

Durham Heritage Coast Seasearch Survey Report



December 2009
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Seasearch North East



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Heritage Coast

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Cover photograph: 'Kelp Garden' by Alison Gleadhill

Seasearch is co-ordinated by the Marine Conservation Society on behalf of the Seasearch Steering Group which comprises the Marine Conservation Society, Wildlife Trusts, Joint Nature Conservation Committee, Natural England, Countryside Council for Wales, Scottish Natural Heritage, Environment and Heritage Service Northern Ireland, Environment Agency, Marine Biological Association, Nautical Archaeological Society, British Sub Aqua Club, Sub Aqua Association, Professional Association of Diving Instructors, Scottish Sub Aqua Club, Irish Underwater Council and independent marine life experts.

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Introduction

The Durham coast is approximately 15 km long and runs between the two conurbations of Tyne and Wear and Teeside. It is an exposed coast, with wave action continually eroding the limestone cliffs and causing significant sediment movement. The main tidal drift is from north to south, but the tidal stream is weak to moderate. There is no major input of freshwater into the sea along this stretch of coastline. There is one major port at Seaham harbour.

Until recently, Durham had one of the most heavily polluted coastlines in Britain, due to the presence of six coal mines along the coast and the practice of dumping of colliery waste and mine water into the sea which persisted for over a hundred years. This ended when the coal mines closed in the early 1990s, but the coastal and marine habitat was still subject to damage from vandalism, car burn outs and illegal tipping.

Between June and August 1991, a Seasearch survey was carried out to gather information on the main habitat and community types along the Durham coast. The survey team visited 20 sites, with depths ranging from 6 metres to 32 metres. The following 7 habitat types were recorded:

1. Stepped circalittoral bedrock and boulders with some silt. Dead men's fingers dominant. Recorded at 1 site at a depth of 24 metres.
2. Sloping circalittoral bedrock with very thick silt. Very little life, occasional spirorbid worms. Recorded at 1 site at a depth of 8 metres.
3. Stepped circalittoral bedrock. Very little life, a few common starfish and anemones. Recorded at 1 site at a depth of 13 metres.
4. Infralittoral sand. Fine rippled sand with occasional red seaweed *Polyides rotundus*. Recorded at 1 site at a depth of 15 metres.
5. Circalittoral sand. Fine muddy rippled sand tainted with coal waste. No visible marine life. Recorded at 9 sites at depths of up to 24 metres.
6. Circalittoral muddy gravel. Very little marine life. Recorded at 1 site at a depth of 14 metres.
7. Circalittoral mixed ground with occasional boulders. Dead men's fingers and hornwrack dominant. Recorded at 6 sites at depths from 28 to 33 metres.

The survey team noted that the seabed was smothered to a certain degree by colliery waste and dredged spoil, and that species diversity was low. The water was turbid and poor visibility made photography difficult.³

Between 1997-2002, the Turning the Tide Partnership was formed to regenerate the Durham coastline. The Partnership initiated a £10 million programme of environmental improvements, including removing 1.3 million tonnes of coal spoil and debris from the beaches, creating hundreds of hectares of high quality wildlife habitat from reclaimed agricultural and industrial land, improving access to the coast and creating opportunities for the local community to appreciate and help to conserve their rich natural heritage.²

This work rejuvenated the coastline, restoring the attractive magnesian limestone clifftop grassland and extensive beaches of sand and pebbles. As a result, the area was defined as Heritage Coast in 2001 by the local authorities and the Countryside Agency. The Heritage Coast definition covers three sections of undeveloped coastline, separated by Seaham and Castle Eden Denemouth, although it is hoped that Castle Eden Denemouth will also achieve Heritage Coast status in the near future. The combined length of these sections of Heritage Coast is around 14km.

In addition to its Heritage Coast status, there are several local nature reserves, two national nature reserves and several Sites of Special Scientific Interest along the Durham coast. Within the Heritage Coast area, the Northumbria Coast in the north and the Teesmouth and Cleveland Coast to the south are designated as Special Protection Areas (SPA) under the EC Birds Directive.

Castle Eden Dene and the adjacent area of Durham Coast are both designated as Special Areas of Conservation under the EC Habitats Directive.⁴

In 2005, the Durham Heritage Coast Partnership produced a 5-year management plan detailing the strategy for continuing to enhance and protect the area's natural beauty and wildlife resource, while encouraging sustainable social and economic development.²

In 2009, with support from the Durham Heritage Coast Partnership, a second Seasearch survey was carried out. The aim of this survey was to assess whether the seabed habitats are recovering and whether marine biodiversity is increasing since the implementation of the Turning the Tide projects and the Durham Heritage Coast management plan. The results of this survey are presented in the following report.

Methodology

Survey dives were carried out on the 30th and 31st August 2009 from aboard the vessel Spellbinder II. The divers adopted the standard Seasearch methodology of using slates and digital cameras to record information on habitats, species, notable features and human impacts. On completion of the dives, these data were entered into either Observation forms or more detailed Survey forms.

The list of Observation and Survey forms completed during this survey is attached as Appendix 1.

On 30th August, a team of 8 divers visited the following sites:

<u>Nose's Point</u>	
Time of dive:	10.15 to 11.15
Location:	From: 54° 49.534 N, 001° 19.064 W To: 54° 49.550 N, 001° 19.070 W
Depth:	4.0 to 6.7 metres below sea level 0.6 to 3.3 metres below chart datum

<u>Phil's Drift</u>	
Time of dive:	12.20 to 13.20
Location:	From: 54° 51.431 N, 001° 20.216 W To: 54° 51.328 N, 001° 20.203 W
Depth:	6.9 to 9.1 metres below sea level 3.2 to 5.4 metres below chart datum

<u>Salterfen Rocks</u>	
Time of dive:	14.40 to 15.40
Location:	54° 52.866 N, 001° 20.934 W
Depth:	6.3 to 9.0 metres below sea level 3.1 to 5.8 metres below chart datum

On 31st August, a team of 10 divers visited the following sites:

<u>Phil's Drift East</u>	
Time of dive:	10.20 to 11.35
Location:	54° 51.352 N, 001° 20.059 W
Depth:	8.0 to 10.7 metres below sea level 5.0 to 7.7 metres below chart datum

<u>Kelp Garden</u>	
Time of dive:	12.40 to 13.35
Location:	54° 50.870 N, 001° 19.989 W
Depth:	4.0 to 8.2 metres below sea level 0.2 to 4.4 metres below chart datum

<u>Pin Cushion (Anemone Carpet)</u>	
Time of dive:	14.50 to 15.35
Location:	54° 51.827 N, 001° 20.510 W
Depth:	5.5 to 7.9 metres below sea level 1.8 to 4.2 metres below chart datum

The locations of the dive sites are shown in Figure 1. On the 30th and 31st August, the underwater visibility ranged from around 3-5 metres and the tidal current was very weak (<1kt), making the conditions suitable for recording habitats and species with a good degree of confidence.

