REPORT OF THE

SUSSEX *SEASEARCH* PROJECT

1992-1998

DECEMBER 1999

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BY

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Full reference: Irving, R.A. 1999. *Report of the Sussex SEASEARCH Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes & Brighton & Hove Council, Brighton.

FROM 1992 UNTIL 1998, THE SUSSEX *SEASEARCH* PROJECT
HAS BEEN SUPPORTED BY THE FOLLOWING ORGANISATIONS:

Arun District Council

Brighton & Hove Unitary Authority

Booth Museum (Brighton & Hove Unitary Authority)

Chichester Harbour Conservancy

East Sussex County Council

English Nature (Surrey & Sussex team)

Environment Agency (Southern Region)

Hastings Borough Council

Joint Nature Conservation Committee

Lewes District Council

Marine Conservation Society

Rother District Council

Standing Conference On Problems Associated with the Coastline (SCOPAC)

Sussex Downs Conservation Board

Sussex Sea Fisheries Committee

Sussex Wildlife Trust

West Sussex County Council

Wealden District Council

Worldwide Fund for Nature (UK)

Front cover photograph: SEASEARCH diver recording details of the seabed off Littlehampton, August 1993. Photographer: Robert Irving.

NON-TECHNICAL SUMMARY

Please note: an 8-page Summary of this Report is included at the back of this report. Further copies are available, free of charge, from:English Nature, Howard House, 31 High Street, Lewes, East Sussex BN7 2LU

Background

The Sussex *SEASEARCH* project started out as being the West Sussex *SEASEARCH* project and was due to last two years (1992-93), investigating the near-shore area between Chichester Harbour and Littlehampton. The interest shown by all parties involved with this first project led to its life being extended by a further three years (until the end of 1996), and then for another three years until the end of 1999, its geographical coverage also extending to include the whole Sussex coast. This report follows the project's progress through its first seven years, from 1992 until 1998.

SEASEARCH is a methodology for surveying near-shore seabed habitats and their associated biological communities by sports divers off the coast of Great Britain. It is designed to be undertaken by volunteers with an interest in natural history and marine nature conservation. *SEASEARCH* is run by the Marine Conservation Society (MCS) on behalf of the Joint Nature Conservation Committee (JNCC), English Nature, the Countryside Council for Wales and Scottish Natural Heritage. The surveys were originally designed to contribute to the Marine Nature Conservation Review (MNCR) of Great Britain, which was being undertaken by the JNCC between 1986 and 1998. *SEASEARCH* is a 'Phase 1' ecological survey which aims to describe and define the extent of broad categories of seabed habitat and community types. At the same time as recording habitat types, the presence of human activities and impacts is also noted.

Outcomes

One of the great successes of the Sussex Project has been the number of volunteer divers that have taken part in it. Up to the end of 1998, **218 volunteers** had dived on behalf of the Project. Participants have mostly been members of the Marine Conservation Society's SE Group, based in the London area. However, a number of divers from dive clubs within Sussex and elsewhere in the South East have also been involved.

In all, **636 dives** have been completed during the seven year period from May 1992 until October 1998. The majority of sites have been visited just once, though on occasion, repeat dives at the same sites have been made. This has allowed comparisons to be made of the recording abilities of different diving pairs.

Most dives have been undertaken during dedicated *SEASEARCH* dive weekends. Typically, these have happened once a month during the summer, on weekends coinciding with neap tides. Up to 25 people have attended any one of these weekends, though numbers have always been limited by the available space in boats. Fortunately, there has never been a shortage of divers! All of the results from the Project Recording Forms have been entered onto a database held at the Booth Museum in Brighton.

End Products

A number of 'end products' have been produced over the years, resulting from work the Sussex Project has undertaken and tying-in with the conservation and educational objectives of the Project. These have included:-

- A draft Sublittoral Habitat Manual for West Sussex
- A Training & Promotion Video
- A colour poster entitled *Undersea Sussex*
- A species identification guide for divers entitled *Sussex Marine Life*
- A marine SNCIs report and leaflet

- Development of *SEASEARCH* recording methodology

The investment by the organisations listed below in the management and day-to-day running of the Project, on an annual basis, has already started to pay off. We now know far more about the near-shore seabed off Sussex than we did just seven years ago. The knowledge that has been acquired is now being utilised to support new initiatives and to comment on various proposed activities. The Project has provided the means for:

- An assessment to be made of the nature conservation value of Sussex's near-shore seabed.
- The creation and identification of Marine Sites of Nature Conservation Importance (mSNCIs), the first such non-statutory sites in the country.
- Establishing a comprehensive database and for the interrogation and analysis of its data.
- The collection of samples/data for scientific research.
- Commenting on applications for aggregate dredging licences off the Sussex coast.
- Contributing towards nature conservation publications, such as the JNCC's *Coastal Directory* Series (Region 8) and English Nature's *Natural Area Profile* (Folkestone to Selsey Bill).

The main conclusions of the Project so far are:-

- Our knowledge of the near-shore seabed habitats and biological communities present off the Sussex coast has been extended considerably.
- This has been done in a cost-effective way by using the skills of volunteer divers to record scientific information.
- The training of divers and the development of aids for them to use under water has increased their awareness of the underwater environment and their own recording capabilities.
- Checks on the accuracy of this information are essential for any reliability to be placed on the data. This has been done at various stages of data assimilation. Information on habitat types is likely to be of a higher quality than that of species recognition.

The future

The Sussex *SEASEARCH* Project will continue into the year 2000 and beyond (given that adequate funding is provided). Emphasis will now be targeted towards:-

- Promotion of the project to local dive clubs
- Filling-in gaps in survey coverage
- Producing a sublittoral habitat manual for the whole of the Sussex coast
- Identifying further marine SNCIs
- Maintenance of the database and developing links with the National Biodiversity Network

The Sussex *SEASEARCH* project is supported by the following organisations: the County and District Councils of Sussex, Booth Museum, Chichester Harbour Conservancy, English Nature, Environment Agency, Joint Nature Conservation Committee, Marine Conservation Society, Standing Conference On Problems Associated with the Coastline (SCOPAC), Sussex Downs Conservation Board, Sussex Sea Fisheries Committee, Sussex Wildlife Trust and World Wide Fund for Nature (UK)

Further information about the Sussex SEASEARCH Project is available from:-

English Nature (Surrey & Sussex Team), Howard House, 31 High Street,
Lewes, East Sussex BN7 2LU Tel. 01273 476595

CONTENTS

1. Introduction

In order to carry out effective conservation management of coastal ecosystems, comprehensive knowledge is required of the marine habitats and their associated communities (which together are referred to as 'biotopes'). The *SEASEARCH* project, which relies upon the participation of volunteer sports divers to record what they see during their dives, is designed to provide baseline information for the description and mapping of near-shore sublittoral biotopes (i.e. those below low water mark) at a Phase 1 level.

1.1 Background

SEASEARCH is a survey of near-shore seabed habitats and their associated biological communities off the coast of Great Britain. It is designed to be undertaken by volunteer sports divers with an interest in natural history and marine nature conservation. The project was devised in the mid-1980s as a result of discussions between Dr Bob Earll (then Head of Conservation at the Marine Conservation Society, Ross-on-Wye) and Dr Roger Mitchell (then Head of the Marine Science Branch at the Nature Conservancy Council, Peterborough). It was then developed further by Dr Bob Foster-Smith of Newcastle University.

SEASEARCH is run by the Marine Conservation Society (MCS) on behalf of the Joint Nature Conservation Committee (JNCC)[1], which is based in Peterborough. *SEASEARCH* surveys are primarily designed to contribute to the Marine Nature Conservation Review (MNCR) of Great Britain, which was undertaken by the JNCC between 1986 and March 1998. One of the main aims of the MNCR was to describe marine ecosystems around Great Britain from the highest zone on the shore (or the normal tidal limit of estuaries) to the 12 nautical mile limit of territorial waters.

SEASEARCH is a 'Phase 1' ecological survey which aims to describe and define the extent of broad categories of seabed habitat and community types. In theory, this information can be used to plan more detailed 'Phase 2' surveys which involve much more recording of species. At the same time as recording habitat types on *SEASEARCH* dives, the presence of human activities and impacts is noted, thus supplying information of value in assessing the effects of human activities on the local marine environment.

The main aims of *SEASEARCH*[2] are (Earll 1992):-

1. To gather information in the sublittoral habitats and major community types at selected areas around the coasts of Great Britain.
2. To note the presence of any human activities and possible impacts in the survey areas.
3. To note areas which appear of particular interest because of the scenic value, habitat diversity and species richness;
4. To illustrate the habitats with photographs where possible.
5. To produce a report of each area surveyed.

Further details of *SEASEARCH* can be obtained by writing (enclosing a large S.A.E.) to:-

MARINE CONSERVATION SOCIETY, 9 Gloucester Road, Ross-on-Wye, Herefordshire HR9 5BU
Tel. 01989 566017

[1] The JNCC is the statutory body constituted by the Environment Protection Act 1990 to be responsible for advice on nature conservation at UK and international levels. The JNCC is established by English Nature (EN), Scottish Natural Heritage (SNH) and the Countryside Council for Wales (CCW).
[2] The *SEASEARCH* Project is currently being reviewed and reassessed by MCS which may lead to changes in the project's stated aims and objectives.

SEASEARCH as a recording methodology has been undertaken at various locations around the country during the past ten years by Marine Conservation Society volunteer divers. Examples include a survey of Loch Broom and Little Loch Broom (Gubbay & Nunn 1988); a survey of Gruinard Bay, Loch Ewe and Loch Gairloch (Gubbay 1990); a survey of the sandstone reefs south-east of Eastbourne (Wood 1990); a survey of Berwick and Dunbar (Foster-Smith & Carrie 1992); and surveys of north-east England and south-east Scotland (Foster Smith 1992). A *SEASEARCH* Habitat Manual, providing descriptions of various near-shore seabed habitats present around the British Isles, was produced by Dr Bob Earll in 1992 (Earll 1992).

Since 1992, *SEASEARCH* surveys and projects have been undertaken off the coasts of Dorset; Jersey; Isles of Scilly; St Agnes, north Cornwall; Lundy; Cardigan Bay; Llyn peninsula; Anglesey; Morecambe Bay; various islands and sea lochs off the west coast of Scotland; and Orkney.

1.2 The Sussex SEASEARCH Project

The Sussex *SEASEARCH* project developed from the success of a much smaller, less ambitious project which had a two year life-span (1992-93) and was entitled the West Sussex *SEASEARCH* project. This was initiated in 1990 as a result of discussions between English Nature and Arun District Council. These discussions concerned the possibility of incorporating information on sublittoral wildlife and its conservation in the proposed coastal zone management plan which Arun District Council were devising at the time.

A number of organisations[3], all of which had (and still have) responsibilities in the near-shore zone off West Sussex, agreed to commission a desk study to assess what was known already about the near-shore coastal zone between Chichester Harbour and Littlehampton. The report, written by Dr Elizabeth Wood entitled *Coastal zone planning: information review and survey proposals for the sublittoral zone between Arun and Chichester* (Wood 1992a), gathered together all the relevant information that was available for this section of the coast, including information on bathymetry, hydrology, geology, historical change, substratum types, archaeological interests, waste disposal, fisheries, mineral extraction, shipping and navigation, recreation, and educational and research uses. One of the recommendations of this study was to adopt the *SEASEARCH* methodology of diving survey, in order to fill in gaps in what was known about the seabed habitats off this stretch of coast.

The seaward limit of the above desk study was set at 6 km offshore, and it was agreed that this would provide a suitable 'approximate' seaward boundary for the *SEASEARCH* survey. However, the extent of the survey was not to be restricted to this boundary - if there were likely to be sites of interest beyond this which were accessible by dive boats (and also shallower than 30 m in depth), then these should still be investigated.

English Nature has been the lead agency in supporting and developing the Sussex *SEASEARCH* project. In their original proposal for the West Sussex *SEASEARCH* project, they state:

"English Nature is committed to maintaining the range and diversity of marine communities and species in our seas and in promoting the sustainable use of the marine environment. We wish to do this in close collaboration with others."

[3] English Nature, the National Rivers Authority [now the Environment Agency], West Sussex County Council, Chichester Harbour Conservancy and Arun District Council.

1.3 Project Objectives

The main aim of the Sussex *SEASEARCH* project was:

To determine the interest and relative nature conservation value of the shallow sublittoral zone off the whole length of the Sussex coast, from Chichester Harbour to Rye Harbour.

The project's specific objectives were:-

1. *To identify and describe the range of seabed types, topography and communities within the area, and to assign significance/importance ratings to them.*
2. *To identify unusual or vulnerable habitats and communities which may be threatened by shore-based or marine activities, e.g. dredging, sewage disposal, fishing or recreational activities.*
3. *To provide baseline 'Phase 1' survey information for future monitoring.*
4. *To produce a habitat manual which details the range of habitats encountered and their associated animal and plant communities, which will provide a basis for future work in the SE coastal zone.*
5. *To educate volunteer divers in basic survey methods and to foster an interest and commitment to marine conservation in the south-east.*
6. *To provide guidance on possible policies for marine conservation to be incorporated into coastal zone planning.*
7. *To develop the survey method and organisation for possible use in the remainder of the coastal cell.*

2. Information gathering

2.1 Existing sources of information

The Sussex *SEASEARCH* project was designed to build on existing, limited, information that was known from selected areas off the Sussex coast. Reports have been written up for those projects mentioned below and the information exists in the public domain. However, several other studies are known to have taken place in the private sector but, sadly, the reports from many of these remain confidential. A book entitled *Dive Sussex* by Kendall McDonald was published in 1985 and provides details of most of the popular dive sites (particularly of shipwrecks) off the Sussex coast.

2.1.1 SEMCS Sussex Sublittoral Survey, 1982-83

This extensive project (between Selsey Bill and Beachy Head) was undertaken on behalf of the Nature Conservancy Council (NCC) by members of the South East Group of the Marine Conservation Society, under the guidance of Chris Wood (Wood 1984). A total of 60 sites were visited over the two years and descriptions were made of all the known sublittoral habitats in the area. At each site, records were made of the presence/absence of 33 'key' species and, where feasible, more detailed species lists were drawn up. A total of 345 species of flora and fauna were recorded, representing the following groups:

> algae 97 spp; sponges 41 spp; cnidarians 41 spp; 'worms' 17 spp; bryozoans 21 spp; molluscs 30 spp; crustaceans 30 spp; echinoderms 6 spp; tunicates 16 spp; & fishes 48 spp.

Several of the sites visited during the 1982/83 survey have been re-visited during the present survey; these have usually been well-known dive sites such as the Outer Mulberry, the Waldrons reef or Looe Gate. The survey has provided very useful background information on which the current *SEASEARCH* survey has been able to add further detail.

Another outcome of the SE MCS Sussex Sublittoral Project was the production of a slide set incorporating 40 photographs, the majority of which are of underwater subjects. Copies of this slide set were sold through the Marine Conservation Society.

2.1.2 Other surveys

A number of other diving surveys have been carried out off the Sussex coast, most of which have involved volunteers. The earliest recorded diving surveys were by Hume Wallace in the Selsey Bill area during the mid-1960s, with articles for *Triton* (later to become *Diver* magazine) by Kendall McDonald, who was particularly interested in shipwrecks off the Sussex coast. Brief descriptions of those diving surveys known to the author are given below, in chronological order.

> **Mixon Hole** (see Wallace 1967a & b; Wallace 1990; and Ackers 1977)
>
> The geomorphology, archaeological history and origins of the Hole have been of life-long interest to Hume Wallace, who has studied the whole of the Selsey area intensively for over thirty years. His early studies were of great value to coastal engineers in their studies of near-shore coastal processes in the vicinity of the Bill.
>
> The topography, hydrography and marine life of the Mixon Hole were studied by the Dolphins Underwater Club (based in Aldershot) during 1977 as their contribution to the Underwater Conservation Year's 'Adopt a Site' Scheme. The project was organised by Graham Ackers. Records were made from six visits to the site during the summer of 1977. A total of 86 animal species (including fish) were recorded from the site.

Inner Mulberry (see Cunliffe 1981)

The flora and fauna of this shallow water (partially intertidal) wreck was studied by Sarah Cunliffe as part of her B.Sc. degree from the Polytechnic of Central London. She recorded a total of 28 species of algae and 69 species of macro-invertebrates from the site, made up of the following groups:- sponges (9 spp.); hydroids (7 spp.); anthozoans (4 spp.); polychaete worms (2 spp.); crustaceans (11 spp.); molluscs (11 spp.); bryozoans (6 spp.); sea squirts (9 spp.); fishes (9 spp.).

Bracklesham Bay (see Collins & Mallinson 1983)

Dr Ken Collins and Jenny Mallinson of Southampton University's Department of Oceanography were commissioned by the Nature Conservancy Council to undertake a sublittoral diving survey of the area between Selsey Bill and the East Solent. The principal habitats encountered were sand, gravel, cobble, boulder, clay bedrock and limestone bedrock. Shallow limestone outcrops had the richest flora and fauna. A total of 35 species of algae were recorded and 169 species of macro-invertebrates and fishes (though note that some of these were found west of the Hampshire/West Sussex border). The following groups were represented:- sponges (17 spp.); hydroids (10 spp.); anthozoans (11 spp.); flatworms (1 sp.); polychaete worms (11 spp.); crustaceans (18 spp.); pycnogonids (1 sp.); molluscs (36 spp.); echinoderms (7 spp.); phoronid worm (1 sp.); bryozoans (8 spp.); sea squirts (21 spp.); fishes (27 spp.).

Hastings (see Wood 1986)

A diving survey by SE MCS members was carried out on 12th July 1986 in the near-shore zone close to the cliffs to the east of Hastings, at the invitation of the Nature Conservancy Council and Hastings Borough Council. It was anticipated that the intertidal rock present in this area would extend below low water mark to form low-lying reefs, but this was not found to be the case. At all six sites, the seabed was of medium fine sand. The associated fauna was extremely sparse.

Seven Sisters (see Wood & Jones 1986)

The Sussex Sublittoral Survey (Wood 1984) identified the area around Beachy Head and Cuckmere Haven as being of special interest and of high nature conservation value. As a result, this survey was undertaken at the request of NCC (and with financial support from both NCC and East Sussex County Council) to provide further information on both the intertidal and subtidal sites within the proposed Seven Sisters Voluntary Marine Conservation Area. A total of 35 species of algae and 110 species of macro-invertebrates and fishes were recorded, made up of the following groups: sponges (10 spp.); hydroids (3 spp.); anthozoans (9 spp.); flatworms (1 sp.); nemertean worm (1 sp.); polychaete worms (8 spp.); phoronid worm (1 sp.); bryozoans (4 spp.); molluscs (19 spp.); crustaceans (25 spp.); echinoderms (2 spp.); sea squirts (7 spp.); and fishes (20 spp.).

Sandstone reefs off Eastbourne (see Wood 1990)

Members of SE MCS used *SEASEARCH* survey techniques to collect information on the main habitat and community types in and around the series of offshore reefs lying south-east of Eastbourne. Fifteen different habitat types were identified, the main ones being sand/gravel/cobble mixtures; sandstone boulders; and sandstone rock slabs/reefs. The species list (not comprehensive) included a total of 112 macro-invertebrate and fish species, made up of the following groups: sponges (22 spp.); hydroids (8 spp.); anthozoans (10 spp.); flatworms (1 sp.); polychaete worms (6 spp.); crustaceans (8 spp.); molluscs (15 spp.); bryozoans (8 spp.); phoronid worm (1 sp.); echinoderms (3 spp.); sea squirts (13 spp.); and fishes (17 spp.).

Brighton Marina (see Natural Science Services 1991)

A survey was carried out by members of SE MCS on behalf of NCC during the summers of 1990 and 1991. Recording by diving of species attached to the floating pontoons, the muddy seabed and the walls of the outer marina was undertaken. Samples of plankton, mud and scrapings off walls were also taken and analysed later. The species list included 4 species of algae and 171 species of macro-invertebrates and fishes, made up of the following groups: sponges (11 spp.); hydroids (19 spp.); anthozoans (10 spp.); scyphozoans (3 spp.); ctenophores (1 sp.); polychaete worms (23 spp.); nemertean worms (1 sp.); crustaceans (39 spp.); pycnogonids (4 spp.); molluscs

(15 spp.); bryozoans (5 spp.); chaetognaths (1 sp.); echinoderms (3 spp.); sea squirts (14 spp.); and fishes (22 spp.).

Chalk reefs (see Wood 1992b)

As part of a study of sublittoral chalk habitats in southern England, fringing chalk reefs and offshore chalk reefs in Sussex were surveyed between 1985 and 1991. This study demonstrated that Sussex was the only location in Britain to have offshore chalk cliffs, as well as chalk reefs. From these two types of chalk habitat, a total of 33 species of algae and species of invertebrates and fishes were recorded, made up of the following groups:- sponges (27 spp.); hydroids (12 spp.); anthozoans (13 spp.); flatworms (1 spp.); nemertean worms (2 spp.); polychaete worms (12 spp.); crustaceans (17 spp.); mollusca (32 spp.); bryozoans (12 spp.); phoronid worm (1 sp.); echinoderms (4 spp.); sea squirts (18 spp.); and fishes (36 spp.).

Chichester Harbour (see Capp 'n' Cook Diving 1996)

As part of an M.Sc. project, a survey of 18 sites (the locations of which were agreed by Philip Couchman of Chichester Harbour Conservancy) was undertaken by Graeme Cappi and Russell Cooke in May 1996. They were able to confirm the rich diversity of sessile fauna found at most sites, which earlier *SEASEARCH* dives within the Harbour had noted. They recorded at total of 5 species of algae and 54 animal species (including fish).

2.1.3 BioMar surveys

The BioMar project, which ran from 1993-1996, was designed to develop techniques for sublittoral mapping of biotopes (seabed habitats and their associated communities). It was funded through the European Union LIFE Programme and involved the following partners: Trinity College (Dublin), The Office of Public Works (Irish Republic), the Joint Nature Conservation Committee (UK) and the University of Newcastle. The team at Newcastle has been involved with developing remote acoustic techniques for mapping seabed biotopes. Under the leadership of Dr Bob Foster-Smith, they visited Sussex on three occasions, from 2-5 May 1995, 10-14 June 1996, and 18-22 August 1997. During the first visit, the stretch of coast between Worthing and Beachy Head was surveyed (Foster-Smith & Davidson 1995); during the second visit, the section between Beachy Head and Rye was surveyed; and during the third visit, the section between Worthing and Pagham was surveyed. A short report on this acoustic survey work, written by Dr Bob Foster-Smith and accompanied by several colour maps, is included in Appendix 1.

The aim of these remote acoustic surveys has been to carry out a broad scale habitat mapping of the near-shore sublittoral zone to obtain data on the types and distribution of biotopes present. Although limited ground-truthing was performed (using a drop-down video), the intention has been to produce a map of seabed types that could be more extensively ground-truthed using volunteer *SEASEARCH* divers. Information on depth (bathymetry) and substratum type (in terms of the roughness and hardness of the seabed) were obtained using a *RoxAnn* signal processor which samples the return echo from a 200kHz echo sounder. Full information on the *RoxAnn* recording methodology is given in Foster-Smith & Davidson (1995).

Funding for the Sussex BioMar surveys came from English Nature, the Environment Agency, and both East and West Sussex County Councils. Though the BioMar project has now finished, the remote acoustic mapping work is being carried on by the same team under the title of SeaMap.

2.2 Existing areas of sublittoral conservation interest

2.2.1 Seven Sisters Voluntary Marine Conservation Area (VMCA)

The Seven Sisters Voluntary Marine Conservation Area (VMCA) was established by East Sussex County Council in June 1987, following considerable interest from a variety of organisations and individuals. The Sussex Sublittoral Survey (Wood 1984) and the Seven Sisters report (Wood & Jones 1986) crystallised this interest and provided the ecological and conservation justification for the designation. The VMCA boundary follows the coastline from the Martello Tower at Seaford (grid ref. TV 485985) to the Wish Tower at Eastbourne (TV 613982), and extends 1 km offshore from the low water mark. It lies adjacent to the South Downs Heritage Coast and the Seven Sisters Country Park (a Site of Special Scientific Interest and a Local Nature Reserve).

References which relate to both intertidal and sublittoral survey work undertaken within the VMCA include Wood & Jones (1986); Tittley *et al.* (1986); and Wood (1992a). A colour information booklet entitled *Seven Sisters Voluntary Marine Conservation Area* was published by East Sussex County Council in 1998.

2.2.2 Solent Maritime candidate Special Area of Conservation

A network of Special Areas of Conservation (SACs) is being established throughout Europe under the Habitats Directive (adopted by Member States in May 1992). Together with Special Protection Areas (SPAs), designated under the Birds Directive, they will form a series of sites known as Natura 2000.

English Nature first identified the Solent and Isle of Wight Sensitive Marine Area (SMA) as being an important area for marine wildlife in 1994 (English Nature 1994). It was then proposed that much of this same area should become an SAC, with the eastern boundary to the Solent Maritime candidate SAC coinciding with that of the existing Solent and Isle of Wight SMA: that is, it would extend as far east as Pagham Harbour. However, in October 1997, English Nature revised the boundary to the cSAC which now only extends as far as West Wittering. This includes East Head at the mouth of Chichester Harbour but excludes the coast and near-shore waters further east. With the exception of the eastern half of Chichester Harbour (which lies within the Solent Maritime cSAC), there are no statutory marine nature conservation areas (covering the sublittoral zone) within either West or East Sussex.

The Solent Maritime cSAC is being submitted to the EC on account of its estuarine interest, though the area it covers will include other marine habitats as well. It includes four estuaries on the north side of the Isles of Wight (Yar, Medina, Kings Quay Shore and Newtown Harbour); and four on the mainland: (Beaulieu, Hamble, Langstone Harbour and Chichester Harbour). SACs will be managed in such a way as "to maintain biodiversity and to maintain a favourable conservation status of the habitats and species involved" (Laffoley, 1997). There will also be an obligation to undertake monitoring and surveillance of sites.

2.3 Participation of volunteer divers

Fortunately, there has been very little trouble in encouraging divers to take part in *SEASEARCH* dives. The majority of divers taking part in the project, particularly during the first two years, have been members of the South East Group of the Marine Conservation Society (SE MCS). SE MCS is a well organised and active group, with a large number of divers willing to participate in worthwhile survey projects. As awareness of the project grew amongst local divers and diving clubs, and as it has spread eastwards along the coast from Chichester, so the number of individual divers from other local clubs has increased, even though this has mostly been through attending Sussex *SEASEARCH* dive weekends. The number of divers participating in the organised

dive weekends has had to be limited, on occasion, as a result of a lack of boats in which to take them to dive sites (see also section 2.4.2).

One surprising aspect has been the distance participants have been willing to travel to take part in the project. Whilst the majority of divers have been based in the Sussex/Surrey/south London area, individuals have attended dive weekends on a regular basis from as far afield as Lymington (85 miles), Maidenhead (90 miles), Watford (95 miles), Peterborough (155 miles), Cambridge (120 miles) and Burnham-on-Crouch (95 miles) (approximate distances to Brighton). The long-distance record, however, goes to someone who travelled from Wakefield in Yorkshire to attend a Training Day at Bognor (starting at 9.30 a.m.) and returned home that same evening - an all-round trip of 450 miles!

Year	1992	1993	1994	1995	1996	1997	1998	Total
No. of completed Dive Forms	37	98	202	119	60	82	38	636
No. of volunteers undertaking dives each year	22	55	88	43	41	51	27	218 (= total no. of participants over 7 years)

Table 1. Numbers of completed Dive Recording Forms and of volunteers taking part in the project between 1992 and 1996. These numbers are represented pictorially in Fig. 1.

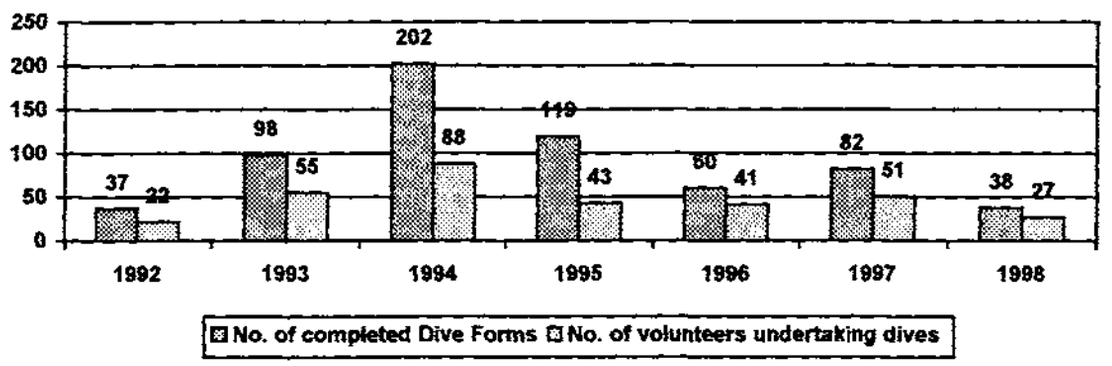


Fig. 1. Pictorial representation of Table 1.

By the end of 1998, a total of 218 individuals had participated in the project. As can be seen in Fig. 1, the greatest number of participants (and the largest number of completed survey forms) was during 1994. This was in part due to news of the project reaching a wider audience, but also because only one of the six planned *SEASEARCH* dive weekends had to be cancelled that year (see Table 4). It is not so easy to say why numbers of participants tailed off after 1994. It should not be forgotten though, that the number of participants on any one weekend was limited by the number of boats available: if only two RIBs were available, each taking six divers, then even if the number of divers wishing to participate exceeded 20, only 12 could be accommodated.

The maximum number of *SEASEARCH* dives undertaken by individuals between 1992-97 is shown in Fig. 2. As can be seen, just over 50% of participants (63 + 48 out of 218) only took part in one or two *SEASEARCH* dives. This perhaps reflects a 'try-it-and-see' approach to taking part in the project, with many finding it was not quite what they wanted to do. Of course, there could be several other reasons besides this one. Congratulations are due to those who persisted beyond a couple of dives, especially the 30 individuals (~14%) who accomplished ten or more *SEASEARCH* dives.

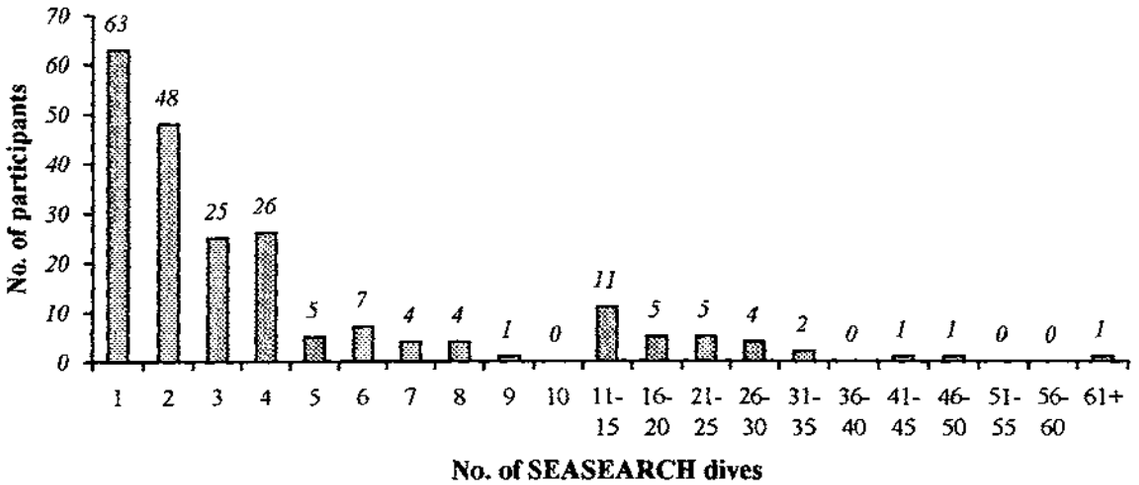


Fig. 2. No. of SEASEARCH dives undertaken by individuals participating in the project (1992-1998).

2.4 Training & survey dives

The majority of completed recording forms have been returned after *dedicated SEASEARCH* dives. Very few have been returned from individuals taking part in their own diving club dives (this fact is discussed in greater detail below).

2.4.1 Training Days

A number of project Training Days were organised at the start of each diving season, usually in March or April and sometimes in May. These were held at various venues on the coast, the essential requirements being a room that could be darkened for showing slides and OHPs, and seating for up to 20 people. The programme for each of the days followed a similar format: a theory session in the classroom during the morning (see Table 2.) was followed by a dive in the afternoon to put the theory into practice. Participants then assembled back in the classroom (or local café or pub) to write up recording forms.

Time	Topic
09.30	What is *SEASEARCH* all about? The national picture & the local context. Background to the Sussex project: what has been achieved so far & what is planned for the coming year and beyond.
10.00	Talking through the project's Promptsheet and Recording Forms.
10.45	*Coffee/tea break*
11.00	Recognition & description of different seabed habitats (slides)
11.45	Recognition of common species (slides)
12.30	End *Lunch break*
14.00	Dive boat(s) depart for single dive in local vicinity
16.30	Re-assemble for writing up recording forms (in classroom or local café or pub)
18.00	Depart

Table 2. Training Day programme.

Date	Venue	Comments
4.4.92	Swanage	No diving planned
5.4.92	Swanage	No diving planned
12.4.92	Brighton	No diving planned
17.4.93	Selsey	Diving OK
18.4.93	Selsey	Diving OK
19.3.94	Brighton	Diving cancelled – poor weather
20.3.94	Brighton	Diving OK
9.4.94	Littlehampton	Diving cancelled – poor weather
23.4.94	Bognor	Diving cancelled - poor weather
25.3.95	Bognor	Diving cancelled – poor weather
26.3.95	Bognor	Diving cancelled – poor weather
22.4.95	Brighton	Diving cancelled – poor weather
23.4.95	Brighton	Diving cancelled – poor weather
27.4.96	Brighton	Diving OK
28.4.96	Brighton	Diving OK
12.4.97	Brighton	Diving OK
26.4.97	Brighton	Diving OK
27.4.97	Brighton	Diving OK
16.05.98	Brighton	Diving OK
17.05.98	Brighton	Diving OK

Table 3. Project Training Days, 1992-1998.

Interest in most of these Training Days by dive clubs within the south-east was encouraging. For instance, in 1994, 13 diving clubs in the south-east were represented on the three Training Days. However, as mentioned previously, participation by those clubs in *SEASEARCH* dives thereafter and returning completed recording forms has been disappointing. One wonders whether this indicates they considered the project to be too complicated for them; or that their interest was overshadowed by what fellow club members wished to do; or that their club had decided to visit sites outside Sussex.

2.4.2 *SEASEARCH* dive weekends

As mentioned above, the majority of completed *SEASEARCH* dive recording forms have been returned after organised diving weekends (mostly from SE MCS members). Usually five or six such weekends have been organised each summer by the project co-ordinator and others, on a monthly basis, timed to coincide with neap tides (as set out in Table 4).

Whilst there has been no lack of participants eager to take part in these weekends, on occasion numbers have had to be limited by the number of boats available. The project has relied heavily on the generosity of boat-owning individuals and diving clubs who have been willing to take out other divers in their craft (see section 12). On occasion, an insufficient number of boats have been available to take all the divers, and volunteers have had to be turned away.

Another problem in organising these dives has been the difficulty of finding suitable launch sites for dive boats. Although there are several slipways along the West Sussex coast, further east there are very few (see Fig. 3). A variety of boats have been used for *SEASEARCH* dives, including soft inflatables, rigid-hulled inflatables (RIBs) and hardboats. It is usually possible to man-handle soft inflatables over beaches, so these may not require a launching slip as such, just parking space close to the launch site. RIBs on the other hand do require a slip as they are launched straight into the water from their trailer. However, over the low tide period, there may not be sufficient water at the foot of the slipway to do this (as for instance at Bracklesham or Bognor), and launching can only proceed if the beach is firm enough to take the weight of a vehicle and a trailored boat. Payment of a fee is usually required before launching at public slipways (ranging from £4 to £12), though some are free. There is no public slipway at Brighton

Marina and none at Eastbourne's Sovereign Marina. RIBs may be launched at the latter site by prior arrangement, when a hoist is used at a cost of £25 per lift (fee charged in 1996).

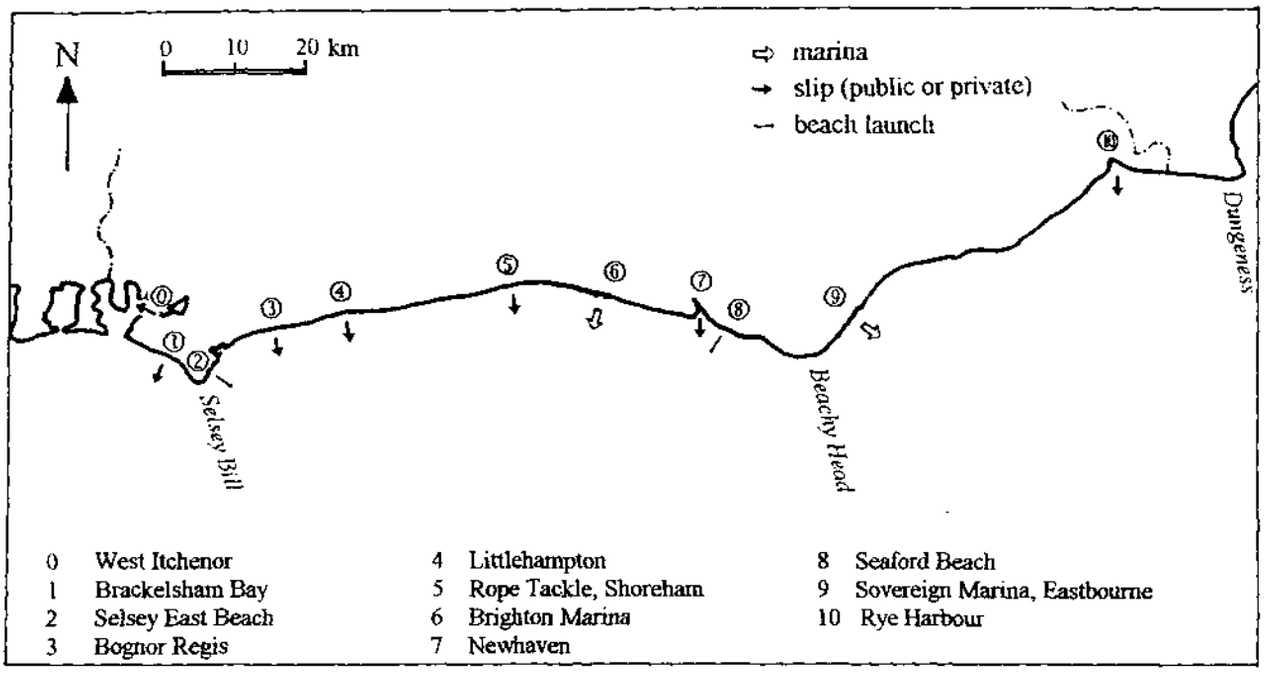


Fig. 3 Location of launch sites along the Sussex coast.

As can be seen in Table 4, quite a number of the SE MCS *SEASEARCH* dives have had to be cancelled over the years due to adverse weather conditions. This, of course, is in the lap of the gods and nothing can be done about it. Volunteers who had put their names down to take part in the dive weekends were asked to ring the project co-ordinator on the Friday evening prior to the weekend, to find out if the dives were still going ahead. Local *MarineCall* or *MetFax* weather forecasts were used to determine if it would be safe to dive on both the Saturday and the Sunday in question.

Safety was of paramount importance on all *SEASEARCH* dives. SCUBA diving is a hazardous sport: all the diving training organisations (such as the British Sub-Aqua Club; Sub-Aqua Association; or the Professional Association of Diving Instructors) have rigorous training programmes, and only those who had reached the standard of BSAC Sports Diver grade (or its equivalent) were eligible for participation in the SE MCS dive weekends. In addition, participants were asked to read the following disclaimer (and sign that they had done so), prior to SE MCS dives.

> *Although these SEASEARCH dives are being organised by the Marine Conservation Society, you dive entirely at your own risk as a volunteer. You are expected to have adequate third party insurance cover (through membership of the BSAC, SAA or independently). Neither the Marine Conservation Society, the project co-ordinator nor any volunteers helping to run the diving on any particular day, can be held responsible for any incident relating to your boating or diving activities which occurs before, during or after a dive.*

The project co-ordinator was excluded from diving on behalf of the project under the terms of his contract. He has, however, taken part in a large number of *SEASEARCH* dives, but this has been on the understanding that he was doing so in his own time.

Date	No. of divers	Launch Site(s)	Dive sites	Boats?
6.6.92		Bognor	Waldrons reef & Bognor Rocks	
7.6.92		Bognor	Waldrons reef	
7.92	-	CANCELLED - adverse weather conditions	-	-
8.92	-	CANCELLED - adverse weather conditions	-	-
23.9.92	5	Itchenor, Chichester Harbour	Bracklesham Bay	H'dboat/launch
29.5.93	10	Bognor	Shelley Rocks & Barn Rocks	
30.5.93	-	CANCELLED - adverse weather conditions		-
12.6.93	12	Bognor	Pagham Box area &	
13.6.93	12	Bognor	Shelley Rocks	
10.7.93	14	Littlehampton	'Spoon reef', The Waldrons; The Park &	
11.7.93	14	Littlehampton	'Stetson reef'	
14.8.93		Bognor & Selsey East Beach	Selsey Bill area	
15.8.93		Littlehampton	reefs south of Littlehampton	
11.9.93	-	CANCELLED - adverse weather conditions	-	-
12.9.93	-	CANCELLED - adverse weather conditions	-	-
14.5.94	12	Littlehampton	Winter Knoll; Kingmere Rocks; reefs S of	3 infl'bles
15.5.94	12	Littlehampton	Littlehampton	
4.6.94	-	CANCELLED - adverse weather conditions	-	-
5.6.94	-	CANCELLED - adverse weather conditions	-	-
2.7.94	12	Brighton Marina	Looe Gate; Jenny Grounds; Ship Rock;	2 RIBs
3.7.94	12		Marina reef	2 RIBs
30.7.94	26	Littlehampton	Reefs S of Littlehampton; Worthing	4 RIBs + 1 infl'ble
31.7.94	26	Littlehampton	Lumps; Winter Knoll	
3.9.94	13	Littlehampton & Shoreham	Reefs S of Littlehampton; Worthing	2 RIBs + 1 infl'ble
4.9.94	17	Littlehampton & Shoreham	Lumps; Lobster g'ds	
1.10.94	18	Brighton Marina & Shoreham	Looe Gate; Ship Rock; Anchor Lump; SW	3 RIBs + 1 infl'ble
2.10.94	22	Brighton Marina & Shoreham	Rocks; 'grass banks'	
6.5.95	15	Brighton Marina	Areas to the east of Brighton	2 RIBs
7.5.95	13	Brighton Marina		
3.6.95	-	CANCELLED - adverse weather conditions	-	-
4.6.95	-	CANCELLED - adverse weather conditions	-	-
24.6.95	6	Newhaven	off Cuckmere Haven; off Seven Sisters	1 RIB +
25.6.95	10	Newhaven & Brighton		1 infl'ble
22.7.95	14	Newhaven & Eastbourne	Royal Sovereign Light; Newhaven area	2 infl'bles
23.7.95	12	Newhaven		2 infl'bles
19.8.95	-	CANCELLED - co-ordinator unavailable	-	-
20.8.95	-	CANCELLED - co-ordinator unavailable	-	-
16.9.95	14	Newhaven	Seaford Head; Cuckmere Haven	1 RIB +
17.9.95	12	Newhaven		1 infl'ble
25.5.96	-	CANCELLED - adverse weather conditions	-	-
26.5.96	-	CANCELLED - adverse weather conditions	-	-
22.6.96		Sovereign Marina, Eastbourne	Horse of Willingdon; Elphick Tree	
23.6.96				
20.7.96		Sovereign Marina, Eastbourne	Royal Sovereign Shoals; Pevensey Bay;	
21.7.96		Newhaven	Beachy Head	
10.8.96	-	CANCELLED - adverse weather conditions	-	
11.8.96		Sovereign Marina, Eastbourne	off Hastings	
7.9.96		Sovereign Marina, Eastbourne		
8.9.96		Sovereign Marina, Eastbourne		
5.10.96	-	CANCELLED - adverse weather conditions	-	-
6.10.96	-	CANCELLED - adverse weather conditions	-	-
31.5.97	-	CANCELLED - adverse weather conditions	-	-
1.6.97	-	CANCELLED - adverse weather conditions	-	-
28.6.97	-	CANCELLED - adverse weather conditions	-	-
29.6.97		Newhaven		H'boat
12.7.97		Selsey & Littlehampton	Off Selsey Bill (Outer Owers)	H'boat
13.7.97		Selsey & Littlehampton	Off Selsey Bill; Worthing Lumps	H'boat + RIB
9.8.97		Eastbourne		
10.8.97			-	-
6.9.97		Selsey & Chichester Harbour	Off Selsey Bill	
7.9.97		Selsey & Chichester Harbour	Off Selsey Bill	
27.9.97		Rye Harbour	Rye Bay	RIB
28.9.97		Rye Harbour	Rye Bay	RIB + h'boat
4.7.98	-	CANCELLED - adverse weather conditions	-	-
5.7.98	3	Brighton	Seaford gullies	
18.7.98	-	CANCELLED - adverse weather conditions	-	-
19.7.98	-	CANCELLED - adverse weather conditions	-	-
1.8.98	9	W. Itchenor, Chichester Harbour	Bracklesham Bay	RIB & launch
2.8.98	9	W. Itchenor, Chichester Harbour	Bracklesham Bay	RIB & launch
15.8.98	7	Sovereign Marina, Eastbourne	vicinity of Eastbourne	H'boat
16.8.98	7	Sovereign Marina, Eastbourne	Pevensey Bay	H'boat
12.9.98	-	CANCELLED - adverse weather conditions	-	-
13.9.98	-	CANCELLED - adverse weather conditions	-	-

Table 4. Dive weekends organised on behalf of MCS members, 1992-1998.

2.4.3 Participation of local dive clubs

As mentioned above, the response of many clubs to participate in the project *en masse* has been disappointing. Some have, and they are to be commended for their efforts. However, few of these have managed to undertake dedicated *SEASEARCH* dives on more than one occasion.

There are likely to be a number of reasons why the project has not been taken up more enthusiastically by diving clubs. These could include:

1. Lack of, or inappropriate, co-ordination to work closely with local clubs.
2. Clubs have not heard of the project (despite widespread publicity for the project).
3. Lack of enthusiasm amongst club members for conservation-orientated dives (wreck diving is far more popular).
4. Lack of on-the-spot expertise and support.
5. Unwillingness to write up forms after dives.
6. Believing that the sites they regularly visit (typically wreck sites) are not of relevance to the project, or that popular dive sites would have already had *SEASEARCH* records made from them.
7. Most clubs dives are organised around diver training and there is little time for any other project-related diving.

Slide presentations have been made by the project co-ordinator to several clubs, which regularly dive off the Sussex coast (see also section 3.4). Most of these have taken place outside the diving season (i.e. during the winter or early spring), and it may be that come the start of the season (usually after Easter each year), people have forgotten about the project and what it entails.

However, a handful of clubs have been most supportive of the project, with individual members regularly returning completed forms from their dives. The following in particular are to be thanked for their efforts:

Bricket Wood SAC (Sub-Aqua Club)
Brighton Marina Yacht Club Diving Section (formerly South Downs Divers SAC)
Bromley SAC
Chichester SAC
Coral Cay Conservation SAC
Imperial College SAC
Orpington SAC
Sussex Diving Club (Brighton)
High Wycombe SAC

2.5 Site selection

Within the programme of dives organised on behalf of SE MCS, it was decided to divide the coastline into a number units which could be targeted on an annual basis (Fig. 4). Having started at the western end of West Sussex, from Chichester Harbour to Littlehampton (1992/93), the project moved eastwards, covering Littlehampton to Brighton (1994), Brighton to Beachy Head (1995) and Beachy Head to Rye Harbour (1996). During 1997 and 1998, gaps in the overall coverage were tackled.

A number of means were used in deciding where to dive within the survey area. Initially, when the western half of West Sussex was being surveyed (during 1992 & 1993), the areas listed by Dr Elizabeth Wood in her report (Wood 1992a) as being worthy of further investigation were targeted first. These were either a) sites where no information was known; or b) sites previously surveyed but from which more information was required; or c) sites which had been surveyed in

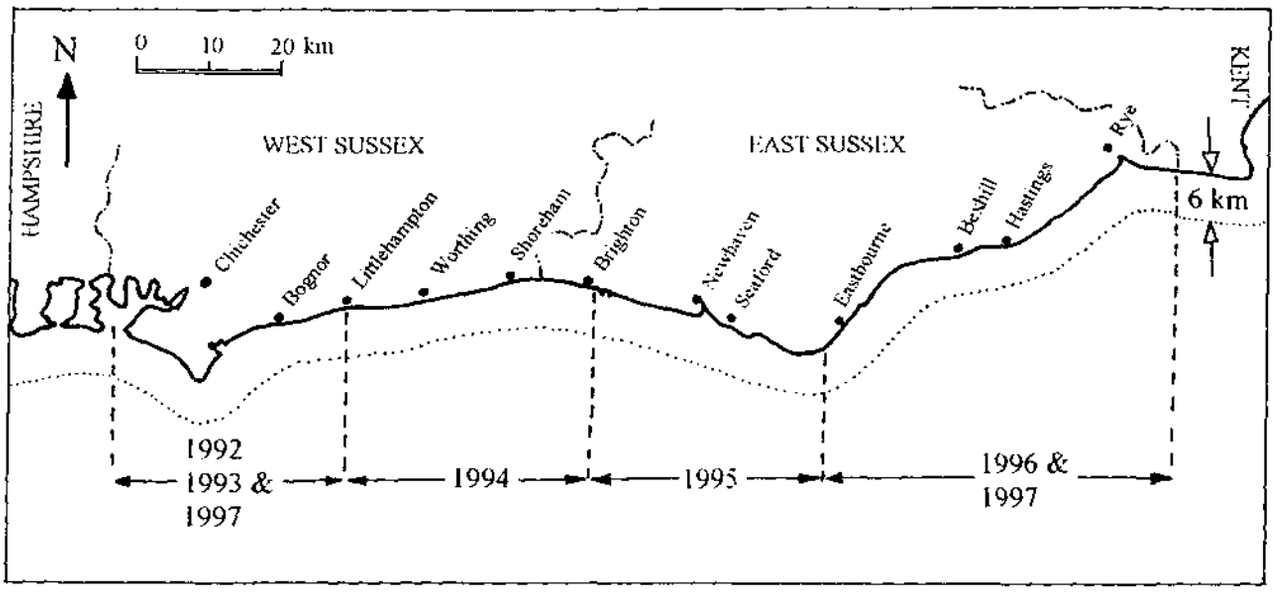


Fig. 4. Annual target units for the SE MCS weekend diving programme along the coastline, 1992-1997. Note that in 1998, dives were undertaken in all units in order to fill in gaps.

1982/83 and where repeat surveys may prove to be of interest. This last category included well-known dive sites such as the Mixon Hole and the Outer Mulberry.

Other priority areas were where a rocky seabed (typically associated with a richer diversity of marine life) was marked on the Admiralty chart; or where the composition of other marked seabed types on the chart could be confirmed. Other sites were recommended by local divers or by members of the survey team who had dived that area before. Finally, obvious gaps in site coverage were targeted. The use of fixed-position transects extending out from points on the shore (at set intervals) was not followed: use of this methodology may well have led to important sites being missed.

An attempt was made to ensure that the weekends selected for SE MCS members' dives coincided with neap tides. During the weekends (and on other occasions), most *SEASEARCH* dives were timed to coincide with periods of slack water, though when this was not possible, drift dives were carried out. Recording habitat information is considerably more difficult in such circumstances.

Of course, the location of launch sites (in terms of slipways for boats on trailers and moorings/berths for larger vessels) also had some bearing in where dives could be undertaken (see Fig. 3). As mentioned above, although there are a number of slipways along the coast of the western half of West Sussex, as one progresses eastwards these become notably scarcer. This created a number of difficulties, particularly along the Eastbourne to Rye stretch of coast.

2.6 Recording methods

Volunteer divers participating in the project were encouraged to take writing slates under water with them on their dives in order to note down various features of the seabed they encountered. Underwater slates are usually made from 'formica' (or a similar man-made board) and can be written on with a standard pencil when wet. Writing in pencil can be cleaned off afterwards with an ordinary household cream cleanser.

Each diver (of each buddy pair) was asked to note down certain points when under water:-

- Depth of seabed (for each habitat encountered)
- Type of seabed - split into percentages of each category (i.e. bedrock, boulders, cobbles, pebbles, gravel, sand, mud, clay, artificial substrata)
- Dominant/conspicuous/characterising marine life

Divers were asked to describe the type of seabed they could see within their limit of vision. This varied considerably depending on the turbidity of the water at the time of the dive. On most occasions, visibility was between 2-3 m. However, some divers experienced nil visibility (i.e. total darkness), while others were fortunate enough to experience 15 m visibility - almost unheard of for the Sussex coast!

Recording the marine life associated within any particular habitat was dependent on the identification skills of each individual diver. These were found to vary widely. Some 'amateur' marine biologists ('underwater naturalists' may be a better description of such divers) may have better species identification skills than some of the 'professionals' in the field. However, other volunteers new to this kind of recording began at the bottom of a steep learning curve! Those with some experience were asked to note down the relative abundance of organisms, approximating to the MNCR's semi-logarithmic 'SACFOR' scale: Superabundant; Abundant; Common; Frequent; Occasional; and Rare. Whilst this scale has agreed definitions within each category for various plant and animal groups, *SEASEARCH* recorders were simply asked to give a subjective assessment of the quantity of the organisms they saw.

To assist with the recording process, a *Promptsheet*, which when laminated could be taken under water and used as an *aide memoire*, was devised. A sample *Promptsheet* can be found in Appendix 2. It provided a number of simple definitions (e.g. cobbles are defined as being between head and fist size; pebbles as being between fist size and 50p coin size; and gravel as less than 50p coin size), and reminders as to what to look out for on different seabed types. The *Promptsheet* was found to be most useful for first-timers to the project, but after having completed a few *SEASEARCH* dives, most could remember what they were being asked to record.

For most sites, dive locations were recorded using satellite position-fixing equipment. Many dive club boats now have a GPS (Global Positioning System) on board their Rigid-hull Inflatable Boats (RIBs). The (old) Decca equipment is in the process of being phased out. The accuracy of different instruments varies, but the hand-held Magellan Nav 5000 (of which two units were on loan to the project from English Nature) purported to give an accuracy of about ± 50 m. This degree of accuracy was quite adequate for our purposes. The Magellan units proved to be very useful items of equipment, as they could easily be passed from boat to boat if necessary.

Once back on dry land (and preferably on the same day that the dive was carried out), divers were asked to complete a Dive Recording Form. A sample completed Dive Recording Form (old format, used from 1992 until 1996) can be found in Appendix 3. For those pairs of divers diving in the same locality as each other (e.g. from the one boat) on the same day, a single Site Recording Form also needed to be completed (1992-1996). A sample completed Site Recording Form can be found in Appendix 4. In 1997 a new, single, Recording Form was introduced (Appendix 5).

Though most volunteers managed to fill in their forms without too much difficulty, some misunderstandings did appear from time to time. Examples of this were in drawing 'a profile of the dive' (see below), working out the depth of the seabed below chart datum (usually done by the Project Co-ordinator using the Hydrographic Office's tidal prediction computer software called TIDECALC), and insufficiently detailed descriptions of the seabed.

