potential impacts from other habitats. They conclude that low-energy, dissipative shores (like Broughton Bay) are most at risk to climate change impacts. This may include the replacement of some species, shifts in distribution, and changes in calcification rates due to changes in oceanic pH.

Potential conservation activities

- Many of the animals and plants observed in this study can be difficult to identify without good field guides and a binocular microscope. However, the most common species, especially bivalves, could be presented in a laminated identification card(s). This would benefit educational and recreation activities based at the camp.
- A reference collection could be developed in conjunction with any educational or research facilities built on the camp grounds.
- Volunteers and staff of St. Madoc Christian Youth Camp currently spend significant time on beach clean-ups. This is hugely beneficial as most of the trash on Gower beaches result from washing up on shore rather than being

deposited by beach visitors. We suggest tying in the beach clean-up to the Marine Conservation Society's UK-wide beach cleanups. This could include a weekend marine conservation weekend, where volunteers from further afield get involved. The practical conservation work could be combined with smaller research projects and creation care teaching to be a unique weekend experience.

- Follow up local contacts to get help and information:

Jane Carpenter lives on the static caravan park and had good local knowledge. She was interested in the survey we were doing for Llanmadoc Christian Camp and is studying the environment on a course in Swansea (mob 07749 835542)

The owners of Delvid Farm, Denise and Graham Matthews are concerned with the local environment

- Make sure Health and Safety assessments are in place. The sea in Broughton Bay is not recommended for bathing although it is popular for surfers and it is not life guarded. Locals who know the bay warn of its dangers eg large holes in the sandy seabed caused by the tide are known to cause drowning. The notices warning of military debris are to be observed!



Recommendations for future research

- There is a standard protocol that should be completed in order to classify habitats to lower levels of the JNCC habitat classification. Future research should seek to classify the habitats to these lower levels as well as map the habitats, preferably in a GIS format.
- As noted previously, this beach is considered particularly hazzardous for swimming. This would also make snorkeling or diving potentially more dangerous than normal. If it is sensible to get into the water for taxonomic study, the subtidal marine habitats should be classified according to the JNCC habitat classification system. Additionally, a diverse marine community is likely to be encountered. Should *in situ* collection be considered unsafe, it may be possible to do minimal sampling in order to characterise these habitats and associated species with minimal damage.
- The majority of sandy beach phyla were likely catalouged during the present study. However, it is virtually certain that more species would be found with more extensive sampling. However, many of the organisms need specialised taxonomic expertise and laboratory facilities for identification. A follow-up project with access to the type of facilities available in laboratories such as the Marine Biological Association of the UK would be fruitful in identifying sponges, bryozoans, and many crustaceans.
- The meiofauna are more diverse than the macrofauna and likely include representatives of almost every kind of invertebrate (Hayward 1994). One study of a sandy beach on the North Sea reported 652 species present in a ratio of 1:25 macrofauna to meiofauna (Armonies & Reise 2000). According to Hayward (1994) careful collection and preparation of samples, a good microscope, and identification guides are critical. This is more likely to be an area that could be contracted to a suitable partner.
- An important next step for comparing this beach to others as well as determing the pattern of animal distribution is to examine and map the distribution of sand grain size. This correlates well with the physical environmental factors affecting the beach and impacts the distribution of animals, allowing good insights into the ecology of a beach. A standard set of sieves used along transects could be used by volunteers to do this.
- Many of the seaweeds and animals are seasonal in abundance and distribution. To further augment our understanding of the marine biodiversity of this beach, seasonal sampling is recommended.
- Basic water quality at the beach should be studied in order to identify the sources of sewage pollution. Are the caravan parks contributing negatively to beach water quality? Sheep grazing? Water-born pollutants?

CONCLUSION

The primary goal of the marine portion of the project was to collect data that will allow evaluation of the beach area adjacent to camp property for biodiversity, threats and potential conservation actions. Habitat and species biodiversity is low compared to other areas of the Gower peninsula. Additional sampling will undoubtedly find additional species at this site. Several threats were identified which require further research to understand their extent and level of disturbance. This included recreation, pollution, exploitation, biological invasions, coastal development, and climate change. There are a number of research projects which would be beneficial given the paucity of information from this site. The next suggested step is to better integrate the current beach cleaning exercises into the Marine Conservation Society's beach cleaning programs. This could include a dedicated "marine" weekend, attracting A Rocha and other interested parties from across the UK to participate in a weekend of marine conservation science.

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Credits

Photography by Robert Thomas, Robert Sluka