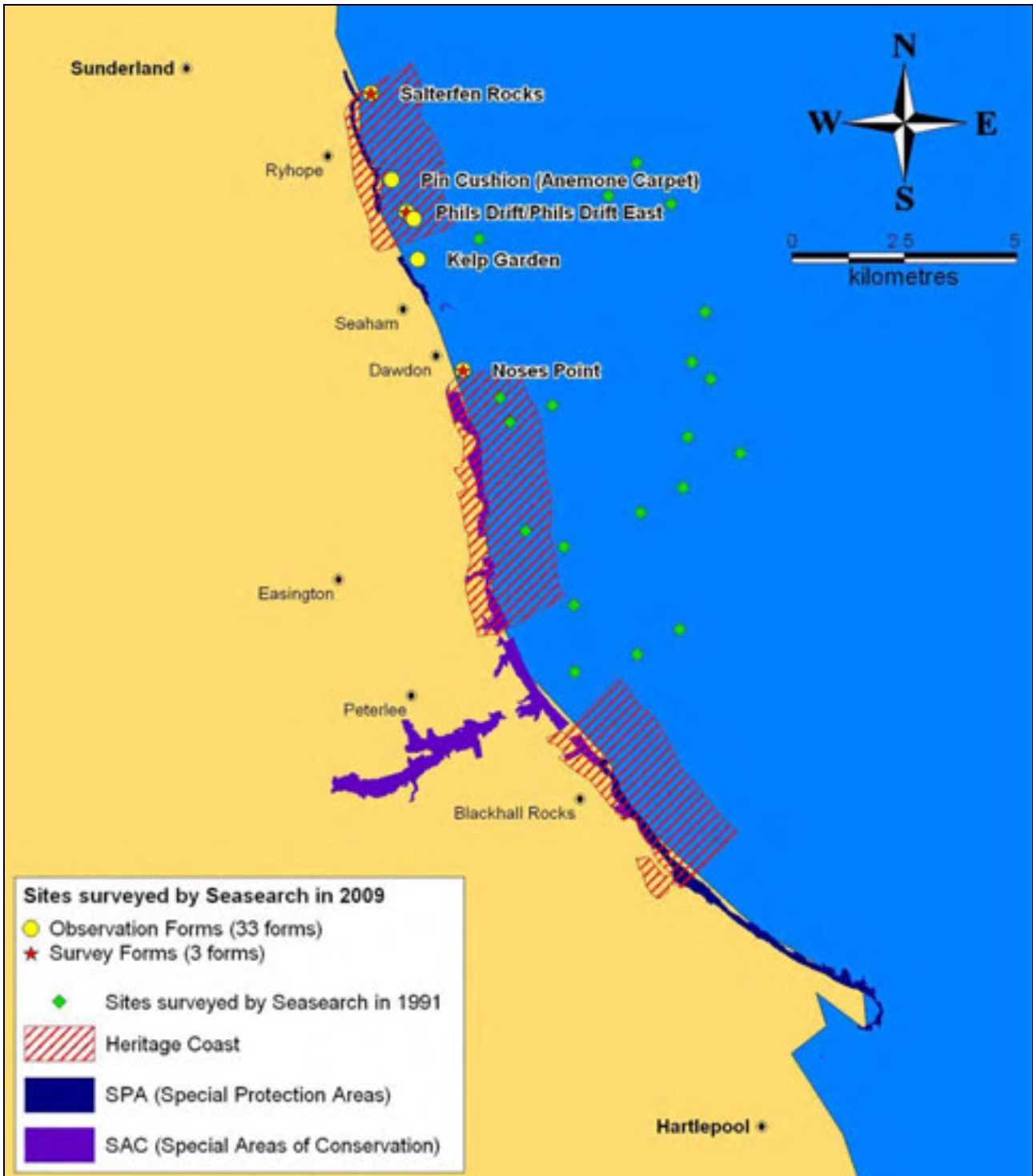


Figure 1: Map of Durham Heritage Coast showing the location of the 6 dive sites

On the 11th October, a team of 11 divers visited the southernmost section of the Heritage Coast between Castle Eden Denemouth and Hartlepool. Several attempts were made to dive here and at sites within the Heritage Coast areas to the north, but the visibility was so poor at each site that it was not possible to carry out any survey dives on this date.

For comparison, the 1991 Seasearch survey was carried out by a team of 17 divers over 5 days of diving. A greater number of sites were visited, but there were fewer divers recording at each site.

Results

The habitats and species recorded at each site are described below, with the sites listed in order from north to south. For each site, the shallowest habitat is recorded first, and the dominant habitat is marked with “d”.

Salterfen Rocks

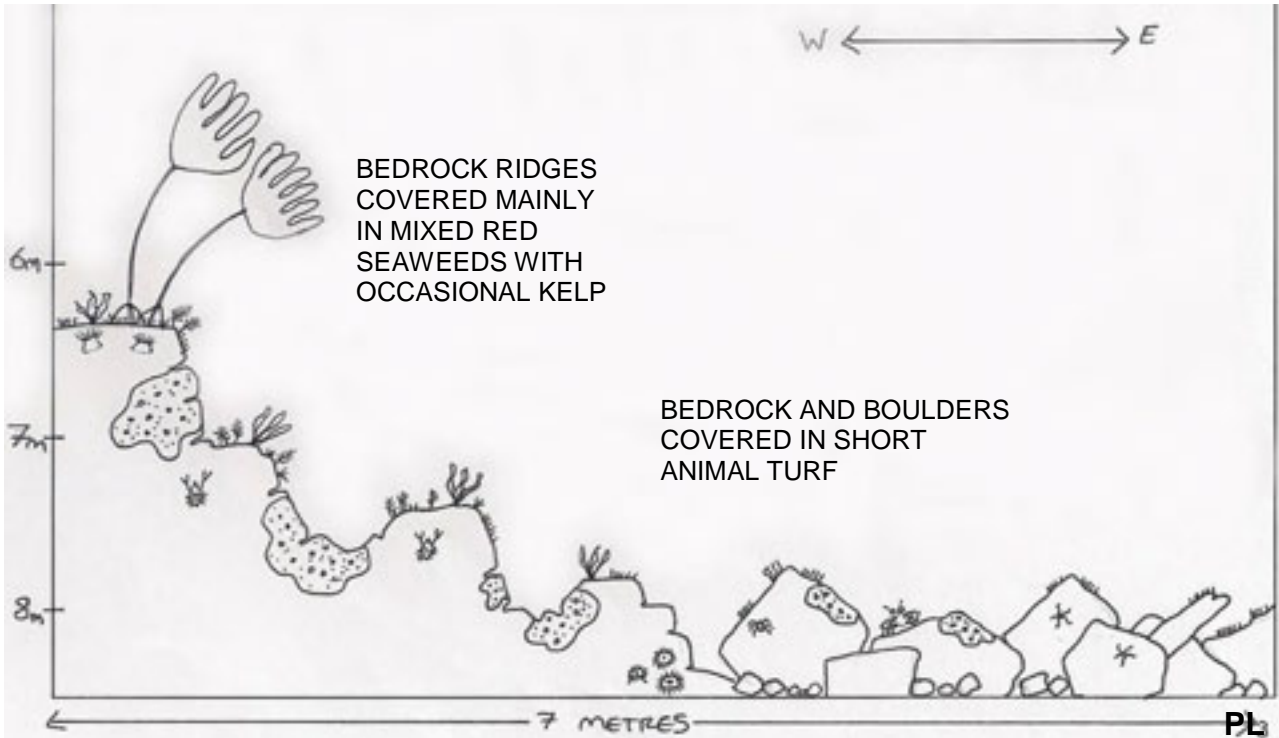


Figure 2: Profile of the seabed at Salterfen Rocks (sketch by Paula Lightfoot)

Two habitats were recorded at Salterfen Rocks:

Habitat 1: Mixed seaweeds on rocky reef.

Ridges of limestone bedrock covered mainly in dense foliose red seaweeds, including sea beech (fig 3).



Figure 3: Sea beech at Salterfen Rocks

The seaweeds were frequently encrusted with the bryozoans *Membranipora membranacea* and *Electra pilosa*, which were grazed by *Polycera quadrilineata* nudibranchs. *Laminaria hyperborea* was present but rare – some divers did not record any kelp species at this site. The bedrock contained many horizontal fissures and overhanging areas, frequently inhabited by squat lobsters (fig. 4).