Once completed, forms were returned to the Project Co-ordinator for checking. Forms were numbered chronologically as and when they were returned. The number of completed forms received back each year is indicated in Table 1.

2.7 Accuracy/reliability of information gathered by volunteer divers

The accuracy of the information gathered by participants in the project was clearly of concern - could the information recorded by keen amateurs be treated as being reliable and accurate? How would it compare to the information able to be recorded by professional survey biologists? The answers to these questions are not straightforward - they depend on the individual recorders concerned and what they are being asked to do. Obviously, some people have a considerable amount of knowledge in identifying what they are seeing under water, whilst others will be largely ignorant of all but the most obvious creatures. The completed Dive Recording forms reflect this: some are accompanied by lists of species written with their Latin names; others are only able to manage 'crab', 'orange sponge' or 'starfish'.

As a result of this wide variation in recording ability, it was stressed to participants that accurate information on seabed habitats was more important than trying to recognise lots of species. In time, species from any particular habitat type would be recorded by someone with a greater knowledge of what marine life was present. Thus, given a good record of the habitat, it would then be possible to predict the sort of marine life that one might expect to find there. After checking completed forms, some records of species have had to be discarded (and not entered onto the database) as they appear dubious. It has been useful for the project co-ordinator to have personally known many of the recorders involved and their marine biological expertise.

Other factors which can affect the quality of the data collected include:

- Underwater visibility – poor visibility will obviously mean a smaller area being seen by the diver and less information on the habitat being recorded. On some *SEASEARCH* dives the visibility has been so poor that recorders could not even see their hands in front of their faces. On such occasions, descriptions of the seabed were carried out by touch!
- Availability of artificial light– an underwater torch is essential on some of the deeper or more turbid dives in order to see the marine life;
- Anxiety of the diver – if the diver is being asked to make notes when they are not comfortable with some aspect of the dive (i.e. darkness, strong current, seabed hazards etc.), then their recording ability is likely to be adversely affected. This may also be the case if some item of their equipment is not functioning correctly.

2.7.1 Under-recorded groups

A number of groups are likely to have been under-recorded by volunteers. This may be because of:

a) ignorance;
b) that individual species (or even the groups they belong to) are not immediately recognised;
c) it would take too long to write down descriptive notes on the slate of *all* unidentified organisms; or
d) they are too small to be noticed by the inexperienced recorder. Examples include algae (seaweeds); sponges; hydroids; bryozoans; barnacles; and certain bivalves.

On the other hand, easily recognised organisms, such as edible and spider crabs, common starfish or cuttlefish for example, are likely to have been recorded even if only one individual was seen.

2.7.2 Seasonality

It should be remembered that the composition of sublittoral biological communities changes depending on the season. Certain organisms will appear plentiful for a few weeks and then all but disappear. Examples include lumpsuckers in February/March; cuttlefish in May/June; certain

hydroids and sea squirts which are annuals and are either eaten or withered by September; sea slugs, most common during May-July; and annual algal species whose fronds become overgrown or withered by the end of the summer. With most diving being undertaken between June and August, this does not present a great problem, although the abundance of certain species could alter considerably between records made in, say, May and October.

3. Project management & feedback

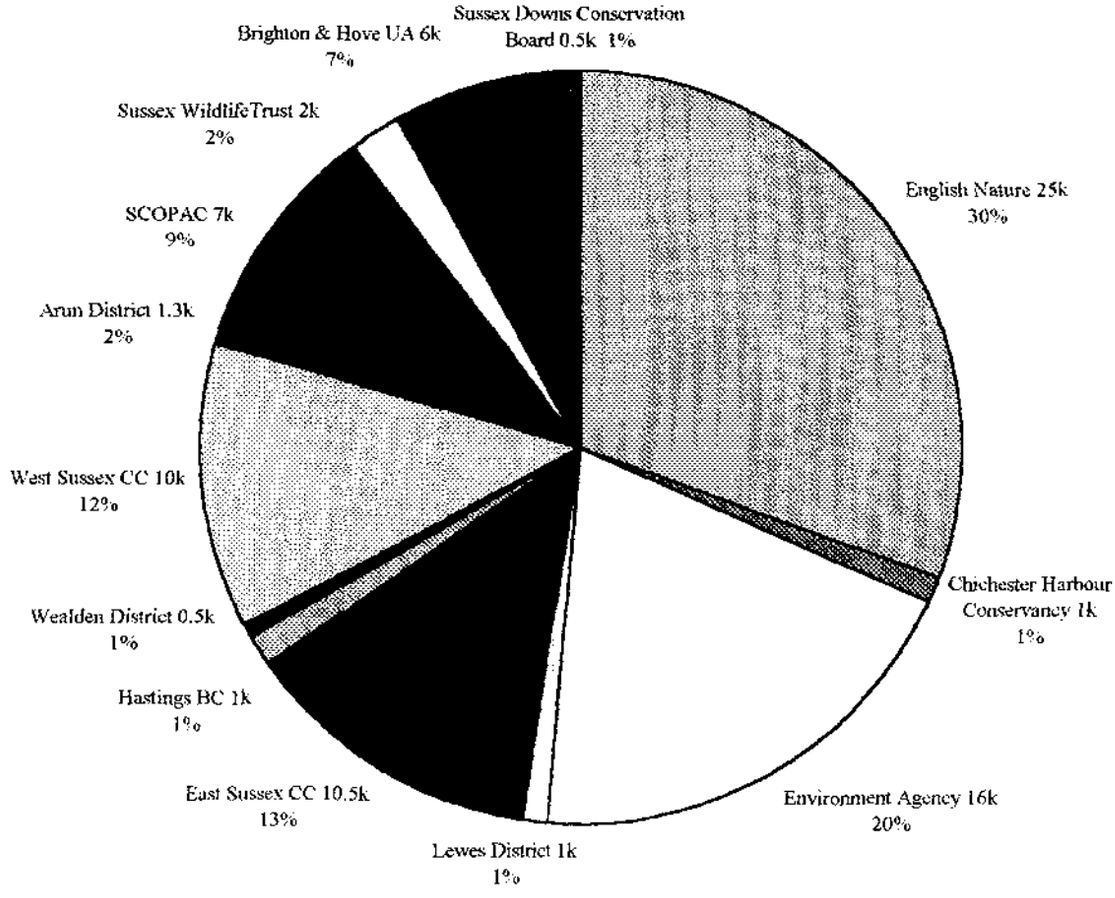
Day-to-day management of the Sussex *SEASEARCH* project has been undertaken by Robert Irving, a marine biological consultant based in West Sussex, who was contracted by the Marine Conservation Society to co-ordinate the survey programme. His activities have been directed by the project's Steering Group, and throughout the course of the project he has maintained close contact with the Group's chairman, David Harvey of English Nature's Surrey & Sussex Team.

3.1 Project Funding

3.1.1 Income

Funding for the project has come from a number of sources (as indicated in Table 3.2). Amounts have varied throughout the life-span of the project, as contributors' budgets have fluctuated and areas surveyed have either been within or lie outside any one funding partner's geographical area of interest. David Harvey (English Nature) has been responsible for procuring funds, while the Marine Conservation Society (through their administrative officer Mrs Pam Bridgewater) has acted as banker.

Fig. 5. The proportion of contributions from various agencies during the period 1992-1997. These have also been tabulated in an annual format in Table 5 (overleaf).



Year:	1992	1993	1994	1995	1996	1997	1998	*Totals*
Contributor	*Annual contribution (£000's)*							
English Nature	2.0k	6.0k	4.0k	2.0k	2.0k	4.0k	5.0k	25.0k
National Rivers Authority	2.0k	2.0k	2.0k	7.0k				
Environment Agency						2.0k	1.0k	16.0k
East Sussex County Council			4.0k	2.0k	0.5k	2.0k	2.0k	10.5k
West Sussex County Council	2.0k	2.0k	0.5k	2.5k		2.0k	1.0k	10.0k
SCOPAC	2.0k	2.0k	3.0k					7.0k
World Wide Fund for Nature *				2.0k			5.0k	(7.0k)
Brighton Borough Council			2.0k	2.0k	2.0k			
Brighton & Hove Unitary Authority								6.0k
Sussex Wildlife Trust					2.0k			2.0k
Arun District Council	0.5k	0.8k						1.3k
Chichester Harbour Conservancy		0.5k				0.5k		1.0k
Hastings Borough Council				1.0k				1.0k
Lewes District Council				0.5k		0.5k		1.0k
Sussex Downs Conservation Board				0.5k				0.5k
Wealden District Council						0.5k		0.5k
Totals:	8.5k	13.3k	15.5k	17.5k	6.5k	11.5k	9.0k	**81.8k**

* WWF-UK helped with the funding of specific projects: *Undersea Sussex* poster and *Sussex Marine Life* ID guide. As these projects were separate from the main projects, these contributions have been excluded from the totals.

Table 5. Financial contributions from various agencies to the Sussex SEASEARCH Project during the period 1992-1998.

It should be noted, however, that the above table may not provide a totally accurate view of financial input into the project, as there has been a considerable element of opportunism in matching available funds to particular elements within the project. An example would be the funding of exhibition panels or the purchase of a computer to run the new database. Additionally, the table of income does not include 'offers in kind' such as incidental photocopying of newsletters, recording forms and leaflets; mailings by English Nature, East Sussex County Council and West Sussex County Council; discounted diving air fills for volunteers by Wittering Divers, East Wittering (formerly known as Scubaworks, Bognor); and assistance with boats from several organisations and individuals.

3.1.2 Expenditure

Fig. 5 shows how the income to the Project (for the period August 1992 - March 1999) has been spent.

1	Co-ordinator's time	£62.6k
2	Travel expenses	£5.0k
3	Office expenses	£1.8k
4	Boat hire/fuel	£3.4k
5	Incidentals	£0.4k
6	Capital items	£1.1k
	TOTAL:	£74.3k

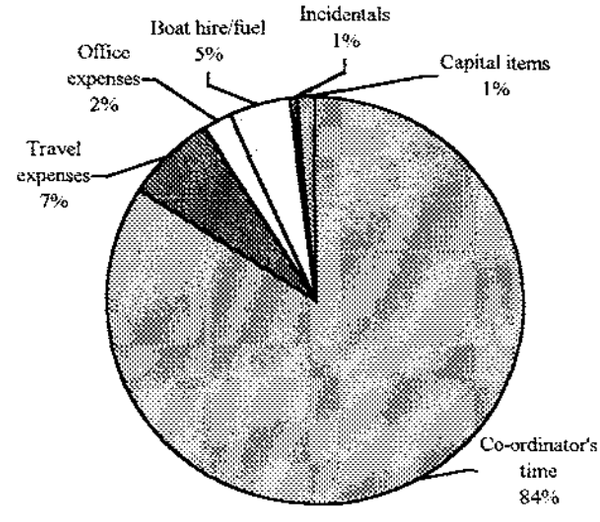


Fig. 5. Project expenditure.

[Note that this excludes approximately £7.5 of income spent on specific sub-projects such as the habitat manual, the video and display materials, which are included under Project Income in Table 5 above].

At the start of the project in order to encourage volunteer participation, it was agreed that certain expenses incurred by the volunteers be refunded. These have included launching fees; boat fuel costs to/from dive sites; half the cost of air fills for those returning five completed Recording forms or more in any one diving season; and replacement film for u/w photographers willing to lend their photos for use by the project.

3.2 Project Steering Group

The organisations which have been represented on the Sussex *SEASEARCH* Steering Group during the period between 1992 and 1998 (though not necessarily for all of that period), are listed in Table 6. Meetings of the Steering Group have taken place between three or four times a year, depending on issues and concerns prevalent at that time. Meetings have either been held at Woods Mill, Henfield (headquarters of the Sussex Wildlife Trust) or at the English Nature offices in Lewes.

ORGANISATION	REPRESENTATIVE(S)	FUNDING PARTNER
Arun District Council	Crispin Scott / David Green / Andrew Blake	✓
Brighton Borough Council/Brighton & Hove Unitary Authority	Geoff Bennett / Matthew Thomas	✓
Booth Museum (Brighton & Hove Unitary Authority)	Dr Gerald Legg	
Chichester Harbour Conservancy	Philip Couchman	✓
Hastings Borough Council	Murray Davidson	✓
East Sussex County Council	Dr Alex Tait / Matthew Thomas	✓
English Nature (Surrey & Sussex team)	David Harvey	✓
Lewes District Council	Debbie Portchmouth	✓
Marine Conservation Society	Arthur Jolly / Samantha Pollard / Richard Harrington	
National Rivers Authority / Environment Agency	Ian Johnson / Phil Griffiths / Mark Elliott	✓
Rother District Council	Frank Williams	
Standing Conference On Problems Associated with the Coastline (SCOPAC)	David Court / David Green	✓
Sussex Downs Conservation Board	David Kay / Paul Walton	✓
Sussex Sea Fisheries Committee	Steve Holman	
West Sussex County Council	Richard Donithorn / Graham Roberts	✓
Wealden District Council	Mike Salmons	✓
Sussex Wildlife Trust	Andrew Lee/Dr Tony Whitbread	✓

Table 6. Organisations represented on the Steering Group of the Sussex SEASEARCH *Project*

3.3 Newsletters

In order to keep those interested in the project informed of its progress, a Newsletter has been produced which comes out approximately three times a year. An example (dating from May 1997) can be found in Appendix 6. Copies of the Newsletters have been sent to all members of the project's Steering Group, all those who have participated in the project, and anyone else who has expressed an interest in the project. Newsletters have been prepared by the Project Co-ordinator, with English Nature and East Sussex County Council generously offering to help with photocopying and mailing costs. By the end of 1993 the Newsletter was being sent to 140 people; by the end of 1998, this number had risen to 300.

3.4 Talks to dive clubs and other groups

Talks have been given by the Project Co-ordinator, Robert Irving, to the following dive clubs and other groups, during the period 1992-1998.

Alton BSAC (Hampshire)
Brighton BSAC
Brighton Marina Yacht Club Diving Section
Bromley BSAC (SE London)
Crawley Mariners Sailing Club (West Sussex)
Crouch End Diving Club (Essex)
Croydon BSAC (Surrey)
Eastbourne BSAC (East Sussex)
Elstree & Borehamwood BSAC (NW London)
Eltham & District Sub-Aqua Club (SE London)
English Nature Council members (Chichester Harbour)
Friends of Chichester Harbour (Chichester)
Holborn BSAC (Central London)
Imperial College BSAC (Central London)
Lensbury SAC (Central London)
Orpington BSAC (SE London)
Scott Polar Research Institute Diving Club (Cambridge)
Scuba Projects Research Team (SAA Conservationists) (Surrey)
SE MCS (Central London)
SE BSAC club representatives, Crawley (West Sussex)
Selsey Manhood Association (Selsey)
Seven Seas SAC (Epsom, Surrey)
Southend PADI Diving Club (Essex)
Sub-Aqua Association (London Region)
Sussex Diving Club (Brighton)
Sussex Wildlife Trust, Biological Recorders Seminar (Hassocks, West Sussex)

3.5 Report of the West Sussex project (1992 & 1993)

A report was written after the two years of the West Sussex *SEASEARCH* project (Irving 1994a) which summarised the findings of the survey of the Chichester Harbour to Littlehampton stretch. A total of 137 dives were completed at over 100 dive sites by 62 volunteers. Most of the planned diving weekends in 1992 were cancelled due to adverse weather, so most dives were undertaken in 1993. The majority of these were undertaken by members of SE MCS. The most extensive seabed type within this sector of the coast was found to be of mixed sediments, the exact form varying in accordance with the different percentages of sand, gravel, pebble & cobble in the mixture. Bedrock areas supported the most diverse and abundant forms of marine life. Limestone outcrops are present to the south and west of Selsey Bill; sandstone is present as reefs off Bognor; and a small amount of low-lying chalk occurs at Winter Knoll off Littlehampton. The range of seabed types identified were collated into a draft Habitat Manual (Irving 1994b) - see also section 4.1.

3.6 Interest in the project from elsewhere

3.6.1 Media coverage

Various news outlets have been utilised over the seven years in order to publicise the project's existence and its achievements.

TV coverage

BBC South - As part of a daily mini-series during 'Marine Science' week at the end of August 1993, the BBC's early evening regional news programme *South Today* made a short 5 minute piece about the West Sussex *SEASEARCH* project, which was screened on 27th August 1992. The reporter, John McIntyre, had arranged for the use of two of the BBC Natural History Unit's 'bubble helmets', so that he could interview Robert Irving actually on the seabed. It proved to be quite an interesting exercise: the yoke holding the helmet down managed to tear Robert's membrane drysuit (though he did not realise this until he was under water and could feel a damp sensation creeping down his back!); and his earpiece fell out of his ear when he entered the water, so he could not hear any of the questions he was being asked! However, he still managed to say something intelligible, and the resulting short feature gave a reasonably accurate feel of what the project was trying to achieve.

Nynex (Brighton) - Nynex is a cable TV company which operates in the Brighton area and, at the time this feature went out, was linked to approximately 15,000 homes. 'The Line', an hour-long programme which is repeated five times a day, featured a five minute piece about the project and was broadcast between 9-15th October 1995. They filmed a small group of *SEASEARCH* volunteers preparing to go for a dive at Brighton Marina on 30th September 1995.

BBC1 Countryfile – Interest was shown by Countryfile researchers in the marine SNCI initiative. Filming of project volunteers undertaking dives out of Littlehampton took place on 13 July 1997, with underwater footage being shot on the Worthing Lumps and the wreck of the *Indiana*. Fortunately, we had excellent underwater visibility on the day (~10 m) which pleased all concerned. The final edited feature lasted 7 minutes and was broadcast on 17 August 1997. This piece generated a large amount of interest in the project and the marine SNCI programme.

Radio

BBC Radio Surrey & Sussex (John Hunt). At the launch of the mSNCI initiative on June 8th 1996. Also broadcast selected interviews from the BBC1 Countryfile programme (17.8.97)

BBC Radio 4's Today programme. 16.8.97. Selected interviews from the BBC1 Countryfile programme on marine SNCIs, shown the following day on television.

Popular articles

Articles about the project have been published in the following magazines:-

SE MCS Newsletter – numerous articles since the project's inception in 1992
MCS magazine (*Marine Conservation*, vol. 3, No. 5, Spring 1995)
MCS magazine (*Marine Conservation*, vol. 3, No. 8, Summer 1996)
Sussex Wildlife Trust magazine (*Wildlife*, No. 124, January 1998)
English Nature magazine (*English Nature*, No. 23, January 1996)

3.6.2. Other publicity

A set of display panels about the West Sussex *SEASEARCH* project were commissioned by Arun District Council in 1993 as part of their contribution to 'Environment Week' during May of that year. Robert Irving prepared three A1-sized panels featuring photographs of divers, recording forms and species. Since that date, the display has been used at a number of other locations to help promote the project.

East Sussex County Council funded the production of an AO-size enlargement of the *Undersea Sussex* colour poster in 1997. This has been used as part of the display to promote the project.

Exhibitions

Information about the Sussex *SEASEARCH* Project has been on display at the following exhibitions:-

Environment Week, May 1993, Bognor Town Hall
Sub-Aqua Association Exhibition, 8th October 1994, Eastbourne
MCS Conference, October 1994, Nottingham
LowTide, 13 May 1995, Brighton
MCS Conference, October 1995, Manchester
MCS Conference, October 1996, Cardiff
MCS Conference, October 1997, Warwick
MCS Conference, November 1998, Southampton

4. End products

Although the primary aim of the Sussex *SEASEARCH* project has been *to determine the interest and relative nature conservation value of the shallow sublittoral zone*, a number of incidental 'end products' have been produced during the course of the project which satisfy, in part, some of the project's associated objectives. Brief descriptions of these are set out below.

4.1 Habitat Manual

One of the accompanying objectives of the Sussex *SEASEARCH* project was to produce a Habitat Manual which detailed the range of seabed habitats encountered off Sussex, together with their associated animal and plant communities. A draft of this manual for the western half of West Sussex was produced in April 1994 (Irving 1994b). The draft was designed as being a working document, with the intention that it should eventually be enlarged to cover sublittoral habitats throughout the whole of Sussex (and even the south-east).

A new *Sussex Sublittoral Habitat Manual* is currently being prepared, utilising information obtained from the database (see below). This will cover the range of seabed habitats present off Sussex together with a description of their associated plant and animal communities. This will replace the draft Habitat Manual.

4.2 Promotional video

An independent underwater wildlife cameraman, Dr Matt Ruglys, made contact with the project co-ordinator in late 1992, and suggested making a short video film about the project for his own purposes. It was agreed that this could also be of benefit to the project as a means of promoting the project to a wider audience. Not only could it encourage other divers to take part in the Sussex project, it could also serve to promote *SEASEARCH* elsewhere in the country. Matt accompanied divers on a number of *SEASEARCH* dives during 1993 and 1994 and was fortunate enough during one dive off Littlehampton to have a close encounter with a dolphin! In addition, over the winter of 1994/95, interviews were filmed with David Harvey (English Nature); Alex Tait (East Sussex County Council); Andrew Lee (Sussex Wildlife Trust); Bob Foster-Smith (BioMar project & former national *SEASEARCH* co-ordinator); and David Connor (Marine Nature Conservation Review, JNCC). Segments of these interviews were then edited into the underwater sequences. English Nature awarded a grant of £950 towards editing and soundtrack costs. Finally, in May 1995, 65 copies of the completed 17 minute video were produced. Each member organisation of the Steering Group received a free copy of this, with the remainder being sold through MCS Sales Ltd. at cost price (£7.50 incl. p&p).

4.3 A2 colour poster

As a means of rewarding divers who had contributed to the project, Ian Johnston (at the time the National Rivers Authority [Southern Region]'s officer responsible for fisheries, navigation, recreation and conservation) suggested that a poster could be produced which highlighted those areas found to be of particular conservation interest off the Sussex coast. This would be given to all of the volunteer divers who had contributed to the project. It was soon realised that this would also provide appropriate educational material for schools and colleges throughout Sussex, and it was agreed by both County Councils to distribute copies to all such establishments (approximately 350). The poster was designed by Robert Irving, with artwork by Carolyn Scrace,

a Brighton-based illustrator specialising in natural history subjects. Printing of the poster was undertaken by Quentin Press in Brighton (special thanks to their Managing Director, Paul Duprey, a member of the Brighton Marina Yacht Club Diving Section). A total of 3,500 copies were printed. Funding partners for this project included East Sussex County Council, English Nature, Environment Agency, West Sussex County Council and the World Wide Fund for Nature (UK). A copy of the poster is included in the folder at the back of this report.

4.4 Marine SNCIs - report & leaflet

The report of the West Sussex *SEASEARCH* project (Irving 1994a) recommended that certain sites found to be of particular interest should warrant some form of conservation recognition, if not protection. East and West Sussex County Councils requested that these sites be formalised as Sussex Marine Sites of Nature Conservation Importance (mSNCIs). In due course, Robert Irving was commissioned to prepare a report and an information leaflet on the selection procedure and descriptions of the first tranche of mSNCIs (Irving 1996). The first twelve sites (as listed in Table 7 below) were chosen by a Selection Panel consisting of marine biologists, nature conservationists and local government ecologists, and announced in March 1996. It is anticipated that a further tranche of marine SNCIs will be designated in the near future.

	FEATURE							
SITE NAME	REEF	WRECK	CHALK CLIFF	CLAY CLIFF	OTHER	SHALLOW 0-9 m BCD	MEDIUM 10-19 m BCD	DEEP 20-30+ m
Bracklesham 'Balls'					✓	✓		
Mixon Hole				✓		✓	✓	✓
Inner Mulberry Harbour Unit		✓				✓		
Outer Mulberry Harbour Unit		✓				✓	✓	
The Waldrons	✓					✓	✓	
Shelley Rocks					✓	✓	✓	
HMS *Northcoates*		✓						✓
Worthing 'Lumps'			✓					✓
South-West Rocks			✓				✓	
Looe Gate			✓			✓		
Seaford Head Gullies					✓	✓		
Royal Sovereign Shoals	✓					✓	✓	

Table 7. The range of physiographic and bathymetric features present within the initial list of mSNCIs.

Marine SNCIs are an extension of the terrestrial SNCIs concept. This includes sites on land which do not quite match up to the necessary requirements for being designated as Sites of Special Scientific Interest (SSSIs) by the country conservation agencies (e.g. English Nature), yet they are still of prime nature conservation interest. Their recognition as SNCIs allows for voluntary management agreements to be made with the landowner and/or occupier in order to ensure the protection of their habitats or wildlife which are of special interest. Terrestrial SNCIs are identified by County Councils and/or Wildlife Trusts and there are now a series of 300 or so throughout both East and West Sussex. However, terrestrial SNCIs and all SSSIs may extend to low water mark but no further. Marine SNCIs are non-statutory sites identified on account of the special interest of their marine habitats, the flora and fauna, or for unusual geological or geomorphological features. The purpose of them is to highlight their importance in terms of the marine wildlife they support and to emphasise the risks of certain operations damaging their interest. Many marine SNCIs would merit SSSI status if this designation extended beyond low water mark.

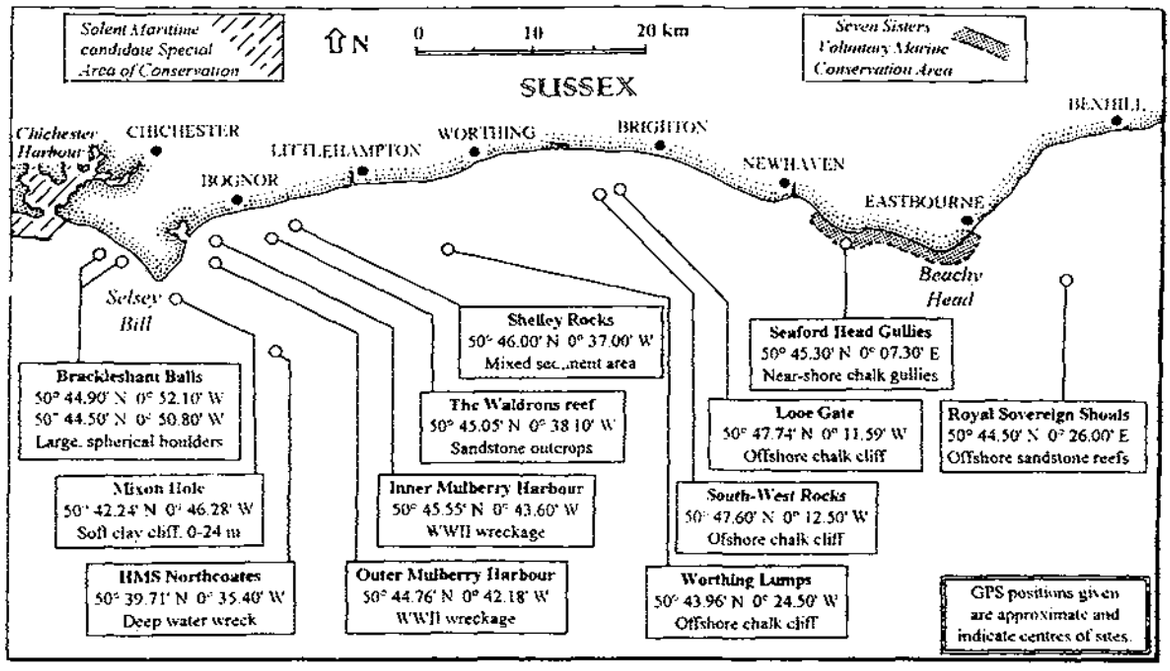


Fig.6. Location of the 12 marine SNCIs identified to date (from Irving 1996) and the Seven Sisters Voluntary Marine Conservation Area.

4.5 Database of marine species and habitats off the Sussex coast

From the outset of the West Sussex *SEASEARCH* project in 1992, it was always envisaged that the results from the Site and Dive Recording Forms would be entered onto a database of some sort, which would allow for analysis and interpretation of the data. Unfortunately, the Marine Conservation Society did not at the time (and still does not, at the time of writing) have such a database for *SEASEARCH* information. The alternatives were either 1) to design a new database for the information; or 2) to use a simplified copy of JNCC's MNCR database, which had been specifically designed to cope with habitat and species records from littoral and sublittoral sites.

After discussions with David Connor, head of the MNCR team at the time, and with Dave McDonald, the MNCR's computer specialist at the time, it was agreed that JNCC could provide the Sussex *SEASEARCH* project with a copy of their database free of charge. In return, the information entered onto the Sussex database would be available to the MNCR to incorporate onto their own database in Peterborough. As a result of a generous grant from English Nature, a pentium-processor personal computer (plus printer) was purchased as hardware on which to load the database software. This has been housed at the Booth Museum of Natural History in Brighton, under the supervision of Dr Gerald Legg.

The database uses Advanced Revelation as its programming language, which is the language used for the 'Recorder' database, utilised by Wildlife Trusts throughout the country for all of their terrestrial biological habitat and species information. The MNCR database was designed by Dr David Mills of the MNCR between 1986 and 1989 and is one of the most sophisticated databases for marine information in existence. Indeed, the MNCR database in Peterborough now has more information on it than any other similar marine database in Europe. However, the software is now out of date and the operation of the database is not particularly 'user friendly'. The Joint Nature Conservation Committee is in the process of converting both of these Advanced Revelation databases to a Windows-based system under the all-enveloping banner of the National

Biodiversity Network. This should be up and running by the summer of 2000 and would allow for direct input of the Sussex *SEASEARCH* data[4].

The two *SEASEARCH* recording forms, which were being used by volunteers from 1992 until 1996 to record habitat and species information, unfortunately had not been designed for 'ease of input' onto a database. They allowed for much descriptive information to be recorded, but very little in the form of 'tick boxes'. In order for the information to be in an appropriate format for data entry, all 518 completed Dive Recording Forms and over 250 Site Recording Forms (from 1992-1996) had to be transcribed onto Intermediate Habitat Recording Forms. This mammoth task was undertaken by Mrs Jane Lilley (a keen and diligent supporter of the project) during the first half of 1997, with special contract funding from English Nature and the Environment Agency.

A number of volunteers have assisted Dr Gerald Legg in entering the *SEASEARCH* information onto the database (see section 12). This task took longer than expected (nine months), and it was not until the end of August 1997 that all the data from the recording forms had been entered onto the database. An initial analysis of these data has been included in this report (see sections 7-10), and further use will be made of the data in compiling the *Sussex Sublittoral Habitat Manual* in the near future. It is also intended that other marine information for the Sussex area will be added to the database in due course, so that it will not necessarily be exclusively *SEASEARCH* information that it stores.

4.6 Sussex Sublittoral Species Identification Guide

With several underwater photographers amongst the volunteers taking part in the project, there was an obvious opportunity to utilise this talent. Photographers were asked to take both wide-angle shots of habitats (for possible inclusion in the Habitat/Biotope Manual) and also close-up portraits of species (for use in a Species Identification Guide). The best of these species photographs are now featured in *Sussex Marine Life - an identification guide for divers*, which was published on 1st October 1998 (Irving 1998a). One hundred and ninety species are included in the Guide, most of which are commonly encountered within Sussex waters, though there are some rarities too and a few species difficult to find in other identification guides. Each species has at least one photograph and sometimes an illustration showing salient recognition features. There are also notes on habitat preference, distribution, and similar species with which it may be confused. The Guide also features descriptions of seabed habitats and a list of all species recorded by divers off Sussex. Two thousand copies have been printed and the retail price is £15 per copy (£10 to those who have returned taken part in the project by returning completed Recording Forms).

The use of this Guide by volunteer *SEASEARCH* recorders should assist their identification skills and consequently the accuracy of their records in the future.

4.7 Scientific papers, reports and conference presentations

A number of public presentations have been made by the project co-ordinator during the course of the Sussex *SEASEARCH* project, as set out below (in chronological order).

- *The West Sussex SEASEARCH Project*. Presentation to the *Standing Conference On Problems Associated with the Coast* (SCOPAC). Portsmouth City Council. 1993

[4] During 1999, MCS prepared a scoping study which reviewed the development and enlargement of the *SEASEARCH* project nationally. This document investigates how the *SEASEARCH* data can be fed into various database systems (see Irving 1999).

- *The West Sussex SEASEARCH Project*. Presentation to *Third Annual Seminar on the West Sussex Coast*. Organised by West Sussex County Council. County Hall, Chichester. 15 February 1994.
- *The West Sussex SEASEARCH Project*. Presentation to *Arun Coastal Forum*. Organised by Arun District Council, Littlehampton. February 1995.
- *The Sussex SEASEARCH Project*. Presentation to *Tidal '96* conference, Brighton. Organised by the Department of Civil Engineering, University of Brighton, 12-13 November 1996.
- Contribution to English Nature's *Natural Area Profile (Folkestone to Selsey Bill)* utilising information on subtidal habitats and species acquired through the Sussex *SEASEARCH* project. English Nature, Lewes. April 1997.
- Contribution to JNCC's Marine Species Recording Workshop held in Newcastle-upon-Tyne on 29th & 30th January 1998.
- Entry in JNCC's *Coastal Directory* Region 8: Sussex as Chapter 4.2 The seabed. Information gleaned from a number of sources, but utilising unpublished data from the Sussex *SEASEARCH* project. (see Barne *et al.* 1998).
- *Sussex SEASEARCH: the hits and misses*. Presentation to the Marine Conservation Society's Annual Conference, 7 November 1998, at Southampton University.
- *The Sussex SEASEARCH Project*. Poster presentation to the Solent Science Conference, Southampton. Organised by the Solent Forum, October 1998.

5. Influencing environmental factors

5.1 Near-shore geology

The following paragraphs are taken from the JNCC's Coastal Directory for Sussex (Barne *et al.* 1998), Chapter 2.2: *Offshore Geology* written by British Geological Survey:

'There tends to be a continuous cover of mobile [Holocene] sediments generally in the form of tidal sand ridges, from the east of Beachy Head to Rye Bay. The ridges are composed largely of medium-grained sand and comminuted shell debris. Between the tidal sand ridges, lag deposits form a discontinuous cover of less than 0.5 m thick interspersed with areas of bare rock. They comprise gravels, sandy gravels and gravelly sands. Muddy sands occur nearer the coastline, derived from the underlying clay and softer clayey sandstone strata. From Rye Bay to Dungeness, the seabed has a cover of muddy fine sand.'

'South-west of Beachy Head, an extensive area of sand waves covers a layer of sandy sediments up to 20 m thick. Towards the coast, in the direction of Selsey Bill, the sand cover thins to less than 0.5 m and becomes slightly gravelly. Further to the south-west, sand waves reduce in size and grade into irregular sand patches, sand ribbons and a smooth, flat, featureless seabed.'

'West of Selsey Bill, a variety of sediment types occur, with muddy sands and sandy mud in the intertidal areas passing into sand and gravelly sand further offshore, with sandy lag gravel exposed locally. Muddy sediments fill the eastern Solent Channel and are probably derived from the underlying channel fill deposits. Sand ripples, sand waves and even gravel waves occur in areas of strong tidal current.'

'The Chalk which forms the cliffs at Beachy Head dips south-westwards beneath the English Channel as the northern rim of a broad, gently dipping synclinal structure known as the Hampshire-Dieppe basin. The boundary between the Upper Cretaceous Chalk and underlying Lower Cretaceous clays can be traced as a small submarine escarpment across the English Channel formed by differential erosion.'

The sedimentary rocks which occur in the Sussex coastal zone range from limestone, through a wide variety of ironstones, sandstones, mudstones and clays to the chalk of the South Downs. The gradual erosion of these 'soft' rocks is most noticeable in the coastal zone, though this action is slowed by the presence of sea defences. Where chalk occurs, wave-cut platforms are formed at sea level which can extend up to 500 m beyond low water mark. The horizontal platforms are cleft by surge gullies up to two metres deep, running out from the shore. Some of the most extensive chalk wave-cut platforms in the country are at the Seven Sisters, and between Brighton and Newhaven (Irving 1996).

There are relatively few rocky reefs present off the Sussex coast. Those that do occur either represent bands of relatively hard rock which have withstood erosion, or soft rocks exposed because of the angle at which they are bedded. The shallow shoals off Selsey Bill (including the Boulder Bank, Pullar Bank and Middle Ground) are a mix of sandstone and limestone strata. Further east, Bognor Rocks and the reef known as the Waldrons are both of sandstone, present within an exposure of London Clay. Lying above this clay stratum are the Brackelsham Beds, most apparent in the Selsey area, containing rich fossil deposits from the Eocene period (55-35 million years ago). At the other (eastern) end of the region, the Sovereign Light tower to the south-east of Eastbourne marks the presence of reefs of shallow sandstone [5]. Greensand occurs as

[5] Wood (1990) believes these sandstone reefs to be of Upper Greensand, lying below the Lower Chalk in the geological succession, but McDonald (1985) describes them as 'oolitic ironstone'.

a small exposure at Head Ledge, Beachy Head, though diving here is difficult due to inaccessibility and to strong tidal streams.

Exposures of seabed chalk become more apparent from Littlehampton eastwards. A discontinuous chalk ledge runs from Worthing roughly parallel with the coast as far as Brighton, probably the result of an eroded fold in the chalk strata. Interestingly, the ledge faces north towards the coast, forming an underwater vertical face up to 3 m high. The chalk bedrock is continually being broken into smaller pieces by the action of boring organisms, particularly piddocks (see also section 6.1.2).

Soft grey clay occurs in patches throughout the region, appearing as smooth, horizontal exposures often covered in part by sand. It is also present as an extensive vertical exposure at the Mixon Hole, off Selsey Bill (see also section 7.3).

5.2 Bathymetry

Much of the near-shore seabed off West Sussex remains shallow and gently shelving for some distance as one travels away from the coast (Fig. 7). The 5 m depth contour is generally about 2-3 km from the coastline and the 10 m contour about 4-5 km. As one moves eastwards into East Sussex, however, the slope of the near-shore seabed increases, such that at Beachy Head the 20 m depth contour is only about 800 m from the foot of the cliffs. Of course there are peculiarities within this generalisation: a complex seabed topography is found off Selsey Bill where the Mixon Hole drops to a depth of 25 m just 1.5 km south-east of the headland, and this lies within an area of shallow shoals which extend over 6 km from the coastline to the Outer Owers. Here, a steeply-sloping section of the seabed known as the Shoal of the Lead, drops from chart datum (i.e. it almost dries at extreme low water on spring tides) to a depth of 67 m.

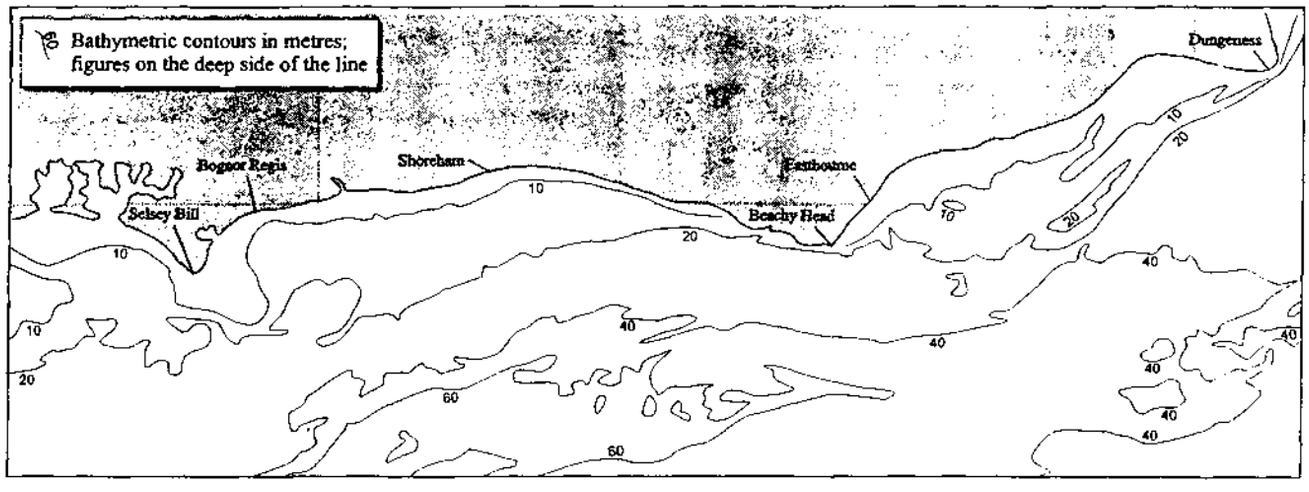
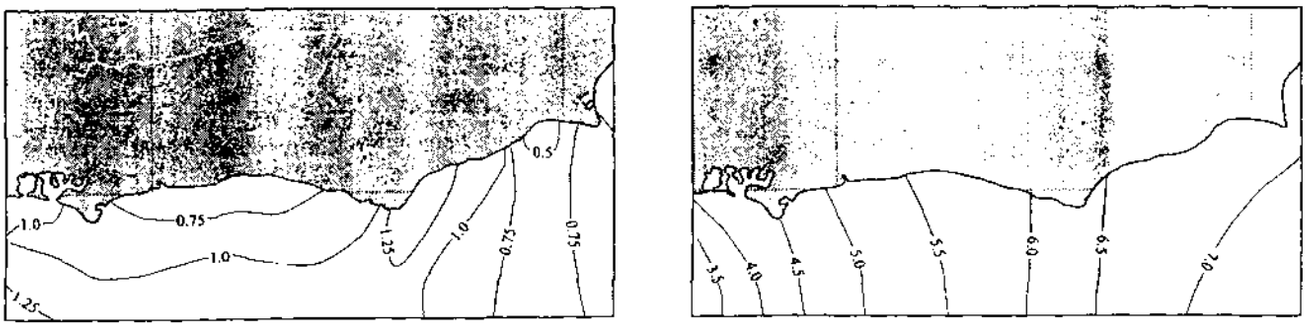


Fig. 7. Near-shore bathymetry off the Sussex coast (taken from Barne et al. *1998).*

5.3 Tidal range & tidal currents

The tidal range at mean spring tides varies from 4.7 m at Selsey to 6.1 m at Newhaven and 7.0 m at Dungeness, the increase further eastwards due in part to the narrowing of the English Channel towards the Dover Strait. In the central part of the Channel, the maximum speed of tidal currents on mean spring tides is between 1.5-2 knots (0.75-1.0 m/s). To the immediate west of Dungeness, in Rye Bay, tidal currents are reduced to 1 knot (0.5 m/s) (see Fig. 8). Close to headlands, for

example Beachy Head, the tidal current increases to 2.5 knots (1.25 m/s), and at the mouth of Chichester Harbour can be as great as 6 knots (3 m/s).



A. Maximum tidal current speed (in m/s) at mean spring tides. Source: Sager & Sammler (1968).

B. Tidal range (m) at mean spring tides. Source: Lee & Ramster (1981). © Crown copyright.

Fig. 8. The maximum tidal current speed (in m/s) at mean spring tides (A); and the tidal range (m) at mean spring tides (B) along the Sussex section of the English Channel. Taken from Barne et al. *(1998).*

According to the definitions of tidal current strengths as used by the MNCR[6] (given in Hiscock 1996), the aforementioned velocities place the currents experienced around headlands in the *moderately strong* category (1-3 knots), with those at the mouth of Chichester Harbour in the *strong* category (up to 6 knots). Elsewhere, tidal currents are *weak* to *moderate*, flowing in a west → east (flood tide) or an east → west (ebb tide) direction.

5.4 Wind & wave exposure

The predominant wind direction is from the south-west quarter, with strong winds occurring most frequently in winter and occasionally at other times of the year. During westerly gales, winds of up to 80 knots have been recorded between the Isle of Wight and Dover (British Geological Survey *et al.*, in Barne *et al.* 1998).

The south-facing, linear nature of most of the open coastline means that it is categorised as being *moderately exposed* to wave action (categories defined in Hiscock 1996). The section of coast between Seaford and Beachy Head, which faces south-west, is on the edge of the *exposed* category, with the south-east facing shoreline between Selsey Bill and Bognor, and between Beachy Head and Eastbourne, being on the edge of the *sheltered* category. Chichester Harbour is *extremely sheltered.*

5.5 Water temperature & salinity

Sea surface temperatures reach an average peak of 16°-16.5°C during August in the English Channel, with temperatures increasing progressively toward the shore (18°C is not uncommon in sheltered, shallow waters during early September). During February, which is usually the coldest month for sea surface temperatures, the average temperature ranges from 6.5° to 8°C.

The salinity of Sussex coastal waters for most of the year is 35‰ (g/kg of total dissolved salt) - that is, *fully marine*.

[6] MNCR: Marine Nature Conservation Review, undertaken by the Joint Nature Conservation Committee, Peterborough, from 1986-1997.

5.6 Sediment transport

The transport of near-shore sediment is described by sub-dividing the coastline into cells and sub-cells. The definition of these is derived from the movement of sand and shingle along beaches. The coastline of Sussex includes the western part of the sub-cell of Folkestone to Beachy Head and the sub-cell Beachy Head to Selsey Bill, from the coastal cell *the Thames to Selsey Bill*. It also includes part of the sub-cell Selsey Bill to Portsmouth Harbour, from the coastal cell *Selsey Bill to Portland Bill* (see Fig. 9).

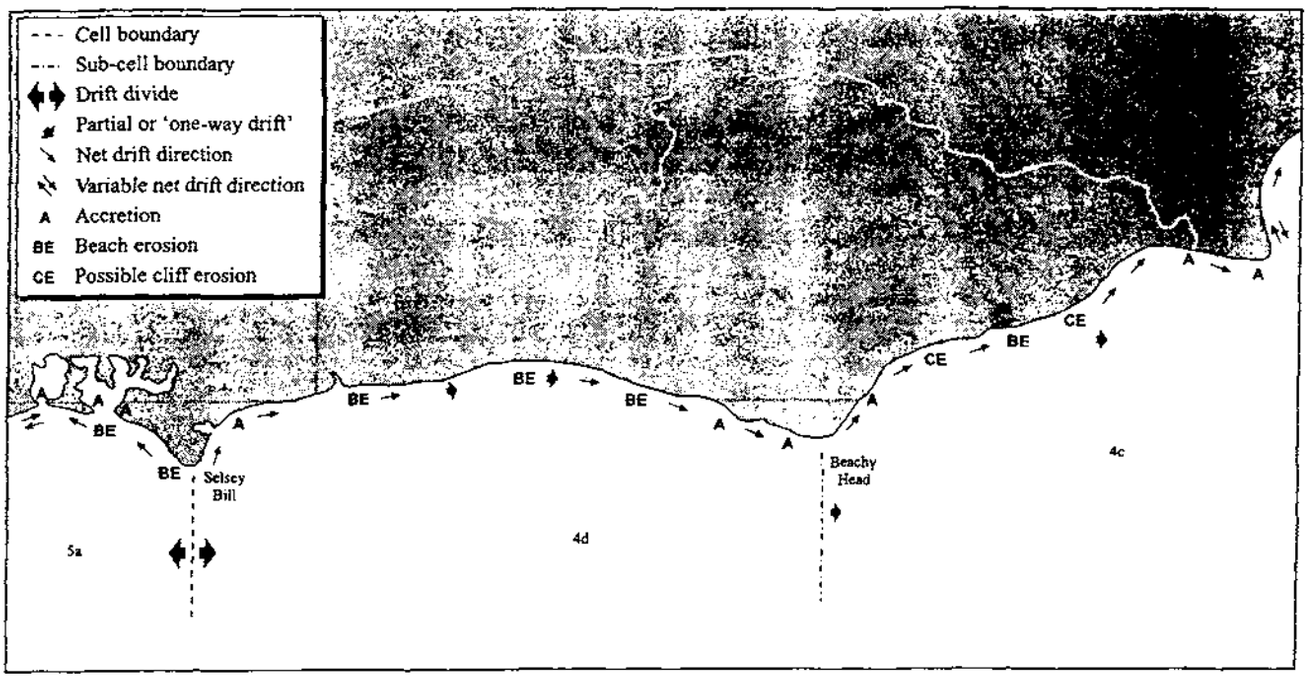


Fig. 9 Sediment transport and coastal cells (4c: Dover Harbour - Beachy Head; 4d: Beachy Head to Selsey Bill; 5a: Selsey Bill - Portsmouth Harbour). After Barne et al. *1998.*

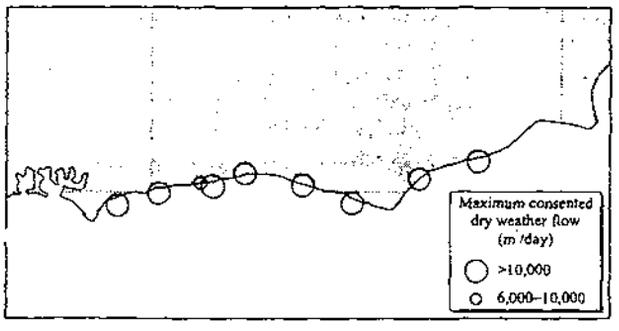
5.7 Turbidity and other factors

The amount of suspended silt in the water column, together with the density of plankton populations and other naturally-occurring matter held in suspension, can have a very influential effect on the distribution of benthic communities. Similarly, the deposition of this silt load, usually in sheltered areas, will also have a bearing. Certain organisms thrive in areas of high siltation while others become smothered and are unable to survive. Light levels are reduced considerably by high loads of suspended silt, having a dramatic limiting effect on the growth of macroalgae (seaweeds). Noticeable quantities of settled silt have been recorded from several sheltered seabed types at shallow and medium depths. Additionally, turbid conditions, often the result of periods of rough weather, would limit a diver's visibility under water, leading to a reduction in the area of seabed which could be seen and thus surveyed.

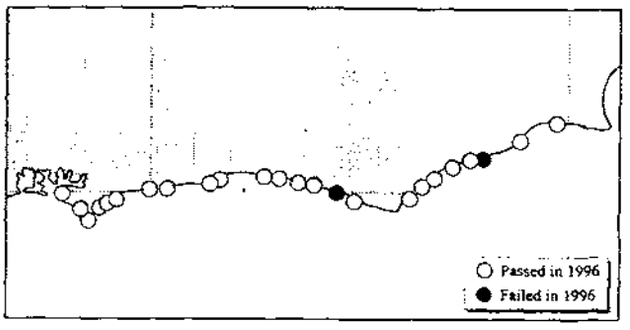
As well as turbidity levels increasing as a result of resuspended silt loads, close proximity to sewage outfall pipes or to spoil dumping grounds also led to similar conditions being experienced by divers. The locations of these are given in Fig. 10.

The water column becomes increasingly murky towards the eastern end of the English Channel, and the effect of this is clearly seen in the distribution and density of kelp *Laminaria* spp. in different areas. For comparison, in the clearer waters off Dorset, kelp plants extend to 12 m below low tide level, but in East Sussex, kelp plants are limited to a maximum depth of just 2.5 m (Wood 1988). Similarly, the maximum depth recorded for foliose red algae was 23 m BCD at the

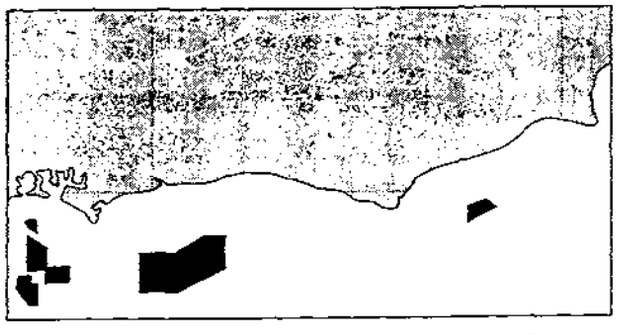
Head. The turbid waters here are due in part to the continuous dissolution of chalk from the rocks; but rivers, sewage and other discharges also contribute.



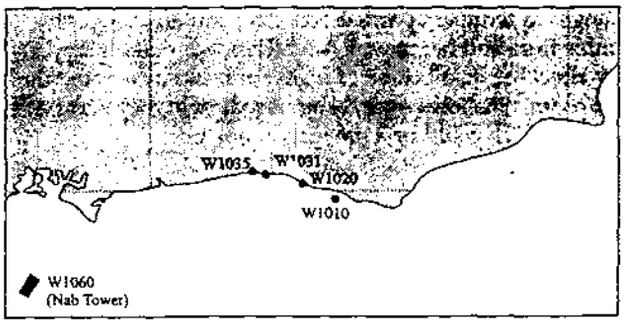
A. Consented sewage outfalls. Map shows all outfalls with consented flows greater than 6,000 m^3/day. Source: Environment Agency.



B. EC-identified bathing waters: results of 1996 sampling. Source: Environment Agency.



C. Licensed dredging areas for marine aggregates. Source: Crown Estate (1996).



D. Sites used for the disposal of dredged material and sewage sludge. Source: MAFF (1996).

Fig. 10. Location of sewer outfalls (A), *bathing waters* (B); *licensed aggregate extraction areas* (C); *and spoil dumping grounds* (B), *off the Sussex coast. Taken from Barne* et al. *(1998).*

At a habitat level, the bases of boulders and bedrock outcrops will often show signs of scouring caused by abrasion from the movement of surrounding pebbles and gravel. Typically the lowest 3-5 cm of rock surface remain free of encrusting marine life and bushy 'turf' organisms. Additionally, where flat-topped boulder slabs and bedrock only stand proud of the surrounding seabed by a few centimetres, then the rock surface is likely to be inundated by a layer of sediment from time to time, especially where this is of sand. This event also has an abrasive action on the rock surface and is likely to have some bearing on the community present.

6. Seabed types

This chapter provides descriptions of the various seabed types present off the Sussex coast, together with the characterising animal and plant communities associated with them. The information used here has primarily come from records made during the Sussex *SEASEARCH* project but it has also been drawn from other sublittoral surveys (see sections 2.1.1 & 2.1.2).

Describing the seabed and its associated plants and animals

A number of terms are used to describe the seabed and its associated wildlife (definitions taken from Hiscock 1996).

A **habitat** is defined as being the space in which a plant or animal lives (i.e. its physical environment). The habitat may be modified depending upon geographical location, physiographic features and the physical and chemical environment affecting it (including salinity, wave exposure, strength of tidal streams, geology, biological zone, substratum, features (e.g. crevices, overhangs) and modifiers (e.g. sand-scour, wave-surge, substratum mobility).

A **community** is defined as being a group of organisms occurring in a particular environment – usually taken as being a particular habitat.

A **biotope** is defined as being the combination of the physical habitat together with its biological community, or distinctive assemblage of conspicuous species.

The **substratum (pl. substrata)** is defined as being the 'material' available for colonisation by plants and animals. This may be abiotic or non-living (i.e. rock, sand or metal) or biotic (i.e. a kelp plant or a crab carapace). In this report, it is used to describe the main type of seabed in any one area.

The seabed habitats which typify the near-shore zone off the Sussex coast are described in the following sections. Please note that when considering the seabed off the Sussex coast, it is not always possible to distinguish separate biological zones within the sublittoral (essentially determined by the presence or absence of certain types of algae). This is due to a number of factors: the seabed has a very gentle gradient, for the most part; the growth of kelp is restricted; and much of the seabed is of soft sediments (e.g. sand) which does not allow for colonisation by the characterising organisms (e.g. kelp, foliose algae, animal turf etc.).

6.1 Hard substrata

Seabed exposures of hard rock (either as solid bedrock or as boulders) off the Sussex coast tend to be either of sandstone (hard), limestone (moderately hard), chalk (soft) or mudstone (also soft). Each rock type has its own characterising communities associated with it, though there are only subtle differences between those colonising sandstone and limestone. It is frequently the case that divers have not been able to distinguish these two rock types (sandstone and limestone) *in situ* under water. Very rarely are any rock surfaces devoid of encrusting marine life, apart from those liable to scouring. Even when the underlying rock is scraped clean of these encrustations, there are no guaranteed indicators to allow positive identification of the type of rock under water - a diver may have to chip off a sample and inspect it back on the surface. And even then, a trained geologist may have difficulty in identifying it.

6.1.1 Sandstone

6.1.1.1 Sandstone bedrock

Sandstone outcrops form a scattering of shallow, near-shore reefs in the area around Selsey Bill (particularly Pullar Bank); off Bognor (Barn Rocks, Bognor Rocks, The Waldrons); off Littlehampton ('Stetson Reef', 'Spoon Reef', the 'Stepping Stones' and Kingmere Rocks); and to the south-east of Eastbourne (Elphick Tree, Horse of Willingdon, Royal Sovereign Shoals and the Royal Sovereign Light reef [7]). Most of these outcrops consist of low-lying bedrock exposures (rarely more than 2 m above the surrounding seabed), some partially covered by sediment, with an assortment of boulders adding to the overall structure of the reef. The surrounding seabed is likely to be of mixed sediments or sand. In most cases the sandstone bedrock and/or boulders have been considerably eroded, forming indented horizontal and vertical surfaces, with a multitude of variously-shaped holes, crevices and fissures. These microhabitats have led to a wide variety of organisms colonising the rock surface. The habitats and communities encountered on the sandstone reefs off Eastbourne were reported by Wood (1990) to be very similar to those found further west (i.e. in the Bognor/Littlehampton area), the most significant difference between them being the higher level of siltation present off Eastbourne.

In shallow depths, kelp (mostly *Laminaria digitata* and some *L. saccharina*), although rarely found growing densely, occurs on upward-facing surfaces from 7 m depth upwards. Beneath the kelp, as much as 80% of the rock surface at these depths, and down to 15 m or so, may be covered by encrusting calcareous algae (*Phymatolithon* sp./*Lithothamnia* sp.). A variety of both brown and red foliose algae occur on the upward-facing surfaces of sandstone reefs below the kelp, including (amongst the Phaeophyta) *Dictyota dichotoma* and *Halidrys siliquosa*; and (amongst the Rhodophyta) *Calliblepharis ciliata*, *Chondrus crispus*, *Plocamium cartilagineum*, *Polyides rotundus*, *Rhodymenia* spp., *Cryptopleura ramosa*, *Delesseria sanguinea*, *Heterosiphonia plumosa*, *Halurus flusculosus* and *Polysiphonia* spp.

At shallow depths, sessile animal species tend to be confined to vertical surfaces, overhangs and crevices, were seaweed cover is less or absent altogether. These microhabitats usually support a dense turf of small bushy bryozoans and feather-like hydroids, colonial sea squirts and clusters of solitary sea squirts, dead man's fingers *Alcyonium digitatum* and encrusting sponges. Amongst this last category, *Esperiopsis fucorum*, *Dysidea fragilis* and *Halichondria* spp. are well represented (see also section 8.3). Indeed, the sponge fauna of the sandstone reefs is particularly rich and diverse, with 24 species having been recorded from the Waldrons reef off Bognor and 21 species from Bognor Rocks during the Sussex Sublittoral Survey (Wood 1984). The most frequently encountered anemone on sandstone bedrock and boulders is *Actinothoë sphyrodeta*, a conspicuous white anemone, which may be found as individuals or in small groups. The fan worm *Bispira volutacornis*, with its long tube made from fine particles, is also commonly found, particularly where there are crevices and/or fissures in the rock surface. In areas subject to sediment deposition or affected by silt, the bushy bryozoan *Flustra foliacea* is often found. Of the fishes, the goldsinny *Ctenolabrus rupestris* is common, as are tompot blenny *Blennius gattorugine* and bib *Trisopterus luscus*.

6.1.1.2 Sandstone boulders

Sandstone boulders may occur as angular cuboidal blocks known as 'sarsens'. They are composed of a very hard silicic sandstone, usually in the region of 30-50 cm thick and 1-2.5 m in length. They have been recorded from Bracklesham Bay and from the Waldrons reef off Bognor

[7] Wood (1990) refers to the Royal Sovereign reefs as being formed of an Upper Greensand sandstone (see also 6.1.5.2).

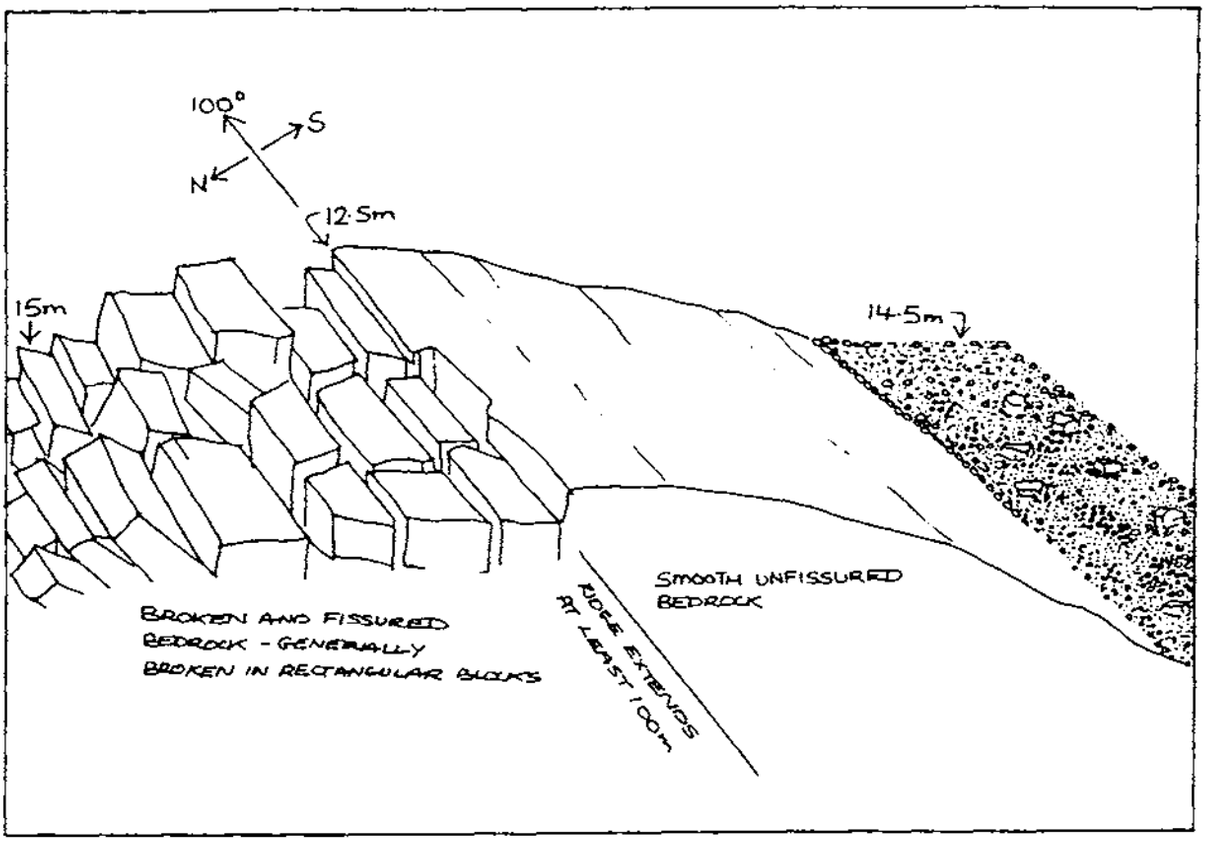


Fig. 11. Sketch (drawn by Chris Wood) of the raised reef structure at the Royal Sovereign Shoals (south-east). Taken from Wood (1990).

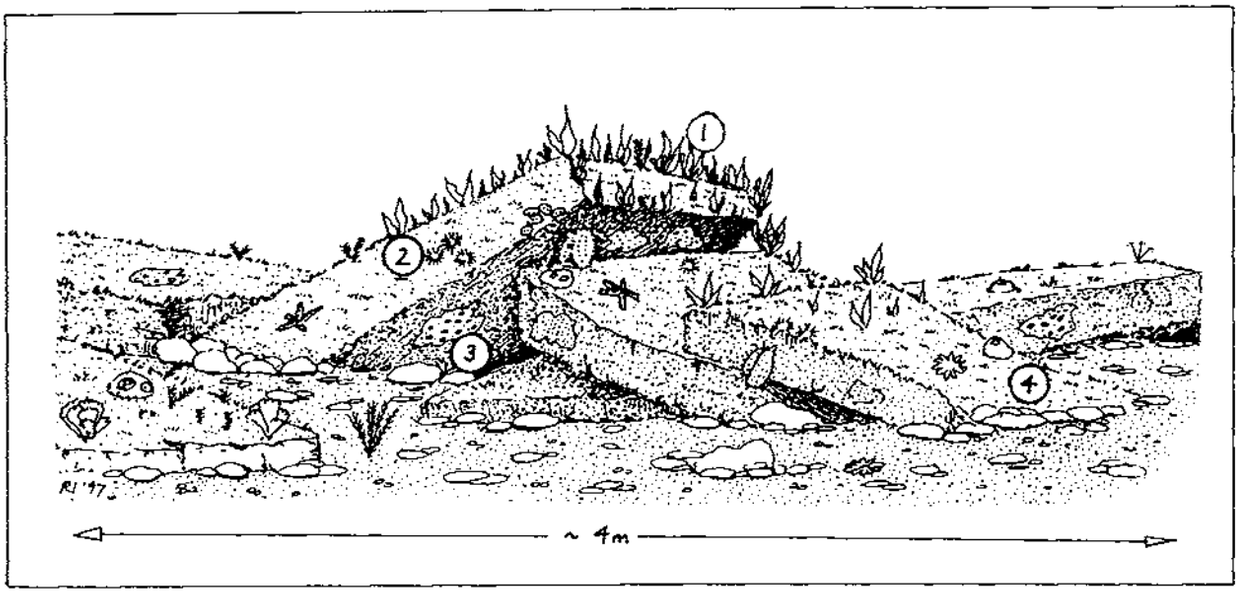


Fig. 12. Representation of a jumbled mass of sandstone sarcens (as occurs at the Waldrons reef off Bognor).

KEY

1. Foliose red algae on shallowest parts of boulders.
2. *Actinothoë sphyrodeta* anemones
3. Underside of boulders with encrusting sponges, sea squirts and dead man's fingers.
4. Other surfaces with bryozoan and hydroid 'turf', anemones, sponges and sea squirts.

(Irving 1994). Their origin is uncertain. One theory is that they were deposited when drift-ice melted during a glacial phase; another that they are discarded ballast stones from early shipping. Wood (1990) recorded sandstone bedrock at the Royal Sovereign Shoals (south-east sector) which had fissured and broken into rectangular blocks (Fig. 12). This could be another possible derivation of these blocks. Sarsens are not restricted to the sublittoral: there are scatterings of them on surface exposures throughout south-east England, with particular concentrations in the Suffolk/Norfolk area and the Oxfordshire/Berkshire area. Dr Ken Collins of Southampton University's Department of Oceanography is currently investigating the origin and distribution of the sandstone sarsens which occur sublittorally in the central and eastern English Channel (pers. comm.).

Elsewhere, sandstone boulders may be rounded, either standing proud of the seabed or being low-lying, flattened and likely to be affected by sediment. In general, the biota associated with them is similar to that found on sandstone bedrock.

The sandstone reefs of the Waldrons (off Bognor), and the Royal Sovereign Shoals (to the south-east of Eastbourne), were identified as marine Sites of Nature Conservation Importance in March 1996 (Irving 1996).

The following biotopes, as defined by Connor *et al.* (1997), are likely to be associated with sublittoral sandstone bedrock & boulder habitats off Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

MIR.Ldig.Ldig [*Laminaria digitata* on moderately exposed sublittoral fringe rock] p.170 – likely to be present close to low water mark on certain shores, though divers did not record from this zone during *SEASEARCH* dives;

MIR.Lhyp.Ft [*Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock] p.179 - The density of *L. hyperborea* plants is insufficient to be termed a 'forest' off the Sussex coast, but otherwise most components of this biotope occur;

MIR.Lhyp.Pk [*Laminaria hyperborea* park and foliose red seaweeds on moderately exposed lower infralittoral rock] p181;

MIR.XKScrR [Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock] p197;

IR.Alc.ByH [*Alcyonium digitatum* with a bryozoan, hydroid and ascidian turf on moderately exposed vertical infralittoral rock] p. 232;

MCR.Flu.Flu [= *Flustra foliacea* on slightly scoured circalittoral rock or mixed substrata] p.267;

MCR.Urt.Urt [= *Urticina felina* on sand-scoured circalittoral rock], p.276;

MCR.StoPaur [= *Stolonica socialis* and/or *Polyclinum aurantium* with *Flustra foliacea* on slightly sand-scoured tide-swept moderately exposed circalittoral rock], p.289;

MCR.MolPol.Sab [= Dense ascidians, bryozoans and hydroids on a crust of *Sabellaria spinulosa* on tide-swept circalittoral rock], p.293 – see Fig. 19.

6.1.2. Limestone

6.1.2.1 Limestone bedrock

Limestone reefs are limited to the western part of the Sussex coast. They tend to occur in the vicinity of Selsey Bill, sometimes being interspersed with sandstone outcrops. Examples of limestone reefs in the Selsey Bill area include the Hounds reef, the Grounds, Boulder Bank, Middle Ground, The Mixon and the Outer Owers. In addition, McDonald (1985) reports the presence of a low limestone 'cliff' marking a former beach line (dating from about 2000 BC) which runs due west from the Hounds to East Pole Sands, but this has yet to be confirmed by *SEASEARCH* dives.

Limestone rock strata may be sandwiched between softer strata of clay. The clay strata tend to erode at a faster rate than the limestone, leading to the bedrock fragmenting, often in the form of angular slabs. This has occurred at the Shoal of the Lead to the south-east of Selsey Bill. To the west of the Bill, at the Hounds reef, interesting mushroom-like features are found. Here the clay

underlying the limestone cap rock has eroded away, leaving tables of limestone on pillars of clay (Fig. 13). It is suspected that limestone bedrock underlies the Medmery Bank in the centre of Bracklesham Bay, but it is covered by shifting sand. Bullock Patch (approximately 8 km due south of the entrance to Chichester Harbour) is composed of limestone boulders.

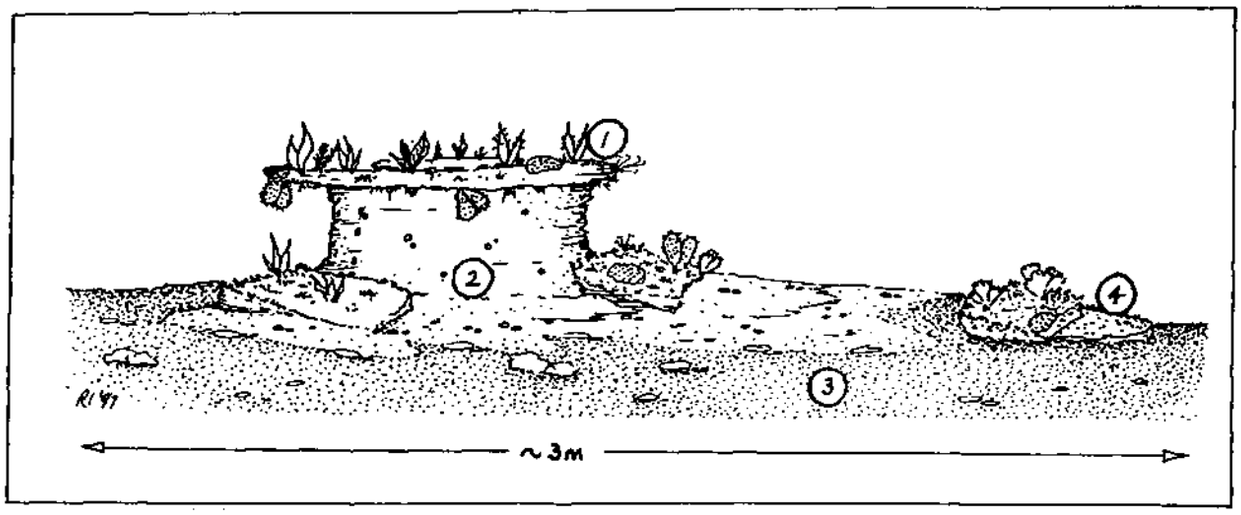


Fig. 13. Illustration of eroded pillar of clay supporting limestone caprock, Bracklesham Bay.

The structure of the limestone outcrops present off the West Sussex coast is complex. It is known as Alveolina limestone, rich in fossil foraminifera (J. Cooper, pers. comm.). Limestone outcrops also present a range of surfaces: flat, horizontal and vertical faces and crevices. They tend to have a more rough and fissured surface than sandstone, thereby providing more 'footholds' for attached organisms (Collins & Mallinson 1983). In addition, they are typically softer than sandstone, allowing for organisms to bore into the surface of the rock. In some areas, e.g. Boulder Bank, the underlying clay strata have been eroded, leaving extensive pavements of limestone slabs with large gaps between them.

Limestone bedrock outcrops support a diverse flora and fauna, especially in the east from the Hounds south to the Pullar Bank, where the outcrops occur within a few metres of the surface. In these areas, the kelps *Laminaria digitata*, *L. hyperborea* and *L. saccharina* dominate the tops of prominent features. They extend down to about 7 m becoming less dense and giving way to smaller brown algae, particularly *Dictyota dichotoma*, and a variety of reds including *Dilsea carnosa*, *Calliblepharis ciliata* and *Chondrus crispus*. The limestone rock is extensively bored by the bivalves *Barnea* sp. and *Hiatella* sp., and by the boring phase of the sponge *Cliona celata*. The rough vertical surfaces are well colonised by sponges, notably *Dysidea fragilis*, *Haliclona* spp. and *Hemimycale columella*. The large sponge *Pachymatisma johnstonia*, rarely found to the east of Selsey Bill, was recorded from here by Collins & Mallinson (1983). The most common anemone found on the limestone was *Sagartia troglodytes*, though *Actinothoe sphyrodeta* and *Urticina felina* were also present. Patches of phoronid worms *Phoronis hippocrepia* are common, though these horseshoe worms are not found on sandstone.

6.1.2.2 Limestone boulders

Limestone boulders have a patchy distribution throughout Bracklesham Bay. They are generally slab-shaped, with a smooth upper- and under-side, though with an irregular edge. They range in size from 0.5-5 m across and up to 20 cm thick (Collins & Mallinson 1983).

The slabs rarely stand proud of the surrounding seabed and are often partially covered by sediment. In shallow water, the slabs may have kelp (*Laminaria digitata*) and/or brown and red foliose algae growing on them. However, the scouring action of the sediment can limit the growth of both plant and animal colonisers. Where the slabs are raised above the seabed, the communities present on them are very similar to those found on both limestone and sandstone bedrock, with only a few subtle differences.

The following MNCR-defined biotopes, as listed in Connor *et al.* 1997, are likely to be represented on limestone exposures within Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

IR.AlcByH.Hia [*Hiatella artica*, bryozoans and ascidians on vertical infralittoral soft rock], p.233

?MCR.ErSPbolSH [= Cushion sponges (*Polymastia boletiformis*, *Tethya*), branching sponges, *Nemertesia* spp. and *Pentapora foliacea* on moderately exposed circalittoral rock], p.259.

6.1.3 Chalk

Chalk is a relatively soft rock and certain species have taken advantage of this by boring into the rock. The most noticeable of these are the bivalve shells called piddocks, of which there are several species which may be found on sublittoral chalk exposures. The largest (up to 15 cm long), and most obvious, is the common piddock *Pholas dactylus* which has a preference for horizontal chalk and typically bores vertically downwards. On boulders and vertical surfaces, the red-nose *Hiatella arctica* is much more common. Two other species, *Barnea candida* and *B. parva*, may also be present, though these are less easy to identify unless the whole animal is seen instead of just the tips of its siphon. In addition, rock surfaces are often riddled with the tiny burrows of the polychaete worm *Polydora ciliata* (see also section 8). The boring action of such organisms leads to the eventual break up of the chalk bedrock into rubble (see below).

Off the Sussex coast, small, discrete exposures of seabed chalk bedrock become more apparent from the Littlehampton area eastwards. They are at their most extensive as the wave-cut platforms off the Seven Sisters, which extend from the foot of the chalk cliffs at the back of the shore to as far as 500 m from low water mark. There is a small, low-lying exposure of chalk at Winter Knoll just to the west of Littlehampton.

The following MNCR-defined biotopes, as listed in Connor *et al.* 1997, are represented on chalk exposures within Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

SIR.Lsac.Ldig [= *Laminaria saccharina* and *Laminaria digitata* on sheltered sublittoral fringe rock], p.211. - occurs on the sheltered chalk bedrock & boulders in the sublittoral fringe, just below low water mark, though divers did not record from this zone during *SEASEARCH* dives.

MIR.Ldig.Pid [= *Laminaria digitata* and piddocks on sublittoral fringe soft rock], p.176, - likely to be present at the lowest zone on chalk shores, though divers did not record from this zone during *SEASEARCH* dives.

MCR.MolPol.Sab [= Dense ascidians, bryozoans and hydroids on a crust of *Sabellaria spinulosa* on tide-swept circalittoral rock], p.293.

MCR.Pid [= Piddocks with sparse associated fauna in upward-facing circalittoral very soft chalk or clay], p.295. - particularly on horizontal exposures.

A comparison of the sublittoral chalk rock from other parts of the country (e.g. Flamborough Head, the Isle of Thanet, the Isle of Wight, Dorset and off Beer Head in south Devon) reveals the consistency (and hence stability) of the chalk to be variable (Wood 1992). The chalk exposed in the sublittoral off Kent and Sussex is soft and thus liable to breakage from fishing activities or anchoring of boats, or from wave surge in shallow areas. Evidence of recently broken rock can be seen at many sites including the Worthing Lumps, Looe Gate and off the Seven Sisters. By contrast, the chalk off Dorset and the Isle of Wight is mostly covered with a tough outer covering of encrusting calcareous algae, resulting in a more resistant bedrock surface, which is not so easily broken or eroded (Wood 1992).

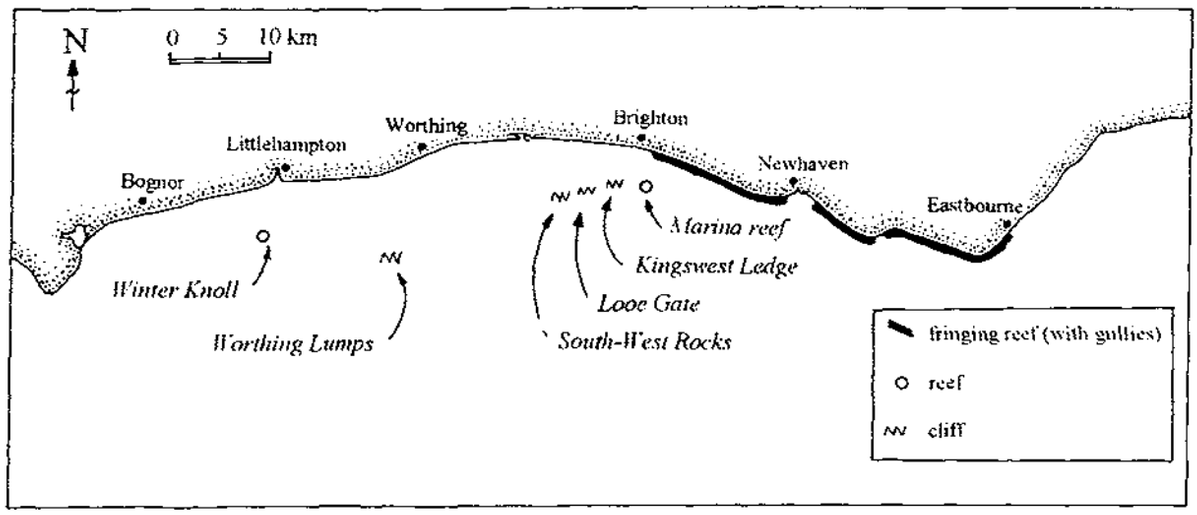


Fig. 14. Location of sublittoral chalk exposures off the Sussex coast.

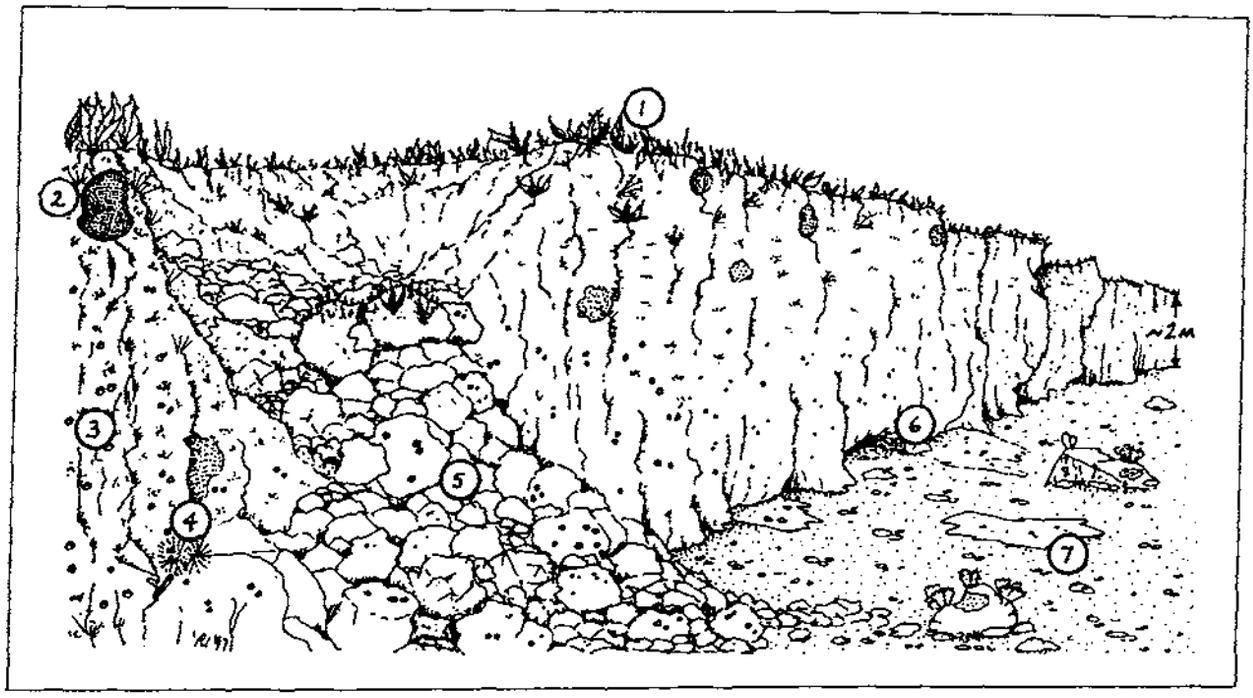


Fig. 15. Representation of a section of chalk cliff.

KEY

1. Foliose red algae on the top of the cliff
2. Encrusting bryozoan *Cellepora pumicosa*
3. Vertical face of the cliff riddled with piddock holes
4. Tubeworm *Bispira volutacornis*
5. Slope of rubble – probably caused by a trawl net snagging on part of the cliff
6. Small caves at the base of the cliff
7. Occasional exposures of horizontal chalk

6.1.3.1 Underwater chalk 'cliffs'

Sussex is the only location in the British Isles where chalk strata appear as offshore, linear 'cliffs' (i.e. vertical faces between 1-4 m in height). Offshore chalk reefs, do occur off the Kent, Isle of Wight and Dorset coasts, off Flamborough Head, and of course off the Sussex coast too. The underwater chalk 'cliff' exposures are therefore of regional, if not national, importance (Irving 1996), more as an unusual feature rather than on account of the marine communities present.

The submerged 'cliffs' appear as part of a discontinuous chalk ledge which runs from south of Worthing roughly parallel with the coast as far as Hove, at a depth of approximately 10 m below chart datum. This ledge is probably the result of an eroded fold in the chalk strata known as the 'Littlehampton anticline' (English Nature 1998). Geologists believe the fold to have taken place about 15 million years ago, at about the same time when the Alps were being formed. Above sea level, the fold is apparent at Portsdown Hill to the north of Portsmouth, with a parallel fold forming the chalk downs on the Isle of Wight. Interestingly, at any one site, the scarp face of the ledge faces north towards the coast, forming an underwater vertical cliff up to a maximum of 3 m high.

Details of the underwater chalk 'cliff' exposures present off the Sussex coast are set out below in Table 8.

Site name	Approximate Position	Distance offshore	Length exposed	General height	Max. height	Notes
Winter Knoll		3.0 km	?	1.0 m	1.5 m +	More a low-lying reef than a distinct 'cliff'. See section 7.5.
Worthing Lumps (W)	50° 43.96' N 0° 24.50' W	8.0 km	350 m +	3.0 m	3.0 m	The most impressive subtidal chalk 'cliff' off the Sussex coast.
Worthing Lumps (E)	50° 43.96' N 0° 24.50' W	8.0 km	190 m +	2.5 m	3.0 m	See section 7.6.
South-West Rocks	50° 47.60' N 0° 12.50' W	3.8 km	270 m	1.0 m	2.0 m	See section 7.7.
Looe Gate	50° 47.74' N 0° 11.59' W	3.0 km	200 m	0.5 m	1.5 m	See section 7.7.
Kingswest Ledge / Ship Rock	50° 47.95' N 0° 09.90' W	2.0 km	107 m	0.5 m	1.0 m	See section 7.8.
Palace Pier Reef / Anchor Lump / Rock Tow	50° 48.03' N 0° 08.51' W	1.5 km	?	0.8 m.	1.5 m	Not mentioned by Wood (1992). See section 7.8.
Marina Reef / Measor's Rocks	50° 47.63' N 0° 06.56' W	1.8 km	?	0.5 m	1.0 m	More a chalk/clay reef than a 'cliff' site. See section 7.8.

Table 8. Details of underwater chalk 'cliff' exposures off the Sussex coast (after Wood, 1984).

Of the sites listed above, the best example of underwater chalk 'cliff' exposures are the Worthing Lumps (see Fig. 16). Three distinct habitats can be distinguished at all of the sites: horizontal chalk bedrock forming the top of the cliff; vertical (or steeply inclined or over-hanging) chalk bedrock forming the face of the cliff; and horizontal chalk bedrock overlain by chalk cobbles, small boulders and flint pebbles and sand at the foot of the cliff. The biological communities present on each of these habitats are summarised in Table 9.

The following description of the communities on the Worthing Lumps is taken from the dossier of Sussex Marine Sites of Nature Conservation Importance (Irving 1996):

> The two cliff formations of the Worthing Lumps provide a wide range of microhabitats with an associated diversity of marine life. Foliaceous red algae, including *Calliblepharis ciliata*, *Plocamium rubrum* and *Delesseria sanguinea*, dominate the upper horizontal chalk surfaces at the top of the cliff. The vertical cliff face has a general covering of faunal turf, a major component of which is the hydroid *Tubularia indivisa*. Other conspicuous species include bushy bryozoans *Bugula* spp., the orange encrusting bryozoan *Cellepora pumicosa*, the tube worm *Filograna implexa* and the black tar sponge *Dercitus bucklandi*. The upper parts of the

CLIFF TOP	CLIFF FACE	CLIFF BASE
Horizontal chalk bedrock, possibly with rockmills (i.e. holes scoured out by hard pebbles being swirled around by the current/wave action).	Near-vertical chalk bedrock, with many small ledges and crevices.	Horizontal chalk bedrock with chalk boulders, rubble, flint gravel and sand.
Between 6 - 8 m depth (BCD)	Between 6 - 12 m depth (BCD). Max. height = 3.0 m	Between 8-12 m depth (BCD)
Calliblepharis ciliata red alga *Plocamium rubrum* red alga *Delesseria sanguinea* red alga *Bryopsis plumosa* green alga *Alcyonium digitatum* dead man's fingers *Flustra foliacea* hornwrack *Suberites* sp. sponge *Cliona celata* sponge	*Dercitus bucklandi* black tar sponge *Aplysilla rosea* sponge *Aplysilla sulfurea* sponge *Hemimycale columella* sponge *Dysidea fragilis* sponge *Esperiopsis fucorum* shredded carrot sponge *Tubularia indivisa* hydroid *Bispira volutacornis* 'feather duster' worm *Bugula* spp. bushy bryozoans *Cellepora pumicosa* encrusting bryozoan *Filograna implexa* tube worm *Barnea parva* piddock *Barnea candida* piddock *Hiatella arctica* 'red nose' piddock *Necora puber* velvet swimming crab *Cancer pagurus* edible crab *Homarus gammarus* lobster *Aplidium* sp. sea squirt	*Urticina felina* dahlia anemone *Cerianthus lloydi* anemone *Pagurus bernhardus* hermit crab *Calliostoma zizyphinum* topshell *Buccinum undatum* common whelk *Scyliorhinus canicula* dogfish *Thorogobius ephippiatus* leopard-spotted goby *Ctenolabrus rupestris* goldsinny *Trisopterus luscus* bib *Trisopterus minutus* poor cod *Pholas dactylus* common piddock

Table 9. Species recorded from the three main habitats comprising sublittoral chalk 'cliffs'.

cliff are bored by piddocks - Wood (1984) records *Barnea candida* and *B. parva* from here. The lower half of the cliff is less densely colonised, with some areas of bare chalk apparent (indicating recent falls?). The common piddock *Pholas dactylus* is present here, though empty holes are more common than occupied ones. Encrusting sponges include *Aplysilla rosea*, and *A. sulfurea, Hemimycale columella* and discrete cushions of *Dysidea fragilis*. A good variety of mobile life occurs here including crabs (*Necora puber* and *Cancer pagurus*), lobster *Homarus gammarus*, leopard-spotted gobies *Thorogobius ephippiatus* and tompot blennies *Parablennius gattorugine*.

The seabed at the base of the cliff consists of a mix of gravel and chalk pebbles with occasional small boulders. Faunal species here are few with dahlia anemones *Urticina felina*, the whelk *Buccinum undatum* and the topshell *Calliostoma zizyphinum* apparent. Lesser spotted dogfish *Scyliorhinus canicula* have been recorded from this ground in October in large numbers.

Considerable concern has been raised by divers and conservationists recently about the damage being done to sections of these underwater chalk cliffs, probably as a result of trawling gear being towed over the face of the cliff(s) - see also section 9.3.1.

6.1.3.2 Chalk bedrock exposures

Chalk bedrock (other than that described in this section under 'cliffs' or gullies) occurs close inshore off the Middleton to Littlehampton stretch of coast (e.g. Winter Knoll, Middleton Ledge and the Shelley Rocks area); off Worthing; off Brighton (e.g. Marina Reef); as part of the Seven Sisters wave-cut gullies (see also 6.1.3.3); and, interestingly, as small, sediment-covered areas adjoining the sandstone reefs off Eastbourne (Wood 1990). Where low-lying chalk bedrock is exposed (Fig. 16) its surface is worn smooth by the movement of overlying sediments. Indeed, one of the few organisms which seem to be able to tolerate this scouring are piddocks (especially *Pholas dactylus*), with their burrowing habit.

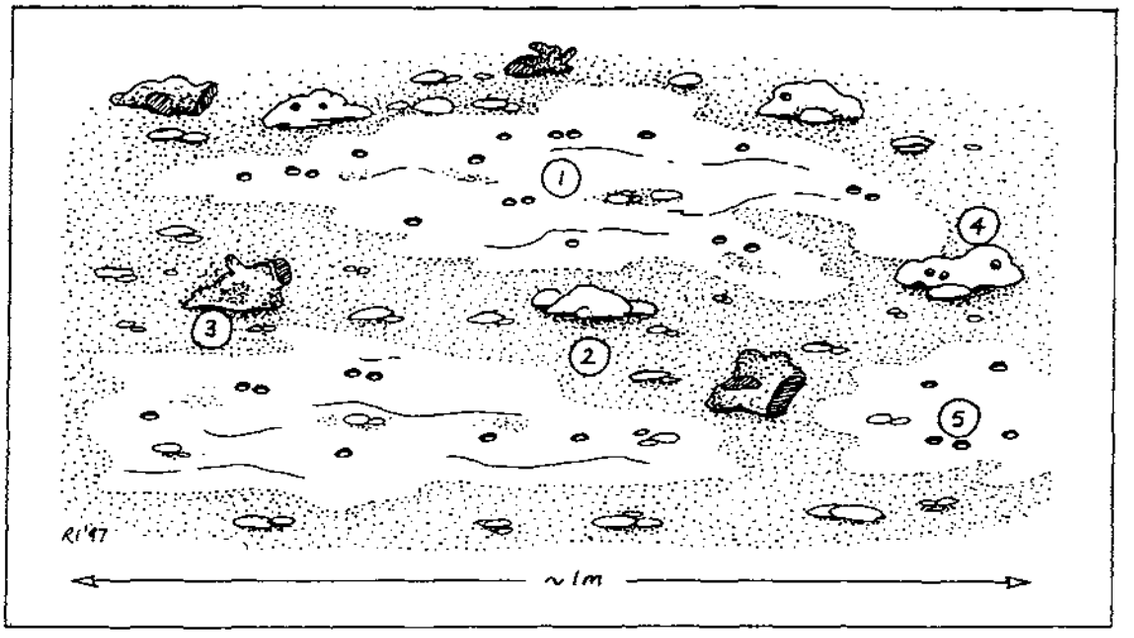


Fig. 16. Representation of horizontal chalk bedrock exposures.

KEY

1. Areas of exposed chalk underlying mixed sediments.
2. Thin covering of overlying sand over the chalk.
3. Occasional flint cobbles and pebbles.
4. Occasional chalk cobbles and pebbles.
5. Chalk bedrock with piddock holes, some of which are occupied by live *Pholas dactylus*.

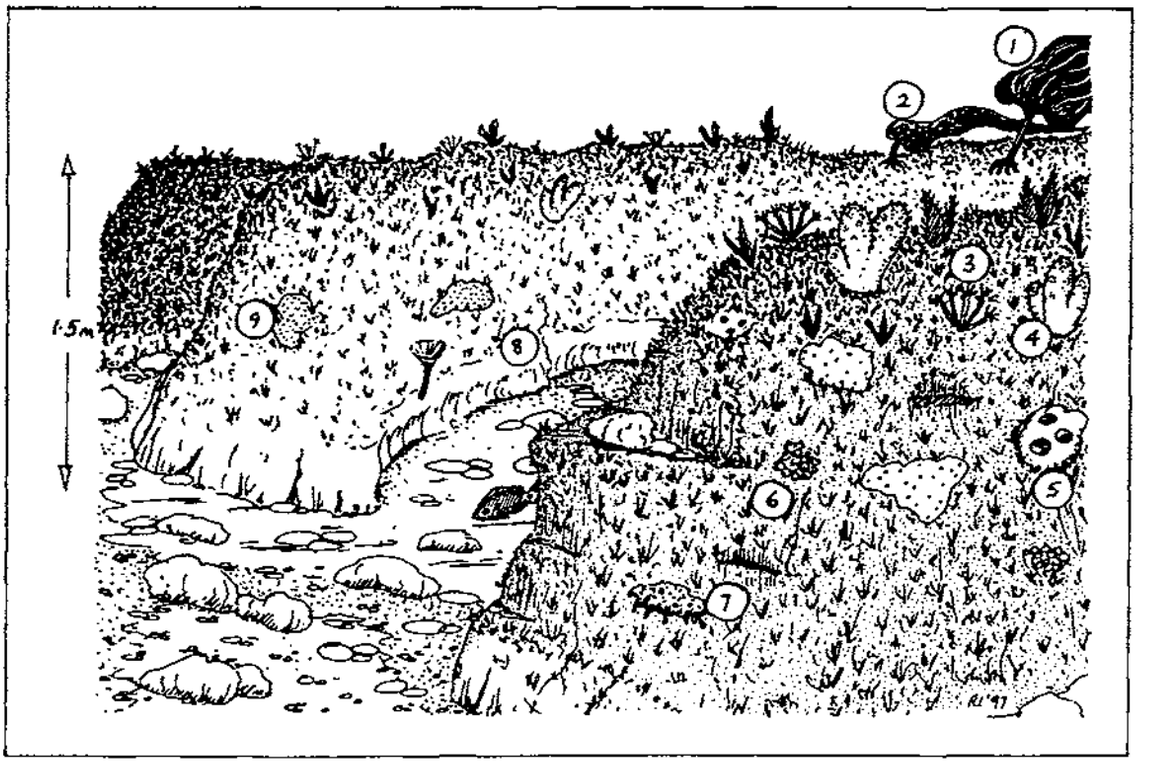


Fig. 17. Representation of the seaward end of the chalk gullies off Seaford Head.

KEY

1. Kelp *Laminaria digitata*
2. Sugar kelp *Laminaria saccharina*
3. Hydroid *Tubularia indivisa*
4. Dead man's fingers *Alcyonium digitatum*
5. Sponge *Suberites* sp.
6. Lightbulb sea squirts *Clavelina lepadiformis*
7. Sponge *Esperiopsis fucorum*
8. Zone likly to be colonised by phoroonid worms *Phoronis hippocrepia*
9. Sponge *Dysidea fragilis*

6.1.3.3 Chalk gullies

A series of gullies extends out from the wave-cut chalk platform between Brighton to Newhaven and from Seaford to Beachy Head. The gullies run perpendicular to the coastline, and extend up to 500 m from low water mark. They appear to be best developed around the Seaford Head/Hope Gap area, and least developed in the Cuckmere Haven to Birling Gap section. At Hope Gap the gullies are up to 1.5 m deep and 2 m wide, though the depth of the gullies decreases towards the shore. Two main biotopes are present within the gullies: the tops and the sides of the ridges between the gullies; and the floor of the gullies themselves.

The ridges are formed of chalk bedrock, which has been eroded into recesses, bulges, ledges and vertical sections (Fig. 17). A silty hydroid-bryozoan turf covers much of the surface, with foliose red algae occurring on the tops of the ridges and, above 2.5 m below chart datum, kelp plants (*Laminaria digitata* and *L. saccharina*). Characterising species include the sponges *Halichondria panicea*, *Esperiopsis fucorum*, *Dysidea fragilis* and *Suberites* sp., the hydroid *Tubularia indivisa*, the sand-binding worm *Sabellaria spinulosa*, the bushy bryozoan *Bugula turbinata* and the piddock *Pholas dactylus*, all of which are recorded as being occasional. The lower parts of the chalk ridges are affected by scour and are often bare. Above this, a narrow band may be present below the faunal turf, colonised by large numbers of the horseshoe worm *Phoronis hippocrepia* (Wood & Jones 1986). *Phoronis* is also found higher up the ridge sides amongst the faunal turf, but in much smaller numbers.

The floor of the gullies is of chalk bedrock worn smooth by a covering of cobbles and pebbles (at their widest) and coarse sand as they become narrower. Scour of the chalk floor and at the base of the ridge sides is most noticeable within these narrower parts.

6.1.3.4 Chalk rubble

Pieces of chalk bedrock, which have broken away from the low-lying cliffs or the sides of gullies, will form 'rubble' at the base of the cliffs. Gradually, the larger pieces of rubble (small boulders or cobbles) will be broken into smaller pieces (pebbles and gravel), which will have become worn smooth and rounded. The mobile nature of this substratum reduces the opportunities for organisms to colonise it, though the small boring polychaete worm *Polydora ciliata* may still survive. The addition of 'fines' (very fine particles of chalk) to the water column through the breakdown of the chalk adds to the turbidity in areas where chalk is found.

6.1.4 Artificial - wrecks, pier pilings, marina pontoons etc.

The Sussex coastline has more 'modern' wrecks lying off it than almost any other slice of Britain's coastline (McDonald 1985). Most of these date from the Second World War and include Mulberry Harbour units, landing craft and aircraft as well as shipwrecks. Together with sea walls and pier pilings, wrecks present a hard substratum upon which organisms can settle. Indeed, many communities present on wrecks bare a close resemblance to those found on bedrock and boulder substrata.

Many wrecks are found in areas of 'soft' sea bed and may provide an 'oasis' effect, giving rise to communities with a totally different species composition to those present on the surrounding sea bed. With parts of the wreckage raised above the sea bed, they can provide a colonising opportunity for species which prefer greater water movement. Examples of such species include plumose anemones *Metridium senile* and the hydroid *Tubularia indivisa*, both of which may dominate the attached fauna on certain wrecks.

6.1.4.1 Near-shore shallow wrecks

Typically, wreckage which ends up nearer the shore tends to become more broken up by wave action than wreckage which lies in deeper water. Consequently all that may remain of a shallow water shipwreck are a few rusting steel plates covered by kelp, and partially hidden by sand and gravel. However, a few near-shore wrecks have avoided such destruction and still offer colonising opportunities for some sessile organisms and shelter for mobile species. In particular, they often have large numbers of fish associated with them.

The *Inner Mulberry* lies just 1 km SE of Pagham village, with the uppermost parts of the wreckage being exposed at low water. The wreckage has not been surveyed by *SEASEARCH* divers. However, a thorough survey of the marine life associated with it was undertaken in 1981 (Cunliffe 1981). Sessile organisms which had colonised the wreck then are characteristic of a typical exposed rocky shore/shallow infralittoral community, with the kelp plants *Laminaria digitata* and *L. saccharina* dominating upward-facing surfaces. Barnacles and mussels were reported to cover the shallowest parts, below which was a zone of fucoid and red algae. A variety of sponges and sea squirts were present on vertical surfaces, and large numbers of plumose anemones *Metridium senile* dominated the sheltered internal surfaces. The wreck was identified as a Marine Site of Nature Conservation Importance in 1996 (Irving 1996).

The *Outer Mulberry* lies approximately 4 km SE of Pagham village from 4-11 m below chart datum. It is probably the most popular shallow water dive site off the West Sussex coast. Several *SEASEARCH* records have been made of the wreck and its environs. The partially intact wreck consists of concrete slabs and rusting steel rods, with a vertical 3 m high 'wall' on the northern and eastern sides. It provides a variety of inclined surfaces as well as a range of exposure to currents. Uppermost surfaces are dominated by assorted algae including kelp, with vertical and shaded surfaces having 70-80% cover by a hydroid and bryozoan faunal turf. In the early 1980s, the overhanging wall at the northern end had large numbers of jewel anemones *Corynactis viridis* on it, but these are no longer present. Large shoals of bib *Trisopterus luscus*, numbering several hundred individuals, gather in amongst the superstructure, while pollack *Pollachius pollachius* hover above it. Other commonly seen fish include poor cod *Trisopterus minutus*, tompot blennies *Parablennius gattorugine*, goldsinny wrasse *Ctenolabrus rupestris*, two-spotted gobies *Gobiusculus flavescens* and butterfish *Pholis gunnellus*. In 1979 the Underwater Conservation Society (later to become the Marine Conservation Society) applied to purchase the wreck (unsuccessfully) and declare it a National Nature Reserve (Wood 1992b). The *Outer Mulberry* has now been identified as a Marine Site of Nature Conservation Importance (Irving 1996).

SEASEARCH records which have come from shallow water wrecks are listed in Table 10 .

NAME	LOCATION	RECORDING FORM REFERENCE NO.	DEPTH RANGE (bcd)	APPROX. LAT./LONG.
Outer Mulberry	Pagham	93/31-33; 94/122	2.0–6.5 m	50° 44.76' N 00° 42.18' W
Miown	Shoreham	94/31; 94/67	?	50° 48.34' N 00° 15.41' W
'Ammo barge'	Pagham	94/64	10.2–12.2 m	50° 47.08' N 00° 06.96' W
Billy Boy	Shoreham	94/70	?	50° 47.55' N 00° 13.27' W
Frode		94/81	8.1 m	50° 46.11' N 00° 28.77' W
Lancer 2	Newhaven	95/100	?	50° 44.21' N 00° 01.08' W
'Palace Pier barge'	Brighton	94/180; 94/181	1.2–3.7 m	50° 48.87' N 00° 08.11' W
The *'Engine'*	Bexhill	95/51-53	8.5–12.5 m	50° 47.49' N 00° 34.10' E
Inverclyde	Brighton	95/99	?	50° 46.51' N 00° 03.73' W

Table 10 . Shallow water wrecks from which SEASEARCH records have been made.

6.1.4.2 Offshore deep water wrecks

These wrecks are dominated by sessile animal communities, there being insufficient light for algae to survive. Typically, a low faunal turf of hydroids and bryozoans dominates most surfaces, with occasional sponges, anemones and sea squirts in amongst the turf. The hydroid *Tubularia indivisa* favours those parts of the wreckage which protrudes into the water column. The tentacular heads of this species are a favourite prey item for several organisms including sea slugs, and by mid-summer all that may remain of the hydroid are its twig-like stems protruding 10-12 cm from the wreck's surface. Both the jewel anemone *Corynactis viridis* and the Devonshire cup coral *Caryophyllia smithii* may be present within small discrete clusters on vertical surfaces. Silt is likely to cover many of the horizontal surfaces. Offshore wrecks are likely to have large fish associated with them, especially bib *Trisopterus luscus*, poor cod *Trisopterus minutus*, pollack *Pollachius pollachius* and conger *Conger conger*.

The communities present on the vertical sides of deep water wrecks are similar to those described by Connor *et al.* (1996, p.250) within the MNCR-defined biotope ECR.CorCri [= *Corynactis viridis* and a crissid/*Bugula*/*Cellaria* turf on steep or vertical exposed circalittoral rock.

SEASEARCH records which have come from deep water wrecks are listed in Table 11 .

NAME	LOCATION	RECORDING FORM REFERENCE NO.	DEPTH RANGE (bcd)	APPROX. LAT./LONG.
HMS Northcoates	off Bognor	94/121		50° 39.71' N 00° 35.40' W
Zaanstroom	off Bognor	94/32		50° 39.12' N 00° 36.97' W
City of Waterford	off Brighton	95/71		50° 40.57' N 00° 06.70' W
Lancer	off Shoreham	94/123	17.7–21.7 m	50° 44.17' N 00° 01.15' E
Unknown wreck, 5 km SW of Royal Sovereign Light	off Eastbourne	94/201	21.0–23.0 m	?50° 40.00' N 00° 20.60' E

Table 11 . Deep water wrecks from which SEASEARCH records have been made.

6.1.4.3 Pier pilings and sea walls

Pier pilings and sea walls provide other forms of hard, man-made substrata, which may be colonised by species of marine life different to those on the surrounding sea bed. Similar communities exist on both types of substratum. The pilings supporting both the Palace pier and the West pier at Brighton have almost 100% cover of mussels *Mytilus edulis*, with barnacles (species indet.) occurring higher up the pilings (extending into the intertidal zone). Considerable numbers of large individuals of the common starfish *Asterias rubens* are often present, feeding on the mussels. The sea bed below the piers is usually very silty.

The outer walls of the eastern and western arms of Brighton Marina have a covering of barnacles too. The boulders at the bases of the walls, particularly on the sheltered inner sides of the walls, provide refuge for assorted crustacea including spider crab *Maia squinado*, velvet swimming crab *Necora puber*, edible crab *Cancer pagurus*, squat lobster *Galathea* sp. and lobster *Homarus gammarus*.

One hazard of diving close to piers and sea walls is the mass of discarded nylon fishing line and tackle which is often present. Not only are these items unsightly, they also constitute a danger to divers who may become inadvertently entangled in line or may accidentally rip their drysuits on fish hooks.

6.1.4.4 Marina pontoons

There are two marinas on the open coast of Sussex at Brighton and Eastbourne, one within the shelter of the River Arun at Littlehampton and a yacht basin within Chichester Harbour. No *SEASEARCH* dives have been undertaken with the specific objective of recording from floating marina pontoons, largely because a reasonably comprehensive survey of Brighton Marina was carried out by MCS volunteer divers in 1989/90 (Natural Science Services 1991). The findings of this survey revealed that the undersides of the floating pontoons, which rise and fall with each tide, have a rich assortment of algae and sessile animal species associated with them. Species which one would not expect to see in such shallow water are present, as they are not exposed even at low water. These include plumose anemones *Metridium senile*, the sea squirts *Ciona intestinalis* and *Ascidia mentula*, and the sponge *Suberites* sp.

This description may include the following MNCR-defined biotopes (Connor *et al.* 1996):
SCR.SoAs [= Solitary ascidians, including *Ciona intestinalis* and *Ascidia mentula*, on sheltered circalittoral rock], p.285. – particularly within Brighton Marina.
SCR.MetAs [= Large *Metridium senile*, solitary ascidians and sparse faunal and algal crusts on very sheltered circalittoral rock], p.287. – particularly within Brighton Marina.

6.1.4.5 Moorings

Within Chichester Harbour a number of moorings are present along the main drainage channels. These consist of a weight with a length of chain connected to it and to a buoy on the surface (Fig. 18). The oyster dredges, which operate in the Harbour during the winter months, are unable to get right up close to the moorings (though they do dredge between individual moorings – P. Couchman, pers. comm.). The sea bed here typically has cobbles and pebbles close to the moorings, with nearby firm mud or clay indicating where the dredges scoured the bottom clean. By leaving the base of the moorings free from disturbance, communities dominated by sponges,

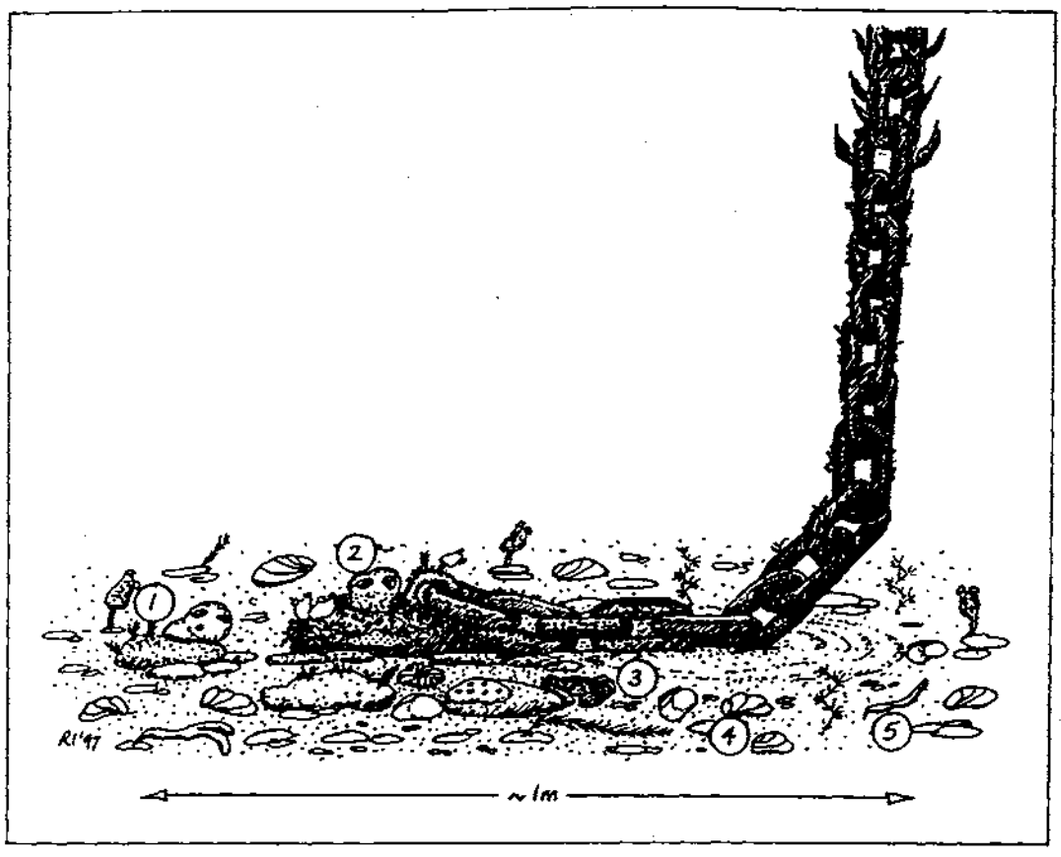


Fig. 18. Representation of benthic community close to a mooring in Chichester Harbour.