Figure 4: Squat lobster under an overhang at Salterfen Rocks

Habitat 2: Short animal turf on boulders and rocky reef (d)

Below around 7.5m, the seabed consisted mainly of angular boulders with occasional low-lying bedrock outcrops, and the seabed cover type was faunal turf rather than algae. The main components of the animal turf were *Sabellaria* worms, feather hydroids and dahlia anemones. Humpbacked prawns were particularly common in this habitat (fig. 5).



Figure 5: Humpbacked prawn on boulder at Salterfen Rocks

Divers reported seeing more litter, specifically plastic carrier bags and other plastic debris, at Salterfen Rocks than at the other two sites dived on the same day (Nose's Point and Phil's Drift). Small piles of pebble-sized, rounded lumps of coal had accumulated at the base of some rocky outcrops, whereas at the other sites only fine coal dust was visible. However, the site supported abundant sessile and mobile fauna, particularly crustaceans and shoaling fish.

Pin Cushion (Anemone Carpet)

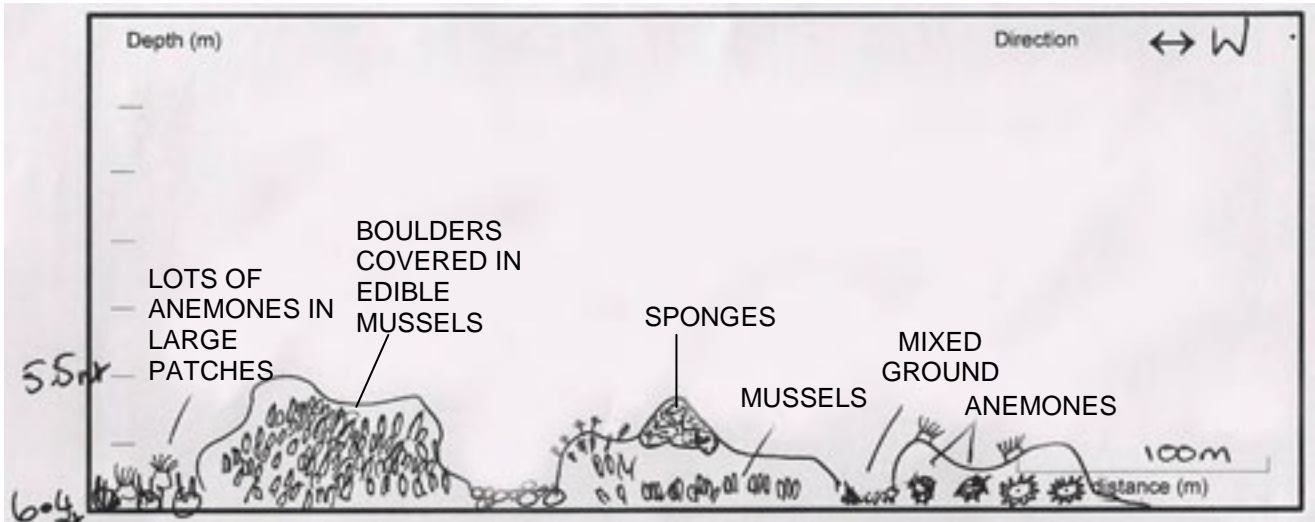


Figure 6: Profile of the seabed at Pin Cushion (sketch by Carrie Pillow)

Three habitats were recorded at this site, which was named Anemone Carpet by the Seasearch survey team due to the presence of large patches of dahlia anemones.

Habitat 1: Kelp park

This habitat is not shown in figure 6 because it was not recorded by all the divers at this site, suggesting that its distribution is limited to the upper surfaces of larger boulders or rocky outcrops. Where kelp was present, edible mussels and common starfish were also recorded, with clumps of mussels attached to kelp stipes.

Habitat 2: Angular boulders covered in short animal turf (including edible mussel beds).

Dahlia anemones and sponges were the main components of the short animal turf, but some boulders also supported dense beds of edible mussels (fig. 7).



Figure 7: Edible mussel bed

Common starfish were present in large numbers on the mussel beds. Gaps between the boulders provided sheltered habitat for goldsinny wrasse and common lobsters (fig. 8).



Figure 8: Common lobster at 'Anemone Carpet'

Habitat 3: Sediment with life apparent (d)

Between the groups of boulders were patches of mixed ground and cobbles, dominated by dahlia anemones (fig. 9).



Figure 9: Dahlia anemone at 'Anemone Carpet'

None of the divers reported seeing any litter or man-made objects at this site. The notable features of the site were the mussel beds (not recorded at any of the other five sites), the large patches of dahlia anemones and the conspicuous abundance of common lobsters and goldsinny.

Phil's Drift

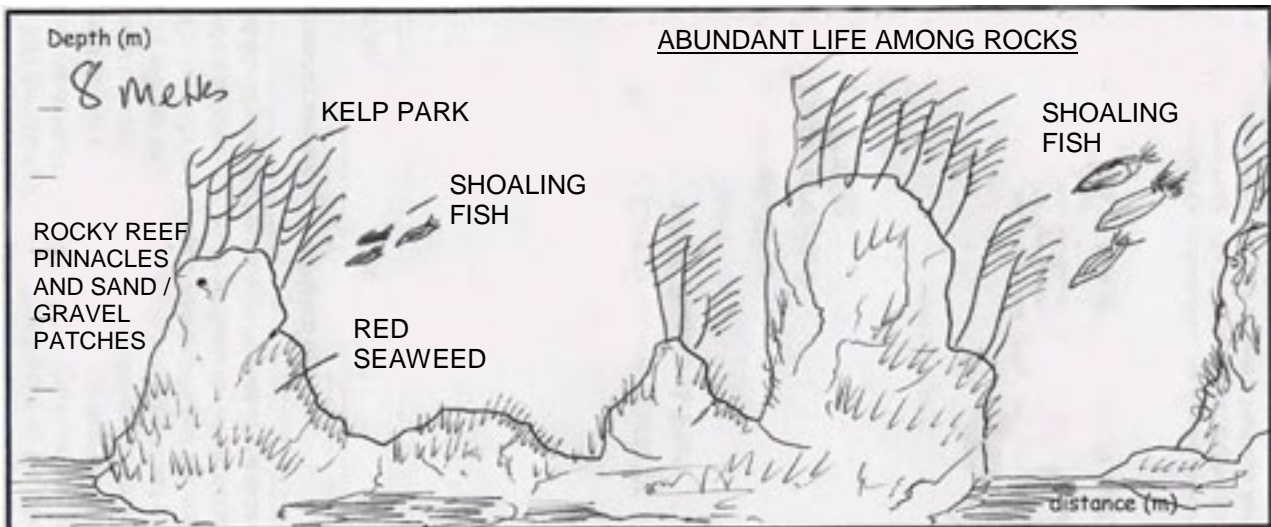


Figure 10: Profile of the seabed at Phil's Drift (sketch by Gavin Scott)

Three habitats were recorded at Phil's Drift:

Habitat 1: Kelp park on rocky reef pinnacles

This habitat was recorded by only one dive buddy pair, so its distribution must have been limited to a few taller limestone pinnacles. This habitat was characterised by *Laminaria hyperborea* kelp with mixed red seaweeds beneath. Shoals of fish (species unidentified) were recorded among the kelp fronds.

Habitat 2: Short animal turf on bedrock and boulders (d)

Low-lying bedrock outcrops and boulders between 7-8 metres depth. Short animal turf, particularly feather hydroids, *Sabellaria* worms, oaten pipe hydroids, barnacles and dahlia anemones, covered the greatest area, although tall animal turf was also present, notably large clumps of hornwrack. Common starfish were especially abundant in this habitat, while velvet swimming crabs and edible crabs were also common. Gaps between boulders and overhanging areas of bedrock provided sheltered habitat, but there was competition for these spaces (fig. 11).