KEY

1. Stalked sea squirt *Styela clava* 2. Sponge *Suberites* sp. 3. Shore crab *Carcinus maenas*
4. Chains of slipper limpets *Crepidula fornicata* 5. Finger bryozoan *Alcyonidium diaphanum*

such as *Suberites* sp., *Dysidea fragilis*, *Hymeniacidon perleve* and *Myxilla incrustans*; solitary sea squirts, such as *Dendrodoa grossularia*, *Ascidiella aspersa* and *Styela clava*; and slipper limpets *Crepidula fornicata*, have developed here. Descriptions of communities associated with moorings have come from the following site records: 712/47, 713/34, 716,55 & 56.

Certain of these moorings were short-listed for identification as Marine SNCIs in November 1995, but at a meeting of the mSNCI Selection Committee it was argued that they were already covered by adequate conservation measures, lying as they do within Chichester Harbour Site of Special Scientific Interest (SSSI) and Special Protection Area (SPA). However, the added interest now shown to be present in these areas should be added to the SSSI description.

6.1.4.6 Historical wrecks

Of the many wrecks off the Sussex coast, there are five (at present) which have statutory protection on account of their historical and/or archaeological interest. These are:

- *HMS Hazardous* in Bracklesham Bay, which sank in 1706 and remained undiscovered until 1986. The centre of the site lies some 100 m from the shore just to the east of the slip at Bracklesham and is buoyed. Excavation work is still continuing at the site c/o the Hampshire and Wight Trust for Maritime Archaeology and the Nautical Archaeological Society.
- HMS *A1* also lies within Bracklesham Bay at 50° 44.52'N 00° 55.19'W, just south of the entrance to Chichester Harbour. She was the Royal Navy's first submarine and sits upright on sand at a depth of 14m. She was launched in 1902, and though she is not a war grave, this was the second time she had been sunk. Her final demise came in 1911 when, unmanned and

on automatic pilot, she was sunk as a gunnery target. Diving is now banned within a radius of 100m of the wreck. The protection order on this wreck has also just been designated (early 1999).

- The 'Black Cat' site on the west side of Brighton Marina. This name refers to the diving club from Basildon, Essex, whose members found the first cannon here in 1974; the actual name of the ship is unknown. The site has produced several cannon (thought to date from the 15th century) and a rare bronze hackbut, a type of swivel gun (McDonald 1985).
- *Amsterdam*, near Hastings, which sank in 1749 and is exposed at low water spring tides. Excavation of the site began in 1984. Many items from the ship's cargo have been recovered, including five bronze cannon (McDonald 1985).
- *Anne*, near Winchelsea, which sank in 1690 – a victim of the Battle of Beachy Head. She was deliberately beached and set on fire, to avoid capture by the French. Excavation work of her hull timbers and artefacts began in 1974.

All of these wreck sites have an exclusion zone around them of 100 m. No diving may take place within these zones unless a licence has been obtained from the Department of Historic Sites and Monuments.

6.1.5 Other hard substrata

6.1.5.1 Mudstone

Consolidated mud, with a hard clay-like consistency, is present as smooth, horizontal exposures in a number of areas, particularly off West Sussex, often being partially or totally covered by mixed sediments. The mudstone encountered is likely to be composed of the same particulate matter as clay, though as a result of greater compaction, it appears harder. Indeed, it may be the same 'stiff blue clay' layer which is found below the layer of limestone cap rock on top of the Mixon cliff. Mudstone is frequently riddled by piddock holes and will easily fracture and break off. See also section 6.3.1.

6.1.5.2 Greensand

A small exposure of Greensand (a form of sandstone) occurs at Head Ledge, Beachy Head. Diving here is difficult due to inaccessibility and to strong tidal streams, though some records have been made from the area [714/114 & 715/26, 27 & 28]. Large angular boulders (presumably of greensand, though this could not be determined under water), were dominated by low mats of the sea squirt *Molgula manhattensis* and large numbers of small mussels *Mytilus edulis* (Fig. 19).

6.1.5.3 Myocardia boulders

Spherical boulders, some 1-2 m in diameter and known popularly as the 'Bracklesham Balls', are present in shallow water within Bracklesham Bay to the west of Selsey Bill. They appear to be concentrated in two main areas, though a full survey of their positions has not yet been undertaken. Several of the boulders have had their tops 'sliced off', though others are intact and entirely spherical (Fig. 20). Some have even been found joined in a manner resembling Siamese twins. Wallace (1996) has shown these to be concretions of the *Myocardia* Bed (consisting of fine shelly sand, sandstone nodules and many bivalve molluscs including *Veniella* (*Myocardia*) and resembling 'shells embedded in clay') standing proud above the seabed. The balls provide a

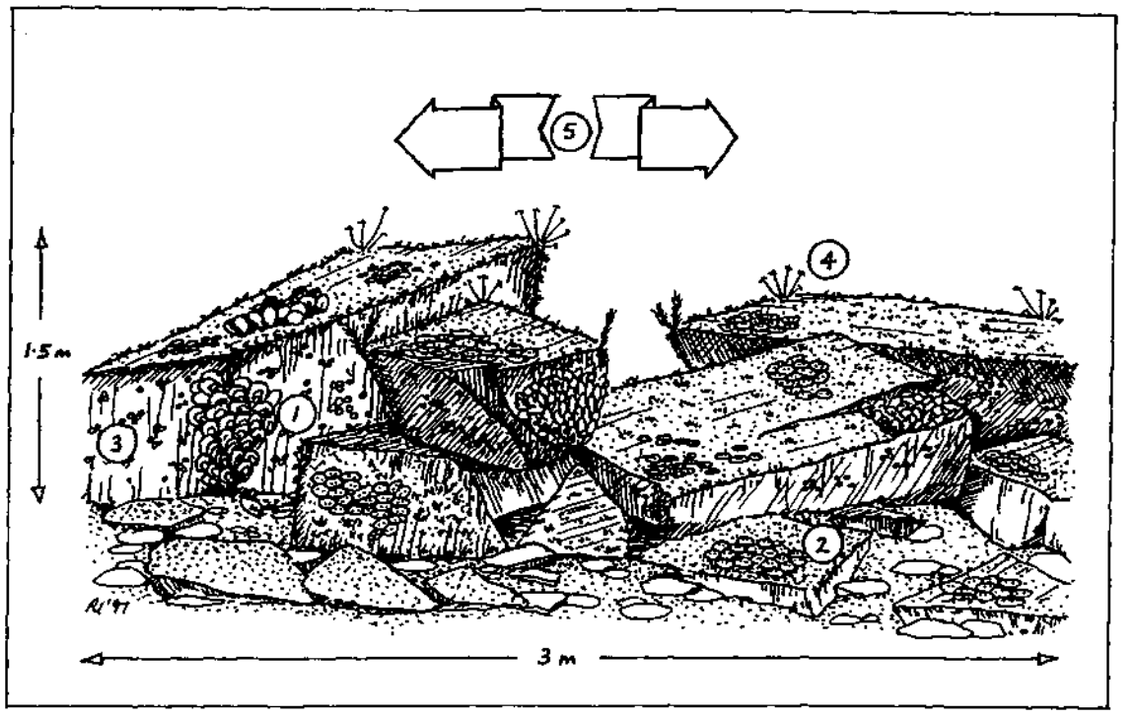


Fig. 19. Representation of Greensand boulders present at ~20 m depth off Head Ledge, Beachy Head.

KEY

1. Mussels *Mytilus edulis*
2. Sea squirts *Molgula manhattensis*
3. Barnacles
4. Hydroid *Tubularia indivisa*
5. Strong currents flowing E → W and W → E

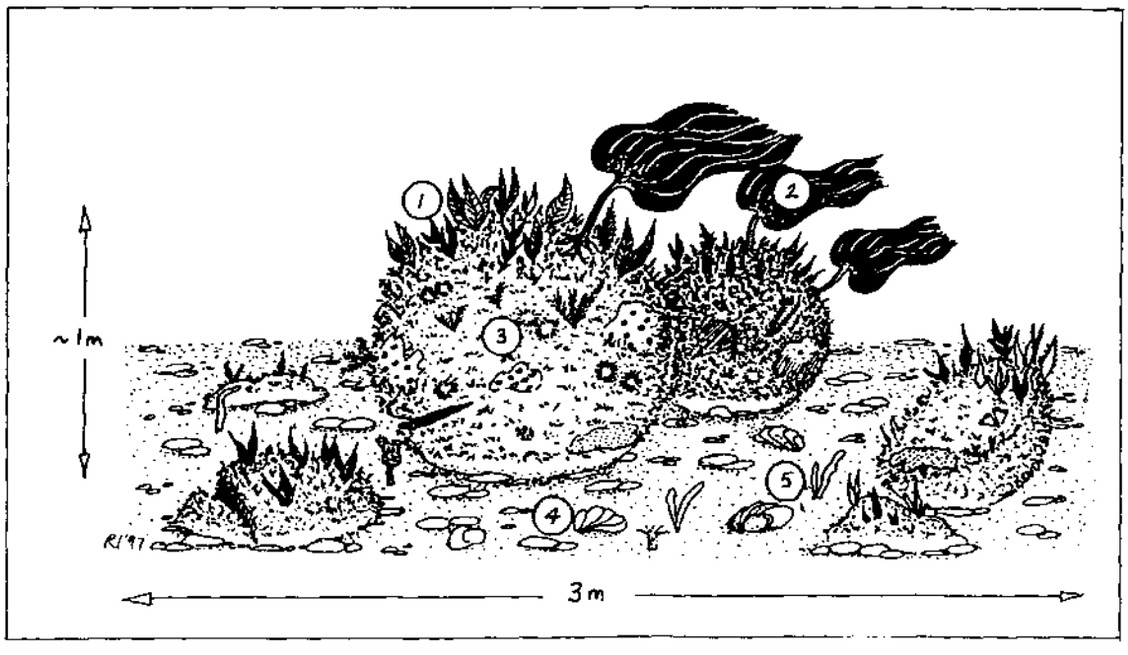


Fig. 20. Representation of the Bracklesham Balls, present at ~6 m depth in Bracklesham Bay.

KEY

1. Foliose red algae growing on tops of boulders
2. Kelp *Laminaria digitata*
3. White anemones *Actinothoë sphyrodeta*
4. Chains of slipper limpets *Crepidula fornicata*
5. Finger bryozoan *Alcyonidium diaphanum*

most unusual, though not unique, geological feature: similar spherical boulders have been reported from Southampton Water (H. Wallace, pers. comm.).

The tops of the shallowest boulders may have occasional kelp plants, *Laminaria digitata* and *L. saccharina* growing on them, together with an assortment of red foliose algae (*Calliblepharis ciliata* and *Halurus flusculosus* being found frequently). In deeper water, growths of the hydroid *Nemertesia antennina* and the leafy bryozoan *Flustra foliacea* may be present. The sides of the boulders are dominated by a hydroid-bryozoan turf (dominated by *Bugula* spp.) with occasional white anemones *Actinothoe sphyrodeta*, dead man's fingers *Alcyonium digitatum* and small patches of the grey colonial sea squirt *Diplosoma listerianum*. A rich encrusting sponge fauna has been recorded from the boulders, including the 'shredded carrot' sponge *Esperiopsis fucorum*, the 'goose bump' sponge *Dysidea fragilis*, *Hymeniacidon perleve* and *Halichondria bowerbanki*. Less common are the sponges *Tethya aurantium*, *Suberites domuncula* and *Polymastia mammilaris*. The boulders tend to have a fine covering of silt and there are signs of scouring around their bases (Irving 1996). Descriptions of the 'balls' have come from the following dives (survey/site/habitat): 711/28/1, 711/30/1, 712/50/2, 712/77/1, 713/157/2, 717/24/1 & 717/25/1 - see also section 7.2.

The *Myocardia* bed is known to outcrop elsewhere in Bracklesham Bay, though the marine life associated with it is sparse, presumably due to the soft, friable nature of the substratum (Wood 1992b).

6.1.5.4 Mussel beds

The common mussel *Mytilus edulis* can form extensive beds in certain locations, the byssus threads of adjacent mussels helping to anchor them to the seabed as well as to each other. These beds may overlie mixed sediment grounds (see below), but as they provide almost 100% cover of the seabed, a different biotope is created. Usually mussel beds occur where water movement is moderately strong (i.e. tide-swept locations), such as close to the headlands of Selsey Bill and Beachy Head. Other species may colonise the beds, finding shelter amongst the mussel shells. These include various small hydroids and bryozoans, with assorted brown and red algae present if there is sufficient light available. Predatory starfish *Asterias rubens* are often found here too. Beds of the common mussel *Mytilus edulis* have been recorded from the following sites: 712/64 & 65; 713/68, 124, 125, 126, 189; 714/89, 90, 109, 111; 715/10, 11, 26, 27, 29, 30, 59, 60; & 716/40

The following biotopes, as defined by Connor *et al.* (1997), are likely to be associated with sublittoral sandstone bedrock & boulder habitats off Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

SIR.MytT [= *Mytilus edulis* beds on reduced salinity tide-swept infralittoral rock], p.223.
MCR.MytHAs [= *Mytilus edulis* beds with hydroids and ascidians on tide-swept moderately exposed circalittoral rock], p.280.

6.2 Mixed sediments

Areas of mixed sediments dominate much of the seabed off West Sussex in particular. They comprise mixtures of cobble, pebble, gravel, shell and sand in varying amounts. Some boulders may be found in such areas too. Mixed sediments occur as 'flattish grounds' (as described by Wood 1984) from shallow to deep depths, with some areas being more mobile than others. Mobile areas include those in shallow water close to the shore which are exposed to wave action, as well as those further offshore in deeper water exposed to strong currents. This latter category tends to consist of a high percentage of clean gravel with some pebble. In general terms, the larger the particle size (and hence its greater stability), the greater the density and diversity of marine life associated with it. However, areas of gravel overlying soft clay may also provide a

relatively stable substratum, and these areas can exhibit a rich and diverse flora and fauna too (Irving 1994).

6.2.1 Mixtures dominated by cobbles

For *SEASEARCH* purposes, cobbles are defined as being between fist-size and head-size - that is between 10 cm and 25 cm (see the 'Promptsheet' in Appendix 2). Cobbles may be formed of flint, sandstone, limestone or chalk. Mixtures dominated by cobbles are colonised by a wide range of organisms, giving rise to rich communities in areas where the substratum is stable (Fig. 21).

In shallow areas, the kelp plants *Laminaria saccharina* and *L. digitata*, together with the sea oak *Halidrys siliquosa*, may be found attached to larger cobbles. Strands of the bootlace weed *Chorda filum* are also likely to be found associated with this habitat, though typically attached to pebbles or gravel. Other commonly encountered foliose algae include *Chondrus crispus*, *Plocamium cartilagineum*, *Palmaria palmata*, *Brogniartella byssoides* and *Halarachnion lingulatum*. Algae may provide 80-90% cover of the seabed during the summer months, though this cover decreases over winter as the fronds of many species decay. Chalk cobbles are not often found in shallow depths as they are quickly broken down to rounded pebbles by wave action. In deeper water they often show signs of boring from organisms such as piddocks, spionid polychaete worms and the sponge *Cliona celata*.

In medium to deep depths, cobbles are likely to be dominated by erect growths of the leafy bryozoan *Flustra foliacea* and clumps of the hydroid *Nemertesia antennina*. Encrusting species include the sponges *Esperiopsis* (*Amphilectis*) *fucorum*, *Dysidea fragilis* and *Hymeniacidon perleve*, the sea squirts *Dendrodoa grossularia* (particularly west of Selsey Bill) and *Molgula manhattensis* (in silty situations), barnacles, and the bryozoans *Bugula* spp. Amongst the cobbles, a number of other sessile species are characteristic, such as the stalked sea squirt *Styela clava*, the hydroid *Hydrallmania falcata* and the 'finger' bryozoan *Alcyonidium diaphanum*.

The following biotopes, as defined by Connor *et al.* (1997), are likely to be associated with sublittoral mixed sediment habitats dominated by cobbles, off Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

MIR.LsacChoR [= *Laminaria saccharina*, *Chorda filum* and dense red seaweeds on shallow unstable infralittoral boulders and cobbles], p.196;

MCR.SmemAdia [= Sparse sponges, *Nemertesia* spp., *Alcyonidium diaphanum* and *Bowerbankia* spp. on circalittoral mixed substrata], p.263;

MCR.Flu.HbyS [= *Flustra foliacea* with hydroids, bryozoans and sponges on slightly tide-swept circalittoral mixed substrata], p.269.

The dense growths on cobbles provided cover for an assortment of small crabs, such as *Hyas coarctatus*, juvenile *Maja squinado*, *Inarchus* sp. and *Macropodia rostrata*. Small edible crabs *Cancer pagurus* were sometimes seen in gaps between the stones. The squat lobster *Galathea squamifera* may be found hiding under cobbles. This type of substrate appeared to attract cuttlefish *Sepia officinalis*. Of the fish recorded from this habitat, small gobies were frequent (often it was impossible to distinguish which species); greater pipefish *Sygnathus acus* and butterfish *Pholis gunnellus* were often present in shallow depths; and dragonets *Callionymus lyra* were present on pebbles and gravel between the cobbles.

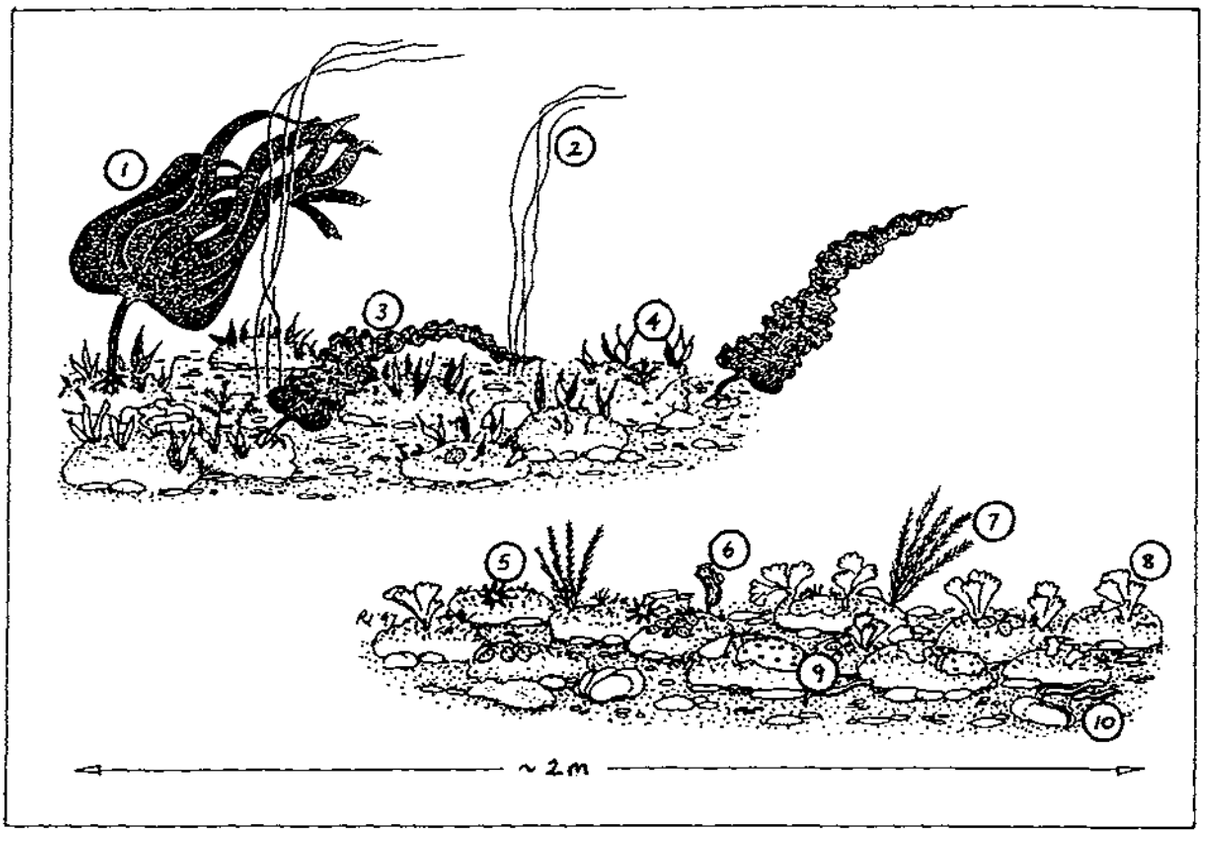


Fig. 21. Representation of cobble-dominated mixed sediment, at shallow and deeper depths.

KEY

1. kelp *Laminaria digitata* or *L. hyperborea*
2. Bootlace weed *Chorda filum*
3. Sugar kelp *Laminaria saccharina*
4. Assorted red and brown algae
5. White anemone *Actinothoë sphyrodeta*
6. Stalked sea squirt *Styela clava*
7. Hydroid *Nemertesia antennina*
8. Leafy bryozoan *Flustra foliacea*
9. Encrusting sponges and sea squirts
10. Finger bryozoan *Alcyonidium diaphanum*

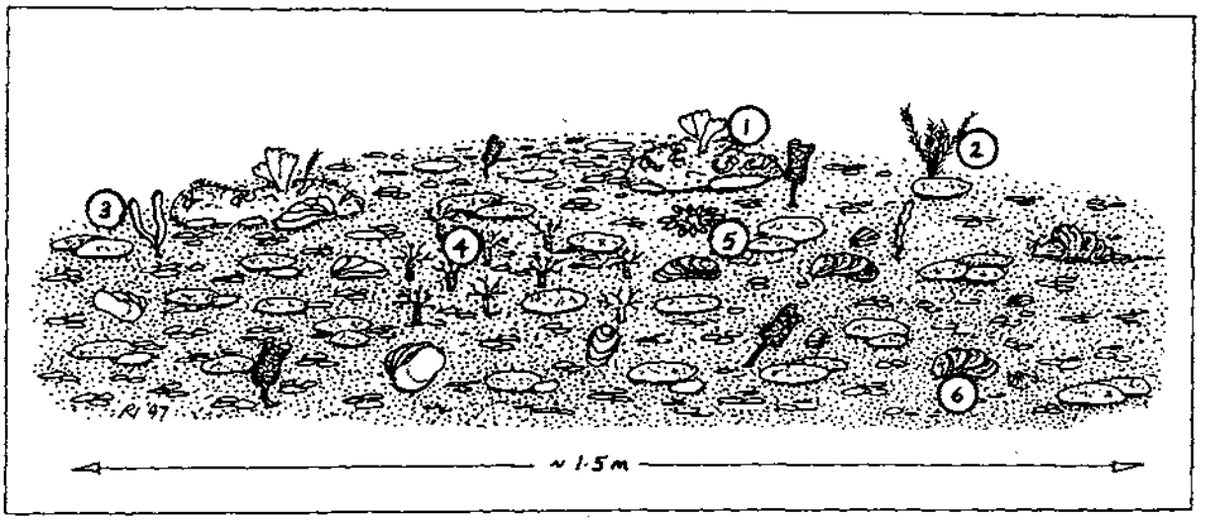


Fig. 22. Representation of pebble-dominated mixed sediment

KEY

1. Cobble with *Flustra foliacea* and *Pomatoceros triqueter*
2. Hydroid *Nemertesia antennina*
3. Finger bryozoan *Alcyonidium diaphanum*
4. Sandmason worms *Lanice conchilega*
5. Dahlia anemone *Urticina felina*
6. Chains of slipper limpets *Crepidula fornicata*

6.2.2 Mixtures dominated by pebbles, shells, gravel and sand

Off the West Sussex coast in particular, extensive flat areas of seabed comprise mixtures of pebbles, gravel, sand and slipper limpet shells (Fig. 22). Species commonly associated with this habitat include sand mason worms *Lanice conchilega*, stalked sea squirts *Styela clava*, the 'finger' bryozoan *Alcyonidium diaphanum* and the dahlia anemone *Urticina felina*. Large areas of seabed may be stabilised by the tubicolous polychaete *Sabellaria spinulosa*, whose sandy tubes help to bind together neighbouring stones. On the larger pebbles, keel worms *Pomatoceros triqueter* are often present, which are sufficiently robust to be able to tolerate a considerable amount of disturbance. Mobile life includes hermit crabs (typically *Pagurus bernhardus*), the common whelk *Buccinum undatum*, the netted dogwhelk *Hinia reticulata*, small edible crabs *Cancer pagurus*, and, in shallow water, shore crabs *Carcinus maenas* and spider crabs *Maja squinado*. Fishes to be seen include dragonets *Callionymus lyra*, small gobies and flatfish, such as plaice *Pleuronectes platessa* and Dover sole *Solea solea*.

Chains of live slipper limpets *Crepidula fornicata* are common within mixed sediment areas, particularly off West Sussex. At their densest, they can form a 'living substratum', with other organisms, such as sea squirts and bryozoans, attached to their shells. Once individuals have died, their shells may collect in heaps, though few organisms are able to colonise them due to their instability. Broken shell debris may also be made up of oyster, scallop and mussel shells.
The common mussel *Mytilus edulis* fulfils a similar niche to the slipper limpet, occurring as continuous 'beds' in shallow waters. These are present in areas of reasonably strong currents (e.g. to the south of Selsey Bill), in areas of organic enrichment (e.g. in the vicinity of sewer outfalls), or in shallow waters where bedrock is present (e.g. around Brighton Palace Pier). Large numbers of the common starfish *Asterias rubens* are often present on these beds, feeding on the mussels.

The following biotopes, as defined by Connor *et al.* (1997), are likely to be associated with sublittoral mixed sediment habitats dominated by pebbles and gravel, off Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

IMX.LsacX {= *Laminaria saccharina*, *Chorda filum* and filamentous red seaweeds on sheltered infralittoral sediment}, p.386.

6.2.3 Mixtures dominated by gravel

Areas of clean, tide-swept gravel are generally devoid of visible life. One example of this was to the south of Selsey Bill where strong currents had formed the clean gravel into waves (~0.75 m high and ~10-15 m in wavelength). Elsewhere (such as at the mouth of Chichester Harbour), where the gravel is slightly more stable, organisms such as the bryozoan *Alcyonidium diaphanum* and the hydroids *Sertularia* spp. and *Hydrallmania falcata* are present as particularly large individuals. However, where there is less tide exposure, the gravel becomes mixed with sand, consolidates and forms a reasonably stable habitat, well colonised by burrowing species in particular (Fig. 23). The diversity of marine life associated with this habitat is dependent on a number of factors including the stability of the substratum and the size of particles (stones). The amount of water movement and the degree of siltation may also be influential.

In sheltered, shallow waters, gravel (with some pebble) is likely to be relatively stable and have a high silt content. During the summer months, cover by various brown and red algae can be high, providing shelter for other organisms. The tube-dwelling sandmason worm *Lanice conchilega* is typical of this habitat, together with burrowing species such as terebellid worms, the anemone *Cerianthus lloydi* and the large mollusc *Mya truncata*. In deeper waters (below about 6 m BCD), a variety of species colonise the gravel surface, particularly the bryozoans *Alcyonidium diaphanum* and *Flustra foliacea*, the ascidians *Polycarpa pomaria* and *Styela clava*, the tubicolous worm *Sabellaria spinulosa* and the dahlia anemone *Urticina felina*. Commonly encountered mobile species associated with this habitat include the molluscs *Buccinum undatum*, *Hinia reticulata* and *Gibbula cineraria*, and the hermit crab *Pagurus bernhardus*.

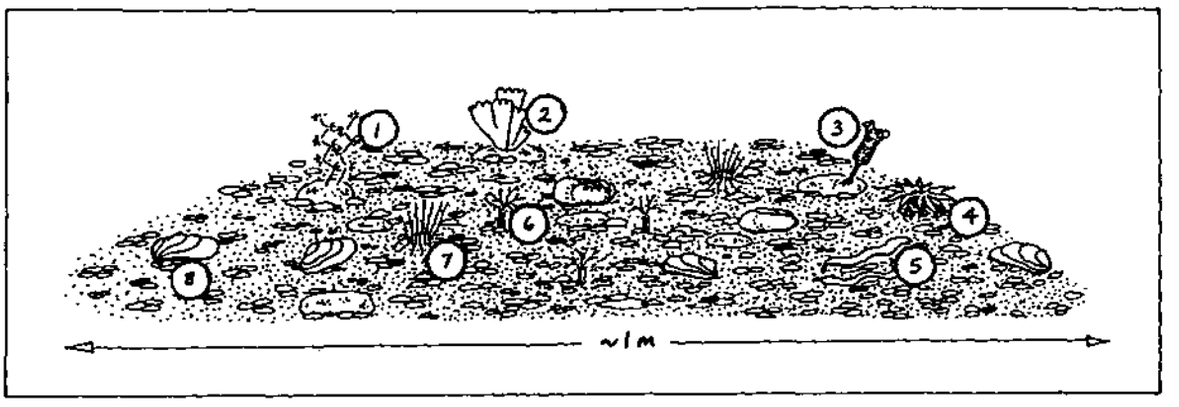


Fig. 23. Representation of gravel-dominated mixed sediment.

KEY

1. Hydroid *Hydrallmania falcata*
2. Erect bryozoan *Flustra foliacea*
3. Stalked sea squirt *Styela clava*
4. Dahlia anemone *Urticina felina*
5. Finger bryozoan *Alcyonidium diaphanum*
6. Sandmason worm *Lanice conchilega*
7. Burrowing anemone *Cerianthus lloydi*
8. Chain of slipper limpets *Crepidula fornicata*

Black sea bream *Spondyliosoma cantharus* come close inshore during April and May to breed in gravel areas, particularly in the Littlehampton/Worthing/Shoreham area. The males excavate large circular depressions up to 1.5 m in diameter, bounded by a low bank of gravel. The female will then lay her eggs in the centre of the circle, and the male will guard the eggs until the young hatch.

The following biotopes, as defined by Connor *et al.* (1997), are likely to be associated with sublittoral gravel habitats off Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

IGS.ScupHyd [= *Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral cobbles or pebbles in coarse sand], p.336;

6.3 Soft substrata

6.3.1 Clay

Clay occurs in patches throughout the western part of Sussex, particularly in the Selsey Bill area. Typically, it appears as smooth, horizontal exposures often covered in part by sand, gravel or pebbles (Fig. 24). However, it may also form clay ridges, with pebbles and gravel accumulating in the troughs in between the ridges. Hiscock (1985) reported such clay ridges at a depth of about 25 m off Middle Ground. The clay ridges were either bare or colonised by a bed of mussels, with large numbers of whelks *Buccinum undatum* present. Collins and Mallinson (1983) also reported clay ridges in Bracklesham Bay, some 2-3 miles south of the entrance to Chichester Harbour.

Typically, the clay exposures may either be 'stiff, blue clay' (which may be referred to by some divers as 'mudstone' – see section 6.1.4), or as 'soft, grey clay'. Very little life is apparent on these clay exposures, largely due to the scouring action of sand and gravel which are also present at most sites. Some organisms however (such as piddocks and razor shells) are able to burrow into the clay, thereby avoiding damage. An additional soft stratum is also present at some sites.

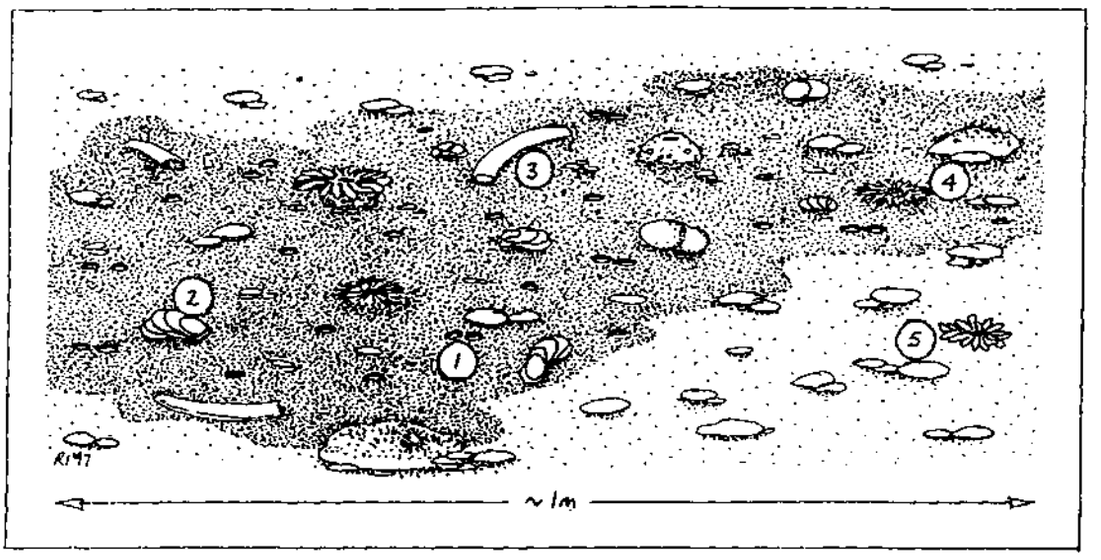


Fig. 24. Representation of horizontal clay exposure.

KEY

1. Clay with piddock holes *Pholas dactylus*
2. Chains of slipper limpets *Crepidula fornicata*
3. Razor shell *Ensis* sp.
4. Daisy anemone *Cereus pedunculatus*
5. Dahlia anemone *Urticina felina* with sand overlying clay.

The following MNCR-defined biotope is likely to be represented on horizontal clay exposures within Sussex, as listed in Connor *et al.* 1997. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

MCR.Pid [= Piddocks with sparse associated fauna *in* upward-facing circalittoral very soft chalk or clay], p.295. – particularly on horizontal exposures.

Clay is also present as the extensive, near-vertical cliff at the Mixon Hole, off Selsey Bill (see also section 9.2). Smaller clay cliffs, in the region of 0.5-2.0 m high, are also known to exist at various sites off the Sussex coast. However, it is the cliff at the Mixon Hole which is the most dramatic. The exposed soft grey clay forming the main cliff has numerous ledges, crevices and fissures, and is continually being eroded by currents sweeping across its face. Much of it is bare and uncolonised by encrusting marine life. It is extensively bored by piddocks *Pholas dactylus* but many of the holes appear empty. Many crustacea are present on the ledges including edible crabs *Cancer pagurus*, velvet swimming crabs *Necora puber* and squat lobsters *Galathea squamifera*. Tompot blennies *Parablennius gattorugine* and leopard-spotted gobies *Thorogobius ephippiatus* are also frequently seen. Towards the base of the cliff, the steep slope is strewn by boulders and cobbles (which have broken off from the layer of blue clay near the top of the cliff) and occasional lumps of softer grey clay.

Whilst the Mixon is a large, open feature, the seabed in other areas, for example Boulder Bank to the south-west of Selsey Bill, has eroded in such a way as to produce a number of pinnacles of clay topped with limestone. The holes and overhangs associated with this habitat provide a particularly good refuge for open water fish such as bib and wrasse, as well as smaller species that occupy holes in the clay (Collins & Mallinson 1983). Similar habitats are present at the southern end of the Shoal of Lead (Outer Owers), where limestone cap rock has fallen onto the 'mudstone' below.

The following MNCR-defined biotope, as listed in Connor *et al.* 1997, is likely to be represented on vertical clay/chalk exposures within Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

MCR.ByAs.Hia [= Bryozoan and ascidian turf on piddock-bored vertical sublittoral soft rock], p.269

6.3.2 Sand

Sandy sediments may be present in sheltered areas (where fine sand is mixed with mud/silt) as well as in areas exposed to strong tidal streams (where the sand is typically coarse and clean). Much of the seabed off the Brighton to Newhaven and Bexhill to Rye sections of the East Sussex coast consists of vast expanses of sand. Large areas within Bracklesham Bay at the western end of the region are also dominated by sand. The sand may be level or formed into ripples or waves – the larger the size and wavelength of ripple, the greater the water movement. One rarely encounters pure sand: it usually has a small amount of broken shell fragments mixed in with it, remains of the huge numbers of bivalve molluscs that remain hidden from sight. As a result of the mobile nature of sand, the associated fauna appears to be very limited. However, as most organisms remain buried within the sand rather than exposed on the surface, this is not necessarily true. Any cobbles or small boulders that may be present act as oases of life, providing a foothold for various species that require an attachment site, such as hydroids, erect bryozoans, barnacles and sea squirts.

Near-shore silty or muddy sand may exhibit lugworms *Arenicola marina* and sandmason worms *Lanice conchilega*. Mobile life includes hermit crabs, small gobies and juvenile flatfish. Further offshore, predatory whelks *Buccinum undatum* and netted dogwhelks *Hinia reticulata* are likely to be found. Cleaner sand tends to be favoured by the burrowing heart urchin *Echinocardium cordatum*, the masked crab *Corystes cassivelaunus* and the sea mouse *Aphrodite aculeata*. Occasionally, the lunate sandy egg-strings of the necklace shell *Polinices* sp. are apparent, though the actual snails themselves are rarely seen. Flatfish include brill *Scophthalmus rhombus*, plaice *Pleuronectes platessa*, dab *Limanda limanda* and sole *Solea solea*. Occasionally thornback rays *Raja clavata* have been encountered on sand.

At the mouth of Chichester Harbour, the sand is affected by strong currents. Here there are dense beds of the sandmason worm *Lanice conchilega* present on the gradual sloping seabed at about 8-13 m depth BCD. Where more gravel and shell debris was present, the *Lanice* tubes, all 'stunted' at about 1 cm high, were interspersed by taller tubes of the peacock worm *Sabella pavonina*.

Sand also forms an important component of mixed sediments, as described above.

The following MNCR-defined biotopes of sandy areas, as listed in Connor *et al.* 1997, are likely to be represented within Sussex. [Note that a Habitat Manual for the Sussex sublittoral is currently being prepared].

IGS.EcorEns [= *Echinocardium cordatum* and *Ensis* spp. in lower shore or shallow sublittoral muddy fine sand], p.350.

IGS.Lcon [= Dense *Lanice conchilega* and other polychaetes in tide-swept infralittoral sand], p.337 - particularly at the mouth of Chichester Harbour.

6.3.3 Mud

The occurrence of mud as a seabed type is extremely restricted on open sections of the coast. It is found in sheltered situations, such as within Chichester Harbour or Brighton Marina, where it occurs extensively. However, it may also be encountered at spoil dumping grounds, such as that present to the east of Brighton Marina and in Seaford Bay close to Newhaven.

Most organisms which can tolerate mud are found living within it as infauna - very little epifauna is visible on its surface. Typically, it is burrowing bivalves which will dominate the infauna, the range of species being determined by how deep the oxygenated surface zone penetrates. Cockles *Cerastoderma edule* are the dominant infaunal species in many parts of Chichester Harbour.

7. Distribution of seabed types and features of interest within near-shore coastal sectors

The locations of all 635 *SEASEARCH* dives undertaken during the period between 1992 and 1998 are plotted in Fig. 25. When viewed together with the diagram below indicating the bathymetry (Fig. 7), it can be seen that the vast majority of these dives have been within the 20 m depth contour (BCD). Fewer dives have been undertaken at the eastern end of East Sussex, in part due to the inaccessibility of this stretch of coast and also because it is known there are few underwater features of interest here.

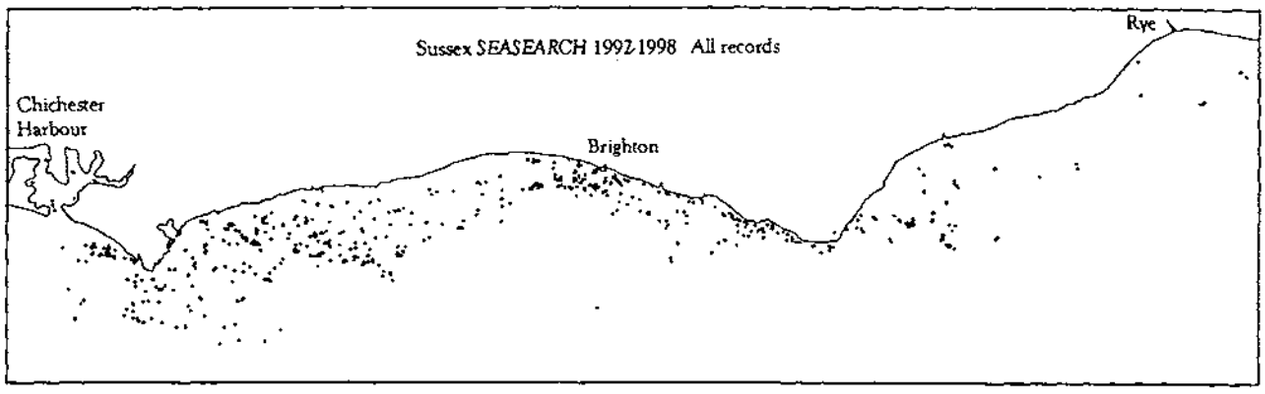
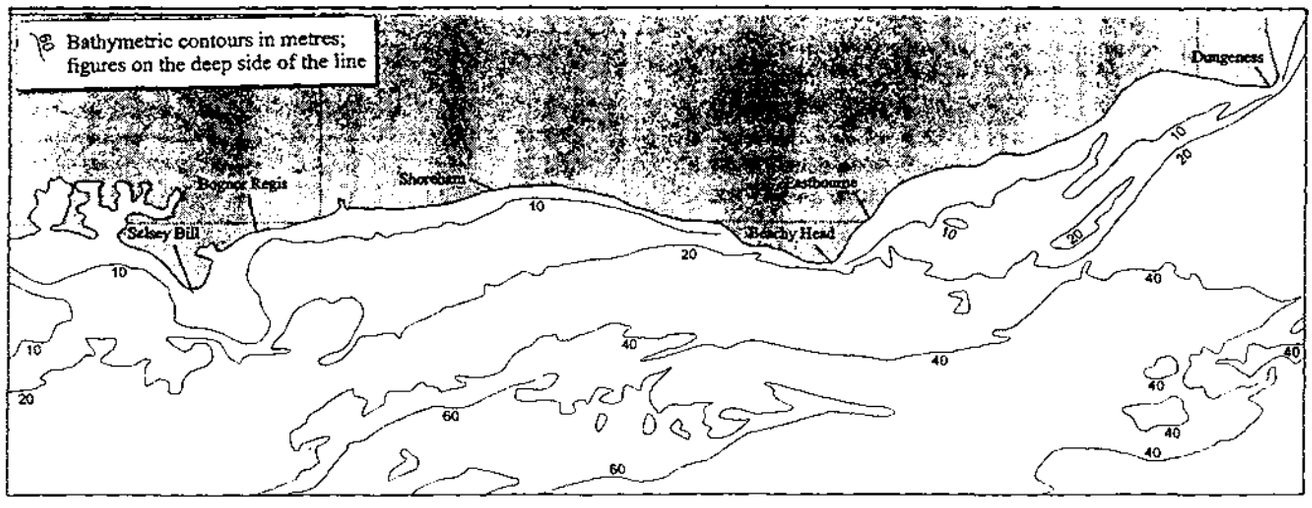


Fig. 25. The location of all 635 Sussex SEASEARCH *site records, 1992-1998.*



[Fig. 7. Near-shore bathymetry off the Sussex coast (taken from Barne et al. *1998)].*

In order to assist the analysis of information that has resulted from *SEASEARCH* dives during the period between 1992 and 1998, the whole of the coastline of both West and East Sussex has been split into a number of sectors (Fig. 26). Each of these is dealt with in turn here. The width of each sector varies somewhat, though for the purposes of sector recognition by the database, each sector 'box' is bounded by N/S lines of longitude and E/W lines of latitude.

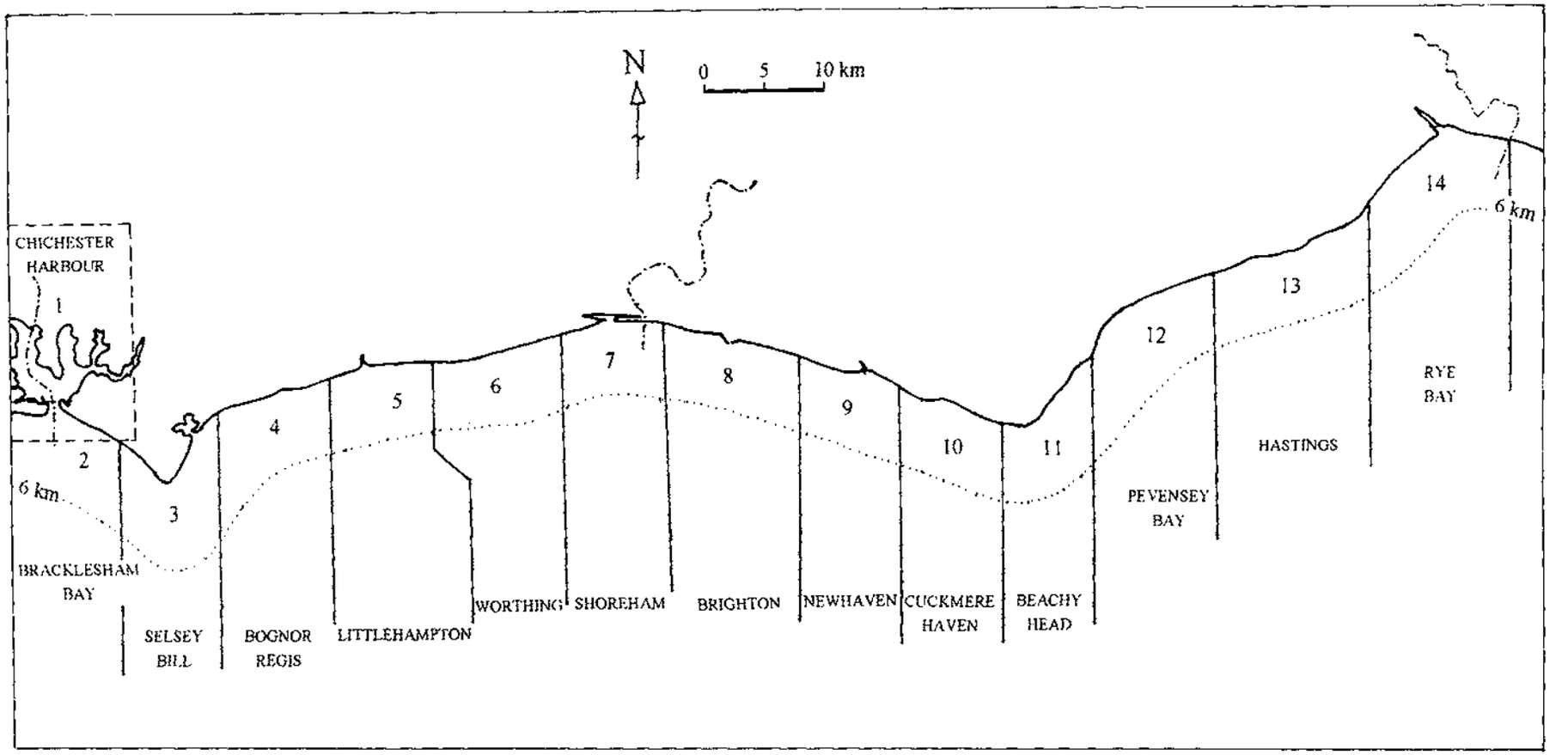


Fig. 26. Distribution of *SEASEARCH* mapping sectors along the coastline of West and East Sussex. (Note that Sector 15, Dungeness, is not marked).

7.1 Chichester Harbour

Overview

Chichester Harbour forms the most easterly of the three major Solent estuaries (the others being Portsmouth Harbour and Langstone Harbour), and is the only large estuary (at almost 3000 ha) in both West and East Sussex. The prime nature conservation importance of the Harbour is centred on its migrant and wintering wildfowl populations, though it also has extensive saltmarsh areas. It is the only estuary throughout Sussex that is a major nursery for sea bass *Dicentrarchus labrax*. The Harbour is predominantly saline, with little freshwater inflow, and is largely sediment-filled. The total area of the Harbour is 2,946 ha, with 79.5% (2,342 ha) being intertidal and 20.5% (589 ha) being subtidal (Barne *et al.* 1998).

Only twelve *SEASEARCH* dives had been carried out within the Harbour up until the end of 1998. All sites were found to be quite silty, especially those least affected by currents. Along the main drainage channels the seabed tends to be a mix of clay and mud with many shells, especially dead and live slipper limpets *Crepidula fornicata*. The clay/mud surface layer becomes anoxic within about 1 cm of the surface. Many of these areas are swept clean of life by the action of oyster dredges during the winter months (November to April). This practice has obviously cleared away the pebbles and slipper limpets from the seabed which one might expect to see. The fishery is regulated by a Sussex Sea Fisheries Committee byelaw (see also Section 9.7.3). A series of 'shallow, discontinuous, parallel grooves in firm mud' were observed by one group of divers (712/46) in Chichester Channel, which it was assumed had been caused by an oyster dredge.

Features of interest

In areas not affected by dredging, such as in the immediate vicinity of **moorings**, there may be scattered pebbles, occasional cobbles and other shells and shell debris on and in the mud (see also Section 6.1.4.5). Attached to the *Crepidula* shells are various small hydroids, the sea squirt *Dendrodoa grossularia* and various other ascidian species, a few sponges and barnacles. Partly buried in the mud are occasional dahlia anemones *Urticina felina*, cockles *Cerastoderma edule* and oysters *Ostrea edulis*. Mobile fauna includes hermit crabs (Paguridae), shore crabs *Carcinus maenas*, small spider crabs and juvenile gobies. These areas amongst moorings are noticeably richer in marine life than other areas, presumably because they manage to avoid the attentions of the oyster dredgers. They were considered for inclusion within the initial list of Marine Sites of Nature Conservation Importance but it was decided to exclude them from the first tranche as the whole of the Harbour was already under the umbrella cover of SSSI and SPA protection.

In shallow areas where there are firm attachment sites, such as concrete mooring blocks, seaweeds may be present. However, the number of species is restricted by the high levels of turbidity. Species recorded include sea lettuce *Ulva lactuca*, and several red algae such as *Griffithsia* and *Polysiphonia*. Occasional mud tubes of the peacock worm *Sabella pavonina* were recorded rising 10 cm or so above the seabed, and the leathery stalked sea squirt *Styela clava* was present attached to pebbles or slipper limpet shells in some areas.

Near the centre of the narrow, tide-swept **entrance to the Harbour**, a deep (26 m) hole is marked on the Admiralty Chart. The site is difficult to dive safely because of strong currents and boat traffic (particularly at weekends - reported as one boat movement every 9 seconds during the summer!). Collins & Mallinson (1983) reported finding a steep slope of sand here, held together by a continuous mat of the tubes of the worm *Sabellaria spinulosa*. However, *SEASEARCH* dives undertaken at the end of October 1998 (717/35-38) found a gradual slope of clean gravel and very little evidence of *Sabellaria*. Clearly the bathymetry of this area changes from time to time, as the deepest part (from echo soundings) was found to be 19 m depth BCD in October 1998, and this was further over to the west side of the channel. Large individuals of the 'finger' bryozoan *Alcyonidium diaphanum* and the hydroids *Sertularia argentea* and *Hydrallmania falcata* dominated the gravel slope, from 8 - 16 m depth BCD. In shallower water, patches of the peacock

worm *Sabella pavonina* and stumpy tubes of the sandmason worm *Lanice conchilega* were present. Slightly to the north, just off the Hayling Island Sailing Club buildings, the *Sabella pavonina* patches had enlarged to become extensive 'forests'. The seabed here has a similar degree of slope, though comprised a 50:50 mixture of flint pebbles and sand. Cleaner sand is present where the slope levels at 15.5 m depth BCD. It is hoped that further dives may be undertaken in the future to assess the extent of the *Sabella* forests here.

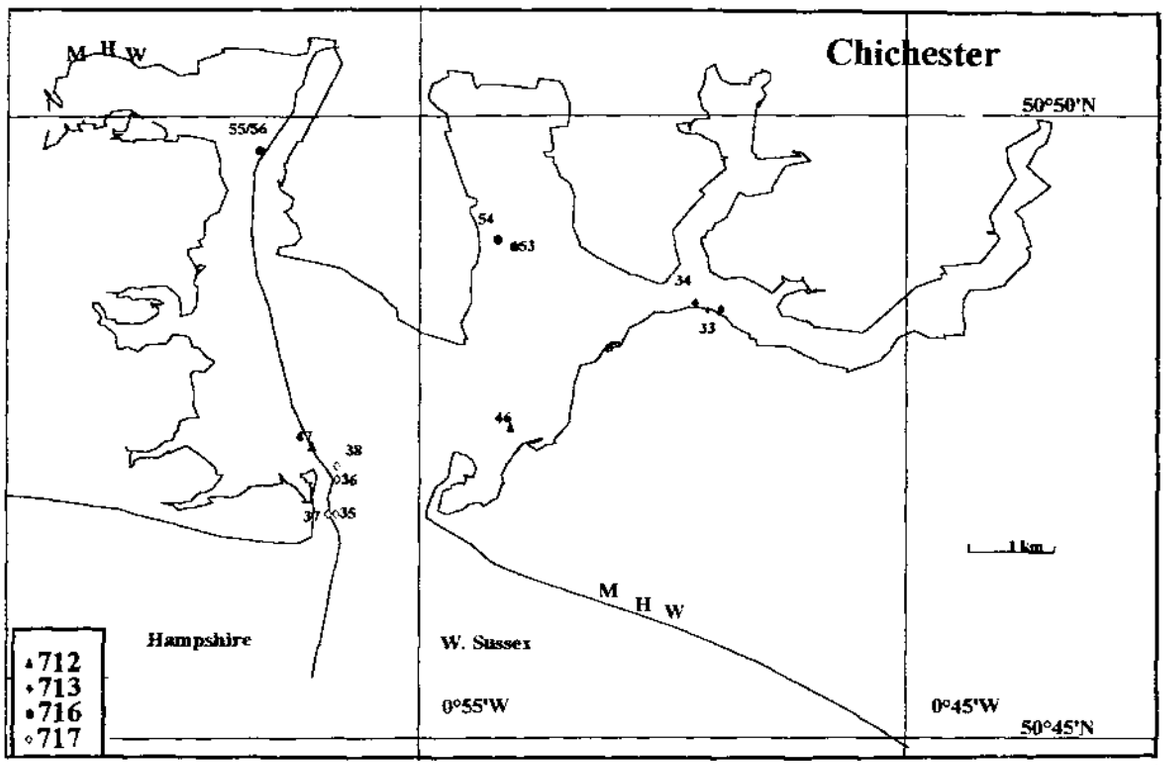


Fig. 27. The location of SEASEARCH *dives undertaken within Chichester Harbour, 1992-1998.*

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CHICHESTER HARBOUR DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 12	Total no. of habitat records: 21
Total number of species (& higher taxa) recorded within this sector: 88	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Carcinus maenas	shore crab	13	62	P – C	O
Sabella pavonina	peacock worm	11	52	R – S	F
Paguridae	unidentified hermit crab(s)	11	52	P – C	O
Hydrallmania falcata	hydroid	7	33	O – A	F
Crepidula fornicata	slipper limpet	10	48	R - A	F
Urticina felina	dahlia anemone	8	38	P – F	O
Lanice conchilega	sandmason worm	7	33	R - A	C
Ostrea edulis	oyster	7	33	O – S	O
Alcyonidium diaphanum	'finger' bryozoan	7	33	O - A	F
Pagurus bernhardus	large hermit crab	6	29	R – C	R
Styela clava	leathery sea squirt	6	29	R – C	O
Sertularia argentea	hydroid	5	24	O - F	O
Pomatoschistus sp.	unidentified gobies	5	24	R - O	R

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

SECTOR: **CHICHESTER HARBOUR**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
716	56	E side of North Emsworth Channel 2.	50 49.80'N 00 56.76'W	SU 742 039	1	Concrete block at 2.5-2.8m BCD.								100
					2	Silty sand and mud at 2.7-2.8m BCD.						90	10	
					3	Seabed of concrete at 2.5-3.2m BSL.								100
716	55	E side of North Emsworth Channel 1.	50 49.79'N 00 56.70'W	SU 742 039	1	Concrete slab at 1.8-2.8m BCD.								100
					2	Mud and shells at 2.8m BCD.			5				70	25
712	47	Emsworth Channel.	50 47.39'N 00 56.20'W	SZ 749 995	1	Empty oyster shells forming waves, with *Alcyonidium* at 12.7m BCD.	3					2		95
					2	Sand, shells forming waves at 9.6m BCD.						60		40
					3	*Crepidula*, pebbles in muddy sand with sponges at 7.6m BCD.								
717	37	Chichester Harbour Entrance 3.	50 46.84'N 00 56.07'W	SZ 751 985	1	Silty sand on gradual slope at 11-12m BCD.						95	5	
					2	Slope of sand and gravel at 1-19m BCD.					45	45		10
					3	Sand forming waves at 19m BCD.						100		
717	35	Chichester Harbour Entrance 1.	50 46.84'N 00 55.97'W	SZ 752 985	1	Flat and gradually sloping seabed of pebbles and gravel at 17-8m BCD.				45	45	5		5
717	36	Chichester Harbour Entrance 2.	50 47.12'N 00 55.97'W	SZ 752 990	1	Soft muddy gravel on sloping seabed from LW to 11.5m BCD.					40	60		
717	38	Black Point, Chichester Harbour Entrance.	50 47.23'N 00 55.97'W	SZ 752 992	1	Flat base and lower side of channel of sand and shells at 11-15m BCD.				15		80		5
					2	Sloping side of channel, from 11.5m BCD upwards, with pebbles and fine sand.				80		20		
716	54	W side of Thorney Channel 2.	50 49.05'N 00 54.30'W	SU 771 026	1	Seabed of mud, sand and broken shells at 2.7-4.7m BCD.				2		6	20	72
716	53	W side of Thorney Channel 1	50 49.00'N 00 54.10'W	SU 773 025	1	Seabed of sand, cobbles and shells at 4-4.2m BCD.			2			13		85
712	46	Chichester Channel.	50 47.53'N 00 54.11'W	SZ 773 998	1	Firm mud, dredged, at 1.4m BCD.							95	5
713	34	Itchenor Moorings.	50 48.55'N 00 52.28'W	SU 795 017	1	Shells on mud with *Dendrodoa* and *Styela* at 5.4m BCD.				5			10	85
					2	Bare concrete mooring block at 5m.								100
713	33	Itchenor Channel.	50 48.50'N 00 51.98'W	SU 798 016	1	*Crepidula* with cobbles and pebbles on mud at 4-4.6m BCD.			5	5			20	70
21 Records Processed														

7.2 Bracklesham Bay

Overview

The stretch of coast bordering this section runs from the entrance to Chichester Harbour in the west (OS northing line of SZ755) to the Bracklesham holiday camp in the east (OS northing line of SZ825), a west-to-east distance of 7 km.

The geology of this sector of the coast is dominated by the Bracklesham Beds, sediments deposited some 47-41 million years ago. These sediments have yielded numerous fossils of birds, insects, fishes and plants, particularly along the shore. This area is the type locality for these deposits and consequently is of national geological importance (English Nature 1998).

Beyond low water mark, much of the seabed in this sector is of sand, either as 'pure' sand or with some pebbles and gravel mixed with it. The **Medmery Bank** in the centre of the Bay is formed largely of sand. Generally, the sand overlies a layer of soft clay which is occasional exposed. A stratum of limestone was laid down above the clay, and though much of this has now eroded away, there are still occasional piles of slab-like boulders scattered over the seabed, where the clay layer underneath the limestone cap-rock has been scoured away (see Fig. 13). There are occasional outcrops of limestone forming low-lying reefs, such as **The Hounds**.

The **Bracklesham Balls** are scattered over an area of approximately 3 km^2 in extent, at a depth of 5-8 m BCD. This area was identified as a marine Site of Nature Conservation Importance in March 1996 (Irving 1996).

Features of interest (west to east)

To the south and west of the area where most *SEASEARCH* dives have taken place, there is reported to be an almost continuous relict beach line, consisting of flattened ovoid beach cobbles cemented together by *Sabellaria* worm tubes. This was found by Hume Wallace together with Ken Collins and Jenny Mallinson of Southampton University's Oceanography Department, in the early 1980s (Wallace 1996). This line stretched almost all the way from the Medmery Bank to Southsea Castle at the mouth of Portsmouth Harbour. It is believed that a second such line runs west from the Hounds reef. Neither of these features have been located by *SEASEARCH* dives as yet.

The '**Bracklesham Balls**' appear to be located in two main areas close to the shore to the west of The Hounds in approximately 6 m depth BCD. The flattish seabed here is of mixed sediment, upon which are scattered a number of spherical and hemispherical boulders, up to 1.5 m in diameter. The following description is taken from the mSNCI description of the site (Irving 1996).

> Several of the boulders appear to have had their tops 'sliced off', though others are intact and entirely spherical. Some have even been found joined in a manner resembling Siamese twins. Wood (1992) reports that Hume Wallace believes these to be concretions of the Myocardia Bed (consisting of fine shelly sand, sandstone nodules and many bivalve molluscs including *Veniella* (*Myocardia*) and resembling 'shells embedded in clay') standing proud of the seabed. The balls provide a most unusual, though not unique, geological feature: similar boulders have been reported from Southampton Water (H. Wallace, pers. comm.).

Descriptions of the 'balls' have come from the following dives (survey/site/habitat): 711/28/1, 711/30/1, 712/50/2, 712/77/1, 713/157/2, 717/24/1 & 717/25/1. See accompanying map of this sector for the locations of these sites.

In various places throughout Bracklesham Bay, there are examples of where the underlying stratum of soft clay has been eroded away, leading to the overlying limestone 'cap-rock' breaking up, leaving flat slabs of rock, about 15-30 cm thick, strewn over the seabed (e.g. 711/32/1, 717/13/1,717/20/1 & 717/23/2). In some places, discrete, weird, mushroom-like forms have been left

(see Fig. 13). Elsewhere where the soft clay has eroded, a low meandering step or 'mini-cliff' may be formed (717/13/2 & 717/16/1), between 0.3-1.5m in height, which may still have a layer of limestone caprock on its top (similar to the Mixon Hole).

Close inshore to the west of Selsey Bill lie a series of rocky outcrops of limestone known as **The Hounds**. The one record from this reef (717/22) describes two distinct habitats: the first being a mixed substratum of cobbles and pebbles over horizontal clay; the second being a thin (15cm) layer of limestone caprock overlying clay. The area of broken ground to the north and west of The Hounds is known locally as 'Betty Peeleys'. The one record from this area (711/30) describes spherical boulders ('balls') amongst fine sand.

Wrecks & wreckage - 'The Barge' is a popular shallow water dive. The wreck is largely intact, approximately 30m long, and lies on its side at a depth of 10-15m BCD. There is a 1-2m deep scour hole around one side of the hull. Most surfaces are covered in hydroid-bryozoan turf, together with many sponges and sea squirts. Some red foliose algae are present on the uppermost surfaces. The surrounding seabed was of grey clay overlain by sandy gravel with some cobbles (717/9/1 & 717/10/1). Further offshore, the only evidence of the *Corbet Woodall* from the one dive carried out in its vicinity (717/12/2), was an anchor and chain. Another one of these was found further to the south, close to the wreck of the *Edenwood* (717/20/1), though no other sign of the wreck itself was found. The seabed here was of coarse sand, shells and gravel with a few outcrops of limestone bedrock and rounded boulders.

The protected wreck site of HMS *Hazardous* lies some 100 m from the shore just to the east of the slip at Bracklesham and is buoyed. This wooden vessel, which sank in 1706, remained undiscovered until 1986. Excavation work is still continuing at the site c/o the Nautical Archaeological Society and the Hampshire and Wight Trust for Maritime Archaeology. Another famous wreck within Bracklesham Bay has also recently (1999) been designated a protected wreck. The first Royal Navy submarine, HMS *A1*, sits upright on sand at a depth of 14m just south of the entrance to Chichester Harbour.

Noteworthy habitats and characterising communities

Shallow **limestone and sandstone reefs**, consisting of bedrock and boulders, have their uppermost surfaces covered with an assortment of algal species. Occasional *Laminaria* kelp plants are present, together with an assortment of red foliose algae (*Calliblepharis ciliata* and *Halurus flusculosus* being found frequently). Vertical and steeply-sloping surfaces will be dominated by a hydroid-bryozoan turf (particularly *Bugula* spp.) with occasional white anemones *Actinothoë sphyrodeta*, dead man's fingers *Alcyonium digitatum* and small patches of the grey colonial sea squirt *Diplosoma listerianum*. Examples of encrusting sponges include the 'shredded carrot' sponge *Esperiopsis fucorum*, the 'goose bump' sponge *Dysidia fragilis*, *Hymeniacedon perleve* and *Halichondria bowerbanki*. Less common are the sponges *Tethya aurantium*, *Suberites domuncula* and *Polymastia mammilaris*. Many surfaces have a covering of silt.

The seabed surrounding reef areas is likely to be of **muddy sand, gravel and shells** (mostly of slipper limpets *Crepidula fornicata* and oysters *Ostrea edulis*). The marine life here is relatively sparse, with occasional dahlia anemones *Urticina felina*, netted dogwhelks *Hinia reticulata*, sandmason worms *Lanice conchilega* and the finger bryozoan *Alcyonidium diaphanum*. Mobile marine life recorded from the locality includes bib *Trisopterus luscus*, bass *Dicentrachus labrax*, plaice *Pleuronectes platessa*, juvenile gobies and small edible crab *Cancer pagurus*.

Where exposures of **clay** are revealed, they are typically peppered with the cigar-sized holes of boring piddocks (typically of the common piddock *Pholas dactylus*). Occasionally empty holes may be occupied by dahlia anemones *Urticina felina*.

Collins & Mallinson (1983) recorded many patches of **flint cobbles** in the size range of 10-20 cm which form small mounds within Bracklesham Bay. The mounds protrude above the surrounding gravel seabed and have a very obvious dense epifauna, the most prominent being the hydroid

Nemertesia antennina and the bryozoan *Flustra foliacea*. There is also a characteristic covering of the ascidian *Dendrodoa grossularia*.

Collins & Mallinson (1983) also reported finding **pure gravel** in the area of dredging to the south and east of Horse Tail (south of Hayling Island); and that clean gravel is found at the mouth of Chichester Harbour (see also section 7.1), though as one progresses further offshore it becomes more sandy. **Pure sand** is found on the top of the Medmery Bank in Bracklesham Bay, where it is very mobile and forms distinct waves.

BRACKLESHAM BAY DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 34	Total no. of habitat records: 62
Total number of species (& higher taxa) recorded within this sector: 145	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Flustra foliacea	hornwrack	24	39	P - A	F
Trisopterus luscus	bib	20	32	P - A	F
Crepidula fornicata	slipper limpet	18	29	P - A	F
Urticina felina	dahlia anemone	16	26	P - C	O
Actinothoe sphyrodeta	anemone	16	26	P - A	O
Homarus gammarus	lobster	16	26	P - F	R
Lanice conchilega	sandmason worm	15	24	P - A	O
Styela clava	leathery sea squirt	15	24	P - A	O
Alcyonium digitatum	dead man's fingers	13	21	P - F	O

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

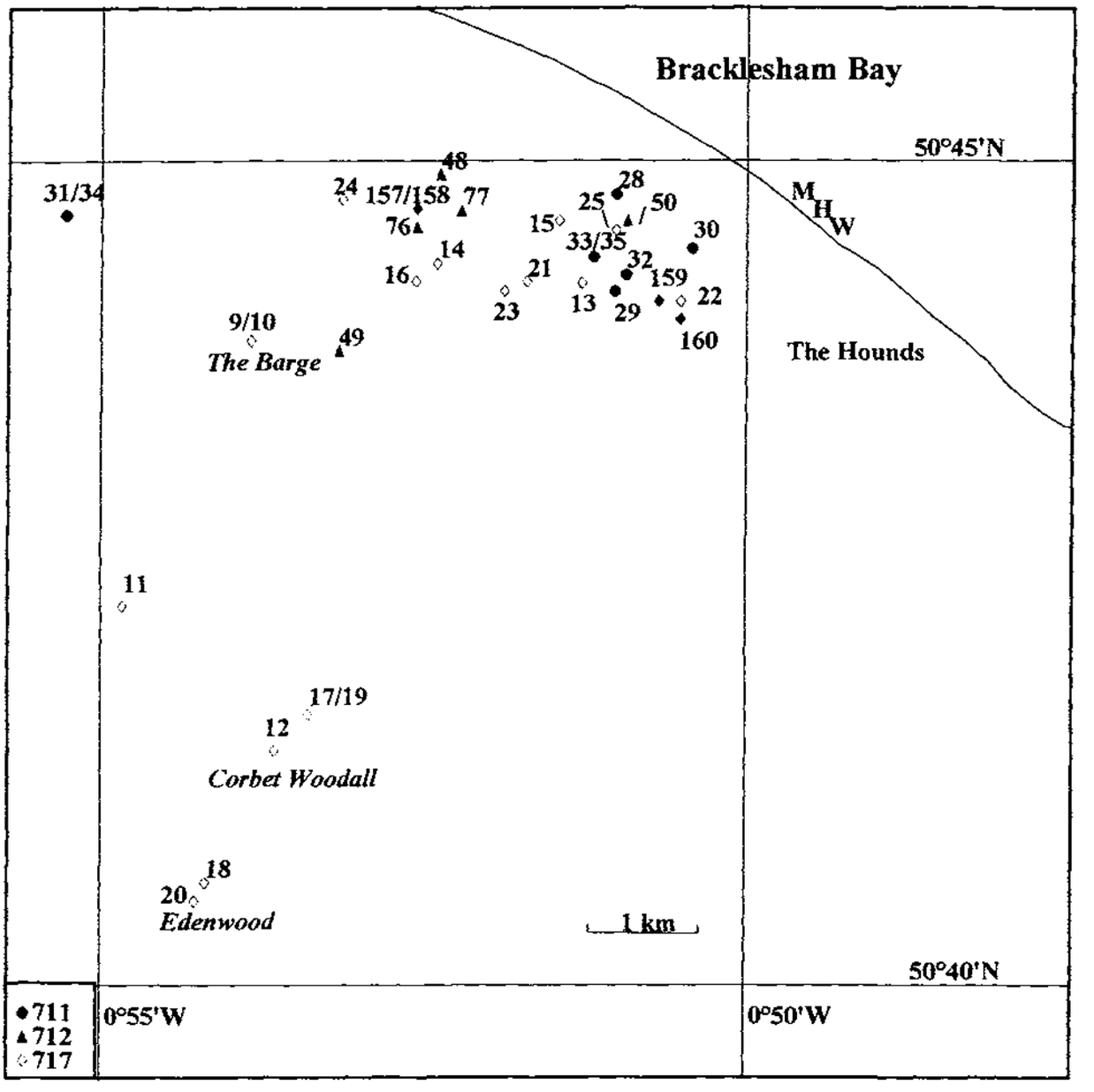

Fig. 27. The location of SEASEARCH *dives undertaken within Bracklesham Bay, 1992-1998.*

SECTOR: **BRACKLESHAM BAY**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
711	31	S of East Pole Sands 1	50 44.70'N 00 55.20'W	SZ 761 945	1	Large solitary ?boulder at 6.7-7.8m BCD.		100						
					2	Level clay seabed at 7.8-8.3m BCD.	50	5				45		
711	34	S of East Pole Sands 2	50 44.70'N 00 55.20'W	SZ 761 945	1	Level rippled sand with silt overlay at 9.2m BCD.					2	93	5	
					2	Horizontal clay outcrops at 9m BCD.	90					5	5	
					3	Small boulders on sand at 9m BCD.		100						
717	11	Bullock Patch	50 42.33'N 00 54.74'W	SZ 767 901	1	Mixed sediment with occasional sandstone blocks at 12.0m depth BCD.		15	5			80		
717	20	Near wreck of 'Edenwood'	50 40.54'N 00 54.25'W	SZ 774 868	1	Large limestone boulders and slabs on mixed sediment at 14.0m BCD.	65	17	5	5		5		3
717	18	'Edenwood' wreck	50 40.63'N 00 54.14'W	SZ 775 870	1	Coarse sand, shells and gravel at 13.5m BCD.	40	8	5	5	2	33	3	4
717	9	The Barge 1	50 43.95'N 00 53.79'W	SZ 778 931	1	Metal wreckage, approx. 30m long, at 10-15m BCD.								100
					2	Grey clay with piddock borings at 11.0m BCD.	80					10		10
					3	Gravel and occasional flint cobbles at 11.0m BCD.			10		70			20
717	10	The Barge 2	50 43.95'N 00 53.79'W	SZ 778 931	1	Wreck known as 'The Barge' at 8-12m BCD.								100
					2	Sandy gravel with *Crepidula* at 10.5m depth BCD.					20	30		50
					3	Gravel, pebbles, cobbles and sand at 10.3m depth BCD.		5	5		30	60		
					4	Low, vertical, clay cliff (scour hole) at 10-12m depth BCD.	100							
717	12	Nr wreck of 'Corbet Woodall'	50 41.43'N 00 53.65'W	SZ 781 885	1	Mixed sediments of clay, sand, pebbles and cobbles at 13.5m depth BCD.	5	5	2	2		84		2
					2	Anchor and chain at 13.3m depth BCD.								100
717	17	Bracklesham Bay 9.	50 41.66'N 00 53.36'W	SZ 784 889	1	Extensive seabed of sand mixed with gravel at 12.5m BCD.					5	70		25
					2	Flat sandstone boulder slabs at 13.0m BCD.		100						
717	19	Bracklesham Bay 10.	50 41.66'N 00 53.36'W	SZ 784 889	1	Fine sand with occasional low-lying sandstone outcrops at 13.5m BCD.	20	10		10	5	50		5
717	24	Extn. of 'Balls' area	50 44.80'N 00 53.15'W	SZ 786 947	1	Spherical (or part-spherical) boulders on sand at 7m BCD.	5	9	1	1		84		
712	49	Bracklesham Bay 2.	50 43.86'N 00 53.16'W	SZ 786 930	1	Rippled sand with pebbles at 12.2m BCD.				10	10	70	10	
717	16	Bracklesham Bay 8.	50 44.29'N 00 52.55'W	SZ 793 938	1	Clay bedrock forming low 'step' at 9.0m BCD.							100	
					2	Rippled, fine sand with patches of cobbles at 10.0m BCD.			15		5	80		
712	76	Bracklesham Bay 3.	50 44.63'N 00 52.54'W	SZ 793 944	1	Sand at 8.7m BCD.			30	35		35		
713	157	2km S of East Wittering 1	50 44.72'N 00 52.51'W	SZ 793 946	1	Shells with gravel and muddy sand at 8m BCD.					20	25	5	50
					2	Rounded large boulders with sessile fauna at 7-8m BCD.		100						
					3	Silty sand with *Lanice* at 7-8m BCD.						90	10	
717	14	Bracklesham Bay 7.	50 44.38'N 00 52.35'W	SZ 795 940	1	Fine sand with occasional pebbles and shell gravel at 8.0m BCD.				15	10	70		5
712	48	Bracklesham Bay 1.	50 44.92'N 00 52.33'W	SZ 795 950	1	Cross-rippled sand with burrowing bivalves and *Lanice* at 6m BCD.					2	93		5
712	77	Bracklesham Bay 4.	50 44.74'N 00 52.18'W	SZ 797 946	1	Large rounded boulders at 7.7m BCD.		100						
713	158	2km S of East Wittering 2	50 44.71'N 00 52.17'W	SZ 797 946	1	Large flat slabs with ?*Ascidiella* at 7m BCD.	90	5		3				2
717	23	Bracklesham Bay 6.	50 44.25'N 00 51.86'W	SZ 801 937	1	Clay ('mudstone') horizontal bedrock with piddock holes at 6.5-9.0m BCD.	80						20	
					2	Flat, limestone boulders at 9m BCD.		80				10		10
717	21	Bracklesham Bay 5.	50 44.30'N 00 51.69'W	SZ 803 936	1	Rippled medium-fine sand at 8m BCD.						100		
					2	Sand and *Crepidula* shells with occasional small boulders at 8m BCD.		5	10	20		65		
					3	Large sandstone slabs (possibly mudstone?) forming a reef at 8.5m BCD.		80		5		15		
717	15	Bracklesham	50 44.68'N 00 51.38'W	SZ 806 945	1	Large rock slabs interspersed with patches of fine sand at 7.0m BCD.		40				47	10	3
717	13	Old Wall Amphitheatre?	50 44.26'N 00 51.22'W	SZ 808 938	1	Loose limestone slabs at 6m BCD at base of low clay cliff.	72	10	10	5				3
					2	Vertical and horizontal soft clay heavily bored by piddocks at 6-7m BCD.	100							

SECTOR: **BRACKLESHAM BAY (cont.)**

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
711	33	W of Hounds Reef 2	50 44.42'N 00 51.15'W	SZ 809 941	1	Fine rippled sand at 6-7m BCD.						100		
					2	Large slabby boulders at 6.7-7.2m BCD.		85	4	4		4		3
711	35	W of Hounds Reef 3	50 44.42'N 00 51.15'W	SZ 809 941	1	Level rippled sand at 5.3m BCD.						100		
					2	Slab-like boulders with gravel and shells at 5m BCD.		85			13			2
711	28	S of Bracklesham 1	50 44.80'N 00 51.00'W	SZ 811 948	1	Lower infralittoral large round boulders at 2-4m BCD.		100						
					2	Lower infralittoral bedrock.	100							
					3	Lower infralittoral sand.						100		
717	25	Bracklesham Balls	50 44.60'N 00 51.00'W	SZ 811 944	1	Spherical boulder(s) embedded in sand at 4m BCD.		3				97		
711	29	S of Bracklesham 2	50 44.20'N 00 51.00'W	SZ 811 937	1	Rippled sand at 5.8m BCD.						100		
712	50	S of Bracklesham	50 44.66'N 00 50.94'W	SZ 812 945	1	Fine sand over clay at 5m BCD.	10					90		
					2	Large isolated spherical boulders on seabed at 5.0m BCD.		100						
711	32	W of Hounds Reef 1	50 44.34'N 00 50.91'W	SZ 812 939	1	Limestone boulders on bedrock in the upper circalittoral at 5.2-7.8m BCD.	50	43		3	1		3	
713	159	W of Hounds Reef 1	50 44.18'N 00 50.63'W	SZ 815 936	1	Limestone slabs with algae and sponges at 3-5m BCD.		100						
					2	Dissected scoured limestone with sponges at 5m BCD.	98	2						
					3	Barren sand at 5m BCD.						100		
717	22	The Hounds	50 44.16'N 00 50.52'W	SZ 817 936	1	Mixed substratum of horizontal clay with a few small boulders, cobbles and pebbles at 8m BCD.		1	1		1		96	1
					2	Small open cave within fault in limestone bedrock at 7.8m BCD.	85			1	2	10		2
					3	Flat limestone cap-rock over clay at 9m BCD.	70	3	1	1	2	22		1
713	160	W of Hounds Reef 2	50 44.05'N 00 50.45'W	SZ 817 934	1	Fissured mudstone with prawns and bib at 6m BCD.	96			2				2
					2	Silty sand with bivalves at 6m BCD.						90	10	
711	30	Betty Peeleys	50 44.49'N 00 50.35'W	SZ 818 942	1	Almost spherical boulders, lower infralittoral at 2.4-3.4m BCD.		95			5			
					2	Level fine sand, lower infralittoral, at 2m BCD.						100		
62 Records Processed														

7.3 Selsey Bill

Overview

The stretch of coast bordering this section runs from the Bracklesham holiday camp in the west (OS northing line of SZ825) to Aldwick in the east (OS northing line of SZ910), a west-to-east distance of 8.5 km.

The near-shore seabed off Selsey Bill is a complex mix of various geological strata. The shallow shoals off Selsey Bill (including the Boulder Bank, Pullar Bank and Middle Ground), are a mix of sandstone and limestone rock strata. Adjacent to these is a clay stratum and the layer known as the Brackelsham Beds, most apparent in the Selsey area, which contains rich fossil deposits from the Eocene period (55-35 million years ago).

Features of interest (west to east)

The Streets (or Stretts) are two parallel, very shallow rocky outcrops. Wallace (1996) states that the eastern is of a grey *Alveolina* limestone and the western of Glauconitic sandstone. To the south-east of the Streets lies **The Grounds** or **Malt Owers**, a continuation of the discontinuous reef that forms a semicircle of shallow ground adjacent to Selsey Bill. On the east side of this area is **The Mixon**, an outcrop of limestone rock that is exposed at low water and which is marked by a beacon. Immediately to the south of this is the Mixon Hole.

The Mixon Hole is one of the best known dive sites Sussex, described by McDonald (1985) rather lavishly as "one of the top diving sites in the south of England, if not the whole country". This is in part due to the great depth it offers close inshore. However, unless it is dived during a period of calm weather coinciding with neap tides which would allow for good underwater visibility, the impressive nature of the cliff cannot be fully appreciated.

The Hole is believed to be a segment of an ancient river gorge, which is kept open by the scouring action of strong tidal streams. The river in question is likely to be what we know today as the River Lavant, which in former times ran into Pagham Harbour and thence southwards past the Mixon Beacon. The Hole is a remarkable feature, of particular interest to coastal geomorphologists. It is also of interest to marine archaeologists because of the remains of worked stone (large cuboidal blocks) found at its base, known to date from Roman times. Here too have been found numerous stone balls and phallus-shaped stones. Though these balls are natural in origin (having a similar composition to the 'Bracklesham Balls'), Wallace (1996) suggests they may have been used as ammunition by a Roman catapult or 'ballista', fired either in anger or as practice. The Mixon Hole site was identified as a marine Site of Nature Conservation Importance in March 1996 (Irving 1996). Records from this site include 712/9, 714/97, 714/101, 716/21, 716/32, 716/36.

The precise location of **Whirlpool Hole** was uncertain as it is not clearly marked on charts, but it was picked up using an echo sounder. It lies just to the east of the Boulder Buoy, some 3 km to the south of Selsey Bill. It was thought that the 'hole' might have a similar structure to the Mixon Hole, i.e. being bounded by a steep clay cliff, but instead it has steeply sloping gravel and pebble sides to it (716/50 & 716/58). There are a few large boulders at its base. It is not known why this hole should be where it is, although the circulation of water around and through it on spring tides must maintain its shape. This was a site recommended for further investigation by Wood (1992b) in her initial report on the Chichester Harbour to Littlehampton near-shore area.

Between 5-6 km away from the Bill is found a ring of shallow reefs consisting of **Boulder Bank** (on the west), through **Pullar Bank**, to **Middle Ground** (on the east). These reefs are formed from a mix of limestone and sandstone exposures, with sections of each almost drying at extreme spring tides. They are dominated by bedrock outcrops, very large and large boulders, with areas

of cobbles and pebbles in between (see 712/78, 712/79, 712/80, 712/81, 712/82, 712/83, 712/85, 716/67, 716/68, 716/69 & 716/62). The semicircular ring which is formed by these reefs encloses a shallow area of flattish ground known as **the Looe**. The seabed in this area consists mostly of a pebble/gravel/sand mixture with occasional boulders and cobbles (712/18, 712/19 & 716/48).

There are numerous **items of wreckage** scattered over the seabed within the area known as the 'Pagham box'. The box appears on charts and indicates that "there are numerous dangers through which it is unsafe to navigate". Much of this wreckage dates from WWII, some sunk on purpose (either through act of war or as bombing targets for the RAF) or by accident. An infantry landing craft, mooring blocks, an aeroplane engine, barges and, most famously, Mulberry Harbour units are all present in varying states of decay (McDonald 1985). The best known of these, the 'Outer Mulberry', is dealt with in the next (Bognor Regis) sector of the coast. The marine life associated with the shallow water wrecks in this area has been described in section 6.1.4.1.

Noteworthy habitats and characterising communities

The Mixon Hole

The 25 m high cliff on the northern side of the Hole can be divided into five main habitats:

(1) The cap of limestone bedrock, breaking the surface at low water spring tides. This is the shallowest part (upon the top of which is fixed the beacon), the rock in the sublittoral fringe being covered by occasional kelp plants and other algae.

(2) There is a ledge at 4 m with loose limestone slabs covered by foliose red algae. The ledge is made of stiff 'blue' clay and forms an overhang, about 1 m thick and extending up to 1.5 m beyond the main cliff below it.

(3) The exposed soft grey clay of the main cliff, from 5 - 22 m BCD, has numerous ledges, crevices and fissures, and is continually being eroded by currents sweeping across its face. The cliff itself is nearly vertical, being inclined at about 80° from the horizontal. Much of the cliff proper is bare and uncolonised. It is extensively bored by piddocks *Pholas dactylus*, but, as with the sublittoral chalk cliffs further to the east, many of the piddock holes are empty. There are many species of crustacea including squat lobster *Galathea squamifera*, edible crab *Cancer pagurus* and velvet swimming crab *Necora puber*. Tompot blennies *Parablennius gattorugine* and leopard-spotted gobies *Thorogobius ephippiatus* are frequently seen on cliff ledges. Other fish observed swimming at or near the top of the cliff face include pollack *Pollachius pollachius*, ballan wrasse *Labrus bergylta*, corkwing wrasse *Crenilabrus melops*, goldsinny wrasse *Ctenolabrus rupestris* and shoals of the small two-spotted goby *Gobiusculus flavescens*.

(4) Towards the base of the cliff, the steep slope is covered by cobbles and small boulders of stiff blue clay that have fallen from the overhanging section above. Attached to these are hydroids such as *Plumularia setacea*, *Hydrallmania falcata* and *Amphisbetia operculata*, the keel worm *Pomatoceros triqueter* and the sea squirt *Dendrodoa grossularia*.

(5) At the base of the cliff (25 m BCD) is a level area of tide-swept pebbles and shells (particularly slipper limpets and oysters) with lumps of muddy clay. Frequent here are live chains of slipper limpets *Crepidula fornicata*, hermit crabs *Pagurus bernhardus* and occasional lobsters *Homarus gammarus*.

There is a less impressive and smaller cliff on the southern side of the Hole. To the east and west the slope of the seabed is much more gradual.

Offshore

Extensive mussel beds are present from 7-9 km SE of the Bill (713/124 & 125), though the exact location of these is likely to change from year to year as old beds get ripped up by winter storms and the success of spat settlement varies from year to year.

SELSEY BILL DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 52	Total no. of habitat records: 92
Total number of species (& higher taxa) recorded within this sector: 199	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance	
Species	Common name	No. of records	%	Range	Median
Crepidula fornicata	slipper limpet	29	32	P - S	O
-	foliose red algae	24	26	P - A	F
Paguridae	unidentified hermit crab(s)	23	25	P - A	O
Anemonia viridis	snakelocks anemone	21	23	P - C	O
Urticina felina	dahlia anemone	20	22	P - C	O

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

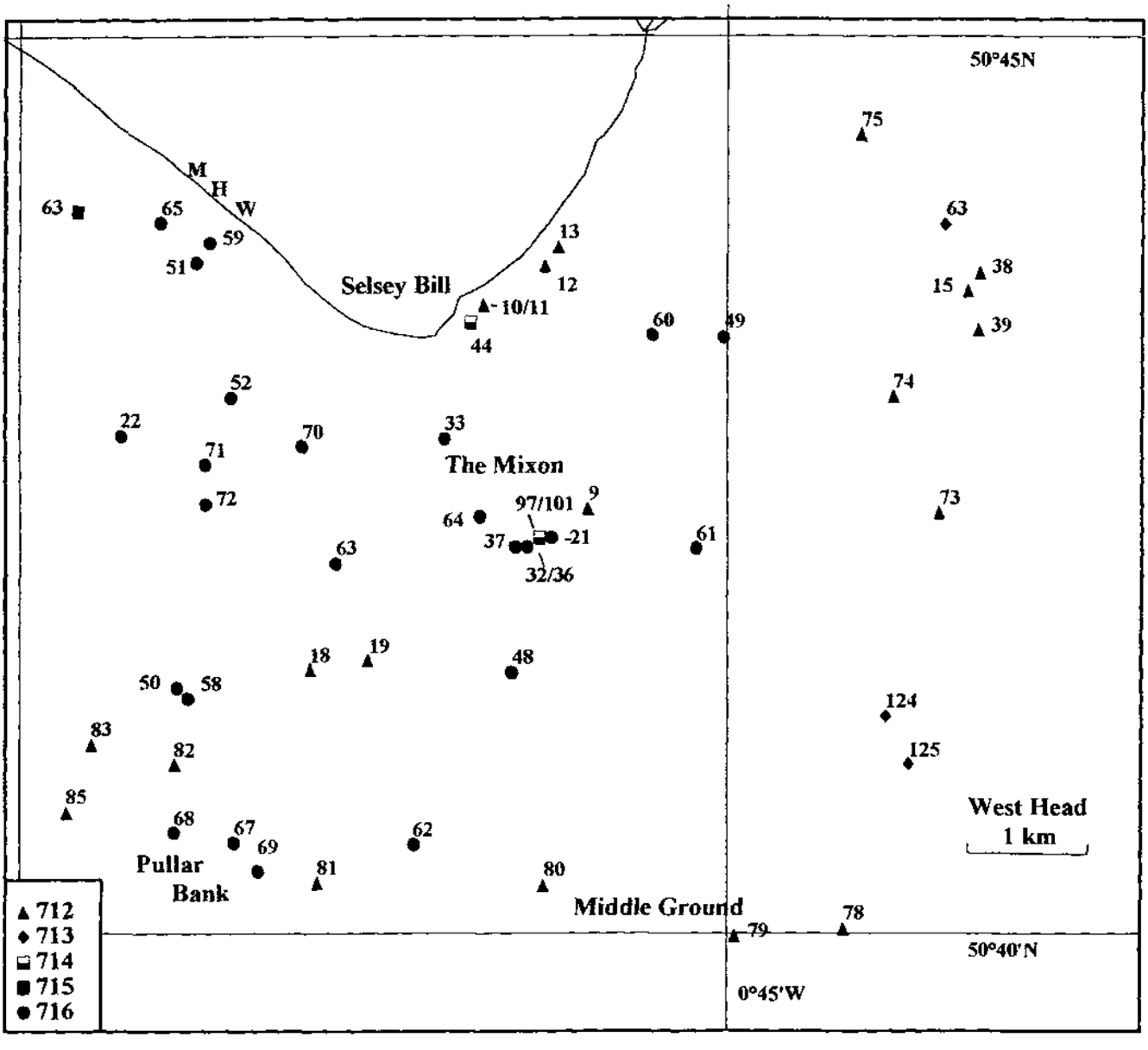

Fig. 28. The location of SEASEARCH *dives undertaken within the Selsey Bill sector, 1992-1998.*

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SECTOR: **SELSEY BILL**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
712	85	W end of Pullar Bank 2	50 40.72'N 00 49.66'W	SZ 828 872	1	Bedrock slope with boulders and crustacea at 5-8m BCD.	40	60						
715	63	S of the Hounds	50 44.06'N 00 49.55'W	SZ 828 934	1	Rippled sand and shells with *Ensis* at 3-4m BCD.				1		97		2
					2	Mudstone with *Cancer* at 8m.b.s.l.	100							
712	83	Boulder Bank	50 41.10'N 00 49.49'W	SZ 830 879	1	Sandstone slabs and pebbles on bedrock at 6m BCD.	40	40		20				
					2	Bedrock with undercut holes and ?*Psammechinus* at 6.7-6.9m BCD.	100							
716	22	The Grounds 1	50 42.80'N 00 49.25'W	SZ 832 911	1	Clay ledge at the top of the Mixon Hole at 2m BCD.								
716	65	The Grounds 2	50 44.00'N 00 49.00'W	SZ 835 933	1	Sand over clay at 0.7m BCD.						95	5	
					2	Clay bedrock at 0.7m BCD.	100							
712	82	W end of Pullar Bank 1	50 40.94'N 00 48.91'W	SZ 837 877	1	Gravel, pebbles and shells with ?*Callionymus* and ?*Sepia* at 6.1-6.5m BCD.			2	20	53	10		15
					2	Slab-like small boulders with encrusting algae and barnacles at 6.1-6.5m BCD.		100						
716	50	Whirlpool Hole 1	50 41.40'N 00 48.85'W	SZ 837 865	1	Slope of gravel, boulders and cobbles at 11.6-19.6m BCD.		15	15		70			
					2	Large boulders at 19.6m BCD.		100						
716	68	Pullar Bank 2	50 40.56'N 00 48.84'W	SZ 837 870	1	Seabed of sand, bedrock, boulders with pebbles and shell at 7-8m BCD.	10	40		5	15	30		
716	58	Whirlpool Hole 2	50 41.32'N 00 48.78'W	SZ 838 884	1	Gravel, cobbles and pebbles at 10-13m BCD.		10	20	30	30			10
716	51	1km SW of Selsey Bill.	50 43.77'N 00 48.67'W	SZ 838 929	1	Seabed of clay bedrock and sand at 0.3-0.7m BCD.						10		90
716	71	Nr The Grounds, 2km SW of the Bill 2.	50 42.64'N 00 48.68'W	SZ 839 908	1	Seabed of sand, bedrock, boulders and shell at 5m BCD.	25	20				35		20
716	72	Nr The Grounds, 2km SW of the Bill 3.	50 42.44'N 00 48.68'W	SZ 839 904	1	Seabed of sand, boulders, bedrock with pebbles and shell at4m BCD.	5	10	2	3		75		5
716	59	S of Selsey Bill.	50 43.86'N 00 48.60'W	SZ 839 931	1	Mud and sand at 0m BCD.						30	70	
					2	Seabed of sand at 0m BCD.						100		
					3	Seabed of pebbles and gravel at 0m BCD.				45	50			5
716	52	2.5km off Selsey Bill.	50 43.00'N 00 48.50'W	SZ 841 915	1	Seabed of sand at 0.4-0.7m BCD.						100		
716	67	Pullar Bank 1	50 40.54'N 00 48.46'W	SZ 842 869	1	Seabed of flat sandstone boulders, with sand and broken shell at 4m BCD.		35				60		5
					2	Sandstone bedrock, sand and boulders at 4m BCD.	70	15				5		10
					3	Seabed of boulders, sand and broken shell at 4m BCD.		25				5		70
716	69	Pullar Bank 3	50 40.37'N 00 48.27'W	SZ 844 866	1	Seabed of bedrock, boulders with sand and shell at 10.7m BCD.	35	25				20		20
716	70	Nr The Grounds, 2km SW of the Bill 1.	50 42.75'N 00 48.00'W	SZ 847 910	1	Seabed of bedrock, boulders, sand and shell at 6.5m BCD.	30	30				10		30
712	18	E of Boulder Buoy, Selsey 1	50 41.51'N 00 47.95'W	SZ 848 887	1	Gravel and cobbles with *Pomatoceros* and barnacles at 10.1-12.6m BCD.		10	43		45			2
					2	Large boulders with sponges and hornwrack at 10.1-12.6m BCD.		100						
					3	Large mobile gravel waves with hermit crabs at 8.1-10.1m BCD.					98			2
712	81	Pullar Bank 4	50 40.33'N 00 47.90'W	SZ 849 865	1	Sloping bedrock and slabs with kelp and ?*Halidrys* at 2.6-3.6m BCD.	30	60				10		
					2	Sloping bedrock and boulders with ?*Aplidium* at 3.8m BCD.	30	60				10		

SECTOR: **SELSEY BILL** (*cont.*)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
716	63	2km SSW of Selsey Bill.	50 42.08'N 00 47.73'W	SZ 850 898	1	Seabed of sand, bedrock with boulders and pebbles at 1-5.4m BCD.	30	7	3	5	5	50		
712	19	E of Boulder Buoy, Selsey 2	50 41.52'N 00 47.47'W	SZ 853 888	1	Gravel, pebbles and occasional boulders at 7.8-9m BCD.		5		45	50			
					2	Soft grey clay or mudstone with fossils at 7.8-9m BCD.	100							
716	62	3km S of Selsey Bill.	50 40.53'N 00 47.17'W	SZ 857 869	1	Seabed of boulders, pebbles and sand at 2.9-6.5m BCD.		70	5	10	5	10		
716	62	3km S of Selsey Bill.	50 40.53'N 00 47.17'W	SZ 857 869	2	Seabed of sand, gravel with pebbles and boulders at 7m BCD.		5	5	20	10	60		
716	33	1km SSE of Selsey Bill.	50 42.76'N 00 46.94'W	SZ 859 911	1	Mixed flint pebbles and cobbles with some shells at 0.9m BCD.			67		30		2	1
714	44	Selsey Lifeboat Station 3	50 43.45'N 00 46.75'W	SZ 861 923	1	Vertical supports with sponges at 2m BCD.								100
					2	Pebbles and cobbles with *Chorda* and green algae at 2m BCD.			15	80				5
					3	Pebbles and cobbles with molluscs at 2m BCD.			15	80				5
712	10	Selsey Lifeboat Station 1	50 43.55'N 00 46.70'W	SZ 862 925	1	Soft clay bedrock with piddocks at 0.2-1.7m BCD.	100							
					2	Mixed sediment with *Crepidula* at 0.8-1.3m BCD.				30	30	30		10
					3	Sand with shingle, mud, *Crepidula* and *Arenicola* at 1-1.7m BCD.					10	60	30	
					4	Concrete and man-made debris with algae at 0.8-1.3m BCD.								100
712	11	Selsey Lifeboat Station 2	50 43.55'N 00 46.70'W	SZ 862 925	1	Pebbles over silty sand with abundant fauna at about 1.9m BCD.				80		13	5	2
					2	*Crepidula* clusters on silty sand at 1.9-2.3m BCD.				80		13	5	2
					3	Concrete block and mooring chains with *Bugula* turf at 1.9-2.3m BCD.								100
716	64	S of Mixon Hole	50 42.33'N 00 46.73'W	SZ 862 903	1	Gravel and sand with cobbles and pebbles at 17-21m BCD.			3	20	70	7		
					2	Clay bedrock at 19m BCD.	100							
					3	Gravel, pebbles and bedrock at 17m BCD.	20			40	40			
716	37	W side of Mixon Hole	50 42.20'N 00 46.49'W	SZ 865 900	1	Mudstone, pebbles and gravel with occasional boulders at 1-6m BCD.		20		60	20			
716	48	1km S of Mixon Beacon	50 41.46'N 00 46.50'W	SZ 865 887	1	Gravel, sand with pebbles and shell fragments at 7m BCD.				30	60	3		7
716	32	W end of Mixon Hole	50 42.18'N 00 46.40'W	SZ 866 900	1	Mudstone slabs and clay cobbles at 5m BCD.	5	60	5	30				
					2	Mudstone 'caprock' at 5-9m BCD.	100							
					3	Sloping mudstone slabs from 9-17m BCD.	50	30		20				
716	36	W of Mixon Hole	50 42.20'N 00 46.40'W	SZ 866 900	1	Firm clay with limestone boulders at 1-3m BCD.	75	25						
712	12	Sluice Rocks, East Selsey 1	50 43.77'N 00 46.28'W	SZ 867 929	1	Sand-covered rock with dense algae and young *Laminaria* at 0.7m BCD.				10	45	45		
					2	Pebbles and gravel with *Crepidula* and *Carcinus* at 0.2m BCD.				60	30	8	2	
					3	Gravel with sand and clay patches, *Urticina* and crustaceans at 1.3m BCD.	15		5		60	20		
714	97	Mixon Hole 1	50 42.24'N 00 46.28'W	SZ 867 901	1	Hard clay with dense red algae at 3-4m BCD.	100							
					2	Soft clay cliff with crustacea at 4-20m BCD.	100							
					3	Mud boulders & cobbles, pebbles & shells at 20-21m BCD.		5	15	70				10

SECTOR: **SELSEY BILL** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	101	Mixon Hole 2	50 42.24'N 00 46.28'W	SZ 867 901	1	Hard clay? with algae and sponges at 5m BCD.	100							
					2	Soft clay cliff with *Diplosoma* and crabs at 5-8m BCD.	100							
					3	Soft clay slope with clay rubble and piddocks at 8-23m BCD.	90	2	5	3				
712	13	Sluice Rocks, East Selsey 2	50 43.87'N 00 46.20'W	SZ 868 931	1	Barren sand with pebbles, 1.3-0.8m ACD.				5		95		
					2	Stable coarse sediment with varied fauna at chart datum.			20	70		10		
716	21	Mixon Hole 3	50 42.23'N 00 46.23'W	SZ 868 901	1	Shells and cobbles at 25m BCD.					10			90
712	80	W end of Middle Ground	50 40.27'N 00 46.23'W	SZ 868 865	1	Trawled gravel, shells and sand at 6.9-7.5m BCD.					45	50		5
712	80	W end of Middle Ground	50 40.27'N 00 46.23'W	SZ 868 865	2	Barren sand with ripples and waves at 7-10m BCD.						100		
					3	Lobster pot with algae, bryozoans and crustacea at 9.9m BCD.								100
712	9	S side of Mixon Hole	50 42.40'N 00 45.94'W	SZ 871 904	1	Empty *Crepidula* and *Ostrea* shells at 8.6-12.6m BCD.			2					98
					2	Mixed pebbles, cobbles and shells with *Urticina* at 7-16.1m BCD.			30	50				20
					3	Soft level mudstone with erosion features at 7.2-7.5m BCD.	100							
					4	Slab-like boulders sheltering edible crabs at 7-16.1m BCD.		100						
716	60	1.5km E of Selsey Bill.	50 43.37'N 00 45.49'W	SZ 876 922	1	Gravel, cobbles, pebbles and sand at 3-3.5m BCD.		2	15	36	36	10		1
716	61	1km E of Mixon Beacon	50 42.18'N 00 45.16'W	SZ 880 900	1	Seabed of pebbles and gravel at 4.8-6.3m BCD.			5	80	10	5		
716	49	2.5km E of Selsey Bill.	50 43.37'N 00 45.00'W	SZ 882 922	1	Gravel, sand, cobbles and pebbles at 3-4m BCD.			5	35	50	3	2	5
712	79	Middle Ground	50 40.00'N 00 44.94'W	SZ 884 860	1	Rock with ?*Aplidium densum* at 5-8m BCD.	60		5	10		25		
712	78	The Swashway & Middle Ground	50 40.03'N 00 44.16'W	SZ 893 861	1	Slab-like boulders and sand with ?*Aplidium* and sponges at 6.5-7.3m BCD.	5	50		5	2	35		3
					2	Sand and rock with ascidians and barnacles at 6.8-7.8m BCD.	5	10				85		
					3	Bedrock and slabs with ascidians and sponges at 8-10m BCD.	20	65		15				
712	75	2km SSE of Pagham Hbr Entrance	50 44.45'N 00 44.01'W	SZ 893 943	1	Mixed coarse sediment with *Maja*, *Lanice* and *Anemonia* at 2.2m BCD.			8	30	30	30		2
713	124	1km N of West Head 1	50 41.26'N 00 43.88'W	SZ 896 883	1	Mussel beds on cobbles and pebbles at 7m BCD.			50	50				
712	74	W of The Park 2	50 43.03'N 00 43.78'W	SZ 896 916	1	Pebbles and small cobbles with algae and *Urticina* at 6.7m BCD.			10	80		8		2
713	125	1km N of West Head 2	50 40.98'N 00 43.71'W	SZ 898 878	1	Mussel bed on cobbles and pebbles at 8m BCD.			50	50				
					2	Large slab like boulders on sand at 8m BCD.		5	20	20		55		
712	73	W of The Park 2	50 42.34'N 00 43.51'W	SZ 900 904	1	*Crepidula* shells over silty sand with varied fauna at 8.4-8.5m BCD.			1		9	35	5	50
713	63	Nr Intact Mulberry	50 43.96'N 00 43.45'W	SZ 900 934	1	Pebbles, gravel, silty sand and cobbles with algae, at 4-5m BCD.			10	50	20	16	4	
712	15	Nr Intact Mulberry 1	50 43.61'N 00 43.25'W	SZ 902 927	1	Clay bedrock scattered with shells and coarse sediment at 6-8m BCD.	50	5	15	15	5	5		5
712	39	Nr Intact Mulberry 3	50 43.36'N 00 43.18'W	SZ 903 923	1	Pebbles and gravel in mud with *Hydrallmania* and *Bugula* at 7.3m BCD.			2	30	40		20	8
712	38	Nr Intact Mulberry 2	50 43.71'N 00 43.16'W	SZ 903 929	1	Gravel with cobbles and sponges at 6.1m BCD.			20	5	50	20		5
92 Records Processed														

7.4 Bognor Regis

Overview

The stretch of coast bordering this section runs from Aldwick in the west (OS northing line of SZ910) to Atherington in the east (OS northing line of TV000), a west-to-east distance of 9 km.

The seabed within this sector remains relatively shallow (i.e. less than 10 m BCD) up to 5-7 km beyond low water mark. Much of it comprises mixtures of sand, gravel, pebbles and cobbles in varying proportions, together with the near-ubiquitous presence of empty shells (or live 'chains') of the slipper limpet *Crepidula fornicata*. There are also a number of sandstone bedrock outcrops (such as Bognor Rocks and the Waldrons) forming extensive though low-lying reefs, with areas of scattered boulders often lying adjacent to the reefs.

A large number of wrecks occur within this sector too, in varying states of decay and at varying water depths. The most well-known of these, at least within the diving fraternity, is the 'Outer Mulberry', a very popular shallow water dive site which lies some 4 km SE of Pagham village.

Features of interest

Near-shore sandstone reef outcrops - **Barn Rocks** lie just 500 m from low water mark and their tops are exposed on extreme spring tides. No actual *SEASEARCH* records have been made for the reef itself, the closest dives being undertaken to the south on a mixed sediment seabed of silty flint and shell gravel, with pebbles and muddy sand (see 712/26, 27, 28, 29 & 30). **Bognor Rocks** start a little further to the east and extend from low water offshore in a south-easterly direction for 1.5 km from the shore. The reef they form is within the 2 m BCD depth contour, the tops of the rocks also being exposed at low water. *SEASEARCH* records have come from the south side of the rocks and describe boulders on bedrock, together with gullies floored with cobbles, pebbles, gravel and sand (see 711/19, 20, 21, 23, 25, 26 & 27). The bedrock is described as irregular, having many fissures, crevices, overhangs and small caves. As one would expect, there is an abundance of foliose algae on the uppermost surfaces. Recorded depths range from 2.2-8.6 m BCD.

Offshore sandstone reef outcrops - **The Waldrons** reef covers an extensive area some 3-5 km to the south-east of Bognor. The reef itself is divided into two, the Inner Waldrons and the Outer Waldrons, though this distinction is based upon the two half-moon shaped depth contour rings which are shown on the chart, rather than from actual proof that changes in the seabed form a division between the two parts of the reef. The following 20 dives were undertaken on the Inner and Outer Waldrons reefs themselves, or in the near vicinity of it: 711/1-16; 712/60, 61; 716/34, 35. There have been recordings of sandstone blocks known as sarsens from the Waldrons (see also section 6.1.1.2).

Two other areas of sandstone 'reef' have been found further offshore in this section, some 7-8 km due south of Middleton-on-Sea. As a result of neither having a known name, their names have been invented and relate to the appearance of the depth contour line as it appears on the chart. The records from **'Stetson' reef** (712/68 & 69) show a mix of flat, small and medium sized boulders at 10-15 m BCD, interspersed with silty sand and patches of clay. The marine life associated with the boulders included the bryozoans *Flustra foliacea* and *Pentapora foliacea*, assorted encrusting sponges and hydroids. The **'Stepping Stones'** (712/86, 87, 88, 89 & 91) are a series of five discrete areas, some 500-750 m apart running SW/NE and each bounded on the chart by the 10 m depth contour. Each record comes from a separate 'stone'. Sandstone slabs were encountered at sites 712/87, 88 & 91, with sandstone bedrock at site 712/89. Sites 712/86,87 & 91 also had clay bedrock recorded as a separate habitat, typically with sand present too. The depth of the seabed from all sites was recorded as between 10-14 m BCD.

Other areas - **The Park** is a large, 'non-descript' area some 5-7 km south of Bognor. The level seabed here is mostly a mix of sand, gravel, broken shell, pebbles and cobbles. Cobbles tend to be covered by hydroids (e.g. *Hydrallmania falcata*) and barnacles (e.g. *Balanus crenatus*), with those in sufficiently shallow water (i.e. <8 m BCD) supporting sparse foliose red and brown algae. Records from this area include 712/40 & 41.

Shelley Rocks comprises an extensive, shallow area of boulders, cobbles and a mix of gravel, sand and shell overlying chalk bedrock or exposures of grey clay, 2-3 km south of Middleton-on-Sea. This is the furthest west (within Sussex) that sublittoral chalk bedrock has been recorded. Areas of mixed sediment such as this dominate much of the seabed off West Sussex, and this area was selected as an mSNCI on account of the wide range of seabed types present in a relatively small area. Where these mixtures appear stable (from disturbance from wave action in particular), a rich variety of sessile animal species occur. By contrast, where the ground is mobile, there are patches of clean gravel and pebbles with very little attached life associated with them. The Shelly Rocks area appears to be a site of high deposition of silt from the water column. Records from this area include 712/21-25 & 44.

The **Outer Owers** area comprises an extensive area of shallows some 8-10 km south-east of Selsey Bill. It includes the seabed between West Head and East Bank and south to the Elbow. Within this triangle lie East Borough Head and the Shoal of the Lead. The top of the reef known as **the Shoal of the Lead** is of a horizontal sheet of limestone similar to that found at the Hounds, to the west of Selsey Bill. The limestone sheet is about 2 m thick, overlain by more broken slabs of Hounds-type limestone in several lesser thicknesses (Wallace 1996). The limestone layers are sandwiched between layers of hard clay or mudstone. As the mudstone is eroded by strong water movements, the limestone slabs are left exposed. Eventually they break and fall down the steep slope as large, flat boulder slabs. Just one *SEASEARCH* dive (716/26) has been undertaken at this site to date, at a depth of 27-28 m BCD, which reported shells and clean shell gravel formed into furrows (evidence of trawling?). The seabed at the base of the slope is given on the Admiralty chart as being 67 m BCD. Records from **East Bank** (716/27, 29 & 31) show sand overlying clay/mudstone as being the predominant habitat type. The whole of the Outer Owers area is subject to strong tidal streams, with under-tows, mini whirlpools and choppy waters being apparent at various states of the tide. Consequently it can only be dived by experienced divers, and then only at neap tides when periods of slack water are longer. It is hoped that further *SEASEARCH* records can be made from this area in the future, as it promises to be most interesting.

Wrecks - The **Outer Mulberry** (712/31, 32 & 33; 713/122; 715/9; 716/20 & 25) still has part of its concrete sides intact, the most complete of the four (on the eastern side) making a wall about 3-4 m high by about 15 m long. The lower part of the northern wall hangs over the seabed below it, and is covered by plumose anemones *Metridium senile* and dead man's fingers *Alcyonium digitatum*. It is interesting to note that, after an absence of some 18 years, jewel anemones *Corynactis viridis* have been recorded from this wall again in 1999 (J. Lilley & T. Dobinson, *pers. comm.*). The biological communities on the Outer Mulberry are described in greater detail in section 6.1.4.1. *SEASEARCH* records have been made from just two of the several deep water wrecks present in this sector: **HMS *Northcoates*** (formerly known as the 'Armed trawler') (713/121) and the ***Zaanstroom*** (713/32). The biological communities associated with these wrecks are described in greater detail in section 6.1.4.2.