Figure 11: Bib attempting to enter a hiding place already occupied by a lobster

Habitat 3: Sediment with life apparent

Medium-coarse grained, poorly sorted sand with ripples running from north to south. Coal dust was visible on the peaks of the ripples. Species recorded in this habitat included plaice, gobies, brown shrimp, sandmason worms and little cuttle (fig. 12).



Figure 12: Little cuttle above the sandy sea bed at 'Phil's Drift'

One diver reported seeing a small amount of plastic litter at this site, and some coal dust was visible. The notable feature that most divers commented on was the abundance of starfish and crustaceans, notably common lobsters, squat lobsters and various crab species.

Phil's Drift East

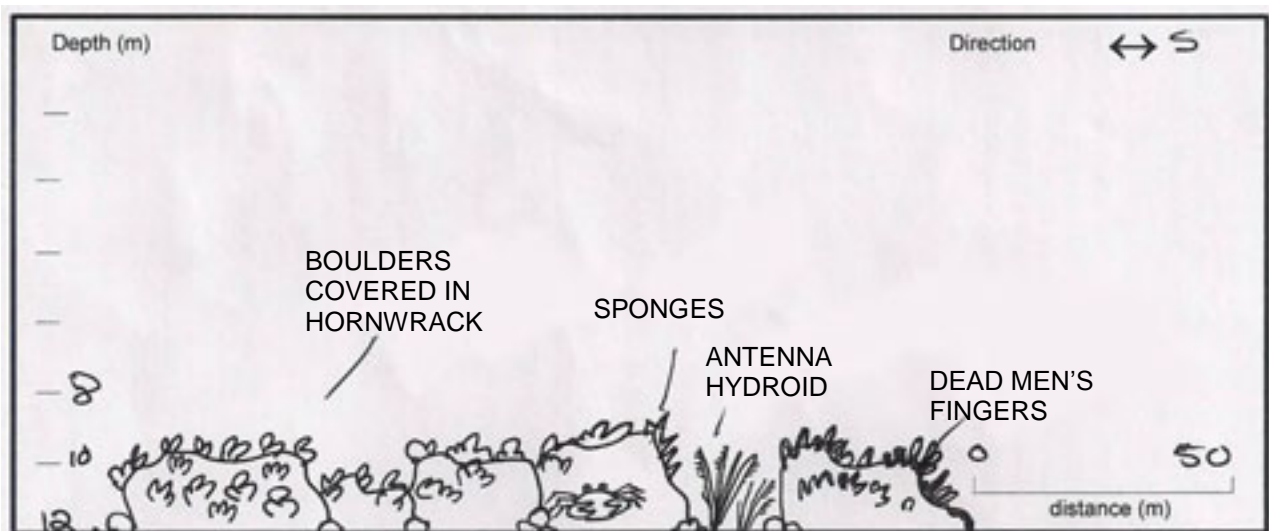


Figure 13: Profile of the seabed at Phil's Drift East (sketch by Carrie Pillow)

This was the deepest site surveyed, and the only one at which no kelp was recorded. Only two divers recorded seeing red seaweed at this site, and they recorded it as 'rare'. As figure 14 shows, at this depth the dominant seabed cover type was animal turf rather than seaweeds.



Figure 14: Tall animal turf at Phil's Drift East

Two habitats were recorded at Phil's Drift East:

Habitat 1: Boulders covered in tall animal turf (d)

The angular boulders at this site were covered in tall animal turf, predominantly hornwrack and antenna hydroids (fig. 15) although dead men's fingers were also recorded (fig. 16).



Figure 15: Hornwrack and antenna hydroids on boulders at Phil's Drift East



Figure 16: Dead men's fingers and *Inachus* sp. spider crab at 'Phil's Drift East'

Short animal turf was also present, particularly encrusting and boring sponges. Edible crabs (fig. 17) were particularly abundant in this habitat, and several divers reporting seeing very large specimens.



Figure 17: Edible crab on sponge-encrusted boulders at 'Phil's Drift East'

Habitat 2: Sediment with life apparent

Some divers recorded sandy areas between the boulders. Common sole was recorded in this habitat, and lugworm casts were also present.

No litter or man-made objects were recorded at this site, although coal dust was visible in the sandy areas. The notable features that divers commented on were the abundance of large edible crabs and the extensive, thick covering of hornwrack on the boulders.

Kelp Garden

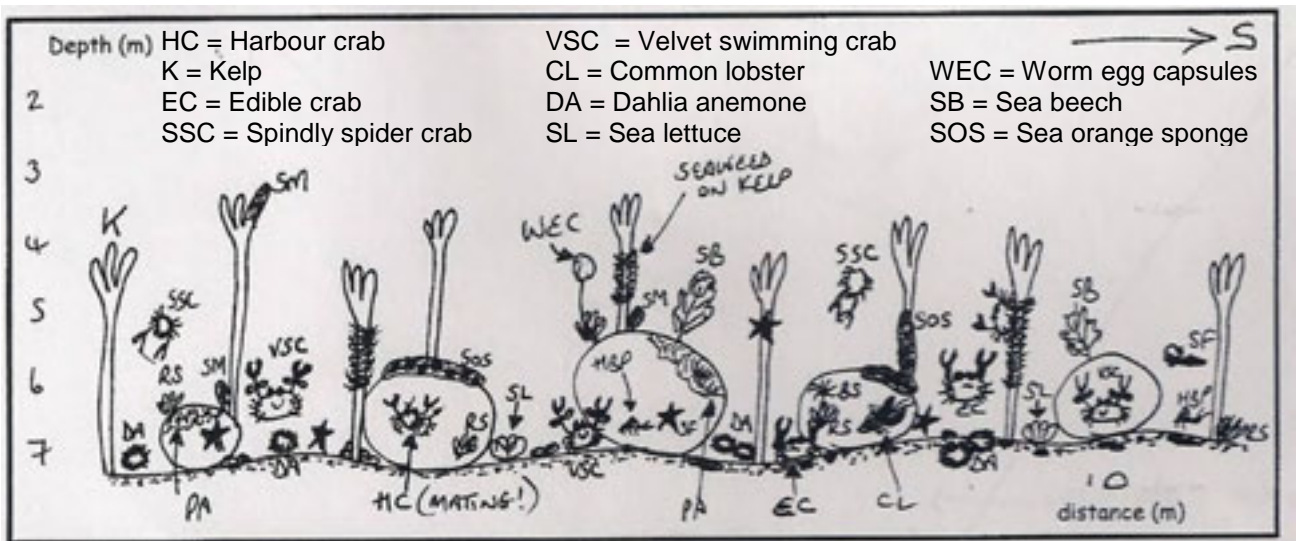


Figure 18: Profile of the seabed at Kelp Garden (sketch by Michelle Simpson)

This site is about 1km north of Seaham harbour and 300 metres offshore; it lies just outside the designated Heritage Coast area, but was surveyed to give an insight into the range of habitats present in the area. It was named Kelp Garden by the Seasearch survey team because the main habitat type was kelp park on boulders. Two habitats were recorded at Kelp Garden:

Habitat 1: Kelp park (d)

The kelp was not so dense as to form a forest; in between the holdfasts the boulders were encrusted with pink algae, sponges, dahlia anemones, barnacles and red seaweeds. Hydroids, algae and bryozoans grew on the kelp stipes (fig. 19).



Figure 19: 'Kelp Garden'

Both the kelp and the red seaweeds were encrusted with bryozoans, providing food for the nudibranch *Polycera quadrilineata* which was abundant at this site (figs. 20 and 21).