Noteworthy habitats and characterising communities

This sector has the largest number of sublittoral species recorded from it (332 species and higher taxa) out of all 14 sectors, which reflects the wide range of habitat types present. However, very few of these species are widespread throughout the sector. Thus, only three species have been recorded from more than 20% of habitat records (see Table below).

BOGNOR REGIS DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 102	Total no. of habitat records: 187
Total number of species (& higher taxa) recorded within this sector: 332	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
-	foliose red algae	57	30	P - S	P
Alcyonium digitatum	dead man's fingers	40	21	P - C	O
Urticina felina	dahlia anemone	38	20	P - F	O
Crepidula fornicata	slipper limpet	38	20	P - A	O

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

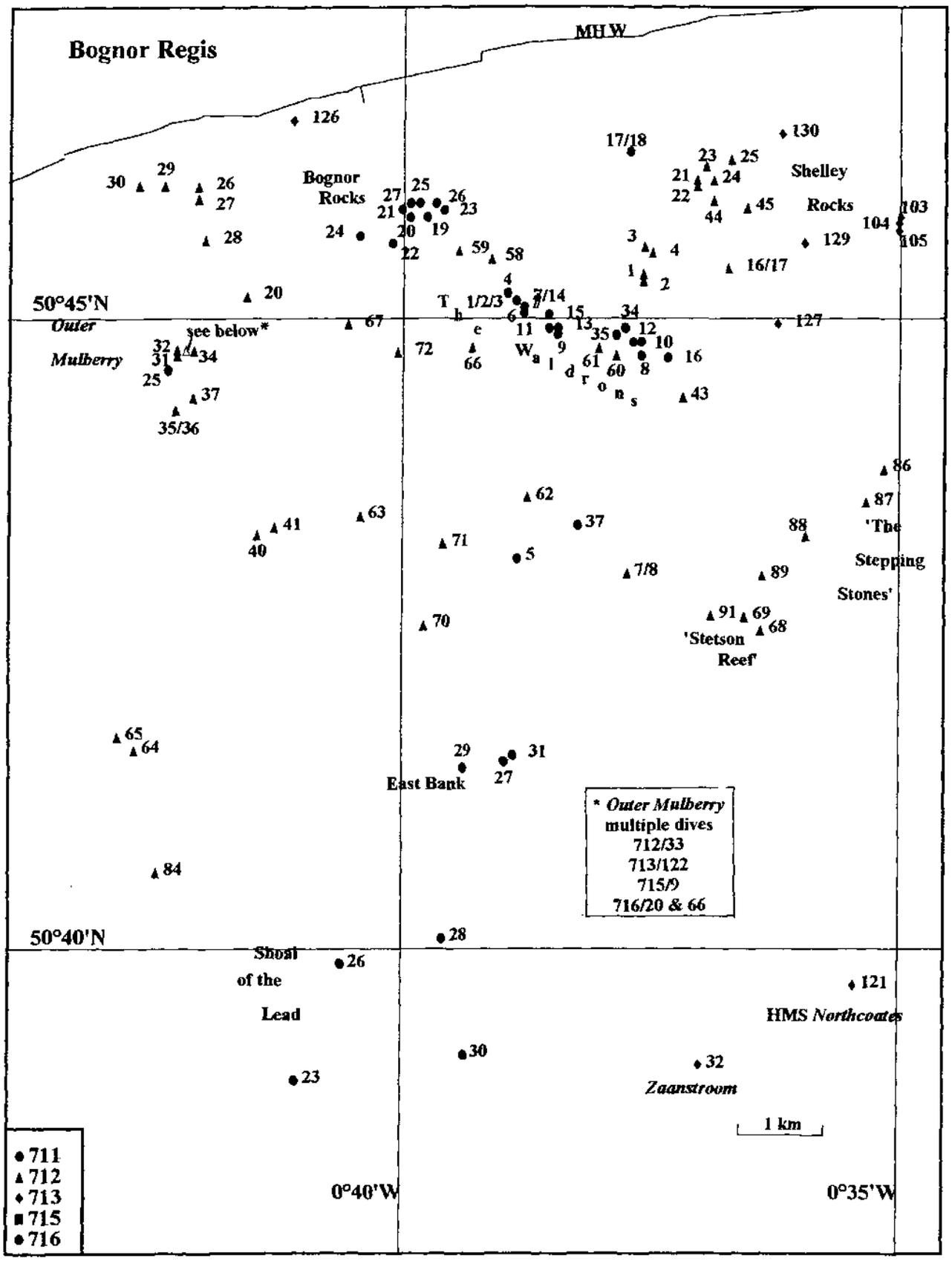

Fig. 29. The location of SEASEARCH *dives within the Bognor Regis sector, 1992-1998.*

SECTOR: **BOGNOR REGIS**

(records arranged in West to East order)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
712	65	Bognor Mussel Beds 2	50 41.70'N 00 42.79'W	SZ 908 892	1	Mussel bed with *Laminaria* and *Maja* at 5.6m BCD.	1	2	95	2				
					2	Low reef with crabs and fish at 5m BCD.	100							
712	30	S of Barn Rocks 5	50 46.06'N 00 42.61'W	SZ 909 973	1	Silty gravel with pebbles and abundant algae and *Lanice* at 2.3-2.5m BCD.				10	80		10	
712	64	Bognor Mussel Beds 1	50 41.58'N 00 42.61'W	SZ 910 890	1	Mussel beds with sparse kelp at 6.1m BCD.								
						Gravel and pebbles with *Maja* and plaice at 6.1m BCD.				30	65	5		
712	29	S of Barn Rocks 4	50 46.08'N 00 42.34'W	SZ 912 973	1	Level gravel, silty sand and pebbles with *Lanice* at 2.4-3.4m BCD.		1	2	10	32	40	10	5
716	25	Outer Mulberry 6	50 44.63'N 00 42.31'W	SZ 913 946	1	Concrete wreckage at 5-8m BCD.								100
712	84	West Head	50 40.64'N 00 42.40'W	SZ 913 872	1	Boulders with gullies, kelp, crustacea and fish at 3m BCD.		90	5			5		
					2	Piled boulders on reef slope with algae at 3-6m BCD.		80	10			10		
					3	Sandy gravel, pebbles and sparse boulders at 6.7m BCD.		10		40	40	10		
712	32	Outer Mulberry 2	50 44.79'N 00 42.21'W	SZ 914 949	1	Sand, gravel and shell seabed at 5.5m BCD.			10	10	48	30		2
					2	Upward-facing concrete surfaces with algae and ?*Epizoanthus* at 4.5-5.5m BCD.								100
					3	Vertical or steeply inclined concrete with *Actinothoe* and sponges at 4.5-5.5m BCD.								100
712	31	Outer Mulberry 1	50 44.75'N 00 42.19'W	SZ 914 948	1	Upper surface of concrete wreckage with brown algae at 0.5-6.5m BCD.								100
					2	Near vertical surfaces of concrete wreckage with *Bugula* at 0.5-6.5m BCD.								100
712	35	W of Outer Mulberry	50 44.27'N 00 42.20'W	SZ 914 940	1	Fine shelly sand with scattered pebbles and shells at 6.3m BCD.				10	10	75		5
					2	Fine shelly sand and pebbles with foliose algae at 5.9m BCD.				28	10	60		2
712	36	S of Outer Mulberry 1	50 44.27'N 00 42.20'W	SZ 914 940	1	Gravel, pebbles and cobbles with algae at 8.3m BCD.			5	10	60	20		5
713	122	Outer Mulberry 7	50 44.76'N 00 42.17'W	SZ 915 949	1	Wreckage with rare *Caryophyllia* at 2-6m BCD.								100
					2	Sand, pebbles and shells with algae at 6m BCD.				30	10	40		20
715	9	Outer Mulberry 8	50 44.76'N 00 42.17'W	SZ 915 949	1	Gravel, sand and bedrock with algae at 8-10m BCD.	5				45	48		2
					2	Sand and gravel, concrete and rusting spars at 9-10m BCD.					40	45		15
					3	Overhanging concrete with *Alcyonium* at 6-10m BCD.								100
716	20	Outer Mulberry 4	50 44.76'N 00 42.17'W	SZ 915 949	1	Vertical concrete surface of wreckage at 4-8m BCD.								100
					2	Mixed sediment of pebbles and sand at 8.0m BCD.	2		1	38	8	40	1	10
					3	Mixed sediment at 8m BCD.			1	40	8	40	1	10
716	66	Outer Mulberry 5	50 44.76'N 00 42.17'W	SZ 915 949	1	Sand and broken shell at 8m BCD.								
712	33	Outer Mulberry 3	50 44.78'N 00 42.17'W	SZ 915 949	1	Vertical concrete wall with algae and turf at 4.1-7.6m BCD.								100
					2	Pebbles, small cobbles and shells on silty sand at 7.6m BCD.			20	45		20	10	5
					3	Sand with pebbles and shells, *Anemonia* and gobies at 7.6m BCD.				10		90		
					4	Boulders and wreckage with kelp, *Flustra* and *Alcyonium* at 7.6m BCD.		25	25	25				25
712	34	E of Outer Mulberry	50 44.78'N 00 42.09'W	SZ 916 949	1	Level fine sand with oyster shells and pebbles at 7.3m BCD.				10		60		30
					2	Level barren fine sand with large ripples at 7.3m BCD.						90		10

SECTOR: **BOGNOR REGIS** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
712	26	S of Barn Rocks 1	50 46.05'N 00 42.03'W	SZ 916 973	1	Flint and shell gravel with *Pagurus* at 2.2-2.6m BCD.					100			
712	27	S of Barn Rocks 2	50 45.95'N 00 42.03'W	SZ 916 971	1	Gravel and pebbles on muddy sand with *Lanice* at 2.3m BCD.		5	10	25	30	20	10	
712	37	S of Outer Mulberry 2	50 44.42'N 00 42.05'W	SZ 916 942	1	Level sand, stone and gravel seabed at 5.6m BCD. Foliose red and brown algae present.				50	20	20		10
712	28	S of Barn Rocks 3	50 45.66'N 00 41.98'W	SZ 917 965	1	Pebbles and gravel in clayey sand with *Desmarestia* at 3.4m BCD.				60	30	5	5	
712	20	Near Mulberry Tops	50 45.18'N 00 41.52'W	SZ 922 957	1	Pebbles and cobbles on sand at 7.2m BCD.			40	40		15		5
712	20	Near Mulberry Tops	50 45.18'N 00 41.52'W	SZ 922 957	2	Rippled sand with occasional *Anemonia* at 7.2m BCD.				2		98		
712	40	The Park 1	50 43.32'N 00 41.45'W	SZ 924 922	1	Gravel and pebbles with *Hydrallmania* at 7m BCD.			2	20	76	1	1	
712	41	The Park 2	50 43.37'N 00 41.22'W	SZ 926 923	1	Gravel with pebbles and cobbles, turf and *Alcyonidium* at 6.9m BCD.			10	30	49	10		1
713	126	Nr East Borough Head	50 46.62'N 00 41.06'W	SZ 927 983	1	Mussel bed at 3-7m BCD.								
716	23	500m NE of Outer Owers buoy	50 39.00'N 00 41.05'W	SZ 930 842	1	Slope of mudstone and limestone boulders from 10-22m BCD.	60	40						
712	67	3km S of Bognor Regis.	50 45.00'N 00 40.52'W	SZ 934 953	1	Rippled sand with cobbles and *Crepidula* at 7.8-8.2m BCD.		2	3			95		
716	26	Shoal of the Lead 1	50 39.92'N 00 40.60'W	SZ 935 859	1	Shells and shell gravel at 27m BCD.					90	10		
711	24	S of Bognor Rocks 6	50 45.65'N 00 40.37'W	SZ 935 966	1	Lower infralittoral gravel with boulders at 5.7-6.7m BCD.		20	5		65			10
712	63	E of the Park 4	50 43.45'N 00 40.37'W	SZ 936 925	1	Rippled sand with pebbles and cobbles at 11.2-11.6m BCD.			4	4		90		2
					2	Clay bedrock at 11.2-11.6m BCD.	100							
711	22	S of Bognor Rocks 4	50 45.60'N 00 40.11'W	SZ 939 965	1	Lower infralittoral gravel with cobbles and boulders at 6.7m BCD.		5	15		70		10	
711	21	S of Bognor Rocks 3	50 45.90'N 00 40.01'W	SZ 940 970	1	Lower infralittoral pebbles on sand at 3.7-4.2m BCD.			5	35		58		2
					2	Lower infralittoral small boulders at 3.7-4.7m BCD.		90		5		5		
					3	Lower infralittoral creviced bedrock at 3.7-4.2m BCD.	90			5		5		
712	72	E of The Park 3	50 44.77'N 00 40.03'W	SZ 940 949	1	Silty sand and pebbles with cobbles and *Alcyonidium* at 9.5-10.3m BCD.			5	73		18	2	2
711	20	S of Bognor Rocks 2	50 45.82'N 00 39.92'W	SZ 941 969	1	Lower infralittoral sand with cobbles/small boulders. Red and green foliose algae present at 7.7m BCD.		5	10			85		
711	27	S of Bognor Rocks 9	50 45.92'N 00 39.90'W	SZ 941 971	1	Upward-facing sandstone bedrock, lower infralittoral. Heavy growths of foliose algae at 2.1-4m BCD.	100							
					2	Vertical/steep sandstone surfaces, lower infralittoral.	100							
					3	Cobbles on bedrock, lower infralittoral.	5	10	75				10	
711	25	S of Bognor Rocks 7	50 45.93'N 00 39.77'W	SZ 942 971	1	Lower infralittoral dissected bedrock at 3.7-5.7m BCD.	100							
					2	Lower infralittoral gravel and *Crepidula* shells at 3.7-5.7m BCD.				5	70	5	5	15
711	19	S of Bognor Rocks 1	50 45.82'N 00 39.73'W	SZ 943 969	1	Lower infralittoral boulders on bedrock at 6.6-8.6m BCD.		60	10	10	10	10		
					2	Lower infralittoral gravel with shells.					80		10	10
					3	Lower infralittoral bedrock.	100							
711	26	S of Bognor Rocks 8	50 45.95'N 00 39.61'W	SZ 944 971	1	Upward-facing bedrock surfaces in the lower infralittoral at 2.2-4.2m BCD.	100							
					2	Vertical bedrock faces in the lower infralittoral at 2.2-4.2m BCD.	100							
					3	Boulders and cobbles on bedrock, in the lower infralittoral at 3.7-4.5m BCD.	30	50	20					
712	70	E of the Park 1	50 42.61'N 00 39.70'W	SZ 944 909	1	Rippled shelly sand and pebbles at 12.3-12.8m BCD.				10	7	80		3

SECTOR: **BOGNOR REGIS** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
711	23	S of Bognor Rocks 5	50 45.89'N 00 39.54'W	SZ 945 970	1	Lower infralittoral silty gravel at 4.4-6.4m BCD.					90		10	
712	71	E of The Park 2	50 43.26'N 00 39.54'W	SZ 946 921	1	Sand with pebbles and cobbles at 10.2m BCD.			15	18	5	60		2
716	28	Shoal of the Lead 2	50 40.13'N 00 39.55'W	SZ 947 863	1	Sand with some shell gravel at 24m BCD.					5	95		
					2	Sand with occasional bedrock outcrops at 24m BCD.				25	15	60		
712	59	NW of Inner Waldrons Reef	50 45.57'N 00 39.36'W	SZ 947 964	1	Pebbles, gravel and cobbles with algae and *Alcyonidium* at 7.4-8.3m BCD.			8	60	30		1	1
					2	Clay bedrock with piddocks at 7.4-8.3m BCD.	100							
716	29	East Bank 2	50 41.43'N 00 39.38'W	SZ 949 888	1	Sand with some shell fragments at 13.5m BCD.			1		4	95		
712	66	W of the Outer Waldrons Reef	50 44.79'N 00 39.20'W	SZ 949 950	1	Gravel with small cobbles with algae at 9.8-10m BCD.			10		75		5	10
					2	Scattered boulders at 9.8-10m BCD.		100						
					3	Clay bedrock at 9.8-10m BCD.	100							
716	30	Shoal of The Lead 3	50 39.21'N 00 39.34'W	SZ 950 846	1	5m wide strip of shells and shell fragments at 28m BCD.					95			5
712	58	NW edge of Inner Waldrons Reef	50 45.50'N 00 39.01'W	SZ 951 963	1	Hard and clay pebbles with algae, *Flustra* and *Styela* at 8.7-8.9m BCD.				80	10		5	5
712	58	NW edge of Inner Waldrons Reef	50 45.50'N 00 39.01'W	SZ 951 963	2	Pebbles with algae and invertebrates at 8.7-8.9m BCD.				90	7		3	
711	4	Inner Waldrons Reef 4	50 45.25'N 00 38.85'W	SZ 953 958	1	Lower infralittoral sandy gravel, with foliose red algae at 8.2m BCD.			5		63	30		2
					2	Lower infralittoral bedrock and boulders with basal scour. Red algae present at 7.2-8.2m BCD.		95	5					
711	1	Inner Waldrons reef 1	50 45.19'N 00 38.84'W	SZ 954 957	1	Lower infralittoral dissected bedrock with red algae at 4.1-6.1m BCD.	90		10					
711	2	Inner Waldrons reef 2	50 45.19'N 00 38.84'W	SZ 954 957	1	Dissected sandstone bedrock slope, upper infralittoral with red algae at 4.5-7.5m BCD.	90	10						
711	3	Inner Waldrons reef 3	50 45.19'N 00 38.84'W	SZ 954 957	1	Bedrock and boulders, lower infralittoral, with red algae at 6.1-8.1m BCD.	80	20						
					2	Fissures and overhangs in bedrock and boulders at 6.1-8.1m BCD.	80	20						
					3	Level cobble/pebble ground and sand, lower infralittoral, with foliose red and brown algae at 6-8.1m BCD.			30	30		30		10
716	27	East Bank 1	50 41.52'N 00 38.90'W	SZ 954 889	1	Sand overlying clay at 14m BCD.						90	10	
716	31	East Bank 3	50 41.54'N 00 38.86'W	SZ 955 890	1	Silty sand overlying ?mudstone at 14m BCD.			3			94		3
711	7	Inner Waldrons reef 7	50 45.10'N 00 38.73'W	SZ 955 956	1	Lower infralittoral angular boulders. Red algae present at 7.4-10.1m BCD.		65		15	20			
					2	Cobbles and pebbles at 8.4-10.1m BCD. Sparse red algae.			70	30				
					3	Muddy gravel with shell fragments at 8.4-10.1m BCD.					80		20	
711	14	Inner Waldrons Reef 8	50 45.12'N 00 38.73'W	SZ 955 956	1	Lower infralittoral boulders on mixed sediment at 8.1-9.1m BCD.		50	15	15		12	5	3
					2	Lower infralittoral sandy sediment at 8.1-9.1m BCD.			15	15	20	40	7	3
711	5	Inner Waldrons reef 5	50 43.13'N 00 38.77'W	SZ 955 919	1	Small boulder heaps on sediment-covered bedrock at 6.9-8.4m BCD. Abundant foliose red algae.	5	60	15		5	10		5
					2	Sand and gravel over bedrock, at 8.4m BCD. with some foliose algae.	10			10	40	40		
					3	Lower infralittoral sandstone reef, with red algae at 5.4-8.4, BCD.	95	5						
711	6	Inner Waldrons reef 6	50 45.07'N 00 38.70'W	SZ 955 955	1	Lower infralittoral jumbled angular boulders. Abundant red algae and some coralline algae at 6.4-9.4m BCD.		90	10					
					2	Silty gravel with shell fragments at 8.4-9.4m BCD. Occasional foliose red algae.				5	75	10	10	

SECTOR: **BOGNOR REGIS** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
712	62	3km S of inner Waldrons Reef	50 43.63'N 00 38.69'W	SZ 956 928	1	Sand and shells with *Crepidula*, *Lanice* and *Alcyonidium* at 12.5m BCD.					30	60		10
					2	Silty cobbles and pebbles with bryozoans and ascidians at 12.5m BCD.			50	48			2	
					3	Small boulders with sponges at 12.5m BCD.		100						
					4	Clay bedrock with piddocks at 12.5m BCD.	100							
711	15	Central Waldrons 4	50 45.04'N 00 38.44'W	SZ 958 955	1	Lower infralittoral boulders with small gravel patches. Abundant foliose algae on all upward-facing surfaces at 4-10m BCD.		70	10	10	10			
711	11	Central Waldrons reef 2	50 44.97'N 00 38.43'W	SZ 958 953	1	Lower infralittoral, silty gravel and cobbles at 7m BCD.			40		50		10	
					2	Dissected bedrock, lower infralittoral. Coralline algae present at 6.5-9m BCD.	100							
					3	Shell, sand patches, lower infralittoral. Foliose algae sometimes established at 7m BCD.						100		
					4	Boulders on bedrock, lower infralittoral at 8-9m BCD.		100						
711	13	Central Waldrons 3	50 44.94'N 00 38.40'W	SZ 959 953	1	Lower infralittoral boulders and cobbles on bedrock at 6.6-8.1m BCD.	30	60	10					
					2	Lower infralittoral sand and gravel with algae at 8.1-8.6m BCD.					50	50		
					3	Lower infralittoral large rectangular boulders at 6.6-10.6m BCD.		100						
					4	Lower infralittoral sand at 9.6-10.6m BCD.						100		
711	9	Central Waldrons reef 1	50 44.89'N 00 38.36'W	SZ 959 952	1	Lower infralittoral large cobbles. Abundant red algae at 11.6m BCD.			100					
					2	Lower infralittoral boulder ledge at 11.2m BCD.		100						
711	37	1km NW of 'HMS Pine'	50 43.40'N 00 38.15'W	SZ 962 924	1	Pebbles and rounded flint cobbles at 4.7m BCD.		5	5	70		15		5
712	61	S side of Outer Waldrons 2	50 44.81'N 00 38.00'W	SZ 964 950	1	Cobbles and silty sand at 7.9-10.4m BCD.		10	30			50	10	
					2	Boulders at reef edge at 9-10m BCD.		100						
					3	Rock outcrops with sponges at 7.9-9m BCD.	100							
716	35	The Waldrons 2	50 44.90'N 00 37.80'W	SZ 966 952	1	Bedrock and boulders at 7-9m BCD.	70	30						
					2	Sand and broken shells at 8-9m BCD.				2	26	70		2
712	60	S side of Outer Waldrons 1	50 44.73'N 00 37.79'W	SZ 966 949	1	Rock outcrops with algae at 7.7-9.7m BCD.	100							
					2	Pebbles with sand and algae at 7.7-9.7m BCD.			90			10		
716	34	The Waldrons 1	50 44.97'N 00 37.72'W	SZ 967 953	1	Seabed of sand, mud, mixed pebbles and cobbles at 10m BCD.			50		5	5	40	
					2	Outcrops sandstone bedrock at 7.2-10.4m BCD.	100							
711	17	SW of Middleton Ledge	50 46.37'N 00 37.66'W	SZ 967 979	1	Lower infralittoral flint pebbles with chalk cobbles with red algae at2.3-3.8m BCD.			5	80	10	5		
					2	Gravel/pebble circular scours at 3.6-4.1m BCD.	20			70	10			
711	12	Outer Waldrons reef 3	50 44.86'N 00 37.60'W	SZ 968 951	1	Slope of angular boulders with sparse foliose algae at 7.5-10m BCD.		80	5	5	2	8		
					2	Shelly, silty sand with occasional boulders at 10-11m BCD.		10	5	10	5	65	5	
712	7	Nr wreck of HMS Pine	50 42.98'N 00 37.65'W	SZ 968 917	1	Level sand and cobbles with ascidians at 14.6m BCD.			5			93		2
712	8	Nr wreck of HMS Pine 2	50 42.98'N 00 37.65'W	SZ 968 917	1	Sand with cobbles and shells at 12.6-14.9m BCD.			10			85		5
					2	Small rock outcrops with ascidians and sponges at 13.6-14.6m BCD.	80					18		2
712	2	SW of Shelley Rocks 2	50 45.33'N 00 37.56'W	SZ 969 960	1	Level fine sand with shell fragments at 8.4-8.7m BCD.					10	90		
					2	Sand, gravel and cobbles with sparse fauna at 8.2-8.7m BCD.			5	5	35	50		5
					3	Cobbles and pebbles with sponges at 8-8.7m BCD.	5		30	20	25	20		
711	10	Outer Waldrons reef 2	50 44.83'N 00 37.56'W	SZ 969 951	1	Sandstone reef with mixed sediment patches at 8-10m BCD. Moderate cover of foliose algae.	60		5		20	15		

SECTOR: **BOGNOR REGIS** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
712	1	SW of Shelley Rocks 1	50 45.35'N 00 37.55'W	SZ 969 961	1	Bored clay with shelly sand, cobbles and boulders at 7.7-8.5m BCD.	20	5	5		10	60		
					2	Clay bedrock overlain by sand at 7.7-7.9m BCD.	20					75	5	
711	8	Outer Waldrons reef 1	50 44.72'N 00 37.55'W	SZ 969 949	1	Lower infralittoral cobbles with sand patches. Abundant red algae at 8.4m BCD.			60	20		20		
					2	Lower infralittoral boulders at 8.4m BCD.		80	10	10				
712	3	SW of Shelley Rocks 3	50 45.58'N 00 37.51'W	SZ 969 965	1	Pebbles and gravel with *Urticina* at 5.7m BCD.		5	95					
712	4	SW of Shelley Rocks 4	50 45.53'N 00 37.47'W	SZ 970 964	1	Sand and shingle with *Urticina* at 5.9-6.3m BCD.		5	10		45	40		
					2	Gravel, pebbles and boulders with *Urticina* at 6.3m BCD.		10		45	43			2
					3	Rippled barren sand at 6.3m BCD.						100		
711	16	Outer Waldrons 4	50 44.72'N 00 37.30'W	SZ 972 949	1	Lower infralittoral sloping bedrock and boulders at 5.9-8.8m BCD.	50	45	5					
					2	Coarse sand and gravel, lower Infralittoral at 8.8-9.7m BCD.		10			50	40		
712	43	S of Middleton Ledge	50 44.40'N 00 37.10'W	SZ 974 943	1	Gravel, pebbles, cobbles and boulders with *Esperiopsis* at 2.8m BCD.		10	30	40	20			
712	21	Shelley Rocks 1	50 46.13'N 00 37.03'W	SZ 975 975	1	Pebbles and occasional cobbles with *Crepidula* at 2.9-4.4m BCD.			10	75			10	5
712	22	Shelley Rocks 2	50 46.09'N 00 37.01'W	SZ 975 974	1	Gravel with bored chalk and other cobbles at 3.8-4.2m BCD.		5	5	20	70			
712	23	Shelley Rocks 3	50 46.22'N 00 36.90'W	SZ 976 977	1	Cobbles with some *Laminaria* at 3.2m BCD.		20	60	15	5			
712	24	Shelley Rocks 4	50 46.14'N 00 36.79'W	SZ 977 975	1	Chalk bedrock with algae and piddocks at 3.6-4.4m BCD.	100							
					2	Mixed coarse sediment with algae and sponges at 4m BCD.	10	20	15	20	30	3	2	
712	44	E of Shelley Rocks 1	50 45.95'N 00 36.80'W	SZ 977 972	1	Cobble dominated sediment with *Esperiopsis* and algae at 4.7m BCD.		10	50	25	15			
713	32	The 'Zanstroom'	50 39.12'N 00 36.96'W	SZ 978 845	1	Sides of hull with *Tubularia* and *Caryophyllia* at 24-27.6m BCD.								100
					2	Horizontal deck surfaces with *Tubularia* and *Aplidium* at 24m BCD.								100
					3	Hold with *Conger* at 24-27.6m BCD.								100
					4	Clean sand at 27.6m BCD.					10	90		
712	91	Stepping Stones 5	50 42.68'N 00 36.82'W	SZ 978 911	1	Sand over bored clay with hermit crabs and dragonets at 12.3-13.1m BCD.		10	10			80		
					2	Sandstone slabs with *Pentapora* at 10.3-12.3m BCD.		40	10			50		
712	16	S of Shelley Rocks 1	50 45.40'N 00 36.69'W	SZ 979 962	1	Gravel and pebbles with mobile fauna at 3.5m BCD.				50	50			
					2	Cobbles and boulders with algae and sponges at 3.5m BCD.		50	50					
					3	Chalk bedrock at 3.5m BCD. with piddocks.	100							
712	17	S of Shelley Rocks 2	50 45.40'N 00 36.69'W	SZ 979 962	1	Pebbles and boulders with algae over chalk at 3.4-4.3m BCD.	5	5		50	40			
712	25	Shelley Rocks 5	50 46.29'N 00 36.66'W	SZ 979 978	1	Gravel, cobbles and boulders with algae at 2.7-3m BCD.		5	10	20	65			
712	45	E of Shelley Rocks 2	50 45.90'N 00 36.50'W	SZ 981 971	1	Gravel, cobbles and chalk boulders with *Esperiopsis* at 4.4m BCD.		10	10	10	45	25		
712	69	Stetson Reef 2	50 42.66'N 00 36.50'W	SZ 982 911	1	Silty boulders with sponges and *Flustra* at 13-14m BCD.		100						
					2	Silty sand with buried cobbles at 13-14.6m BCD.		2	5			85	8	
					3	Clay bedrock bored by piddocks at 14.4m BCD.	100							
712	68	Stetson Reef 1	50 42.55'N 00 36.34'W	SZ 984 909	1	Clay bedrock bored by piddocks at 10.4-12.4m BCD.	100							
					2	Sand between boulders at 10.4-12.4m BCD.						100		
					3	Flat boulders with *Pentapora* at 10.4-12.4m BCD.		100						
712	89	Stepping Stones 4	50 42.97'N 00 36.30'W	SZ 984 917	1	Rippled sand over sandstone with *Alcyonium* at 11-13m BCD.				5		95		
					2	Cobbles and shingle with *Actinothoe* at 10m BCD.			50		50			
					3	Rock, cobbles and shingle at 10m BCD.	50		25		25			
713	127	E of The Waldrons	50 44.97'N 00 36.21'W	SZ 985 954	1	Cobbles on sand and gravel with *Crepidula* and *Styela* at 9m BCD.			10		40	40		10
713	130	NE of Shelley Rocks	50 46.50'N 00 36.10'W	SZ 985 962	1	Pebbles, cobbles and boulders at 3-4m BCD.		10	20	60		5	5	

SECTOR: **BOGNOR REGIS** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	129	SE of Shelley Rocks	50 45.60'N 00 35.90'W	SZ 988 966	1	Pebbles and one boulder with small fish at 5m BCD.		1	5	94				
712	88	Stepping Stones 3	50 43.32'N 00 35.90'W	SZ 989 923	1	Sandstone slabs on sand with sea anemones at 11.4-12.4m BCD.		50				48	2	
712	87	Stepping Stones 2	50 43.59'N 00 35.32'W	SZ 996 928	1	Rippled sand over clay with piddocks at 11.7-12.5m BCD.			2	3	2	90		3
					2	Clay bedrock bored by piddocks at 11.7-12.5m BCD.	100							
					3	Sandstone slabs with *Flustra* at 11.7-12.5m BCD.		90	10					
713	121	"H.M.S. Northcoates"	50 39.71'N 00 35.39'W	SZ 996 857	1	Wreck with *Caryophyllia* and *Corynactis* at 20-26m BCD.								100
					2	Silty gravel with *Cerianthus* and *?Epizoanthus* at 26m.					70	20	10	
712	86	Stepping Stones 1	50 43.81'N 00 35.12'W	SZ 998 933	1	Clay bedrock with piddocks and silty sand at 11-13m BCD.	40					50	10	
					2	Silty sand with dragonets and hermit crabs at 11-12m BCD.						80	20	
					3	Silty sand, shell, pebbles and cobbles at 12-13m BCD.			2	15		60	10	13
713	103	4km SE of Middleton-on-Sea 1	50 45.80'N 00 34.98'W	SZ 999 970	1	Pebbles and gravel on chalk with algae at 6m BCD.	5			30	65			
713	104	4km SE of Middleton-on-Sea 2	50 45.76'N 00 34.94'W	SZ 999 969	1	Gravel, pebbles and rare cobbles with algae at 4-6m BCD.			5	30	65			
713	105	4km SE of Middleton-on-Sea 3	50 45.71'N 00 34.94'W	SZ 999 968	1	Gravel and pebbles with algae at 4m BCD.			5	40	50	5		
187 Records Processed														

7.5 Littlehampton

Overview

The stretch of coast bordering this section runs from Atherington in the west (OS northing line of TV000) to Ferring in the east (OS northing line of TQ090), a west-to-east distance of 9 km. The River Arun runs into the sea at Littlehampton, which leads to localised increases in turbidity from time to time, particularly in the winter after heavy or prolonged periods of rainfall. Only a handful of *SEASEARCH* records have been made from within 2 km of the mouth of the River Arun, primarily because of the shallow nature of the seabed here (< 2 m BCD) and the generally poor visibility.

Features of interest (west to east)

Winter Knoll, which lies 2-3 km SW of the mouth of the River Arun, is a low lying chalk reef, parts of which are often obscured as a result of movement of the surrounding mixed sediments. According to Wallace (1996), the reef is bounded by 4 m high cliffs to the north and east, though the presence of these cliffs has yet to be confirmed by *SEASEARCH* divers. Even by zig-zagging over the area with an echo sounder, we have not picked up these features, which sound very dramatic. Although several dives were undertaken in this area (713/106-108, 112 & 113), only dives 713/106 & 107 recorded chalk bedrock as being present, either as underlying horizontal bedrock or as broken, low-lying outcrops. Wood (1992) describes the Knoll as being roughly circular, with an edge formed by a cliff 1-1.5 m high.

Close inshore, in an arc approximately 2-3 km SW to SE from the mouth of the River Arun, all records report the seabed as being a mix of gravel, pebbles and sand with occasional cobbles, level, at between 2-5 m BCD (713/109-111, 114-120). The cobbles and larger (more stable) pebbles had algae attached to them. Between 10-40% of the pebbles and cobbles were of chalk (as opposed to flint).

The precise extent of **'Spoon reef'** (so named because on the Admiralty chart, the 10 m contour here resembles a spoon) is not known. The reef lies approximately 3 km due south of Winter Knoll, about 6 km from the coastline. A handful of dives have been undertaken in this area (712/5, 6, 51-53, 56 & 57), though only 712/5, 6, 52 & 57 are from the sandstone reef itself, which appears to be of discrete outcrops of bedrock (?sandstone) together with small to very large boulders, from 9-14 m BCD. The other records (to the north and east of the reef) describe a seabed of gravel, sand, pebbles and cobbles at 8-12 m BCD.

Further outcrops of sandstone bedrock were found a little further to the east at **'Spanner reef'** (again named for the similarity of the 10 m contour here to a double-headed spanner), at 9.5-12.1 m BCD. This reef lies 7 km due south of Littlehampton. A number of *SEASEARCH* records have been made from the area around the reef (712/90, 92 & 93, 713/71, 72 & 73), though only 712/92 recorded 100% bedrock as the predominant habitat.

To the west of Kingmere Rocks (approximately 8 km SE of Littlehampton), there is an area marked on the chart as **Lobster Grounds**. Four dives were undertaken in this area (713/23, 149, 150 & 151) in order to confirm the seabed type. This was found to be a mix of sand, with pebbles and cobbles and a sparse associated fauna, at 10-13 m BCD. Perhaps these dives missed the features which might constitute the 'lobster grounds', as lobsters are normally associated with areas of bedrock and boulders.

Kingmere Rocks lies SSE or Littlehampton, approximately 7-8 km offshore. The records from this area (711/36, 712/102, 713/17, 21, 22, 25, 146 & 147) show depths ranging from 7-13 m BCD, though there is very little obvious inclination to the seabed. Several of these records show medium to very large sized boulders as being present on a base of sand, gravel, pebbles and cobbles. At

one site (711/36) a base of 'extensively bored soft rock' (mudstone?) is present, and 713/17 records very large, flat-topped boulders being present which were 'heavily bored by piddocks'. This latter record implies that the rock in question may not be sandstone (typically too hard for piddocks to bore into) but could be limestone. This would be unexpected, as the only other records of limestone off West Sussex are from the Selsey Bill area. However, it could also have been mudstone. The slab-like nature of the sandstone boulders is emphasised by several recorders, ranging in size from small (<1 m) to very large (>1.5 m across).

An area of horizontal chalk bedrock was encountered approximately 6 km SE of the mouth of the River Arun, at 6-8 m BCD (713/7, 9 & 10). The exposures of chalk were well scoured and comparatively small in area (up to 50 cm across), being covered by occasional small flint boulders, large and small flint cobbles, chalk and flint pebbles and gravel, with some small patches of coarse sand. The chalk bedrock was riddled with piddock holes, though most of these were occupied not by piddocks but by anemones and sea squirts.

Although there are a number of wrecks which are popular dive sites within this sector, the only one from which a *SEASEARCH* record has been made is that of the *Frode* (712/101). There is not much left of this ship (a 733-ton steamer which sank in 1943) except for some metal plates and girders, many partially covered by sand and silt. The surrounding seabed at 7-8 m BCD is of coarse sand and gravel with occasional boulders (713/81).

Noteworthy habitats and characterising communities

Much of the seabed in this sector is a mix of sand, gravel, broken or dead shell, pebbles and cobbles. In shallow areas, this type of seabed often has a covering of foliose algae, which may be quite lush during the summer months. In deeper water, hydroids, bryozoans, burrowing sea anemones and solitary sea squirts dominate in place of the algae. In places there may be large numbers of slipper limpets *Crepidula fornicata*, either as live chains or, more frequently as dead shells. Amongst the mobile animal life of such areas one is likely to encounter hermit crabs, spider crabs, netted dogwhelks, tompot blennies, dragonets, various flatfish and dogfish.

The mixed sediment seabed habitat (as described above) in the near-shore zone off Littlehampton is a favoured nesting ground for black sea bream *Spondyliosoma cantharus* during the early summer months (mid-April to mid-June). Indeed, the spawning grounds extend from Bognor to Worthing, with most nest sites concentrated around the 10 m contour. EMU (1998) highlight three areas where more than five nest sites per 10 m long transect have been encountered: from the mouth of the River Arun, these lie about 6 km SSW; 4 km SSE and 8 km SSE. Nest sites, which consist of cleared gravel circles 1-2 m in diameter, have only been encountered on one *SEASEARCH* dive (716/24).

All the boulders present at Kingmere Rocks were covered by marine life, the tops of the shallower ones (< 8 m depth BCD) having a covering of foliose red algae, whilst those slightly deeper were dominated by a dense animal turf, particularly the bryozoans *Bugula* spp. and *Flustra foliacea*. Extensive patches of encrusting coralline algae were present on the sides of the boulders, together with various sponges, dead man's fingers, sea squirts; starfish, edible crabs and fan worms. Fish included bib, tompot blenny and ballan wrasse, though the most frequently recorded wrasse species from here was the goldsinny.

It is interesting to note that a common dolphin was seen breaching just off Littlehampton by *SEASEARCH* divers following dives in August 1994. This was approximately 2-3 km offshore.

LITTLEHAMPTON DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 88	Total no. of habitat records: 128
Total number of species (& higher taxa) recorded within this sector: 279	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
-	foliose red algae	68	53	P - S	O
Crepidula fornicata	slipper limpet	56	44	P - S	O
Urticina felina	dahlia anemone	50	39	P - C	R
Paguridae	unidentified hermit crab(s)	48	38	P - A	O
Styela clava	leathery sea squirt	48	38	P – C	O
Maja squinado	spiny spider crab	44	34	P - F	R
Flustra foliacea	hornwrack	44	34	P – A	O
Porifera indet. crusts	unidentified encrusting sponges	33	26	P - A	R
Calliostoma zizyphinum	painted topshell	33	26	P - C	O
Hydrozoa	unidentified hydroids	31	24	P - A	P
Dysidea fragilis	'goose bump' sponge	29	23	P - C	P
Alcyonium digitatum	dead man's fingers	27	21	P - F	R
Esperiopsis fucorum	'shredded carrot' sponge	26	20	P - A	P
Anemonia viridis	snakelocks anemone	26	20	P - C	O
Calliblepharis ciliata	red alga	26	20	P - A	O

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

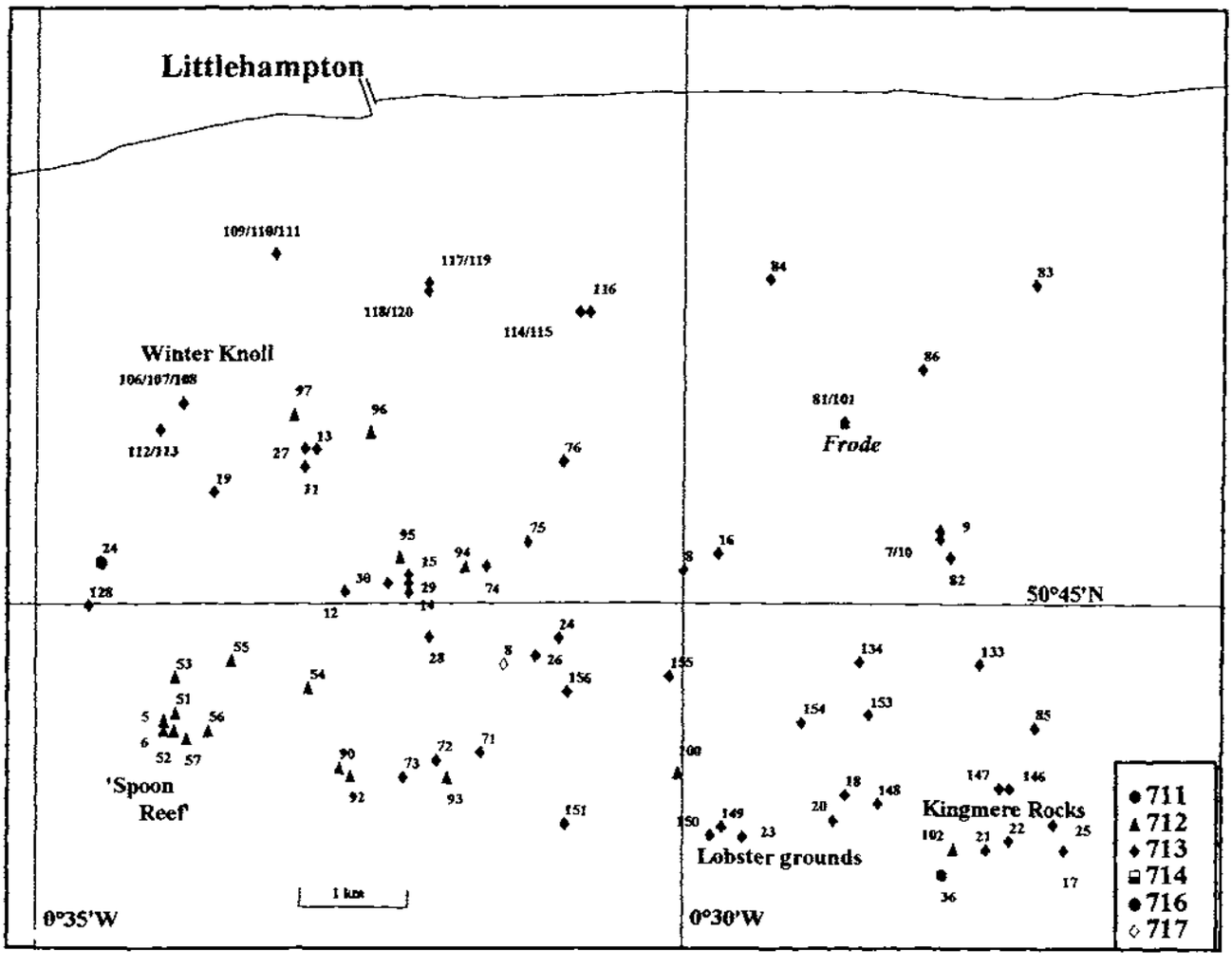

Fig. 30. Location of SEASEARCH *dives within the Littlehampton sector, 1992-1998.*

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SECTOR: **LITTLEHAMPTON**

(records arranged in West to East order)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	128	NW of Spoon Reef	50 45.00'N 00 34.60'W	TV 004 955	1	Gravel and shells with algae and hydroids at 10m BCD.					40	15	5	40
716	24	S of Winter Knoll	50 45.26'N 00 34.44'W	TV 005 960	1	Gravel and pebbles overlying chalk bedrock at 8.2m BCD.	10			30	60			
					2	Low-lying chalk bedrock outcrop at 7-8m BCD.	100							
713	113	Close to Winter Knoll 2	50 46.10'N 00 34.00'W	TV 010 975	1	Pebbles, cobbles and gravel with algae at 4m BCD.		5	25	25	25	10	10	
712	5	Spoon Reef 1	50 44.28'N 00 34.01'W	TV 011 942	1	Pebbly sand with *Crepidula* shells and starfish at 11.4-12.4m BCD.			5	10	5	70		10
					2	Horizontal silty sandstone with varied but sparse fauna at 11.4m BCD.	100							
					3	Vertical rock surfaces with sponges at 11.4-12.4m BCD.	100							
					4	Large overhang with sponges and fish at 11.9m BCD.	100							
712	6	Spoon Reef 2	50 44.27'N 00 33.96'W	TV 011 941	1	Massive upright boulders with *Tubularia* and fish at 8.9-13.9m BCD.		50	30			15		5
					2	Sand and small boulders with *Flustra* at 13.4-13.9m BCD.		15				80		5
					3	Rippled sand with a few cobbles at 13.4-13.9m BCD.			5			90		5
712	51	N of Spoon Reef 1	50 44.36'N 00 33.91'W	TV 012 943	1	Sand with pebbles, cobbles and boulders at 12.7m BCD.		5	10	10		65		10
712	53	N of Spoon Reef 3	50 44.58'N 00 33.89'W	TV 012 947	1	Gravel and sand with pebbles and cobbles at 9.9m BCD.		2	3	7	68	20		
712	52	N of Spoon Reef 2	50 44.27'N 00 33.87'W	TV 012 941	1	Boulders with bryozoans and sponges at 13m BCD.		100						
					2	Sand, pebbles and shells at 13m BCD.				20		70		10
713	106	Nr Winter Knoll 1	50 46.25'N 00 33.80'W	TV 012 978	1	Pebbles, gravel and shells with algae at 4m BCD.				50	30			20
713	107	Nr Winter Knoll 2	50 46.25'N 00 33.80'W	TV 012 978	1	Chalk with gravel, pebbles, sand and algae at 5m BCD.	50	1		10	25	13		1
713	108	Nr Winter Knoll 3	50 46.25'N 00 33.80'W	TV 012 978	1	Pebbles and rare boulders in silt over chalk at 4m BCD.		4	4	80	8		4	
712	57	E end of Spoon Reef 3	50 44.20'N 00 33.79'W	TV 013 940	1	Separated sandstone outcrops with sponges at 9-13m BCD.	50	50						
					2	Sand with dragonets at 10-13.8m BCD.	2				5	90	3	
					3	Empty slipper limpet shells at 11m BCD.								100
					4	Cobbles with *Flustra* at 9-12m BCD.			100					
713	19	1km S of Winter Knoll	50 45.70'N 00 33.60'W	TV 015 968	1	Pebbles and gravel with few cobbles and boulders at 8.5-11.5m BCD.		5	5	60	30			
712	56	E end of Spoon Reef 2	50 44.25'N 00 33.62'W	TV 015 941	1	Silty sand with patches of cobbles at 12.9m BCD.			20			70	10	
					2	Sandstone reef with *Esperiopsis* and other sponges at 12m BCD.	60	40						
712	55	NE of Spoon Reef 2	50 44.69'N 00 33.46'W	TV 017 949	1	Pebbles and flint cobbles with *Asterias* and algae at 9.5m BCD.		2	10	80	4		2	2
					2	Low boulders with algae and *Flustra* at 9m BCD.		100						
713	109	2km SSW of Littlehampton 1.	50 47.15'N 00 33.10'W	TV 020 995	1	Pebbles and cobbles with algae, hermit crabs, sponges at 2-4m BCD.		5	30	40	20	5		
713	110	2km SSW of Littlehampton 3.	50 47.15'N 00 33.10'W	TV 020 995	1	Gravel with pebbles on chalk with algae at 5m BCD.	5		5	30	60			
713	111	2km SSW of Littlehampton 2.	50 47.15'N 00 33.10'W	TV 020 995	1	Gravel with pebbles and algae at 2-4m BCD.				28	70			2
712	97	E of Winter Knoll 2	50 46.17'N 00 33.03'W	TV 022 977	1	Gravel, cobbles and occasional chalk boulders at 5.4-7.5m BCD.		5	20		75			
					2	Shattered chalk at 5.4-5.7m BCD.	100							
713	11	1km SE of Winter Knoll 1	50 45.84'N 00 32.95'W	TV 023 971	1	Cobbles and pebbles over chalk at 7.2-7.7m BCD.	2	2	25	5	63	2		1
713	27	1km SE of Winter Knoll 3	50 45.95'N 00 32.90'W	TV 023 973	1	Pebbles and gravel, some cobbles and shells with *Urticina* at 7-8.7m BCD.			5	40	35	9	1	10
					2	Pebbles, gravel with flint and chalk cobbles at 7-8.7m BCD.		2	10	38	30	9	1	10
713	13	1km SE of Winter Knoll 2	50 45.96'N 00 32.85'W	TV 024 973	1	Sandy gravel with few cobbles and boulders, with *Styela* at 8.2m BCD.		1	5		82	10	2	
712	54	NE of Spoon Reef 1	50 44.53'N 00 32.88'W	TV 024 946	1	Pebble seabed with *Flustra*, *Styela* and *Hydrallmania* at 11.5m BCD.		1		80	10	9		
712	90	Reef 7km S of Littlehampton 1.	50 44.01'N 00 32.67'W	TV 027 937	1	Rock outcrops with sponges at 10-12m BCD.	100							
					2	Gravel with pebbles at 12m BCD.			3	7	90			
					3	Silty sand with *Callionymus* at 12m BCD.						90	10	

SECTOR: **LITTLEHAMPTON** (cont.)

Survey	Site	SITE NAME	Position	*Grid ref.*	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	12	5km S of Littlehampton 1.	50 45.12'N 00 32.57'W	TV 027 957	1	Chalk bedrock with pebbles and gravel, sponges and *Urticina* at 7.4-8.5m BCD.	1		5	40	45	4		5
					2	Pebbles, gravel and sand with algae at 3m BCD.		5		45	30	20		
712	92	Reef 7km S of Littlehampton 2.	50 43.94'N 00 32.55'W	TV 028 936	1	Rock outcrops with sponges at 9.5-10.3m BCD.	100							
					2	Sand at 10m BCD.						100		
712	96	E of Winter Knoll 1	50 46.04'N 00 32.40'W	TV 029 975	1	Pebbles, gravel and chalk cobbles at 7.8m BCD.		1	9	35	30	18	2	5
713	30	5km S of Littlehampton 5.	50 45.17'N 00 32.29'W	TV 031 958	1	Chalk bedrock under pebbles, gravel and rare boulders at 6.9-8.3m BCD.	5	1		89	5			
					2	Flint cobbles and some chalk boulders with sponges at 6-6.9m BCD.		6	74	10	10			
712	95	5km S of Littlehampton 2.	50 45.30'N 00 32.20'W	TV 032 961	1	Chalk and flint gravel, cobbles and boulders with sponges at 6m BCD.		5	10		70	15		
713	29	5km S of Littlehampton 4.	50 45.15'N 00 32.12'W	TV 033 958	1	Chalk bedrock, rare boulders, mobile pebbles and gravel at 7.2-9.2m BCD.	50	2	7	20	20			1
713	14	5km S of Littlehampton 2.	50 45.10'N 00 32.10'W	TV 033 957	1	Silted cobbles, pebbles and gravel at 9.9m BCD.			30	35	35			
					2	Chalk bedrock with some chalk cobbles and pebbles at 8.7m BCD.	80		5	10	5			
					3	Gravel with some pebbles and cobbles over chalk at 8.6-9.9m BCD.			5	15	80			
					4	Flint and chalk boulders, cobbles and pebbles at 8.4-9.9m BCD.		20	50	30				
713	15	5km S of Littlehampton 3.	50 45.16'N 00 32.08'W	TV 033 959	1	Pebbles and gravel over chalk at 6.1-7.1m BCD.	5			65	30			
713	73	"Spanner Reef" 3	50 43.94'N 00 32.10'W	TV 033 936	1	Sand and gravel with groups of boulders and *Pentapora* at 10m BCD.		10	10	20	30	30		
713	117	3km S of Littlehampton 1.	50 46.95'N 00 31.92'W	TV 034 992	1	Gravel and pebbles with algae and hermit crabs at 4m BCD.				40	60			
713	118	3km S of Littlehampton 2.	50 46.95'N 00 31.92'W	TV 034 991	1	Sand, gravel and pebbles with algae at 3m BCD.			5	15	20	60		
713	119	3km S of Littlehampton 3.	50 46.95'N 00 31.92'W	TV 034 992	1	Pebbles, gravel and sand with algae at 4m BCD.				50	30	20		
					2	Cobbles, pebbles, gravel, sand and algae at 4m BCD.			20	45	25	10		
713	120	3km S of Littlehampton 4.	50 46.95'N 00 31.92'W	TV 034 991	1	Pebbles and gravel with large fish at 3m BCD.			5	40	50	5		
713	28	6km S of Littlehampton.	50 44.81'N 00 31.91'W	TV 035 952	1	Coarse sand, possibly trawled, at 10.4-10.9m BCD.				10		80		10
					2	Gravel with sand and small boulders at 9.9-10.4m BCD.		10			80	10		
					3	Chalk with piddocks, and piled gravel and pebbles at 9.5-9.9m BCD.	50			25	25			
713	72	"Spanner Reef" 2	50 44.06'N 00 31.84'W	TV 036 938	1	Gravel, pebbles and rare boulders with sponges at 10m BCD.		2	18	40	40			
712	93	Reef 7km S of Littlehampton 3.	50 43.93'N 00 31.80'W	TV 037 936	1	Flat boulders on sand, gravel and cobbles with *Pentapora* at 8-9m BCD.		40	40		10	10		
					2	Rock outcrops with sponges at 7-8m BCD.	100							
712	94	5km S of Littlehampton 1.	50 45.23'N 00 31.65'W	TV 038 960	1	Mix of pebbles, cobbles and shells at 7.8m BCD.		5	10	70				15
713	74	5km S of Littlehampton 6.	50 45.23'N 00 31.52'W	TV 040 960	1	Gravel, pebbles, chalk cobbles and small boulders at 7m BCD.		3	7	35	45	8	2	
713	71	"Spanner Reef" 1	50 44.09'N 00 31.51'W	TV 040 939	1	Sand, gravel, pebbles and small groups of boulders at 10m BCD.		10		20	20	50		
					2	Rippled sand over pebbles with bivalves at 10m BCD.						100		
717	8	Black Ledge	50 44.65'N 00 31.30'W	TV 042 949	1	Level sand with occasional flint cobbles at 11.0m BCD.			15	5	2	75		3
					2	Level seabed of sand with chains of slipper limpets at 10.5m BCD.						98		2
					3	Rocky reef with some sand and slipper limpets at 10m BCD.	50					20		30
713	75	5km S of Littlehampton 7.	50 45.42'N 00 31.14'W	TV 044 963	1	Gravel and one boulder with algae at 6-7m BCD.		1			98			1
713	26	6km S of Rustington 2	50 44.69'N 00 31.08'W	TV 045 950	1	Pebbles, sand, gravel and few cobbles with *Hydrallmania* at 11.3m BCD.			5	40	22	30		3
713	24	6km S of Rustington 1	50 44.82'N 00 30.92'W	TV 047 952	1	Coarse sand, gravel and a few cobbles and pebbles at 11-11.5m BCD.			2	3	40	50		5
713	76	4km SE of Littlehampton.	50 45.87'N 00 30.89'W	TV 047 972	1	Gravel and pebbles with algae at 6m BCD.		1		39	40	10		10
713	114	2km S of Rustington 1	50 46.82'N 00 30.80'W	TV 048 989	1	Pebbles, gravel and sand over chalk with algae at 5m BCD.			5	40	30	25		

SECTOR: **LITTLEHAMPTON** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	151	W of Lobster Grounds	50 43.65'N 00 30.90'W	TV 048 931	1	Rippled sand, pebbles and cobbles with sponges at 12m BCD.			10	40		50		
					2	Very large boulders with sponges on sand at 12m BCD.		35				65		
713	156	6km S of Rustington 4	50 44.46'N 00 30.85'W	TV 048 946	1	Gravel, silty sand and pebbles with bream at 10m BCD.				10	50	30	10	
713	115	2km S of Rustington 2	50 46.82'N 00 30.75'W	TV 048 989	1	Gravel with some pebbles and hermit crabs at 4m BCD.				5	90		5	
713	116	2km S of Rustington 3	50 46.82'N 00 30.69'W	TV 049 989	1	Pebbles, gravel and cobbles with algae at 4m BCD.			25	40	30	5		
713	155	6km S of Rustington 3	50 44.58'N 00 30.03'W	TV 057 948	1	Rippled sand with few thin slabs, barren, at 10m BCD.		5		2	3	90		
					2	Gravel with a few slabs, pebbles and cobbles at 10m BCD.		5	1	2	80	10		2
					3	Gravel and sand with slabs at 10m BCD.		5	1	2	45	45		2
713	8	5km S of Rustington 1	50 45.23'N 00 29.99'W	TV 058 960	1	Pebbles & gravel, cobbles & small boulders + sponges at 8.4m BCD.		5	15	60	15	3	1	1
712	100	N of Lobster Grounds 4	50 43.98'N 00 29.98'W	TV 058 937	1	Shell sand, gravel and cobbles with *Alcyonidium* at 11m BCD.			5		30	65		
713	150	N of Lobster Grounds 3	50 43.61'N 00 29.77'W	TV 061 930	1	Rippled sand with cobbles, almost barren, at 13.5m BCD.			10			85	5	
713	16	5km S of Rustington 2	50 45.34'N 00 29.68'W	TV 061 962	1	Gravel and pebbles and some cobbles at 7.4m BCD.			5	20	70			5
					2	Pebbles with cobbles and some boulders, *Anemonia* and *Styela* at 7.4m BCD.		5	80	15				
					3	Chalk bedrock with cobbles and *Anemonia* at 7.4m BCD.	5	10	85					
713	149	N of Lobster Grounds 2	50 43.67'N 00 29.68'W	TV 062 931	1	Rippled sand over pebbles and cobbles with *Flustra* and ray at 10m BCD.			20	20		60		
713	23	N of Lobster Grounds 1	50 43.58'N 00 29.49'W	TV 064 930	1	Gravel, sand, pebbles, some cobbles with sparse fauna at 10.6-11.5m BCD.			6	30	30	30		4
713	84	2km SSW of Angmering-on-Sea	50 47.00'N 00 29.30'W	TV 065 993	1	Gravel, some pebbles and cobbles with algae and *Gibbula* at 2m BCD.			10	15	65	7	3	
713	154	NW of Lobster Grounds 2	50 44.28'N 00 29.07'W	TV 069 943	1	Gravel and pebbles with *Crepidula* and *Flustra* at 8-9m BCD.		1		20	50	25	4	
713	81	Close to "The Frode"	50 46.11'N 00 28.77'W	TV 072 977	1	Gravel, coarse sand, some boulders with algae and hydroids at 8m BCD.		4	10		40	40		6
712	101	"The Frode"	50 46.13'N 00 28.74'W	TV 072 977	1	Metal wreckage, sand and gravel with algae at 7m BCD.					25	25		50
713	20	W of Kingmere Rocks 2	50 43.70'N 00 28.80'W	TV 072 932	1	Barren pebbles and gravel with silty sand and shells at 9.3-10.8m BCD.			4	36	39	12	4	5
					2	Boulders with sponges on pebbles, gravel and sand at 9.3-10.8m BCD.		46	5	20	21	5	1	2
713	18	W of Kingmere Rocks 1	50 43.85'N 00 28.71'W	TV 073 935	1	Broken shell, pebbles, gravel and cobbles at 7-9m BCD.		5	10	40	35			10
					2	Sand, pebble patches and rare small boulders at 7-8m BCD.			2	28		70		
713	134	NW of Kingmere Rocks	50 44.67'N 00 28.62'W	TV 074 950	1	Sandy gravel and some pebbles at 9m BCD.				10	45	45		
713	153	NW of Lobster Grounds 1	50 44.35'N 00 28.56'W	TV 075 944	1	Pebbles, cobbles and blocks with *Spondyliosoma* at 9m BCD.		1	10	60	15	7	2	5
713	148	W of Kingmere Rocks 3	50 43.83'N 00 28.47'W	TV 076 934	1	Rippled sand, pebbles and cobbles with nursehound at 10-12m BCD.			10	8		80		2
					2	Rippled sand and shell with sparse algae at 10m BCD.						90	5	5
					3	Boulders with sponges and fish on sand at 9.5-10m BCD.		40				55		5
713	86	2km SE of Angmering-on-Sea	50 46.46'N 00 28.16'W	TV 079 983	1	Gravel with muddy sand, cobbles and small boulders at 4m BCD.		2	8	10	60	15	5	
713	9	5km S of Angmering-on-Sea 2	50 45.45'N 00 28.02'W	TV 081 965	1	Chalk bedrock, flint boulders, cobbles, pebbles & gravel at 7.3m BCD.	25	5	20	25	20	5		
713	7	5km S of Angmering-on-Sea 1	50 45.41'N 00 28.01'W	TV 081 964	1	Chalk underlying cobbles, pebbles and gravel at 7.5-8.2m BCD.	5	6	9	30	45	3	1	1
713	10	5km S of Angmering-on-Sea 3	50 45.41'N 00 27.96'W	TV 081 964	1	Cobbles, pebbles and gravel with *Archidoris* at 6.1-8.1m BCD.		7	13	40	40			
711	36	Kingmere Rocks 5	50 43.36'N 00 28.00'W	TV 082 926	1	Angular boulders on soft bedrock at 7-13m BCD.	10	90						
					2	Silty pebbles and shells in the upper circalittoral at 11-13m BCD.				60		10	20	10
713	82	5km S of Angmering-on-Sea 4	50 45.31'N 00 27.91'W	TV 082 962	1	Gravel with muddy sand and some boulders at 7m BCD.		5			75	15	5	
712	102	Kingmere Rocks 6	50 43.52'N 00 27.92'W	TV 083 929	1	Large boulders on sand with sponges at 7-11m BCD.		45				55		

SECTOR: **LITTLEHAMPTON** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
					2	Pebbles and small cobbles at 11m BCD.			50	50				
713	133	N of Kingmere Rocks 2	50 44.66'N 00 27.64'W	TV 085 950	1	Pebbles, gravel and cobbles with ?*Molgula* at 9m BCD.		1	12	45	22	12	3	5
713	21	Kingmere Rocks 2	50 43.53'N 00 27.62'W	TV 086 929	1	Pitted boulders with sponges on gravel and cobbles at 7.8-8.3m BCD.		40	10	10	30	5		5
					2	Scattered boulders on sand and gravel with sponges at 8.3-9.9m BCD.		20	10	10	30	30		
713	147	N of Kingmere Rocks 4	50 43.90'N 00 27.56'W	TV 087 936	1	Sand with pebbles, cobbles and small boulders at 11m BCD.		1	2	2		95		
713	22	Kingmere Rocks 3	50 43.55'N 00 27.48'W	TV 088 930	1	Gravel with large boulders and sponges at 7.8-9.8m BCD.		15	5	5	65	8	2	
713	146	N of Kingmere Rocks 3	50 43.89'N 00 27.42'W	TV 088 936	1	Sand, gravel, pebbles, and some cobbles and boulders at 11m BCD.		3	2	15	35	45		
713	83	3km SE of Angmering-on-Sea	50 45.98'N 00 27.26'W	TV 089 993	1	Gravel, cobbles and small boulders with hydroids at 5m BCD.		5	15		80			
713	85	N of Kingmere Rocks 1	50 44.30'N 00 27.28'W	TV 090 943	1	Sand with gravel and rare cobbles and boulders at 10m BCD.		2	3		15	80		
713	25	Kingmere Rocks 4	50 43.66'N 00 27.09'W	TV 092 932	1	Sand, gravel and pebbles with *Crepidula* and *Urticina* at 10.2m BCD.			5	25	25	40		5
713	17	Kingmere Rocks 1	50 43.54'N 00 27.03'W	TV 093 929	1	Large boulders with sponges on gravel at 7.4-8.9m BCD.		50	1	4	35	5		5
126 Records Processed														

7.6 Worthing

Overview

The stretch of coast bordering this section runs from Ferring in the west (OS northing line of TQ090) to South Lancing in the east (OS northing line of TQ200), a west-to-east distance of 11 km.

Features of interest (west to east)

Kingston Rocks are marked on the Admiralty Chart as being close inshore at 3-4 m BCD, just 1-2 km off Ferring. This area was briefly investigated by dives 713/83 & 713/98, but neither encountered a noticeable 'reef', i.e. bedrock and/or boulders. Both dives record a covering of 5-10% of small boulders, but otherwise the seabed was a mix of gravel (predominantly), pebbles and/or cobbles. The seabed in this area has been highlighted as having a particularly dense covering of seaweed during the summer months (Binnie & Partners 1987) - see below.

A little further to the south and east, approximately 3 km due south of Goring-on-Sea, dives 713/90-94 confirmed Admiralty Chart record of the seabed here (*P.G.S.Wd*) as being of pebbles, gravel, sand and weed. Gravel appeared to predominate (30-80%) with occasional cobbles and small boulders. The noting of 'weed' as a constituent part of the seabed is of interest and is discussed below. Depths at these sites ranged from 6-7 m BCD.

There are two adjoining exposures of sublittoral chalk cliffs some 7 km SSW of Worthing known as the **Worthing Lumps**. The vertical section of the cliffs faces north and varies from 2-3 m in height. The western section (>350 m in length) is separated from the eastern section (>190 m in length) by an area of pebble/gravel/sand approximately 200-300 m wide (Wood 1992). It is believed that these sections are part of the same substratum of chalk, and it has been suggested (though not proven) that these exposures are a continuation of the group of sites further to the east (South-West Rocks, Looe Gate and Ship Rock).

The following description of the Worthing Lumps is taken from Irving (1996):

> The eastern cliff runs generally east-west (90°-270°) and has an irregular outline and a pronounced overhang; the western cliff has a more curved plan view and presents a more vertical face. Below the cliff face on both sections is an area of exposed chalk bedrock with small boulders, broken off from the cliff. This gives way to fine sand with some gravel. The upper (top) surface of the cliff is also of horizontal chalk with number of rock mills and narrow channels present. The relative lack of silt at this site, as opposed to the cliff sites further to the east, may be due to greater separation from coastal influences and being exposed to stronger currents.

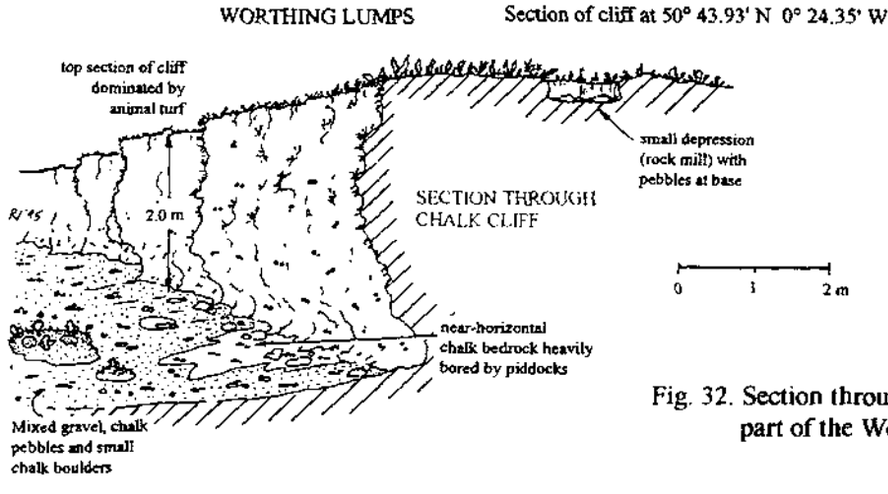

Fig. 32. Section through the western part of the Worthing Lumps

Descriptions of the communities present on these (and other) cliff exposures are given in section 6.1.3.1. A total of eight *SEASEARCH* dives have been undertaken on the Worthing Lumps: 713/87, 713/136-138, & 713/197-200.

Closer inshore, within 2 km of the shore off Worthing, is an area marked on the Admiralty Chart as **Grass Banks**. The origin of this name is unclear - it may simply refer to the large amount of seaweed which grows in the shallows here. Dives 713/191, 195 &196 were undertaken in this area on 2nd October 1994. The seabed was similar at each site: 30-50% cobbles, 30-40% pebbles and 20-50% gravel, at 3-6 m BCD. The cover provided by foliose brown and red seaweeds was 10% at 191, 30-40% at 195 and 75% at 196.

Dive 713/68 was on a site known as **College Rocks**, a site well known to dive charter skippers in the area. The seabed here, at 10-11 m BCD, consisted of 'irregular, craggy boulders up to about 1 m across, with cobbles, pebbles and gravel in between'. Patches of chalk bedrock and small chalk boulders were encountered a little further to the south and west (713/190), though most of the seabed here was dominated by mixed sediments.

Noteworthy habitats and characterising communities

There are no particularly noteworthy habitats or communities within this sector, other than those found on the sublittoral chalk cliffs of the Worthing Lumps (as described in section 6.1.3.1). There are a small number of wrecks off this sector of the coast, one of the most popular with divers being the *Indiana*. This 2,266 ton steamer sank in 1901 after a collision with another steamer in fog (McDonald 1985). Lying in about 10 m depth, there is little left of her now for, as a hazard to shipping, explosives have been used to blow her up. All that remains are a number of rusting plates covered by weed, though some are arranged in such as way as to provide cave-like habitats.

Whilst outside the prescribed remit of the *SEASEARCH* project, it seems appropriate to make some mention of the 'seaweed problem' which has afflicted the coastline within this sector for many years. The problem arises from large quantities of drift seaweed which are washed up onto the shore, most noticeably at the end of the summer, creating a gradually decaying and foul-smelling pile of organic matter mixed with shingle. The species which make up the bulk of this matter are sugar kelp *Laminaria saccharina* (20-25% - though the main constituent in terms of bulk), sea lettuce *Ulva lactuca* (25-50%), the red alga *Palmaria palmata* (20-30%), with the remaining 10% or so made up of bootlace weed *Chorda filum*, *Cystoclonium purpureum*, *Chondrus crispus*, *Dilsea carnosa* and *Calliblepharis ciliata*, amongst others (Price & Tittley, 1987).

Worthing Borough Council commissioned a report into the seaweed problem at Worthing in 1986 (Binnie & Partners, 1987). The following points were highlighted in the summary of the report:

- A particularly dense bed of weed is found just below low water at Worthing, extending from Littlehampton in the west to Shoreham in the east.
- During storms, seaweed is torn from the seabed to be carried away by the sea currents. Under certain conditions, large amounts of the floating weed are deposited on the shore at Worthing, gradually being pushed into banks by successive tides beyond high water mark (spring tides). When this occurs the seaweed decays giving rise to strong nauseating smells and the breeding of very large numbers of seaweed flies. Some of the seaweed deposits are very heavy - heavier than any deposits reported anywhere else in the world.
- Suggested remedial action includes (1) assisting the natural removal of the seaweed, or (2) taking action to prevent the deposition of the seaweed.

The problem still persists to the present day, although in some years it is worse than in others.

WORTHING DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 40	Total no. of habitat records: 55
Total number of species (& higher taxa) recorded within this sector: 188	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
-	foliose red algae	27	44	P - S	C
Alcyonium digitatum	dead man's fingers	25	40	P - C	R
Anemonia viridis	snakelocks anemone	25	40	P - F	R
Crepidula fornicata	slipper limpet	21	34	P - C	O
Dysidea fragilis	'goose bump' sponge	19	31	P - C	O
Urticina felina	dahlia anemone	19	31	P - F	O
Cancer pagurus	edible crab	18	29	P - F	R
Necora puber	velvet swimming crab	17	27	P - F	O
Calliostoma zizyphinum	painted topshell	17	27	P - O	O
Paguridae	unidentified hermit crab(s)	16	26	P - C	O
Galathea sp.	squat lobster	16	26	P - F	R
Flustra foliacea	hornwrack	16	26	P - A	R
Porifera indet. crusts	unidentified encrusting sponges	15	24	P - C	P
Styela clava	leathery sea squirt	15	24	P - C	R
Trisopterus luscus	bib	15	24	P - C	R
Maja squinado	spiny spider crab	14	23	P - A	O
Clavelina lepadiformis	lightbulb sea squirt	14	23	P – O	P
Parablennius gattorugine	tompot blenny	14	23	P - C	O
Calliblepharis ciliata	red alga	14	23	P - C	P
Trochidae	unidentified topshells	13	21	P - C	P
Ctenolabrus rupestris	goldsinny	13	21	P - F	R

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

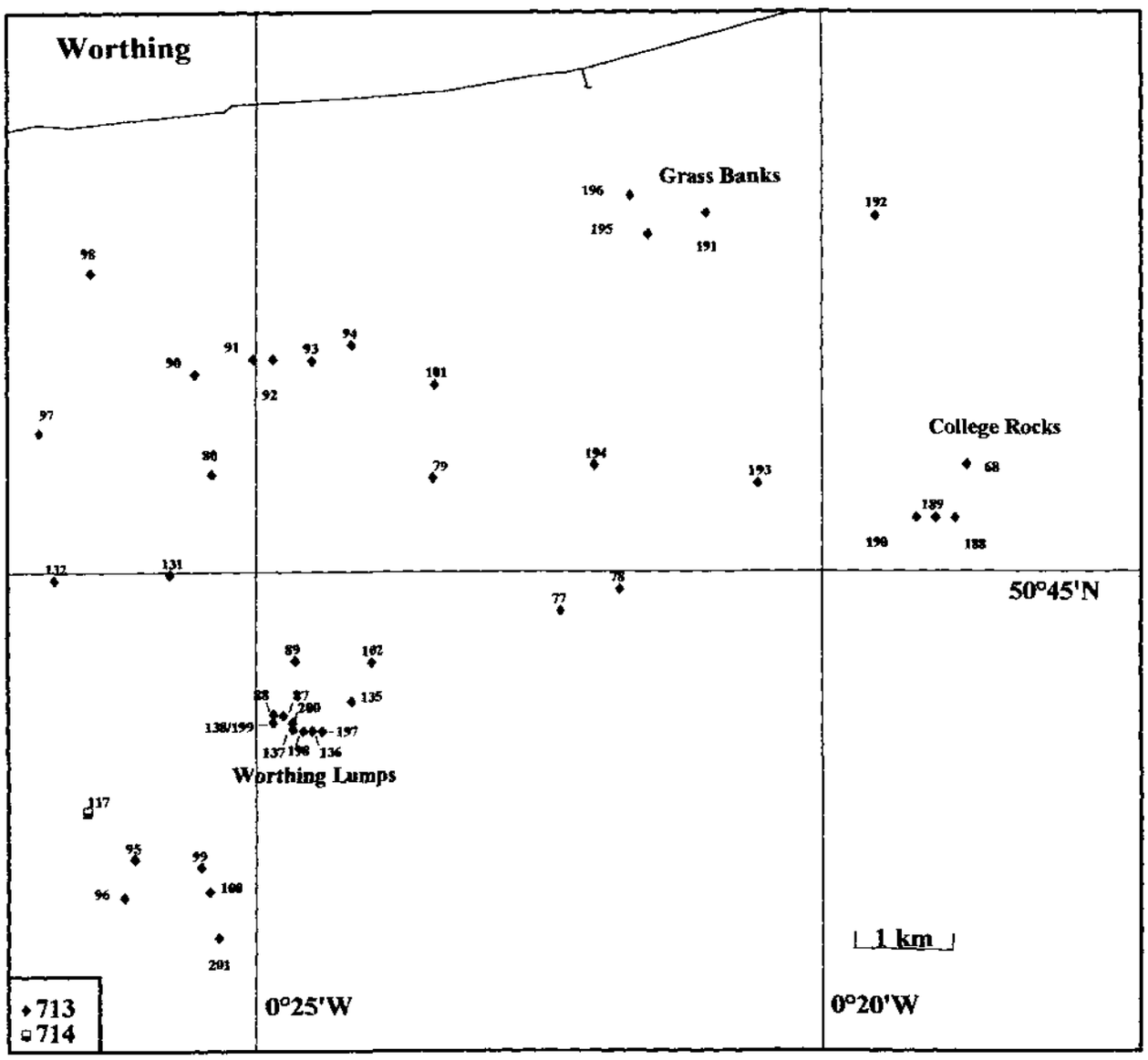

Fig. 32. Location of SEASEARCH *dives within the Worthing sector, 1992-1998.*

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SECTOR: **WORTHING**

(Sites arranged in order of West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	97	S of Kingston Rocks	50 46.01'N 00 26.90'W	TV 094 975	1	Gravel, sand and small boulders with hydroids at 7-8m BCD.		5			45	50		
714	117	Kingmere Rocks arch	50 43.33'N 00 26.47'W	TV 100 926	1	Sandstone arch at 11m BCD.	50	1	24	25				
713	132	NNE of Kingmere Rocks.	50 44.99'N 00 26.73'W	TV 096 956	1	Pebbles, cobbles & gravel with algae and hydroids at 8-9m BCD.		1	22	60	10	7		
713	98	Kingston Rocks.	50 47.13'N 00 26.39'W	TV 099 996	1	Pebbles, gravel and small boulders with algae at 5m BCD.		8		47	45			
713	96	SE of Kingmere Rocks 2.	50 42.76'N 00 26.16'W	TV 104 915	1	Sand, shells, gravel and boulders with *Flustra* at 13m BCD.		10			40	20		30
713	95	SE of Kingmere Rocks 1.	50 43.00'N 00 26.03'W	TV 105 920	1	Large boulders on gravel with *Alcyonium* & *Nemertesia* at 11m BCD.		15		40	45			
					2	Pebbles and gravel, rather barren, at 13m BCD.				50	50			
713	131	NW of Worthing Lumps.	50 44.99'N 00 25.74'W	TV 108 957	1	Pebbles and cobbles on chalk bedrock with *Spondyliosome* at 5m BCD.	1	3	17	60	11	8	1	1
713	90	3km S of Goring-by-Sea 1.	50 46.41'N 00 25.51'W	TV 110 983	1	Pebbles, gravel, sand, some cobbles with epifauna at 7m BCD.		1	9	30	30	30		
713	99	SE of Kingmere Rocks 3.	50 42.94'N 00 25.48'W	TV 112 919	1	Pebbles and sand with large boulders at 11m BCD.		10		45		40		5
					2	Sandstone slabs with *Pentapora* at 11m BCD.		100						
713	80	5km S of Goring-by-Sea.	50 45.68'N 00 25.32'W	TV 112 970	1	Cobbles, pebbles and muddy sand with Filograninae & *Archidoris*.		5	30	30		25	10	
713	100	SE of Kingmere Rocks 4.	50 42.81'N 00 25.34'W	TV 113 916	1	Large boulders on sand and gravel at 12-13m BCD.		30			35	30		5
713	91	3km S of Goring-by-Sea 2.	50 46.50'N 00 25.00'W	TV 116 985	1	Gravel, pebbles, cobbles and sand with algae at 6m BCD.			20	30	40	7	2	1
713	92	3km S of Goring-by-Sea 3.	50 46.52'N 00 24.81'W	TV 118 985	1	Gravel with pebbles and cobbles at 5.6m BCD.			20	30	40	10		
713	199	Worthing Lumps 7.	50 43.96'N 00 24.85'W	TV 119 938	1	Pot-holed chalk plateau with dense algae and *Pentapora* at 8m BCD.	95			5				
					2	Chalk cliff and slope at 8-10m BCD.	100							
					3	Gravel with pebbles and sand at 11m BCD.				30	60	10		
713	138	Worthing Lumps 4.	50 43.97'N 00 24.84'W	TV 119 938	1	Chalk plateau at 8m BCD.	100							
					2	Chalk cliff with piddocks at 8-11m BCD.	100							
					3	Sandstone pebbles and sand at 11m BCD.		2	3	45		48		2
713	88	Nr Worthing Lumps 1.	50 44.05'N 00 24.80'W	TV 119 939	1	Pebbles and some cobbles over sand at 9m BCD.			5	70	5	18		2
713	87	Worthing Lumps 1.	50 44.03'N 00 24.72'W	TV 120 939	1	Chalk platform with algae and sponges at 7m BCD.	97			3				
					2	Vertical chalk cliff with piddocks and fish at 8-11m BCD.	100							
					3	Gravel and small boulders with sponges at 11m BCD.	2	8		20	70			
713	200	Worthing Lumps 8.	50 43.97'N 00 24.65'W	TV 121 938	1	Chalk cliff and some sand at 8-10m BCD.								
713	89	Nr Worthing Lumps 2.	50 44.39'N 00 24.63'W	TV 121 946	1	Gravel with some shells, cobbles and chalk outcrops at 12m BCD.	1		4		95			
713	136	Worthing Lumps 2.	50 43.94'N 00 24.64'W	TV 121 937	1	Chalk with dense algae and sponges at 7m BCD.	100							
					2	Chalk cliff with piddocks and crustacea from 7-9.6m BCD.	100							
					3	Sand, pebbles and rare cobbles with sponges at 9-11m BCD.		1	2	49		48		
713	93	3km S of Goring-by-Sea 4.	50 46.50'N 00 24.50'W	TV 122 985	1	Gravel and small cobbles with algae and *Anemonia* at 6m BCD.			20		80			
713	198	Worthing Lumps 6.	50 43.90'N 00 24.57'W	TV 122 937	1	Chalk cliff at 8-11m BCD.								
713	137	Worthing Lumps 3.	50 43.90'N 00 24.49'W	TV 123 937	1	Gullied chalk with *Pentapora* at 9-10m BCD.	75		5	5	5	10		
					2	Undercut chalk cliff with piddock borings at 10-12m BCD.	100							
					3	Gravel and silty sand with burrowers at 12m BCD.					50	45	5	
713	197	Worthing Lumps 5.	50 43.93'N 00 24.35'W	TV 124 937	1	Chalk with algae, hydroids and *Tubularia* at 9m BCD.	95			5				

SECTOR: **WORTHING** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	197				2	Chalk cliff and debris at 9-12m BCD.	95	1	2	2				
					3	Gravel, pebbles and small chalk boulders at 12m BCD.		2		20	70	3		5
					4	Chalk outcrops or boulders at 11m BCD.								
713	94	3km S of Goring-by-Sea 5.	50 46.61'N 00 24.15'W	TV 126 987	1	Mixed sediment ground at 3-6m BCD.		1	12	17	35	35		
713	135	Nr Worthing Lumps 3.	50 44.12'N 00 24.16'W	TV 127 941	1	Gravel and flint cobbles with clingfish and bream at 11m BCD.		1	9		80	8	2	
713	102	NE of Worthing Lumps.	50 44.41'N 00 23.97'W	TV 129 946	1	Pebbles and large flints with sponges at 11m BCD.		1	10	89				
713	101	4km SW Worthing.	50 46.32'N 00 23.41'W	TV 135 982	1	Pebbles and gravel with algae, anemones and sponges at 8m BCD.			5	45	40	10		
713	79	5km SW of Worthing.	50 45.68'N 00 23.39'W	TV 135 970	1	Pebbles in muddy sand with *Styela* and *Anemonia* at 9m BCD.		2	3	55		30	10	
713	77	7km S of Worthing 1.	50 44.75'N 00 22.25'W	TV 149 953	1	Flint pebbles and cobbles with algae and sponges at 10m BCD.		2	8	90				
713	194	W of College Rocks 2.	50 45.75'N 00 21.90'W	TV 152 972	1	Gravel with cobbles, pebbles and *Crepidula* over chalk at 9m BCD.	2		28	10	60			
713	196	W of Grass Banks 2.	50 47.64'N 00 21.65'W	TQ 155 007	1	Flint and chalk cobbles, pebbles and gravel with algae at 3m BCD.			50	30	20			
713	78	7km S of Worthing 2.	50 44.91'N 00 21.74'W	TV 155 956	1	Flint pebbles with algae, hydroids and varied fauna at 10m BCD.				100				
					2	Flint pebbles, cobbles and small boulders at 10m BCD.		10	10	80				
713	195	W of Grass Banks 1.	50 47.39'N 00 21.48'W	TQ 157 002	1	Cobbles and gravel with *Laminaria* at 4-6m BCD.			50		50			
713	191	Grass Banks.	50 47.55'N 00 20.94'W	TQ 163 005	1	Gravel, pebbles and cobbles with crustacea at 4.5m BCD.		1	29	40	25	5		
713	193	W of College Rocks 1.	50 45.66'N 00 20.53'W	TV 169 970	1	Sand, pebbles and cobbles at 9-10m BCD.			10	40		50		
713	192	Elbow.	50 47.50'N 00 19.48'W	TQ 180 005	1	Chalk cobbles and flint pebbles amongst mixed sediment 5m BCD.		5	30	45	13	5		2
713	190	S of College Rocks 3.	50 45.41'N 00 19.15'W	TV 185 966	1	Mussel patches and *Maja* on pebbles and cobbles at 11m BCD.	5	5	35	50		5		
713	189	S of College Rocks 2.	50 45.40'N 00 19.00'W	TV 187 966	1	Pebbles, cobbles, rare boulders with mussel beds, bream and *Maja* at 12m BCD.		2	8	20	20	50		
713	188	S of College Rocks 1.	50 45.37'N 00 18.77'W	TV 189 966	1	Sand with scarce cobbles and pebbles at 13m BCD.			2	5		93		
713	68	College Rocks.	50 45.78'N 00 18.70'W	TV 190 973	1	Chalk boulders on gravel with sponges and mussel beds at 10-11m BCD.	5	30	10	10	45			
57 Records Processed														

7.7 Shoreham

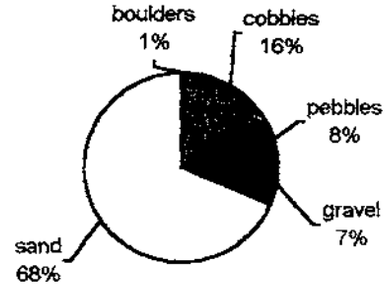
Overview

The stretch of coast bordering this section runs from South Lancing in the west (OS northing line of TQ200) to Hove in the east (OS northing line of TQ284), a west-to-east distance of 8.4 km.

Features of interest (west to east)

The two dive sites (713/173 & 174) at the western edge of this sector, about 6 km from the shore, record a seabed of sand and gravel overlying chalk bedrock from 9-12 m BCD. The chalk probably belongs to the same stratum as that exposed as the low-lying cliffs of South-West Rocks to the east and the Worthing Lumps to the west, as it too lies on the 10 m depth contour. Irregular, fairly dense patches of mussels *Mytilus edulis* were also present here. Small chalk boulders and cobbles were recorded from dive site 713/176, amongst a mix of flint cobbles, pebbles and sand.

Sand predominates much of the seabed in this area. The pie chart to the right gives an indication of the average proportion of component sediment types recorded from the following dive sites, spread out across the western half of this sector: 713/143, 144, 145, 152, 164, 165, 166, 175, 176 & 203.



Church Rocks lie close to the shore, some 300 m beyond low water mark, at the western end of this sector. Though no *SEASEARCH* dives have been undertaken here, McDonald (1985) describes them as being "rocks which stand 2-3 m high, have tunnels in them, and are home to bass, congers and some lobsters". They have a dense covering of seaweeds and the tallest of the rocks break the surface at low water spring tides.

Further to the east (due south of the eastern arm of Shoreham Harbour) but still close to the shore, lies the Jenny Ground or **'The Jennys'**. Dives 714/89 & 90 record mussels growing on low-lying bedrock (unfortunately without stating the type of rock), and both 714/95 & 96 describe areas of flat chalk bedrock underlying cobbles, pebbles, sand and mudstone. It is interesting to note that chalk bedrock is apparent so close to the shore here.

South-West Rocks lie approximately 4.5 km SW of Hove The following description of this marine Site of Nature Conservation Importance (SNCI) is taken from Irving (1996).

> The 'Rocks' constitute a length of exposed vertical chalk cliff, 270 m long, northward-facing and running approximately 240°/60°. In places the cliff is divided into discrete 'mounts' or raised areas of reef. It is believed (though not proven) that this is the same chalk stratum which forms the Worthing Lumps, Looe Gate and Ship Rock, following the 10 m depth contour which runs parallel to the coastline. The general height of the cliff is 1.0 m, though in places (especially to the east of the central point) it reaches a maximum height of 2.0 m. At the western end the cliff face diminishes to become covered by sand. The vertical face of the cliff is undercut at its base, giving way to a seabed of fine sand and pebbles. Leading away from the top of the cliff is a relatively flat chalk plateau which again gradually becomes covered by sand and pebbles. Occasional rock mills, circular holes formed by flint pebbles being swirled around in the currents, are present.

A total of five *SEASEARCH* dives have been undertaken on the South-West Rocks: 713/69, 161-3, & 714/91.

Looe Gate is another length of low-lying chalk cliff, mostly 0.5 m in height but reaching a maximum height of 1.5 m in places. It lies approximately 4 km SSW of Hove and has also been identified as a marine SNCI (Irving 1996). The reasons for its name are unknown, though a hole in the cliff has been reported at one point. The length of the exposed chalk 'cliff' here is approximately 220 m. Its width can vary with shifting overlying sand, but may reach up to 5 m. The surrounding seabed is of silty sand with shell debris. The northward-facing cliff face varies in profile from a vertical face with an undercut base, through a low series of terraces, angled faces, smooth slope to jumbled chalk boulders and broken bedrock (Wood 1992). A total of nine *SEASEARCH* dives have been undertaken on Looe Gate: 713/35-7, 46-7, 167, 171-2 & 716/11.

There are two wrecks from which *SEASEARCH* records have been obtained from this sector. The first is that of the *Miown* (713/31 & 67), a small British steamer which sank in 1914 after hitting a low-lying reef in the vicinity of Shoreham Harbour (McDonald 1985). In order to alleviate possible navigation difficulties, the wreck was blown apart and all that remains now is a pile of iron plates, some hull ribs and a boiler. Her cement cargo soon turned to stone(!) and now lies scattered around the site as irregular-shaped blocks. The second wreck is that of the *Billy Boy* (though McDonald (1985) says it could be the *Billy Bee* or the *Billy B*) which lies at 7-9 m BCD some 4 km SSE of the harbour entrance (713/70). Her cargo was of stone and the *SEASEARCH* record describes "10-15 large rectangular blocks up to 2.5 m high, with their tops covered by mussels".

Noteworthy habitats and characterising communities

The seabed habitats represented within this sector include various mixes of sediments (including boulders, cobbles, pebbles, gravel and sand in varying amounts); sand; and horizontal and vertical chalk bedrock. Of these, the last are arguably the most noteworthy (see also section 6.1.3). Horizontal exposures of chalk tend to be well scoured by surrounding sand and gravel and consequently tend to have a limited fauna associated with them. Piddocks which form vertical burrows in the chalk (most commonly *Pholas dactylus*) can cope with the periodic submersion of the surface of the chalk by other sediments, but many of the burrows encountered appeared not to house live animals. Empty burrows were sometimes found to contain the anemones *Urticina felina* or *Sagartia troglodytes*.

The horizontal tops of the chalk 'cliff' have a mixed turf of red foliose algae, the commonest species being *Calliblepharis ciliata*, *Plocamium rubrum* and *Delesseria sanguinea*. The green alga *Bryopsis plumosa* is also found occasionally. On the vertical face of the 'cliff', the attached fauna is varied and densely packed, except on broken surfaces. Sponges and bryozoans provide much of the cover - indeed, eleven species of sponges have been recorded from here, the most common being *Cliona celata* (the boring form), *Esperiopsis fucorum* and *Dysidea fragilis* (Wood 1992). The bryozoans *Flustra foliacea*, *Cellepora pumicosa* and *Bugula* spp. are frequently recorded. Anthozoans represented include the anemone *Sagartia troglodytes* and the soft coral dead man's fingers *Alcyonium digitatum*. The mud tubes of the 'feather duster' worm *Bispira volutacornis* are often found in small groups poking out of crevices. Two species of piddock are present: the common piddock *Pholas dactylus*, which tends to prefer boring vertically into horizontal bedrock, and the smaller 'red nose' *Hiatella arctica*, which favours boring horizontally. Amongst the smaller sessile groups, 12 species of sea squirts have been recorded, seven of which were common. These included *Aplidium punctum*, *Morchellium argus*, *Pynoclavella auriculens*, *Ascidiella scabra* and *Molgula manhattensis*. A variety of fishes have been recorded from this site, with bib *Trisopterus luscus* and poor cod *Trisopterus minutus* being common, and goldsinny *Ctenolabrus rupestris* and corkwing wrasse *Ctenolabrus melops* also being present (Irving 1996).

SHOREHAM DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 42	Total no. of habitat records: 67
Total number of species (& higher taxa) recorded within this sector: 176	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
-	foliose red algae	28	42	P - S	R
Cancer pagurus	edible crab	24	36	P - A	O
Necora puber	velvet swimming crab	24	36	P - A	O
Alcyonium digitatum	dead man's fingers	22	33	P - A	R
Trisopterus luscus	bib	22	33	P - C	F
Paguridae	unidentified hermit crab(s)	19	28	P - C	O
Hydrozoa	unidentified hydroids	18	27	P - A	P
Crepidula fornicata	slipper limpet	17	25	P - A	O
Porifera indet. crusts	encrusting sponges	16	24	P - A	O
Dysidea fragilis	'goose bump' sponge	15	22	P - C	O
Mytilus edulis	mussel	15	22	P - S	A
Ctenolabrus rupestris	goldsinny	15	22	P - C	R
Flustra foliacea	hornwrack	14	21	P - C	R

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

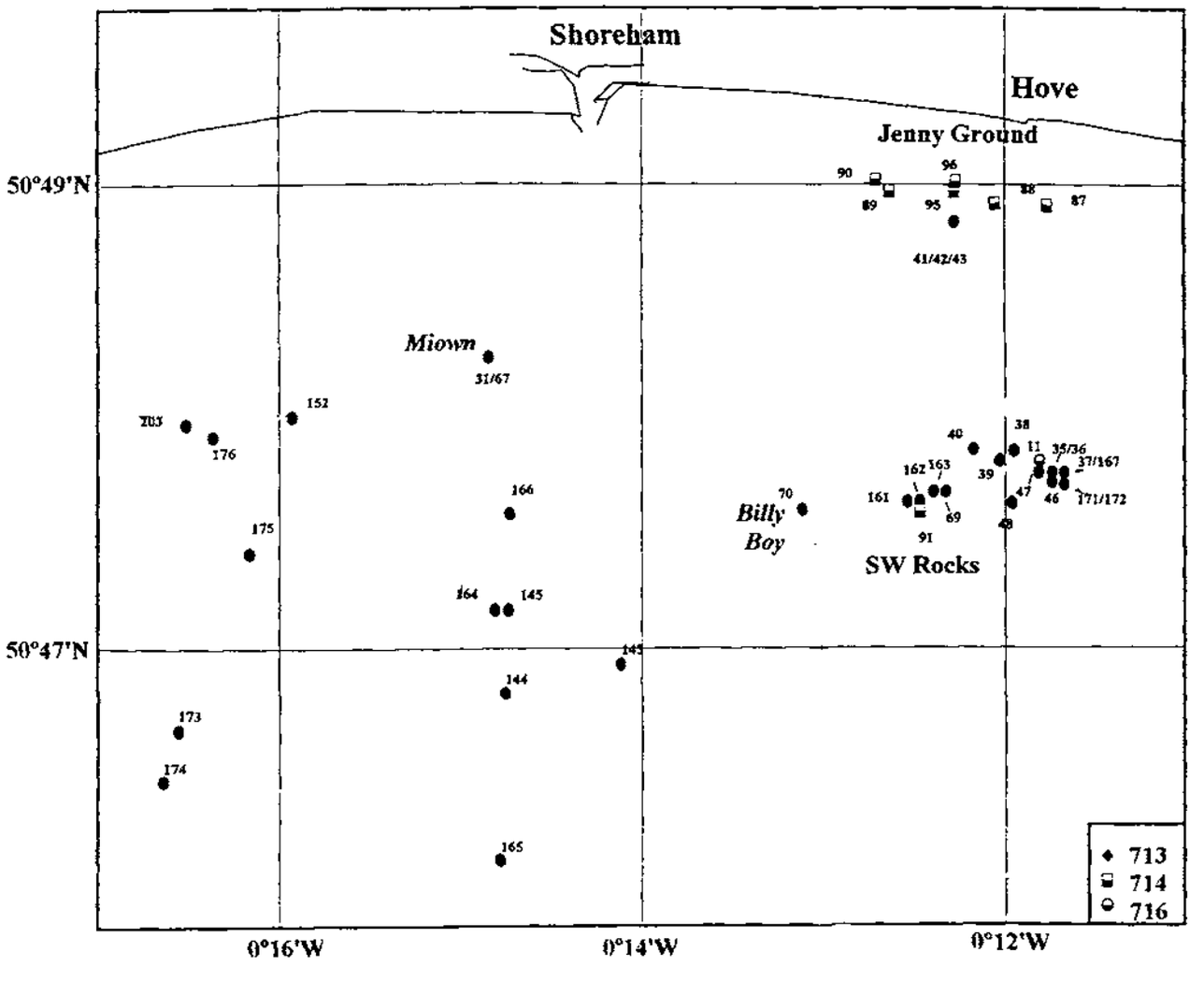


Fig. 33. Location of SEASEARCH *dives within the Shoreham sector, 1992-1998*

SECTOR: **SHOREHAM**

(records arranged in West to East order)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	*Habitat name*	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	174	6km SSW of Shoreham 2.	50 46.16'N 00 17.51'W	TV 204 980	1	Sand and gravel with mussel clumps at 11-12m BCD.	5	2	3	5	40	40		5
713	203	4km SW of Shoreham 3.	50 47.94'N 00 17.34'W	TQ 205 014	1	Sand and gravel with cobbles and crustacea at 6m BCD.		1	19		40	40		
713	173	6km SSW of Shoreham 1.	50 46.42'N 00 17.37'W	TV 205 985	1	Gravel and sand overlying chalk with slipper limpets and cobbles at 9m BCD.			4		23	23		50
713	176	4km SW of Shoreham 2.	50 47.89'N 00 17.17'W	TQ 207 013	1	Cobbles, pebbles and sand with crustacea at 4m BCD.		2	40	30	8	20		
713	175	4km SW of Shoreham 1.	50 47.30'N 00 16.96'W	TQ 210 002	1	Rippled sand at 11m BCD.						100		
					2	Sand, gravel and some pebbles with *Ostrea* at 11m BCD.				10	40	50		
713	152	3km SW of Shoreham 1.	50 48.03'N 00 16.71'W	TQ 213 015	1	Rippled shelly sand with hermit crabs at 6m BCD.					5	95		
					2	Cobbles on sand with *Mytilus* at 6m BCD.			75			25		
					3	Cobbles with *Crepidula* at 7m BCD.		5	65			30		
713	31	The "Miown" 1.	50 48.34'N 00 15.41'W	TQ 228 021	1	Concrete blocks with fish at 6m BCD.								100
					2	Metal boiler with *Alcyonium* and ascidians at 6m BCD.								100
					3	Sand, pebbles and shells at 6m BCD.				40		50		10
713	67	The "Miown" 2.	50 48.34'N 00 15.41'W	TQ 228 021	1	Wreckage with sponges at 5-6m BCD.								100
713	164	5km S of Shoreham.	50 47.04'N 00 15.32'W	TV 229 997	1	Chalk bedrock, cobbles and anchor block and chain.	20		50					30
					2	Fine sand with *Lanice* and worms at 9m BCD.				10		85		5
713	144	4km S of Shoreham 2.	50 46.60'N 00 15.30'W	TV 230 989	1	Sand with a few pebbles and cobbles at 12m BCD.			3	7		90		
713	165	7km S of Shoreham.	50 45.72'N 00 15.32'W	TV 230 973	1	Sand and pebbles with *Sabellaria* at 12m BCD.				20		80		
713	145	4km S of Shoreham 3.	50 47.00'N 00 15.25'W	TV 230 997	1	Rippled sand, scarce pebbles and cobbles at 10m BCD.			1	9		90		
713	166	4km S of Shoreham 4.	50 47.48'N 00 15.22'W	TQ 230 006	1	Silty sand with some pebbles at 12-13m BCD.			2	3		90	5	
713	143	4km S of Shoreham 1.	50 46.75'N 00 14.50'W	TV 239 992	1	Sand, rare pebbles and cobbles with clingfish at 10m BCD.	1		1	10		88		
713	70	"Billy Boy", Shoreham.	50 47.54'N 00 13.27'W	TQ 253 007	1	Large blocks with mussels and sponges at 7-9m BCD.								100
					2	Gravel and sand with mussels at 9m BCD.	10				45	45		
714	90	W of Jenny Ground 2.	50 49.23'N 00 12.80'W	TQ 258 039	1	Uneven rock with mussel bed, sediment and algae at 2m BCD.	60			10	15	10		5
					2	Shallow gullies, sand and shell with algae at 2m BCD.	70				5	15		10
					3	Level sand at 2m BCD.						100		
714	89	W of Jenny Ground 1.	50 49.19'N 00 12.75'W	TQ 259 038	1	Mussel beds on rock with crustacea and fish at 4m BCD.	80			5			10	5
713	161	South-West Rocks 2.	50 47.55'N 00 12.59'W	TQ 261 008	1	Level chalk bedrock with *Cliona* at 8m BCD.	100							
					2	Chalk cliff from 7.7-9.2m BCD.	100							
					3	Jumbled chalk boulders with fish at 9m BCD.		80		14	1	4	1	
714	91	South-West Rocks 1.	50 47.50'N 00 12.55'W	TQ 262 007	1	Boulders, cobbles and sediment with sessile fauna at 8m BCD.		10	10	35	5	35		5
713	162	South-West Rocks 3.	50 47.59'N 00 12.47'W	TQ 262 008	1	Chalk plateau with sponges and bryozoa at 7m BCD.	100							
					2	Chalk cliff at 7-8m BCD.	100							
					3	Gravel with chalk boulders and amphipods at 9m BCD.	10	20			60		10	
713	163	South-West Rocks 4.	50 47.62'N 00 12.41'W	TQ 263 009	1	Level chalk with sponges and piddocks at 6m BCD.	100							
					2	Chalk cliff with crabs and fish at 7-9m BCD.	100							
					3	Pebbles and cobbles with small gadoids at 9m BCD.		10	40	40		7	3	
714	95	Nr Jenny Ground 1.	50 49.17'N 00 12.29'W	TQ 264 038	1	Pebbles, cobbles, gravel and sand with *Cancer* at 4m BCD.			20	60	10	6	2	2
					2	Flat boulders and outcrops with overhangs at 5m BCD.	10	50	20		10	10		
					3	Chalk outcrops and flat mudstone cobbles with piddocks at 5m BCD.	40	30	30					

SECTOR: **SHOREHAM** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	69	South West Rocks 1.	50 47.63'N 00 12.34'W	TQ 264 009	1	Boulders and mixed sediments with sponges at 9m BCD.	5	20	10	10	55			
713	41	S of Jenny Ground 1.	50 49.00'N 00 12.28'W	TQ 264 035	1	Large flat rocks and gullies at 3.2-4m BCD.		60			30	10		
					2	Barren rippled sand at 4m BCD.								
713	42	S of Jenny Ground 2.	50 49.00'N 00 12.28'W	TQ 264 035	1	Sand, shells and small boulders at 3.6m BCD.		40				55		5
713	43	S of Jenny Ground 3.	50 49.00'N 00 12.28'W	TQ 264 035	1	Chalk bedrock and sand with mussels and starfish at 2.5-3m BCD.	10			10		80		
714	96	Nr Jenny Ground 2.	50 49.24'N 00 12.25'W	TQ 264 039	1	Rocky ground with crustacea and fish at 3m BCD.	5	10	40	40		3	2	
713	40	NW of Looe Gate 3.	50 47.81'N 00 12.15'W	TQ 266 013	1	Sand with *Corystes*, flatfish and cuttlefish at 6-8.5m BCD.				2		98		
					2	Sand with pebbles and *Crepidula* at 8-8.5m BCD.				30		70		
714	88	E of Jenny Ground 2.	50 49.14'N 00 11.99'W	TQ 267 037	1	Seabed of sand at 2m BCD.						100		
713	39	NW of Looe Gate 2.	50 47.77'N 00 12.02'W	TQ 268 012	1	Sand with *Crepidula* clumps, some gravel and boulders.		5			10	85		
713	48	SW of Looe Gate.	50 47.54'N 00 11.91'W	TQ 269 008	1	Boulders and cobbles on chalk at 9-10m BCD.	10	10	40	40				
713	38	NW of Looe Gate 1.	50 47.84'N 00 11.88'W	TQ 269 013	1	Silty sand, pebbles and *Crepidula* clumps at 9m BCD.			10	30		40	15	5
714	87	E of Jenny Ground 1.	50 49.14'N 00 11.71'W	TQ 271 037	1	Rippled sand with tubeworms and hermit crabs at 3m BCD.								
716	11	Looe Gate.	50 47.75'N 00 11.74'W	TQ 271 012	1	Chalk bedrock at 8m BCD.	100							
					2	Vertical face of low chalk cliff at 8-10m BCD.	80	10	10					
					3	Chalk cobbles and pebbles overlying grey clay at 10m BCD.			30	50	10	10		
713	47	Looe Gate 5.	50 47.73'N 00 11.74'W	TQ 271 011	1	Boulders, cobbles and pebbles at 8.6m.		10	40	48				2
713	46	Looe Gate 4.	50 47.69'N 00 11.69'W	TQ 272 010	1	Irregular chalk with *Flustra* and *Nemertesia* at 7-8m.	95			5				
713	35	Looe Gate 1.	50 47.74'N 00 11.63'W	TQ 272 011	1	Chalk boulders on pebbles at 6.1-7.4m BCD.	60			30	7	3		
713	167	Looe Gate 8.	50 47.70'N 00 11.60'W	TQ 273 011	1	Level chalk with sponges at 6-8m BCD.	100							
					2	Chalk cliff with bryozoan/hydroid turf at 6-9m BCD.	100							
					3	Level sand, cobbles and boulders with *Alcyonium* at 9-11m BCD.		20	40	10	10	20		
713	36	Looe Gate 2.	50 47.74'N 00 11.59'W	TQ 273 011	1	Undercut ?chalk cliff at 7.7-8.6m BCD.	100							
					2	Boulders and flints on bored chalk at 8.6-9.1m BCD.	50	20	15		10	5		
713	171	Looe Gate 6.	50 47.67'N 00 11.59'W	TQ 273 010	1	Chalk cliff with sponges and *Aplidium* at 6-8m BCD.	100							
713	37	Looe Gate 3.	50 47.71'N 00 11.58'W	TQ 273 011	1	Chalk bedrock with boulders, cobbles and mussels at 8.2m BCD.	20	15	20	30	15			
					2	Scoured bored chalk with silt and sand at 8.2m BCD.	50					30	20	
713	172	Looe Gate 7.	50 47.68'N 00 11.56'W	TQ 273 010	1	Chalk cobbles, pebbles and sand at 9m BCD.		10	70	10		8	2	
67 Records Processed														

7.8 Brighton

Overview

The stretch of coast bordering this section runs from Hove in the west (OS northing line of TQ284) to Telscombe Cliffs in the east (OS northing line of TQ400), a west-to-east distance of 11.6 km. Much of the seabed within this sector is of sand. This is true in the western half of the sector beyond 2-3 km of the shore, with mixed sediments (i.e. sand/gravel/pebbles/cobbles) appearing closer inshore. Amongst these area of sediment, there are discrete chalk reefs and wrecks (as described below). In the eastern half of the sector, a chalk wave-cut platform extends into the shallow sublittoral from the shore, but beyond 1 km. the seabed is dominated by sand. Depths increase very gradually as one moves further offshore, the 10 m depth contour occurring 3.5 km offshore in the western part of this sector and just 1 km offshore in the east.

Features of interest (west to east)[8]

It would appear as though the site named as **Ship Rock** by some is known as **Kingswest Ledge** by others. However, Wood (1984) gives the position of Kingswest Ledge as being 50° 48.5' N 0° 9.5' W, though *SEASEARCH* records from 1994 for Ship Rock give the position as being 50° 48.05' N 0° 9.99' W. Despite this discrepancy, it is still believed to be the same site. Whatever name is used, the site consists of a low-lying chalk reef/cliff some 2 km SSW of the West Pier, at 9-11 m depth BCD. Wood (1992) reports the cliff to be at least 107 m long, with an average height of 0.5 m but reaching 1.0 m at two short sections. Ten *SEASEARCH* dives (713/49-51, 168-170, 185-187 & 202) have taken place at the Ship Rock site.

SEASEARCH dives close to the **Palace Pier** (716/4, 5, 8, 9) were undertaken as training dives. None were undertaken beneath the pier for safety reasons. All confirm the seabed here to be of chalk bedrock with occasional chalk boulders. There is also a large amount of debris and wreckage of various sorts (as there is too close to and under the West Pier), which, together with the pier pilings themselves, are covered by mussels. A considerable amount of silt was noted at this site.

Palace Pier Reef lies between 1.5-2 km due south of the Pier. Dives undertaken here (713/1, 2, 3, 4, 6, 59, 60, 61) describe outcrops of chalk bedrock with small chalk boulders at 8-12 m BCD, surrounded by mixed sediments of cobbles, pebbles and sand. It is possible that this site is the same as **Anchor Lump** (confusingly also known as **Rock Tow**), which McDonald (1985) describes as being "2 km off the West Pier" (no direction being given). He states that there is another small section of chalk 'cliff' exposed at Anchor Lump, and *SEASEARCH* dives 713/59 & 60 both record encountering "a low ridge of chalk, running E/W for about 30 m, ending abruptly in a 1.5 m scarp at the western end". The position of dive 713/59 was 50° 48.03' N 0° 8.51' W. Apparently, the name Anchor Lump refers to the mass of slabs which were dumped on the seabed here at one time to provide the only decent piece of holding ground in the area for warships. The alternative name of 'Rock Tow' refers to the jumble of rocks that would end up in trawlers' nets, should they be used in this area (McDonald 1985).

A little further east of Palace Pier reef lies an area of broken ground known as **The Manors**. It can be split into a northern part (the Inner Manors), where the seabed is a mix of pebbles, sand and gravel with occasional cobbles at 5-8 m BCD; and a southern part (the Outer Manors), where outcrops of sandstone (713/139 & 140) and chalk boulders (713/65, 66,) have been reported. The appearance of sandstone is of note as this has been the only record of sandstone bedrock occurring between 'Spanner Reef' (7 km due S of Littlehampton) and the Royal Sovereign Shoals (12 km due E of Beachy Head).