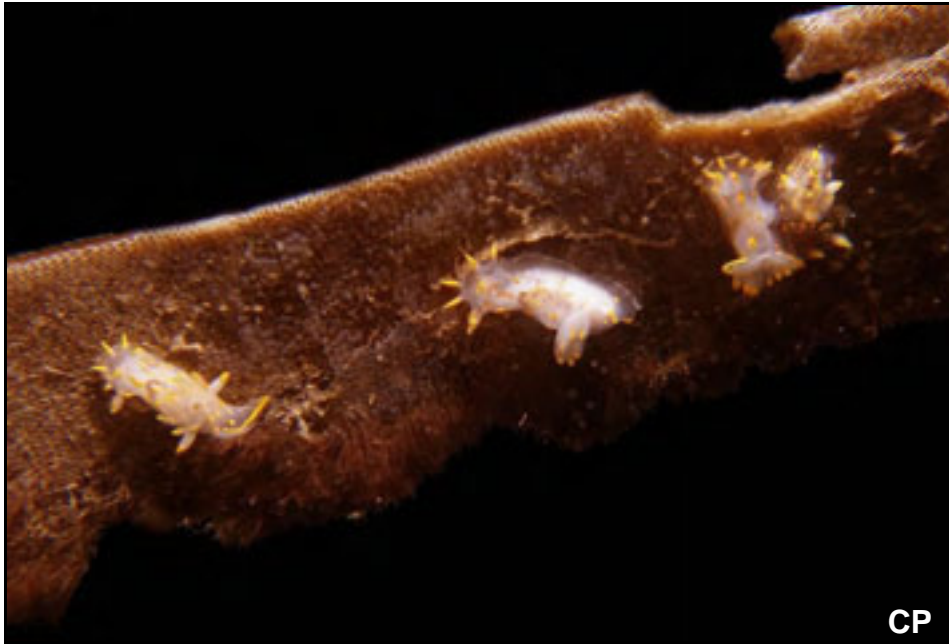


Figure 20: *Polycera quadrilineata* on bryozoan-encrusted kelp frond at 'Kelp Garden'



Figure 21: *Polycera quadrilineata* on red seaweeds at 'Kelp Garden'

Habitat 2: Sediment with life apparent

Between the groups of boulders there were large areas of mixed ground of coarse sand, gravel, pebbles and cobbles. The sediment was quite mobile, so there was little sessile life, but various crustaceans and fish, including butter fish, plaice and short-spined sea scorpion were recorded here.

Divers commented that this site was less 'coal dusty' than Phil's Drift East. Only one piece of litter was reported, which appeared to be a car hub-cap. Divers noted a large number of crabs at this site; edible crabs were especially common, but harbour crabs, velvet swimming crabs and small spider crabs were also present. One diver reported seeing a large number of dead crabs (or possibly moulted shells).

Nose's Point

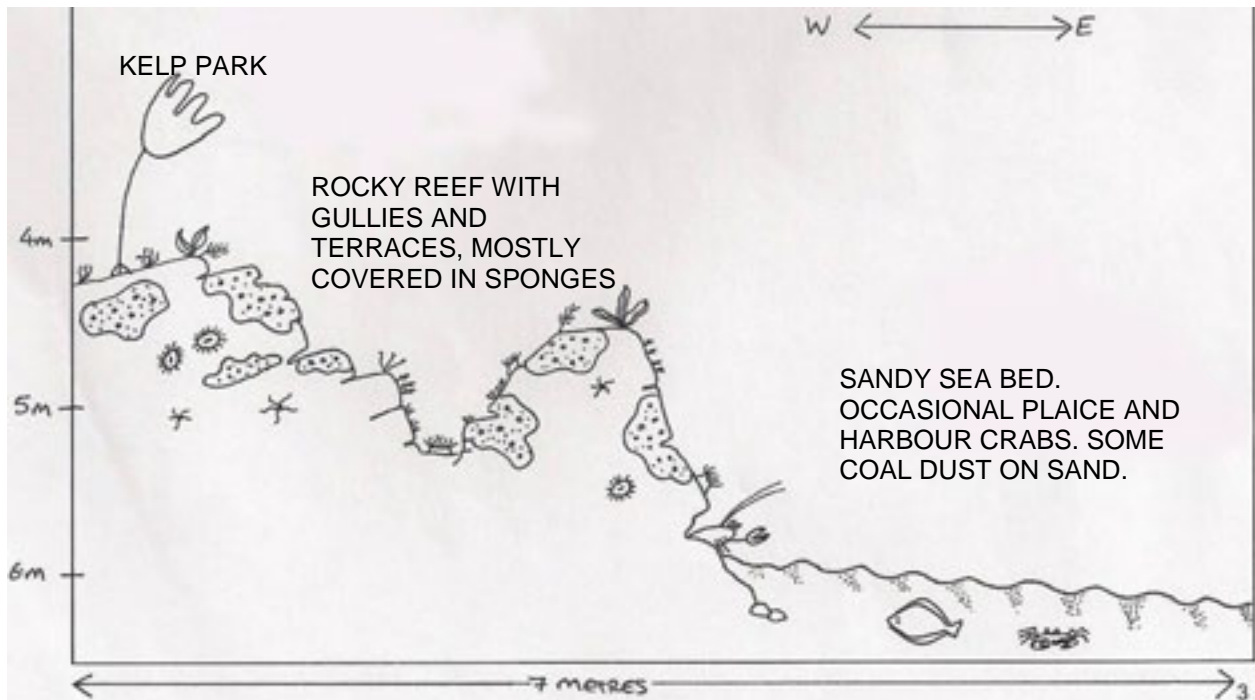


Figure 22: Profile of the seabed at Nose's Point (sketch by Paula Lightfoot)

Three habitats were recorded at Nose's Point:

Habitat 1: Kelp park

The kelp species *Laminaria hyperborea* and *L. digitata* were present, but sparse, on the upper surfaces of the rocky ridges. Mixed red seaweeds were present on the bedrock beneath the kelp and on the kelp stipes.

Habitat 2: Short animal turf on rocks (d)

The limestone bedrock forms gullies and terraces, with numerous fissures and crevices providing micro-habitats. The main component of the short animal turf was a variety of encrusting sponge species, but dahlia anemones, oaten pipe hydroids, feather hydroids and the bryozoan 'sea chervil' were also prominent. Brittle stars were also frequently observed in this habitat (fig. 23).



Figure 23: Brittle star on sponge at Nose's Point

Habitat 3: Sediment with life apparent.

The sand was medium-coarse grained and fairly firm, with ridges 5-10cm high running in a northwest to southeast direction and several lugworm casts. Coal dust and larger coal particles were visible on the sand. Species recorded in this habitat included plaice and harbour crabs (figs. 24 and 25).



Figure 24: Harbour crab on sand, with coal dust visible in the background

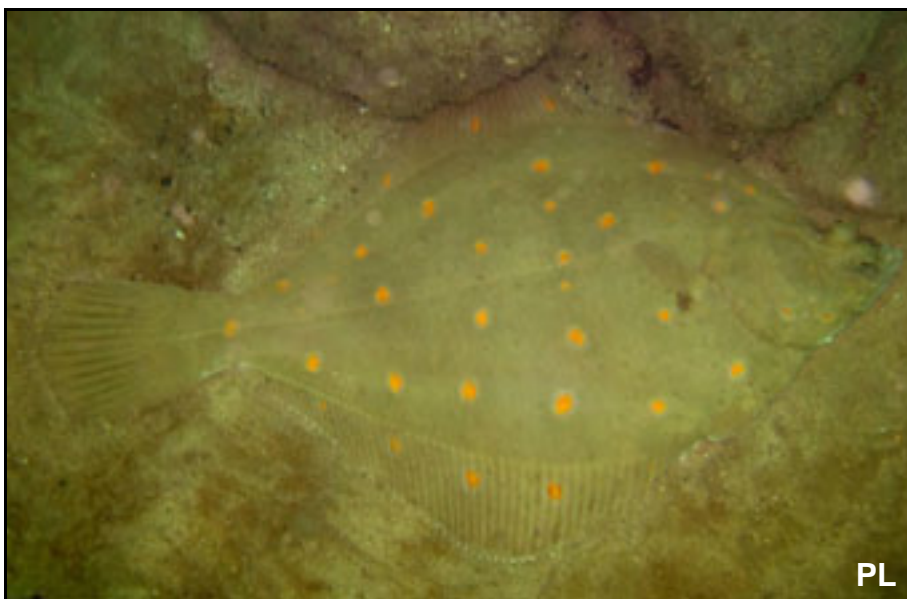


Figure 25: Plaice on sandy seabed at Nose's Point

Some divers recorded seeing a large pipe extending from the shore at Nose's Point, and one diver said the pipe had a split in it. There was some litter apparent, including plastic bags and a lead fishing weight.

Summary of species and habitats recorded

A total of 94 species were recorded across all six sites on the 30th and 31st August. The complete list of species recorded during this survey is attached as Appendix 2.

The taxonomic groups for which the most species were recorded were crustaceans, fish, cnidarians and molluscs (fig. 26). Six species were recorded at all six sites: dahlia anemone, edible crab, common lobster, velvet swimming crab, humpbacked prawn and the *Inachus* spider crab. *Laminaria hyperborea* kelp and common starfish were recorded at five out of six sites. Feather hydroids, barnacles, encrusting sponges and mixed red seaweeds were all recorded at five out of six sites, but could not always be identified to species level.

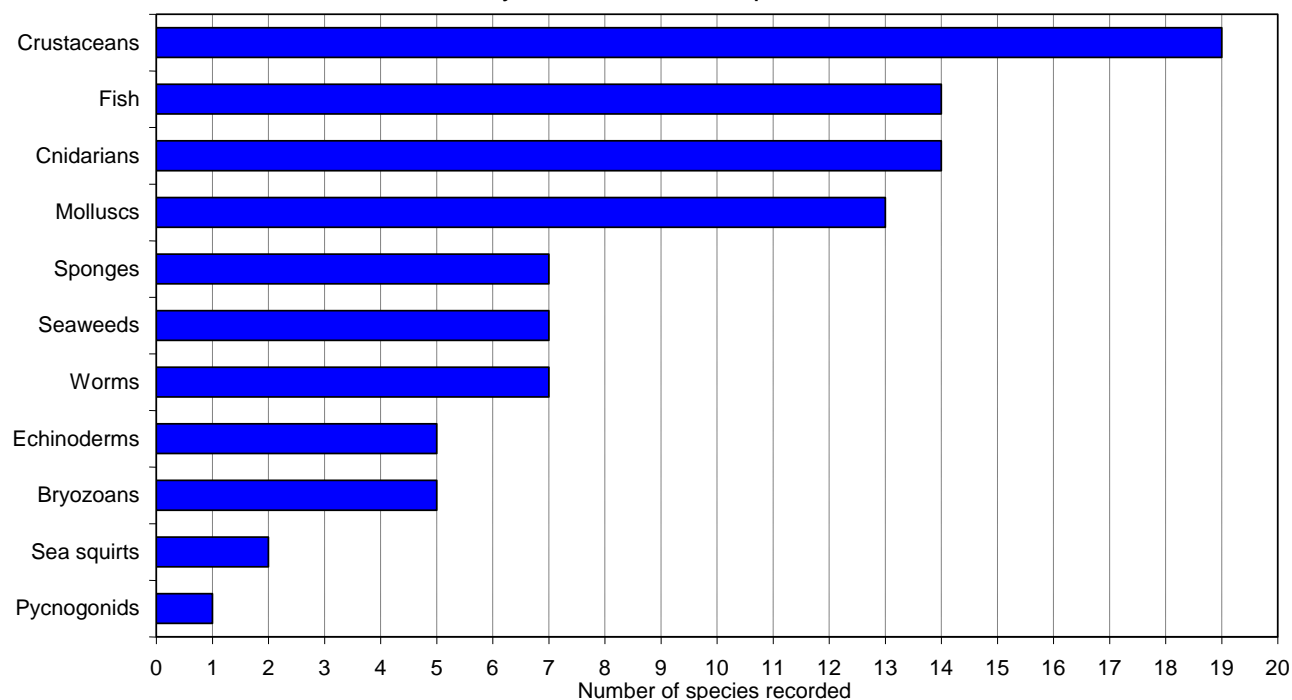


Figure 26: Total number of species recorded broken down by taxonomic group

As Table 1 shows, the highest number of species was recorded at Phil's Drift, and the lowest number at Pin Cushion.

	Kelp Garden	Nose's Point	Phil's Drift	Phil's Drift East	Pin Cushion (Anemone Carpet)	Salterfen Rocks
Bryozoans	2	1	2	1	2	3
Cnidarians	4	10	5	6	4	3
Crustaceans	10	13	14	10	8	10
Echinoderms	2	1	3	2	2	3
Fish	4	7	5	4	5	4
Molluscs	5	1	6	1	4	4
Pycnogonids			1			1
Sea squirts			2			
Seaweeds	5	4	3	1	2	2
Sponges	5	3	1	5	3	3
Worms	2	2	5	1		1
Total number of species	39	42	47	31	30	34
Survey effort	6 Obs	6 Obs	6 Obs	6 Obs	6 Obs	3 Obs
Obs: Observation Form		1 Surv	1 Surv			1 Surv
Surv: Survey Form						

Table 1: Total number of species recorded broken down by taxonomic group and dive site

Table 2 summarises the habitats recorded at each site. The dominant habitat type at each site is marked with “d”.

JNCC Biotope Complex	Habitat details	Kelp Garden	Nose's Point	Phil's Drift	Phil's Drift East	Pin Cushion Anemone Carpet	Salterfen Rocks
Sublittoral coarse sediment (SS.SCS)	Mixed ground – sand, gravel, pebbles and cobbles with some silt.	✓				✓(d)	
	Muddy sand and gravel				✓		
	Medium-coarse grained sand with ripples scattered with coal dust.		✓	✓			
Moderate energy infralittoral rock with kelp. (IR.MIR.KR)	<i>Laminaria hyperborea</i> kelp park with some red seaweeds beneath.	✓(d)	✓	✓		✓	
	Foliose red seaweeds dominant, kelp occasionally present.						✓
Moderate energy circalittoral rock (CR.MCR)	Hornwrack, antenna hydroids, sponges and dead men's fingers on boulders				✓(d)		
	Sponges dominant and other short faunal turf present on rocky reef		✓(d)				
	Edible mussel beds, sponges and anemones on boulders					✓	
	<i>Sabellaria</i> worms and feather hydroids on boulders and/or bedrock			✓(d)			✓(d)

Table 2: Habitats recorded at each dive site

Discussion and Recommendations

The results of this survey suggest that the subtidal habitats of the Durham Heritage Coast have undergone significant recovery since the survey of 1991, and that species diversity has increased greatly.

All of the sites surveyed in 1991 were affected to some degree by colliery waste, some sites being covered in a layer of fine dark silt up to 50cm deep. Some sites were visibly affected by sewage pollution, and at one point a “slick of dark suspended solids” was recorded by the survey divers.³

In 2009, small lumps of coal were visible at one site and coal dust was recorded in the sandy habitats, but the quantities present were small and seemed to have no adverse impact on the marine life.

In 1991 the water was turbid with suspended black silt³, while in August 2009 the underwater visibility was up to 5 metres. The current abundance of filter-feeding sessile animals, particularly sponges, suggests that water quality has improved greatly.

Seven habitat types were recorded in 1991. The 2009 survey did not cover such a wide range of habitats because the sites surveyed were all fairly shallow and close to shore. Nevertheless, even though the same broad habitat types tended to occur at each site (infralittoral rock with kelp and red seaweeds, circalittoral rock with animal turf, coarse sublittoral sediment), there was significant variation in the dominant communities from one site to the next.

A species list was not produced as part of the 1991 survey, but the report states that species diversity was generally low, particularly in the shallower sites. At one site, no life was recorded except for a few spirorbid worms, while at another site a few starfish were the only visible life. At the deeper sites, dead men's fingers and hornwrack were prominent, but species diversity was still low.³

The divers who carried out the 2009 survey were surprised and impressed by the diversity of species and habitats at the sites, which some described as ‘teeming with life’. The number of species recorded in just six dives is very encouraging, especially considering that these records are limited to species that could be identified with confidence *in situ* or from digital photographs.

Species of particular interest include plaice and common sole, which are priority species for conservation in the UK Biodiversity Action Plan. The *Sabellaria spinulosa* worms recorded at three sites are significant because the reefs they build are a Biodiversity Action Plan priority habitat. Plaice, sole, common lobsters and edible crabs are also of interest as commercial fishery species.

The following recommendations arise from the results of this survey:

1. The southern section of Heritage Coast should be surveyed in 2010, as this site could not be surveyed in 2009 due to poor diving conditions.
2. A greater range of sites should be surveyed, including sites further offshore and in deeper water, perhaps revisiting some of the deeper sites surveyed in 1991. In particular, the 1991 survey recorded large specimens of the horse mussel *Modiolus modiolus* at two sites around 5km offshore and at 27-30m depth. This would be worth investigating, as horse mussel beds are a Biodiversity Action Plan habitat.
3. Efforts should be made to record some of the more difficult taxonomic groups to species level. This could be achieved by engaging Seasearch experts from outside the area to take part in future surveys, or by taking samples of specimens (such as sponges) to enable identification through microscopy.
4. Focussed surveys should take place to assess and monitor the abundance and distribution of key species, e.g. Biodiversity Action Plan or commercial species.
5. Shore surveys should be conducted to generate data on the habitats and species present in the intertidal zone. Methodologies which could be adopted include the “Shoresearch” methodology developed by Seasearch and the Wildlife Trusts, OPAL's “Big Seaweed

Search”, the Shark Trust’s “Great Eggcase Hunt” or the Shore Thing methodology developed by MarLIN at the Marine Biological Association. This could provide an opportunity to involve a wider range of people in recording marine life along the Durham Heritage Coast, continuing the valuable community engagement work initiated by the Turning the Tide projects and the Durham Heritage Coast management plan.

6. Annual surveys should be carried out to monitor the distribution and composition of sedimentary habitats, as these are likely to change due to ongoing coastal erosion and drift.
7. Information from this survey should be made available to Net Gain, the project to recommend the location of Marine Conservation Zones in the North Sea by the end of 2011. In particular, the Durham coast should be highlighted as a successful case study to emphasise the importance of protecting and enhancing areas for their *potential* to support biodiversity, rather than focussing only on protecting areas which already support priority habitats or species.

References

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Appendix 1: List of Observation and Survey Forms

2009 Seasearch Durham Heritage Coast Survey				
Observation Forms		33		
Survey Forms		3		
Kelp Garden	Allison Gleadhill	Observation Form	31/08/2009	NE9/120
	Mark Hammond	Observation Form	31/08/2009	NE9/106
	Caroline Slater	Observation Form	31/08/2009	NE9/096
	Carrie Pillow	Observation Form	31/08/2009	NE9/091
	Jane Willis	Observation Form	31/08/2009	NE9/094
	Michelle Simpson	Observation Form	31/08/2009	NE9/141
Nose's Point	Chris Newton	Observation Form	30/08/2009	NE9/081
	Christine Maddison	Observation Form	30/08/2009	NE9/087
	Gavin Scott	Observation Form	30/08/2009	NE9/112
	Joanna Jackson	Observation Form	30/08/2009	NE9/079
	Keith Best	Observation Form	30/08/2009	NE9/103
	Suzanne Beal	Observation Form	30/08/2009	NE9/104
	Paula Lightfoot	Survey Form	30/08/2009	NE9/126
Phil's Drift	Chris Newton	Observation Form	30/08/2009	NE9/083
	Christine Maddison	Observation Form	30/08/2009	NE9/088
	Joanna Jackson	Observation Form	30/08/2009	NE9/080
	Gavin Scott	Observation Form	30/08/2009	NE9/113
	Keith Best	Observation Form	30/08/2009	NE9/101
	Suzanne Beal	Observation Form	30/08/2009	NE9/102
	Paula Lightfoot	Survey Form	30/08/2009	NE9/078
Phil's Drift East	Allison Gleadhill	Observation Form	31/08/2009	NE9/119
	Mark Hammond	Observation Form	31/08/2009	NE9/105
	Caroline Slater	Observation Form	31/08/2009	NE9/097
	Carrie Pillow	Observation Form	31/08/2009	NE9/090
	Jane Willis	Observation Form	31/08/2009	NE9/093
	Spencer Cook	Observation Form	31/08/2009	NE9/142
Pin Cushion / Anemone Carpet	Allison Gleadhill	Observation Form	31/08/2009	NE9/121
	Mark Hammond	Observation Form	31/08/2009	NE9/107
	Caroline Slater	Observation Form	31/08/2009	NE9/095
	Carrie Pillow	Observation Form	31/08/2009	NE9/100
	Jane Willis	Observation Form	31/08/2009	NE9/092
	Spencer Cook	Observation Form	31/08/2009	NE9/143
Salterfen Rocks	Chris Newton	Observation Form	30/08/2009	NE9/082
	Christine Maddison	Observation Form	30/08/2009	NE9/089
	Gavin Scott	Observation Form	30/08/2009	NE9/114
	Paula Lightfoot	Survey Form	30/08/2009	NE9/127

Appendix 2: Species List

List of species recorded at 6 sites on the Durham Heritage Coast, 30th-31st August 2009

	Scientific name	Common name	Kelp Garden	Nose's Point	Phil's Drift	Phil's Drift East	Pin Cushion (Anemone Carpet)	Salterfen Rocks
Sponges	<i>Amphilectus fucorum</i>	Grated carrot sponge	✓			✓	✓	✓
Sponges	<i>Cliona celata</i>	Boring sponge	✓	✓		✓		
Sponges	<i>Halichondria panicea</i>	Breadcrumb sponge	✓			✓	✓	
Sponges	<i>Myxilla incrustans</i>	Encrusting yellow sponge		✓				✓
Sponges	Porifera	Sponge (unidentified)	✓	✓	✓	✓	✓	
Sponges	<i>Scypha compressa</i>	Purse sponge						✓
Sponges	<i>Suberites sp.</i>	Sea orange	✓			✓		
Cnidarians	<i>Actinia equina</i>	Beadlet anemone	✓	✓		✓		
Cnidarians	<i>Alcyonium digitatum</i>	Dead men's fingers		✓		✓		
Cnidarians	<i>Aurelia aurita</i>	Moon jellyfish			✓			
Cnidarians	<i>Caryophyllia smithii</i>	Devonshire cup-coral		✓				
Cnidarians	<i>Cereus pedunculatus</i>	Daisy anemone					✓	
Cnidarians	Hydroida	Feather hydroids		✓	✓	✓	✓	✓
Cnidarians	<i>Metridium senile</i>	Plumose anemone	✓					
Cnidarians	<i>Nemertesia antennina</i>	Antenna hydroid		✓	✓	✓	✓	
Cnidarians	<i>Obelia geniculata</i>	Kelp fir	✓	✓				
Cnidarians	<i>Sagartia elegans</i>	Elegant anemone		✓				
Cnidarians	Scyphozoa	a jellyfish		✓				
Cnidarians	<i>Tubularia indivisa</i>	Oaten pipe hydroids		✓	✓	✓		
Cnidarians	<i>Urticina eques</i>	Horseman anemone						✓
Cnidarians	<i>Urticina felina</i>	Dahlia anemone	✓	✓	✓	✓	✓	✓
Worms	<i>Arenicola sp.</i>	Lugworm		✓		✓		
Worms	<i>Eulalia viridis (eggs)</i>	Green leaf worm (eggs)	✓					
Worms	<i>Lanice conchilega</i>	Sandmason worm			✓			
Worms	<i>Myxicola infundibulum</i>	Eyelash worm			✓			
Worms	<i>Pomatoceros sp.</i>	Keel worm	✓		✓			

	Scientific name	Common name	Kelp Garden	Nose's Point	Phil's Drift	Phil's Drift East	Pin Cushion (Anemone Carpet)	Salterfen Rocks
Worms	<i>Sabella pavonina</i>	Peacock worm			✓			
Worms	<i>Sabellaria spinulosa</i>	Ross worm		✓	✓			✓
Crustaceans	<i>Cancer pagurus</i>	Edible crab	✓	✓	✓	✓	✓	✓
Crustaceans	<i>Carcinus maenas</i>	Shore crab		✓				
Crustaceans	Cirripedia	Barnacles (unidentified)	✓	✓	✓		✓	✓
Crustaceans	<i>Crangon crangon</i>	Brown shrimp			✓			
Crustaceans	<i>Galathea dispersa</i>	Squat lobster		✓				✓
Crustaceans	<i>Galathea strigosa</i>	Spiny squat lobster		✓	✓	✓		✓
Crustaceans	Galatheidae	Squat lobster (unidentified)	✓	✓	✓			
Crustaceans	<i>Homarus gammarus</i>	Common lobster	✓	✓	✓	✓	✓	✓
Crustaceans	<i>Hyas araneus</i>	Sea toad	✓					
Crustaceans	<i>Inachus sp</i>	Small spider crab	✓	✓	✓	✓	✓	✓
Crustaceans	<i>Ligia oceanica</i>	Sea slater		✓				
Crustaceans	<i>Liocarcinus depurator</i>	Harbour crab	✓	✓				
Crustaceans	<i>Macropodia sp.</i>	Spindly spider crab			✓	✓	✓	
Crustaceans	<i>Munida rugosa</i>	Long-clawed squat lobster			✓			✓
Crustaceans	<i>Necora puber</i>	Velvet swimming crab	✓	✓	✓	✓	✓	✓
Crustaceans	<i>Pagurus bernhardus</i>	Hermit crab			✓	✓		✓
Crustaceans	<i>Palaemon serratus</i>	Common prawn	✓		✓	✓	✓	
Crustaceans	Caridea	Prawn (unidentified)		✓	✓	✓		
Crustaceans	<i>Pandalus montagui</i>	Humpbacked prawn	✓	✓	✓	✓	✓	✓
Molluscs	<i>Aequipecten opercularis</i>	Queen scallop				✓		
Molluscs	<i>Goniodoris nodosa</i>	Nudibranch						✓
Molluscs	<i>Facelina auriculata</i>	Nudibranch			✓			
Molluscs	<i>Flabellina pedata</i>	Violet sea slug			✓			
Molluscs	<i>Helcion pellucidum</i>	Blue-rayed limpet	✓					
Molluscs	<i>Hinia reticulata</i>	Netted dog whelk			✓			
Molluscs	<i>Janolus cristatus</i>	Crystal sea slug	✓					✓
Molluscs	<i>Mytilus edulis</i>	Blue mussel	✓				✓	

	Scientific name	Common name	Kelp Garden	Nose's Point	Phil's Drift	Phil's Drift East	Pin Cushion (Anemone Carpet)	Salterfen Rocks
Molluscs	Nudibranchia	Nudibranch (unidentified)	✓	✓			✓	
Molluscs	<i>Polycera faroensis</i>	Nudibranch					✓	
Molluscs	<i>Polycera quadrilineata</i>	Four lined polycera	✓		✓		✓	✓
Molluscs	<i>Sepiolo atlantica</i>	Little Cuttle			✓			
Molluscs	<i>Trivia sp.</i>	Cowry			✓			✓
Bryozoans	<i>Alcyonidium diaphanum</i>	Sea chervil		✓				
Bryozoans	<i>Electra pilosa</i>	Frosty sea mat			✓			✓
Bryozoans	<i>Flustra foliacea</i>	Hornwrack	✓		✓	✓	✓	
Bryozoans	<i>Membranipora membranacea</i>	Sea mat	✓				✓	✓
Bryozoans	<i>Securiflustra securifrons</i>	Square-end hornwrack						✓
Echinoderms	<i>Asterias rubens</i>	Common starfish	✓		✓	✓	✓	✓
Echinoderms	<i>Echinus esculentus</i>	Common urchin			✓	✓		
Echinoderms	<i>Luidia ciliaris</i>	Seven-armed starfish						✓
Echinoderms	<i>Ophiothrix fragilis</i>	Common brittle star		✓	✓			✓
Echinoderms	Ophiuroidea	Brittle star (unidentified)	✓				✓	
Sea squirts	<i>Ciona intestinalis</i>	Yellow ringed sea squirt			✓			
Sea squirts	<i>Dendrodoa grossularia</i>	Gooseberry sea squirt			✓			
Fish	<i>Callionymus lyra</i>	Common dragonet					✓	
Fish	<i>Ctenolabrus rupestris</i>	Goldsinny					✓	
Fish	<i>Echiichthys vipera</i>	Lesser weever fish		✓				
Fish	<i>Eutrigla gurnardus</i>	Grey gurnard		✓				
Fish	Gobiidae	Goby (unidentified)		✓				
Fish	<i>Merlangius merlangius</i>	Whiting						✓
Fish	<i>Myxocephalus scorpius</i>	Short-spined sea scorpion	✓				✓	
Fish	<i>Pholis gunnellus</i>	Butter fish	✓	✓	✓	✓	✓	✓
Fish	<i>Pleuronectes platessa</i>	Plaice	✓	✓	✓			
Fish	<i>Pomatoschistus minutus</i>	Sand goby			✓			
Fish	<i>Solea solea</i>	Sole				✓		
Fish	<i>Thorogobius ephippiatus</i>	Leopard spotted goby		✓	✓	✓		✓

	Scientific name	Common name	Kelp Garden	Nose's Point	Phil's Drift	Phil's Drift East	Pin Cushion (Anemone Carpet)	Salterfen Rocks
Fish	<i>Trisopterus luscus</i>	Bib			✓			
Fish	<i>Taurulus bubalis</i>	Long-spined sea scorpion	✓	✓		✓	✓	✓
Seaweeds	Chlorophyta	Mixed green seaweeds		✓				
Seaweeds	<i>Delessaria sanguinea</i>	Sea beech	✓		✓			✓
Seaweeds	<i>Laminaria digitata</i>	Kelp		✓				
Seaweeds	<i>Laminaria hyperborea</i>	Kelp	✓	✓	✓		✓	✓
Seaweeds	Rhodophyta	Mixed red seaweed	✓	✓	✓	✓	✓	
Seaweeds	<i>Ulva latuca</i>	Sea lettuce	✓					
Seaweeds	Lithophylloideae	Pink algae (unidentified)	✓					
Pycnogonids	Pycnogonida	Sea-spider (unidentified)			✓			✓

Total number of species	39	42	47	31	30	34
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Survey effort	6 Obs	6 Obs	6 Obs	6 Obs	6 Obs	3 Obs
Obs: Observation Form						
Surv: Survey Form		1 Surv	1 Surv			1 Surv