[8] Note: there is some confusion over the names of certain dive sites in this sector, particularly of sites that exhibit sections of chalk 'cliffs' or chalk reef. Where known, alternative names are given in the text.

The **'Black Cat' Protected Wreck** site lies very close inshore just to the west of Brighton Marina. A number of cannon and a rare bronze hackbut (a type of swivel-gun from the 15th Century) have been found here. However, the ship's identity from which they are thought to have come has not been determined (McDonald 1985). The name 'Black Cat' derives from the Essex diving club that first found the site in 1974. The exclusion area (for all divers unless issued with a licence) lies between Nos. 6-17 of the West Wall caissons and extends some 200m to the west. The seabed here is of flat chalk with shallow gullies filled with fine sand.

The construction of the Marina complex to the east of Brighton has taken nearly 30 years to complete (construction work starting in 1971), though the Inner and Outer Harbours were operational by 1980. The Marina was built on Black Rock Ledge, an Upper Cretaceous chalk exposure of considerable geological and marine biological interest (Irving 1998b). A survey of the **Marina** was carried out by members of the South-East branch of the Marine Conservation Society in 1990 and 1991 (Natural Science Services 1991). The only *SEASEARCH* dives to have been undertaken within the Marina have been training dives. One record (714/1) is from the Inner Marina which described a concrete wall as being totally covered by the solitary sea squirt *Ciona intestinalis*.

Marina Reef (also known as **Measor's Rocks**) lies approximately 1 km SSW of the entrance to the Marina at a depth of 11-12 m BCD. The reef is said to be up to 500 m long, though its form varies considerably along its length. It rises to a maximum height of 3 m above the surrounding seabed. Essentially, the reef consists of a narrow stratum of chalk (only about 30 cm thick) with a softer grey clay beneath it. The clay is being eroded at a faster rate than the chalk, and the lower part of the reef consists of chalk slabs and boulders which have broken off from the chalk stratum following erosion of the clay base (Wood 1992). Ten *SEASEARCH* dives have taken place here (713/53, 54, 55, 58, 715/1, 8, 717/1, 2, 4, 5).

There are four *SEASEARCH* records from wrecks within this sector. The **'Palace Pier Barge'** (713/180-1) lies in shallow water just off the end of the pier. The barge rises 1-2 m above the seabed, much of it being covered by mussels and common starfish *Asterias rubens*. The **'Ammo Barge'** (713/64) lies further out to sea, approximately 3.5 km SSW of the Marina at a depth of 10-12 m BCD, surrounded by fine sand. There are numerous plumose anemones *Metridium senile* of various colours attached to prominent parts of the wreck, together with occasional dead man's fingers *Alcyonium digitatum*. There is little left of the ***Inverclyde***, which lies in 12-16 m BCD, approximately 6 km SE of the Marina. She was a trawler which sank whilst under tow in 1942. She is now scattered over a wide area, with just a boiler and other metal wreckage being visible (714/99). Again, plumose anemones and a few dead man's fingers dominate the fauna which now adorns the wreckage.

The ***City of Waterford*** lies much further offshore, some 15 km due south of the Marina. She was a 1,334 ton British steamer which sank in 1949 after a collision with a Greek steamer in thick fog (McDonald 1985). She now sits upright on the seabed with a slight list to port, the shallowest part of her superstructure at 23 m BCD with the seabed at 29 m. The main biological interest on the wreck is the presence of variously coloured patches of jewel anemones *Corynactis viridis* on the vertical metal plates, as reported from dives 714/71 & 716/12.

To the east of the Marina, a **wave-cut chalk platform** is present close to the shore, which extends beyond low water mark into the shallow sublittoral. This platform continues eastwards, at the foot of the chalk cliffs, to the mouth of the River Ouse at Newhaven. A further section is present from Seaford Head past the Seven Sisters to Beachy Head. Dives undertaken close in between the Marina and Saltdean (714/2-7, 10, 19-21, 49 & 50) confirmed the presence of chalk bedrock forming low-lying reefs, often partially covered by sand, at depths of between 1 to 8 m BCD. Evidence of gullies in between low-lying ridges of chalk were also reported from the shallower dives. Further offshore from these sites, i.e. over 1 km beyond the low water mark, sand dominates the seabed, as reported from dives 714/14-18, 25-27 & 45-47.

Noteworthy habitats and characterising communities

The benthic habitats and communities present within this sector have all been described elsewhere in this report (see, for instance, sections 6.1, 6.2, 6.3, 7.6 & 7.7).

The floating pontoons within Brighton Marina, which rise and fall with each tide, provide suitable sheltered conditions for several species which would otherwise be found only in deeper water. These include the sea squirts *Ciona intestinalis*, *Ascidia mentula* and *Ascidiella aspersa*, the plumose anemone *Metridium senile* and the sponges *Suberites ficus* and *Halichondria bowerbanki*.

BRIGHTON DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 115	Total no. of habitat records: 166
Total number of species (& higher taxa) recorded within this sector: 252	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Paguridae	unidentified hermit crab(s)	75	44	P - A	O
Necora puber	velvet swimming crab	57	33	P - C	O
Echinocardium cordatum	heart urchin	49	29	P - A	F
Hydrozoa	unidentified hydroids	47	27	P - A	O
Hinia reticulata	netted dogwhelk	45	26	P - C	O
Alcyonium digitatum	dead man's fingers	42	25	P - A	O
Cancer pagurus	edible crab	40	23	P - C	R
Crepidula fornicata	slipper limpet	40	23	P - S	O
Lanice conchilega	sandmason worm	37	22	P - A	O
Corystes cassivelaunus	masked crab	35	20	P - C	O

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

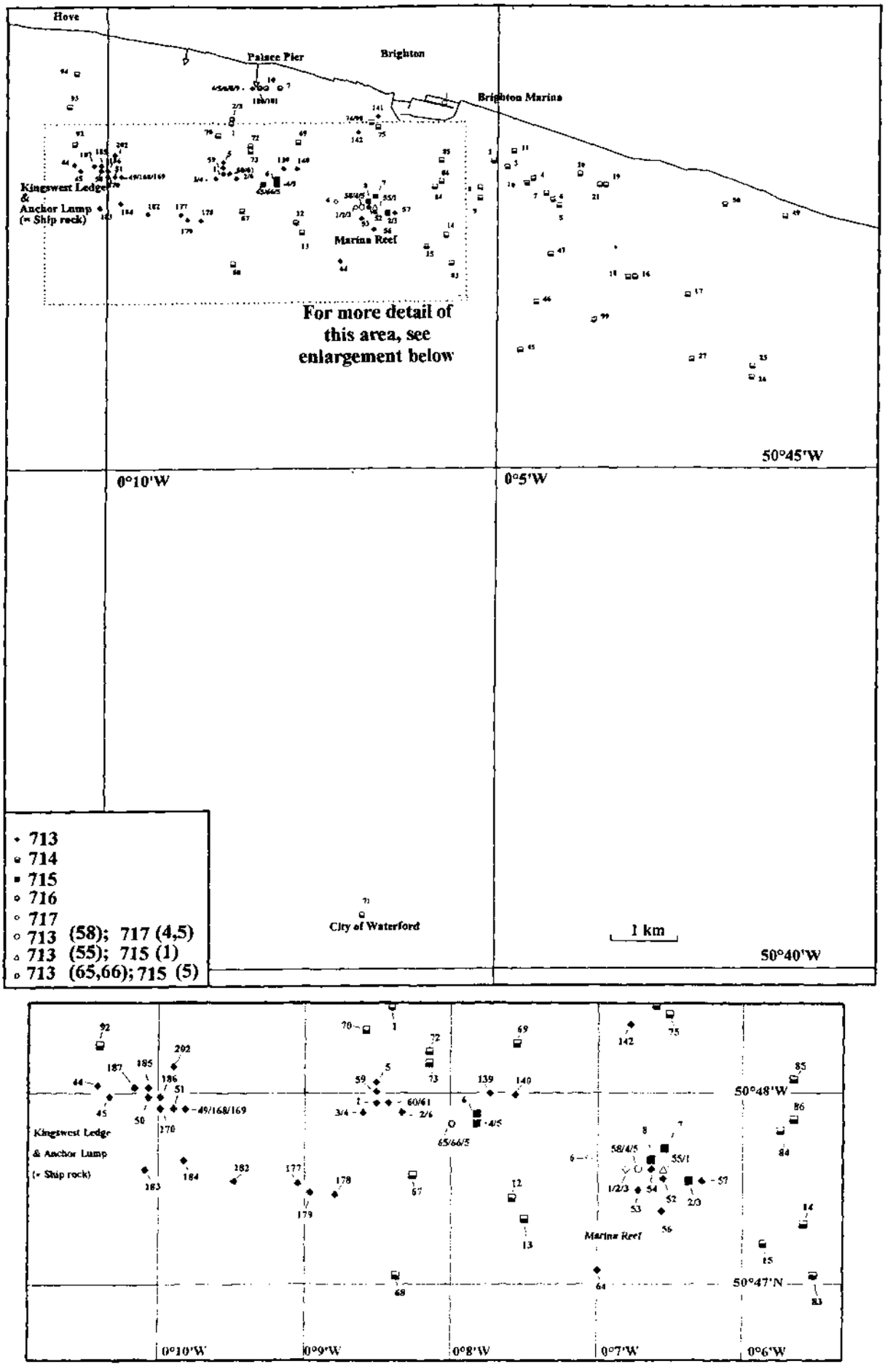


Fig. 34. Location of SEASEARCH *dives within the Brighton sector, 1992-1998.*

SECTOR: **BRIGHTON**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	93	S of Hove 2.	50 48.68'N 00 10.43'W	TQ 286 029	1	Sand with some pebbles and gravel, with squid eggs at 6m BCD.				2	3	95		
					2	Rocky ground with *Ascidiella* at 6m BCD.		20	30	30		20		
714	92	S of Hove 1.	50 48.28'N 00 10.39'W	TQ 287 022	1	Fine sand with a few pebbles and burrowers at 8m BCD.				2	2	96		
713	44	"Position approximate" off Hove 1.	50 48.05'N 00 10.37'W	TQ 287 018	1	Silty sand with *Corystes* and *Polinices* at 7.7-8.2m BCD.				2	10	80	7	1
714	94	S of Hove 3.	50 49.01'N 00 10.29'W	TQ 287 035	1	Sand at 3.9m BCD.				2	3	95		
713	45	"Position approximate" off Hove 2.	50 48.02'N 00 10.29'W	TQ 288 017	1	Sand with *Corystes* at 8m.				4		96		
713	187	Ship Rock 9.	50 48.06'N 00 10.07'W	TQ 290 018	1	Sand with some boulders, sponges and John Dory, at 10m BCD.		5	10	5		75	5	
					2	Almost level chalk surface bored by piddocks at 9m BCD.	95				5			
					3	Chalk scarp slope with mud at base at 8-10m BCD.	95						5	
713	50	Ship Rock 2.	50 48.00'N 00 10.01'W	TQ 291 017	1	Level silty sand with *Ensis* at 10m BCD.						90	10	
					2	Stepped chalk cliff at 8-10m BCD.	100							
					3	Fissured chalk plateau at 8m BCD.	100							
713	183	S of Ship Rock 2.	50 47.65'N 00 10.02'W	TQ 291 010	1	Rippled sand with shells and *Echinocardium* at 10m BCD.						98		2
713	185	Ship Rock 7.	50 48.05'N 00 09.99'W	TQ 291 018	1	Level chalk with sponges and bryozoans, upper circalittoral at 8m BCD.	90	10						
					2	Undercut chalk cliff with *Morchellium* at 8-10m BCD.	90	10						
					3	Boulders on chalk at cliff base at 10m BCD.	30	30			5	30	5	
713	186	Ship Rock 8.	50 48.04'N 00 09.98'W	TQ 292 017	1	Chalk slope, upper surface and base, at 7-9m BCD.	90	2	2	2		4		
713	170	Ship Rock 6.	50 47.97'N 00 09.91'W	TQ 292 016	1	Chalk slope and cliff at 9-11m BCD.	100							
					2	Undulating chalk and silty sand at 8-9m BCD.	80					15	5	
713	168	Ship Rock 4.	50 47.95'N 00 09.90'W	TQ 293 016	1	Chalk cliff with turf at 7-8m BCD.	100							
					2	Chalk debris, sand, gravel, boulders at 8m BCD.		15	10	10	25	40		
713	49	Ship Rock 1.	50 47.98'N 00 09.89'W	TQ 293 016	1	Chalk cliff and boulders with sponges at 9-11m BCD.	50	45			5			
713	169	Ship Rock 5.	50 47.95'N 00 09.88'W	TQ 293 016	1	Craggy chalk slope with *Aplidium* and sponges, 9-10m BCD.	100							
713	202	Ship Rock 10.	50 48.18'N 00 09.82'W	TQ 293 020	1	Dissected chalk surface with small bib at 8-9m BCD.	90				3	5		2
713	184	S of Ship Rock 3.	50 47.67'N 00 09.79'W	TQ 294 011	1	Sand with fanworms, hermit crabs and gobies at 11m BCD.			1	2		95		2
713	51	Ship Rock 3.	50 47.97'N 00 09.75'W	TQ 294 016	1	Chalk cliff and plateau at 8-10m BCD.	100							
					2	Chalk debris, fine sand and gravel, silt pockets at 10m BCD.	10	5	20	15	15	30	5	
713	182	S of Ship Rock 1.	50 47.58'N 00 09.46'W	TQ 298 009	1	Level sand with burrowing bivalves at 12m BCD.						100		
713	177	SE of Ship Rock 1.	50 47.57'N 00 09.04'W	TQ 303 009	1	Pebbles with cobbles, boulders and *Crepidula* at 9-11m BCD.		2	10	70		18		
713	179	SE of Ship Rock 3.	50 47.54'N 00 08.97'W	TQ 304 008	1	Small cobbles or pebbles on mud or clay at 10m BCD.			40	30			30	
713	178	SE of Ship Rock 2.	50 47.53'N 00 08.78'W	TQ 306 008	1	Rippled sand at 12m BCD.						100		
					2	Bored clay, sand and gravel, some cobbles at 12m BCD.	20	1	2	20	30	27		
713	4	Palace Pier Reef 4.	50 47.96'N 00 08.58'W	TQ 308 016	1	Sand over bedrock with rare pebbles and cobbles at 9.4-11.4m BCD.			1	2		95		2
					2	Cobbles in sand with *Flustra* and hermit crabs at 10.4-11.4m BCD.			90			10		

SECTOR: **BRIGHTON** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
713	3	Palace Pier Reef 3.	50 47.94'N 00 08.56'W	TQ 308 016	1	Chalk outcrops with sessile fauna at 9.5-10.5m BCD.	90			1		8		1
714	70	N of Palace Pier Reef.	50 48.35'N 00 08.54'W	TQ 308 024	1	Coarse rippled sand with silt and *Lanice* at 8-10m BCD.						90	10	
714	70	N of Palace Pier Reef.	50 48.35'N 00 08.54'W	TQ 308 024	2	Firm muddy sand with *Crepidula* and *Echinocardium* at 8-10m BCD.						80	20	
713	1	Palace Pier Reef 1.	50 47.98'N 00 08.52'W	TQ 309 017	1	Rippled sand at 9.8-10.8m BCD.						100		
					2	Sand with shell, pebbles and cobbles with *Alcyonium* at 9.8-10.8m BCD.			5	1		90		4
713	59	Palace Pier Reef 7.	50 48.03'N 00 08.51'W	TQ 309 018	1	Muddy sand with *Echinocardium* and *Arenicola* at 9m BCD.						90	10	
					2	Chalk cliff and pebble base with *Phoronis* at 9.5-11m BCD.	50	7	3	35				5
713	5	Palace Pier 5.	50 48.10'N 00 08.47'W	TQ 309 019	1	Rippled barren sand with occasional shells at 10.3m BCD.						98		2
716	2	150m N of Palace Pier Reef.	50 48.52'N 00 08.40'W	TQ 310 027	1	Mixed sediment at 11-12m BCD with associated fauna.		40	15		10	25	10	
716	3	200m N of Palace Pier Reef.	50 48.54'N 00 08.40'W	TQ 310 027	1	Flat sand with some pebbles and shells at 10m BCD.				10		75		15
716	1	100m N of Palace Pier Reef.	50 48.50'N 00 08.39'W	TQ 310 026	1	Mixed sediment at 11-12m BCD with attached fauna.		25	25	10		30	10	
713	61	Palace Pier Reef 9.	50 47.97'N 00 08.41'W	TQ 310 017	1	Sand and pebbles with some boulders at 8-10m BCD.		10		35		50		5
713	60	Palace Pier Reef 8.	50 47.97'N 00 08.39'W	TQ 310 017	1	Chalk ridge with *Phoronis* at 8-9m BCD.	90					8	2	
					2	Cobbles, pebbles, shells, some boulders at 9.0m BCD.		10	40	40				10
					3	Sand at 9m BCD.		10				90		
714	68	1km S of Palace Pier Reef.	50 47.10'N 00 08.40'W	TQ 311 000	1	Fine rippled sand with *Lanice* and razor shells at 8-9m BCD.				1		97		2
713	2	Palace Pier Reef 2.	50 47.93'N 00 08.31'W	TQ 311 016	1	Gravel, shells and cobbles with sparse algae at 9.9-10.9m BCD.			5		93			2
					2	Gravel, cobbles and small boulders with *Flustra* at 10.9-12.4m BCD.		5	5		85			5
					3	Chalk bedrock, gravel, sand, shells and cobbles at 9.4-12.4m BCD.	10		15		50	18	2	5
					4	Boulder reef with *Alcyonium* at 7.4-9.4m BCD.		100						
713	6	Palace Pier Reef 6.	50 47.93'N 00 08.31'W	TQ 311 016	1	Small cobbles with *Alcyonium* on gravel and pebbles at 12m BCD.			70	15	15			
					2	Small chalk boulders with *Flustra* at 12m BCD.		50			25	25		
					3	Steep, smooth bedrock at 8-12m BCD.	98				1	1		
714	67	S of Palace Pier Reef.	50 47.60'N 00 08.25'W	TQ 312 010	1	Rippled sand with *Lanice* and hermit crabs at 10m BCD.				1		98		1
713	180	"Palace Pier Barge" 1.	50 48.87'N 00 08.11'W	TQ 313 033	1	Sand and mud with man-made debris at 2-3m BCD.						50	50	
					2	Wreck with *Mytilus* and *Asterias* at 2m BCD.								100
713	181	"Palace Pier Barge" 2.	50 48.87'N 00 08.11'W	TQ 313 033	1	Chalk bedrock with sand and debris at 3.5m BCD.	80					10		10
					2	Wreck with *Mytilus* and *Asterias* at 1.5-3.5m BCD.								100
					3	Chalk bedrock, pebbles, *Mytilus* and *Asterias* at 3.5m BCD.	50			50				
714	73	NE of Palace Pier Reef 2.	50 48.21'N 00 08.12'W	TQ 313 021	1	Silty gravel, sand, pebbles and *Crepidula* at 10m BCD.				5	30	15	10	40
714	72	NE of Palace Pier Reef 1.	50 48.28'N 00 08.10'W	TQ 313 022	1	Crepidula chains over anoxic sand at 10m BCD.						10		90
					2	Clean rippled sand with *Echinocardium* at 10m BCD.						100		

SECTOR: **BRIGHTON** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
716	4	Palace Pier 1.	50 48.87'N 00 08.05'W	TQ 314 033	1	Pier pilings and wreckage on seabed at 2.0m BCD.								100
					2	Chalk boulders on chalk bedrock at 2m BCD.	50	50						
					3	Muddy and/or silty sand overlying chalk bedrock at 2.5-3.2m BCD.						80	20	
716	5	Palace Pier 2.	50 48.87'N 00 08.05'W	TQ 314 033	1	Metal pier pilings at 2.9m BCD.								100
					2	Chalk bedrock, cobbles and pebbles at 2.9m BCD.	70		20	10				
716	6	E of Palace Pier 1.	50 48.87'N 00 08.05'W	TQ 314 033	1	Level sand plain with silt and some rippling at 9m BCD.						90	10	
716	8	Palace Pier 3.	50 48.87'N 00 08.05'W	TQ 314 033	1	Seabed of bedrock, boulders and cobbles at 2.7m BCD.	80	15	5					
					2	Metal pier piling at 0-2.5m BCD.								100
					3	Seabed of chalk bedrock at 2.4m BCD.	100							
716	9	Palace Pier 4.	50 48.87'N 00 08.05'W	TQ 314 033	1	Mixed substrata with mussels dominating cover organisms, at 2m BCD.				20	20	20		40
					2	Shallow, scoured chalk bedrock under pier at 2.8m BCD.	90					5	5	
713	65	The Manors 1.	50 47.86'N 00 08.00'W	TQ 315 015	1	Low chalk boulders on sand and mud at 9-10 metres BCD.		40			4	28	28	
					2	Fine silty sand with ?*Echinocardium* at 10m BCD.						90	10	
713	66	The Manors 2.	50 47.86'N 00 08.00'W	TQ 315 015	1	Small chalk boulders on sand and mud at 9-11m BCD.		30				60	10	
715	5	Nr The Manors 2.	50 47.86'N 00 07.98'W	TQ 315 015	1	Soft sand with hydroids and ?*Aequipecten* at 10m BCD.						99		1
716	10	E of Palace Pier 2.	50 48.86'N 00 07.93'W	TQ 315 033	1	Level plain of fine sand at 1m BCD with *Lanice* .						98		2
715	4	Nr The Manors 1.	50 47.85'N 00 07.85'W	TQ 317 015	1	Silty sand and pebbles with *Corystes* at 10m BCD.				20	10	64	5	1
715	6	Nr The Manors 3.	50 47.93'N 00 07.84'W	TQ 317 016	1	Firm sand with gravel and pebbles at 10m BCD.				5	10	80	5	
716	7	Nr Palace Pier.	50 48.83'N 00 07.76'W	TQ 317 033	1	Flat, fine sand at 1-2m BCD.						100		
713	139	The Manors 3.	50 48.01'N 00 07.70'W	TQ 318 018	1	Bedrock, cobbles, gravel, sand and mud at 13m BCD.								
713	140	The Manors 4.	50 48.04'N 00 07.59'W	TQ 320 018	1	Bedrock and broken chalk and sandstone at 11m BCD.								
					2	Small sandstone outcrops at 10-11m BCD.								
714	12	SE of Palace Pier Reef 1.	50 47.49'N 00 07.60'W	TQ 320 008	1	Sand, shell fragments and gravel with *Echinocardium* at 10m BCD.					10	90		
714	69	1km SSE of Palace Pier.	50 48.30'N 00 07.55'W	TQ 320 023	1	Gravel with sand, pebbles, cobbles and *Crepidula* at 11m BCD.		1	5	5	80	9		
714	13	SE of Palace Pier Reef 2.	50 47.40'N 00 07.46'W	TQ 321 006	1	Fine sand with dying *Echinocardium* at 9m BCD.					5	95		
717	6	Nr Marina Reef.	50 47.69'N 00 07.10'W	TQ 326 012	1	Fine sand at 10-11.8m BCD.						99		1
713	64	"Ammo Barge".	50 47.08'N 00 06.96'W	TQ 327 001	1	Fine sand with hermit crabs at 12m BCD.						100		
					2	Wreck with *Metridium* and *Alcyonium* at 10-12m BCD.					2		8	90
713	142	Nr Brighton Marina 2.	50 48.40'N 00 06.75'W	TQ 329 025	1	Gullied bedrock with *Maja* at 2-4m BCD.	80					15		5
717	1	Marina Reef 1.	50 47.66'N 00 06.78'W	TQ 329 011	1	Bedrock outcrop at 11-12m BCD.	70						28	2
717	2	Marina Reef 2.	50 47.66'N 00 06.77'W	TQ 329 011	1	Fine sand with some slipper limpet shells at 12.2m BCD.					10	80		10
713	58	Marina Reef 4.	50 47.65'N 00 06.76'W	TQ 330 011	1	Stepped cliff with crabs, lobsters and fish at 10-12m BCD.	90	2	5	3				
713	53	Marina Reef 1.	50 47.55'N 00 06.72'W	TQ 330 009	1	Fissured reef with *Nemertesia* and *Aplidium* at 9-11m BCD.	98		2					
717	5	Marina Reef 4.	50 47.65'N 00 06.72'W	TQ 330 011	1	Flat sandy seabed with occasional pebbles and shells at 9.9m BCD.				5		90		5

SECTOR: **BRIGHTON** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
717	4	Marina Reef 3.	50 47.63'N 00 06.69'W	TQ 330 011	1	Low outcrops of bedrock with *Nemertesia* at 11.3-12.2m BCD.	100							
					2	Mixed sediment of small boulders, pebbles and shells at 12.2m BCD.		20		10		50		20
713	54	Marina Reef 2.	50 47.64'N 00 06.66'W	TQ 331 011	1	Dissected rock with crustacea and fish at 10-11m BCD.	100							
714	98	W of Brighton Marina 3.	50 48.49'N 00 06.61'W	TQ 331 027	1	Rippled sand with little life at 5m BCD.						100		
					2	Chalk reef with piddocks and ascidians at 4-5m BCD.	100							
					3	Fine, very silty sand at 5m BCD.						90	10	
					4	Horizontal chalk bedrock with piddocks at 4-5m BCD.	100							
714	74	W of Brighton Marina 1.	50 48.50'N 00 06.60'W	TQ 331 027	1	Chalk bedrock with *Sabellaria* and ?*Molgula* at 4m BCD.	95					5		
715	8	Marina Reef 2.	50 47.67'N 00 06.62'W	TQ 331 012	1	Reef with 'silty shelves' & *Alcyonium* at 9-12m BCD.	78				2	10	10	
715	8	Marina Reef 2.	50 47.67'N 00 06.62'W	TQ 331 012	2	Sand at 12m BCD.						100		
715	7	N of Marina Reef.	50 47.75'N 00 06.58'W	TQ 332 013	1	Muddy sand and shells with flatfish at 10-11m BCD.						80	10	10
714	75	W of Brighton Marina 2.	50 48.45'N 00 06.55'W	TQ 332 026	1	Chalk bedrock with *Sabellaria* and amphipods at 4m BCD.	100							
					2	Silty rippled sand with gobies at 4m BCD.						95	5	
713	141	Nr Brighton Marina 1.	50 48.53'N 00 06.53'W	TQ 332 028	1	Chalk spurs and gullies with *Maja*, ascidians and eels at 4m.	80		2	3			15	
713	55	Marina Reef 3.	50 47.63'N 00 06.56'W	TQ 332 011	1	Rock slope at 9-12m BCD.	95	3		2				
715	1	Marina Reef 1.	50 47.62'N 00 06.55'W	TQ 332 011	1	Flat rock under sand and silt with hydroids at 8-10m BCD.	20					70	10	
					2	Silty, irregular bedrock with hydroids at 9-12m BCD.	100							
					3	Chalk outcrops with mud, bryozoa and sponges at 11m BCD.	80						20	
713	52	Nr Marina Reef 1.	50 47.58'N 00 06.51'W	TQ 332 010	1	Level silty sand with *Corystes* and shells at 10m BCD.					2	90	6	2
713	56	Nr Marina Reef 2.	50 47.42'N 00 06.52'W	TQ 332 007	1	Level silty sand with *Echinocardium* and *Cerianthus* at 12m BCD.				2		90	6	2
715	2	E of Marina Reef 1.	50 47.59'N 00 06.42'W	TQ 334 010	1	Silty sand and shell gravel with *Ensis* at 10-11m BCD.					10	75	13	2
					2	Soft, silty sand with *Echinocardium* at 11m BCD.					10	50	40	
714	71	"City of Waterford".	50 40.57'N 00 06.69'W	TV 334 880	1	Metal wreckage with *Corynactis* at 23-29m BCD.								100
716	12	City of Waterford.	50 40.57'N 00 06.69'W	TV 334 880	1	Metal wreck at 24-28m BCD.								100
715	3	E of Marina Reef 2.	50 47.58'N 00 06.34'W	TQ 334 010	1	Clean sand and shell gravel with *Corystes* at 10-12m BCD.					9	90		1
713	57	Nr Marina Reef 3.	50 47.59'N 00 06.33'W	TQ 335 010	1	Level silty fine sand with *Echinocardium* and *Corystes* at 11m BCD.					4	90	6	
714	15	2.5km SSE of Brighton Marina 2.	50 47.26'N 00 05.85'W	TQ 340 004	1	Sand with dying *Echinocardium* at 12m BCD.						100		
714	84	1.5km SE of Brighton Marina 2.	50 47.82'N 00 05.81'W	TQ 341 015	1	Silty rippled sand with varied fauna at 10m BCD.				1		85	10	4
714	86	1.5km SE of Brighton Marina 4.	50 47.91'N 00 05.73'W	TQ 342 016	1	Rippled silty sand with *Echinocardium* and hermit crabs at 9m BCD.				1		88	10	1
714	85	1.5km SE of Brighton Marina 3.	50 48.10'N 00 05.70'W	TQ 342 020	1	Fine sand with *Echinocardium* and *Euspira* at 5m BCD.						90	8	2
714	1	Inner Marina Brighton.	50 48.73'N 00 05.65'W	TQ 342 032	1	Concrete wall with *Ciona*, ?low salinity.								100
					2	Soft mud with algae and gobies, ?low salinity.							95	5
714	14	2.5km SSE of Brighton Marina 1.	50 47.37'N 00 05.65'W	TQ 343 006	1	Sand with *Echinocardium*, *Hinia* and hermit crabs at 11m BCD.					5	95		

SECTOR: **BRIGHTON** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	83	1.5km SE of Brighton Marina 1.	50 47.08'N 00 05.55'W	TQ 344 001	1	Silty sand with broken shells and hermit crabs at 10m BCD.					2	90	5	3
					2	*Crepidula* shells, flints, cobbles and silty sand at 10m BCD.			10	5		23	2	60
714	8	2km SE of Brighton Marina 1.	50 47.83'N 00 05.16'W	TQ 348 015	1	Coarse clean rippled sand with *Echinocardium* at 9m.						100		
					2	Chalk boulders and cobbles with *Urticina* at 9m BCD.		50	50					
					3	Soft mud with dogwhelks at 9m BCD.							100	
714	9	2km SE of Brighton Marina 2.	50 47.71'N 00 05.16'W	TQ 348 013	1	Fine sand with *Arenicola* at 9.6m BCD.					4	94	2	
714	2	1.5km SSE of Roedean Sch. 1.	50 48.12'N 00 04.97'W	TQ 350 020	1	Rippled sand with *Arenicola* and *Hinia* at 3m BCD.						100		
					2	Low chalk reefs with red algae and piddocks at 3m BCD.	90		5			3	1	1
714	3	1.5km SSE of Roedean Sch. 2.	50 48.05'N 00 04.85'W	TQ 352 019	1	Chalk bedrock and sand at 3-4m BCD.	50					45	5	
714	11	1.5km SSE of Roedean Sch. 5.	50 48.20'N 00 04.70'W	TQ 353 022	1	Clean rippled sand at 3m BCD.						100		
					2	Soft barren mud at 4m BCD.							100	
					3	Chalk boulders and cobbles on sand at 5m BCD.		30	35			35		
714	45	5km SSE of Brighton Marina.	50 46.19'N 00 04.66'W	TV 355 985	1	Rippled sand with *Lanice* and hermit crabs at 12m.					4	96		
714	10	1.5km SSE of Roedean Sch. 4.	50 47.90'N 00 04.55'W	TQ 355 016	1	Chalk bedrock with low algal growth at 8m BCD.	60	10	10			20		
714	4	1.5km SSE of Roedean Sch. 3.	50 47.95'N 00 04.48'W	TQ 356 017	1	Chalk bedrock with barnacles and sand at 4m BCD.	40					60		
714	46	4km SSE of Brighton Marina.	50 46.68'N 00 04.49'W	TV 357 994	1	Silty sand with shells and *Lanice* at 12m BCD.						90	5	5
714	7	2km SSE of Roedean Sch. 3.	50 47.74'N 00 04.31'W	TQ 358 014	1	Sand with small chalk outcrops at 8m BCD.	10					90		
714	47	3.5km SE of Brighton Marina.	50 47.19'N 00 04.26'W	TQ 359 003	1	Fine muddy sand with *Ophiura* at 12m BCD.				25	25	45	3	2
714	6	2km SSE of Roedean Sch. 2.	50 47.69'N 00 04.21'W	TQ 359 013	1	Rippled sand with *Echinocardium* at 7-8m BCD.				2		95		3
714	5	2km SSE of Roedean Sch. 1.	50 47.66'N 00 04.19'W	TQ 360 012	1	Sand with algal mat at 6-8m BCD.						98		2
					2	Chalk reef and cobbles at 6-8m BCD.	90		10					
714	20	1km S of Rottingdean 2.	50 47.95'N 00 03.89'W	TQ 363 018	1	Chalk outcrops with barnacles in sand at 4m BCD.	40					60		
714	99	"Inverclyde".	50 46.50'N 00 03.72'W	TV 366 991	1	Broken wreckage with *Metridium* at 12-16m BCD.								100
714	21	1km S of Rottingdean 3.	50 47.88'N 00 03.62'W	TQ 366 016	1	Chalk with narrow gullies, algae and sponges at 2m BCD.	90					10		
714	19	1km S of Rottingdean 1.	50 47.84'N 00 03.57'W	TQ 367 016	1	Chalk gullies with algae and sponges at 5m BCD.	95					5		
714	18	2km S of Rottingdean 2.	50 46.96'N 00 03.27'W	TV 371 999	1	Sand with shell fragments, *Lanice* and *Ophiura* at 13m BCD.						98		2
714	16	2.5km S of Rottingdean 1.	50 46.92'N 00 03.20'W	TV 372 999	1	Fine sand with *Corystes*, *Lanice*, *Hinia* and hermit crabs at 13m BCD.						90	8	2
714	17	2.5km S of Saltdean.	50 46.74'N 00 02.48'W	TV 380 996	1	Sand with shells and *Echinocardium* at 13m BCD.						98		2
714	27	4.5km S of Saltdean.	50 46.11'N 00 02.42'W	TV 381 984	1	Muddy sand with *Lanice* and *Ophiura* at 14m BCD.						95	5	
714	50	S of Saltdean.	50 47.67'N 00 02.01'W	TQ 385 013	1	Silt-covered chalk with ?*Molgula* and algae at 2m BCD.	75		5	10		10		
714	25	5km S of Saltdean 1.	50 46.06'N 00 01.67'W	TV 390 983	1	Clean rippled sand with *Echinocardium* at 15m BCD.						100		
714	26	5km S of Saltdean 2.	50 45.96'N 00 01.66'W	TV 390 981	1	Rippled sand with dead *Echinocardium* at 14m BCD.						98		2
714	49	W of Peacehaven.	50 47.57'N 00 01.27'W	TQ 394 011	1	Dissected chalk with *Mytilus* and dead crabs at 1m BCD.	70	15	15					
166 Records Processed														

7.9 Newhaven

Overview

The stretch of coast bordering this section runs from Telscombe Cliffs in the west (OS northing line of TQ400) to the Martello Tower, Seaford in the east (OS northing line of TV485), a west-to-east distance of 8.5 km.

The number of dives within this sector (28) has been considerable fewer than within the Brighton sector (115). This reflects the fact that most *SEASEARCH* dives within this central belt of the Sussex coast have centred on Brighton, in part because of the ease of access to the sea via the Marina, and also because of the support of the project (and loan of diving boats) by two Brighton-based diving clubs (the Marina Yacht Club Diving Section and the Sussex Diving Club). In addition, Newhaven is a busy port with large cross-Channel ferries entering and leaving the harbour at frequent intervals (especially during summer weekends); and there is a sewage outfall pipe just to the east of the Harbour mouth. Consequently, it has not always been prudent to dive in close proximity to where these activities take place.

Another noteworthy point to make here is that the Greenwich Meridian crosses the south coast at Peacehaven, at the western end of this sector. On charts, the longitude of all points to the east of this line are given in degrees/minutes EAST, while those to the west are given in degrees/minutes WEST. It has been most important for *SEASEARCH* recorders to record most carefully the longitude position of their dive sites with this in mind!

Features of interest (west to east)

The **wave-cut chalk platform**, which is present between Brighton Marina and Newhaven Harbour, extends 100-200 m beyond low water mark as a series of low-lying ridges with gullies in between (715/38, 716/13, 16, 18 & 19). The maximum height of the ridges recorded on these dives was 0.5 m, the seabed depth at the base of the gullies ranging from 1.5 m to 5.0 m BCD. The ridges had about 20% cover of foliose red algae and 20% cover of mussels *Mytilus edulis*. The gullies were filled mostly by sand, but with occasional chalk pebbles and cobbles too. There was heavy silting apparent at all sites. More impressive chalk gullies are present a little further along the coast at Seaford Head (see section 7.10), starting with site 717/7 which records gullies being 1.5 m deep and 1 m wide at 6-8.5 m BCD.

Wood (1992) lists all the species recorded from chalk coastal fringing reefs in Sussex, the sites from which records were made being Rottingdean, Newhaven and the Seven Sisters. Dive 715/38, just east of Burrow Head, also records chalk bedrock as being present, but here it was "fairly flat and heavily bored by piddocks, with a few chalk pebbles".

Two records were made close to the western harbour wall at the mouth of the River Ouse (714/102 & 119). Small gullies in the chalk bedrock (about 30 cm deep) were apparent at site 714/119 at a depth of 4 m BCD, before jumbled large concrete blocks were encountered at the base of the wall. One interesting observation from here was the presence of the shore sea urchin *Psammechinus miliaris* in amongst the boulders, a species which has only been recorded from a handful of sites along the Sussex coast at, or around, low water mark. Shallow sites further to the east (714/77, 715/34, 35 & 36) all record the sandy seabed as being particularly silty. The silt could result from the close proximity of these sites to the long sewer outfall pipe (as mentioned above), or to the fact that dredge spoil from maintenance dredging of the harbour is dumped in this vicinity periodically.

The ***Lancer II*** wreck (713/123 & 714/100) lies 5 km SSW of the entrance to Newhaven Harbour. She was an Admiralty trawler of 275 tons which collided with another vessel in July 1918 (McDonald 1985). She is now very broken up. The depth of the seabed here is 21 m BCD, but the wreckage extends some 4½ m above this at its highest point. Like other wreckage in the

vicinity and at this depth, it has a covering of animal turf, the most conspicuous components being plumose anemones *Metridium senile* (white and orange forms) and dead man's fingers *Alcyonium digitatum*. The surrounding seabed is of sand with some fragments of heart urchins apparent and a few netted dogwhelks *Hinia* sp.

Noteworthy habitats and characterising communities

The benthic habitats and communities present within this sector have all been described elsewhere in this report (see, for instance, sections 6.1, 6.2, 6.3, 7.6 & 7.7).

Dives 714/22, 23 & 24, approximately 3 km south of Peacehaven, all record sand as being the dominant seabed type at 16-17 m depth BCD. However, dives 714/23 & 24 also recorded chalk and flint cobbles and small boulders as being present as a separate habitat. The cobbles and boulders were densely covered by barnacles. A little further to the east at a similar depth, dives 714/57-60 recorded silty sand as being the main seabed type, though chalk and flint pebbles were present too. At sites 714/58 & 60 the silty sand and pebbles were formed into waves (2.5 m wavelength and 0.5 m amplitude) which ran east/west. This habitat appeared to have a rich infauna as many polychaete worm tubes were exposed upon fanning away the sediment (including the sandmason worm *Lanice conchilega* and terebellids), together with razor shells *Ensis* sp. and possibly burrowing shrimps ?*Upogebia* sp..

Both dives 714/62 & 63, about 3 km offshore and close to the 20 m depth contour, record the seabed as being of soft muddy sand with a few broken shells and flint pebbles. The fauna at both sites was dominated by sandmason worms *Lanice conchilega* with occasional *Ophiura* sp. brittlestars. Dives 716/14 & 15 recorded fine sand at 21-22 m BCD with occasional broken bivalve shells, and dive 716/17 recorded fine sand overlying mud.

NEWHAVEN DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 28	Total no. of habitat records: 46
Total number of species (& higher taxa) recorded within this sector: 146	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Hinia reticulata	netted dogwhelk	18	35	P - A	F
Necora puber	velvet swimming crab	16	31	P - C	R
Pagurus bernhardus	large hermit crab	14	27	R - C	O
Lanice conchilega	sandmason worm	12	24	P - C	O
Callionymus lyra	dragonet	12	24	P - C	R
Cirrepedia	barnacles	11	22	P - A	O
Paguridae	unidentified hermit crab(s)	11	22	R - C	F
Maja squinado	spiny spider crab	11	22	P - A	F
Buccinum undatum	common whelk	11	22	R - C	O
Mytilus edulis	common mussel	11	22	P - A	C

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

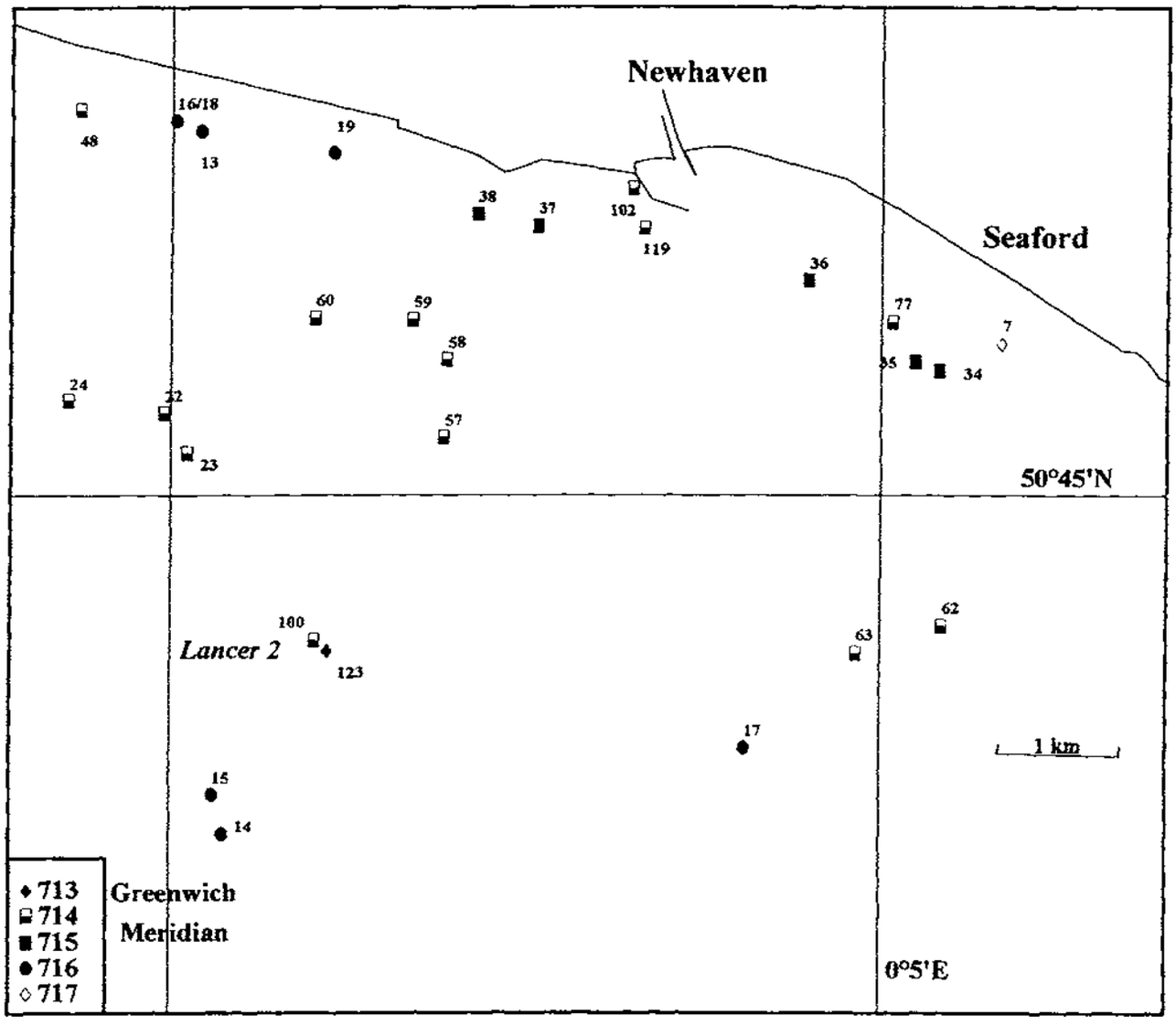


Fig. 34. Location of SEASEARCH *dives within the Newhaven sector, 1992-1998.*

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SECTOR: NEWHAVEN

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	48	S of Peacehaven.	50 47.14'N 00 00.62'W	TQ 402 004	1	Low chalk outcrops with silty sand and dead *Maja* at 2m BCD.	80					18	2	
					2	Fine rippled silty sand with *Lanice* at 2m.						90	10	
714	24	4km S of Peacehaven 3.	50 45.57'N 00 00.67'W	TV 402 974	1	Muddy sand with *Echinocardium*, *Hinia* and worms at 16m BCD.					5	90	5	
					2	Muddy sand with flint cobbles and barnacles at 16m BCD.			20	10		67	3	
714	22	4km S of Peacehaven 1.	50 45.46'N 00 00.01'E	TV 410 973	1	Clear rippled sand with dead *Echinocardium* at 17m BCD.						98		2
716	16	Peacehaven Gullies 1.	50 47.10'N 00 00.10'E	TQ 410 003	1	Chalk gullies and ridges at 2m BCD.	90	10						
					2	Sand at 1.4m BCD.						100		
716	18	Peacehaven Gullies 2.	50 47.10'N 00 00.10'E	TQ 410 003	1	Sand at 4m BCD.						100		
					2	Chalk gullies at 3-4m BCD.	85					10		5
					3							100		
714	23	4km S of Peacehaven 2.	50 45.28'N 00 00.12'E	TV 412 969	1	Coarse sand with shell debris and scallops at 16m BCD.						95		5
					2	Chalk and flint cobbles with barnacles on sand at 16m BCD.		5	15			80		
716	13	Peacehaven Gullies 3.	50 47.04'N 00 00.23'E	TQ 412 002	1	Sand at 2m BCD.						90	5	5
					2	Sand-filled chalk gullies at 2m BCD.	60					35		5
					3	Chalk boulders (small), cobbles and pebbles at 2m BCD.		20	40	10	10	10		10
716	15	7km SSW of Newhaven 1.	50 43.37'N 00 00.33'E	TV 415 934	1	Sand and broken shell at 21m BCD.					10	90		
716	14	7km SSW of Newhaven 2.	50 43.15'N 00 00.38'E	TV 416 930	1	Sand at 21m BCD.				5		88	2	5
714	60	3km WSW of Newhaven.	50 46.01'N 00 01.00'E	TV 422 983	1	Sandy silt with worms at 15m BCD.				11		70	17	2
716	19	Friars Bay, Peacehaven.	50 46.90'N 00 01.15'E	TQ 423 000	1	Low-lying chalk bedrock at 1m BCD.	100							
					2	Level sand at 1.5m BCD.					4	96		
714	100	"Lancer 2".	50 44.21'N 00 01.08'E	TV 423 950	1	Wreckage with *Metridium* at 16-21m BCD.								100
					2	Sand with shell fragments and *Echinocardium* at 21m BCD.					2	98		
713	123	"Lancer 2".	50 44.16'N 00 01.15'E	TV 424 949	1	Wreck with plumose anemones at 18-22m BCD.								100
					2	Sand with *Hinia* at 22m BCD.						100		
714	59	2.5km WSW of Newhaven.	50 46.01'N 00 01.73'E	TV 430 983	1	Silty sand with dogwhelks and hermit crabs at 17m BCD.						95	5	
714	58	3km SW of Newhaven 2.	50 45.76'N 00 01.93'E	TV 433 979	1	Sand waves with polychaete worms at 16m BCD.			1	4		90	5	
714	57	3km SW of Newhaven 1.	50 45.32'N 00 01.97'E	TV 433 971	1	Silty sand with scavengers at 16-17m BCD.						95	5	
715	38	off Burrow Head 2.	50 46.59'N 00 02.21'E	TV 435 994	1	Rippled sand with young flatfish and rays at 4.6m BCD.				2		90	5	3
					2	Level chalk with barnacles, mussels and anemones at 5m BCD.	95				5			
					3	Gullied chalk with algae at 4-5m BCD.	80					20		
715	37	off Burrow Head 1.	50 46.49'N 00 02.58'E	TV 440 993	1	Level sand with worm casts and *Echinocardium* at 5m BCD.						100		
714	102	Newhaven Hbr. Outer Wall 1.	50 46.70'N 00 03.25'E	TV 448 997	1	Concrete blocks with algae and *?Psammechinus* at 0-9m BCD.								100
					2	Sand, shingle and shells with dabs at 9m BCD.					50	45		5
714	119	Newhaven Hbr. Outer Wall 2.	50 46.5'N 00 03.4'E	TV 449 993	1	Cobbles with crustacea and gobies at 4m BCD.			100					
					2	Rippled coarse sand with *Necora* at 4m BCD.						100		
					3	Chalk gullies with piddocks and *Necora* at 4m BCD.	90	5				5		
					4	Concrete blocks with *Fucus* and *Crenilabrus* at 4m BCD.			10			10		80
716	17	5km S of Newhaven.	50 43.62'N 00 04.11'E	TV 459 940	1	Sand over mud at 22m BCD.				5	10	10	70	5
715	36	2km SE of Newhaven.	50 46.19'N 00 04.56'E	TV 463 988	1	Cobbles, pebbles, sand and silt at 8m BCD.								
714	63	4km SSW of Seaford.	50 44.17'N 00 04.88'E	TV 468 950	1	Muddy sand with *Lanice* and *Ophiura* at 22m BCD.				1	5	83	10	1
714	77	W of Seaford.	50 45.98'N 00 05.10'E	TV 470 984	1	Silty sand with chalk pebbles, worms and gobies at 9-10m BCD.				2		88	10	
715	35	1km from Seaford 2.	50 45.79'N 00 05.25'E	TV 472 980	1	Rippled silt and sand with *Ensis* and young fish at 10m BCD.			1			79	10	10

SECTOR: **NEWHAVEN**

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
715	34	1km from Seaford 1.	50 45.70'N 00 05.44'E	TV 474 979	1	Rippled silty sand with *Ensis* and ophiuroids at 9-11m BCD.					10	80	10	
714	62	3km SSW of Seaford.	50 44.30'N 00 05.43'E	TV 475 953	1	Soft muddy sand with *Lanice* and *Ophiura* at 21m BCD.				8		82	5	5
717	7	Seaford Gullies.	50 45.85'N 00 05.84'E	TV 479 962	1	Flattish sand with flat chalk bedrock underneath at 8.5m BCD.	50					40	10	
					2	Gullies in chalk bedrock, 1.5m deep, at 6-8.5m BCD.	70					20	10	
46 Records Processed														

7.10 Cuckmere Haven

Overview

The stretch of coast bordering this section runs from the Martello Tower, Seaford in the west (OS northing line of TV485) to the Belle Tout lighthouse in the east (OS northing line of TV565), a west-to-east distance of 8.0 km. It includes the Seven Sisters (the name reflecting the seven rounded crests along the top of the cliff), a Site of Special Scientific Interest (SSSI), an Area of Outstanding Natural Beauty (AONB), a local nature reserve and part of the Sussex Heritage Coast. Sussex's only marine reserve, the Seven Sisters Voluntary Marine Conservation Area (VMCA), runs from the Martello Tower at Seaford to the Wish Tower at Eastbourne and extends 1 km out to sea from the low water mark.

The main interest of this section of coast from a *SEASEARCH* point of view are the wave-cut platforms at the foot of the cliffs. These extend beyond low water mark into the shallow sublittoral, forming a series of ridges and gullies running perpendicular to the shore. Both the foreshore and shallow sublittoral zones were surveyed by Marine Conservation Society volunteers between 1982-84 (Wood & Jones 1986). *SEASEARCH* records have added to these.

Features of interest (west to east)

The gullies between Seaford Head and Hope Gap are regarded as being the best developed and have been identified as a marine SNCI (Irving 1996). The gullies are up to 2 m deep and up to 1.5 m wide. Tidal currents sweep across the gullies in an east/west or west/east direction. The combination of exposure to these currents on the tops of the ridges, coupled with the shelter from the currents within the gullies, adds to the diversity of the habitats present here. The height of the ridges and the extent of the chalk bedrock, decreases with increasing distance from the shore and increasing depth.

Within this sector, chalk gullies have been recorded from the following 19 dive sites, all within 500 m of low water mark: 714/28-30, 34-36, 39-42, 78, 80, 81, 103, 106, 107, 113, 115 & 118. Wood (1984) records the chalk reef at Seaford Head extending to 18 m depth (probably Below Sea Level?), though the bedrock at this depth was recorded as being flat and featureless, in contrast to the gullies and outcrops in shallower areas. The deepest chalk bedrock encountered on *SEASEARCH* dives within this sector was 10 m BCD (714/110, 111 & 715/33), with the deepest record of gullies/ridges being at 8-9 m BCD (714/113) off Birling Gap.

Dives further offshore (i.e. 714/61, 64, 76 & 112) recorded the seabed as being fine muddy sand with cobbles at around 20 m BCD depth.

Noteworthy habitats and characterising communities

Near-shore chalk gullies (see also section 6.1.3.3). In the shallowest zone closest to low water mark, the chalk ridges lining the gullies are about 1.5 m high with a dense growth of kelp (*Laminaria saccharina* and *L. digitata*). The kelp does not extend below 2.5 m BCD; beyond this, upward-facing surfaces are dominated by smaller brown and red algae such as *Taonia atomaria*, *Calliblepharis ciliata* and *Ceramium rubrum*. Algal cover becomes sparse below 5 m and is absent below 7 m BCD. On upper surfaces of the chalk ridges, large growths of the breadcrumb sponge *Halichondria panicea* are present, and in less exposed places, the sponges *Halichondria bowerbanki* and *Esperiopsis fucorum*. The sides of the ridges have a covering of animal turf, made up largely of bryozoans (*Bugula* spp.) and hydroids, with various tubicolous worms including *Sabellaria spinulosa* and *Pomatoceros triqueter*. The lower sides of the ridges are affected by the movement of sand and pebbles from the gully floor and are often bare (Wood & Jones 1986). There is, however, a narrow (10-20 cm) band between the animal turf and the

bare rock which is colonised by large numbers of the horseshoe worm *Phoronis hippocrepia*. Other major burrowing organisms in the chalk include the polychaete *Polydora ciliata* and the piddocks *Pholas dactylus*, *Barnea parva* and *Hiatella arctica*. Common fishes associated with the gullies include tompot blenny *Parablennius gattorugine*, long-spined sea scorpion *Taurulus bubalis* and leopard-spotted goby *Thorogobius ephippiatus* (near the eastern limit of its distribution). Beyond 500 m from the low water mark, the seabed flattens out and sand predominates.

CUCKMERE HAVEN DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 38	Total no. of habitat records: 67
Total number of species (& higher taxa) recorded within this sector: 141	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Necora puber	velvet swimming crab	21	33	P - C	R
Paguridae	unidentified hermit crab(s)	18	28	P - C	O
Hydrozoa	unidentified hydroids	16	25	P - C	P
Cancer pagurus	edible crab	16	25	P - C	R
Urticina felina	dahlia anemone	13	20	P - O	P
Pholas dactylus	piddock	13	20	P - A	C

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

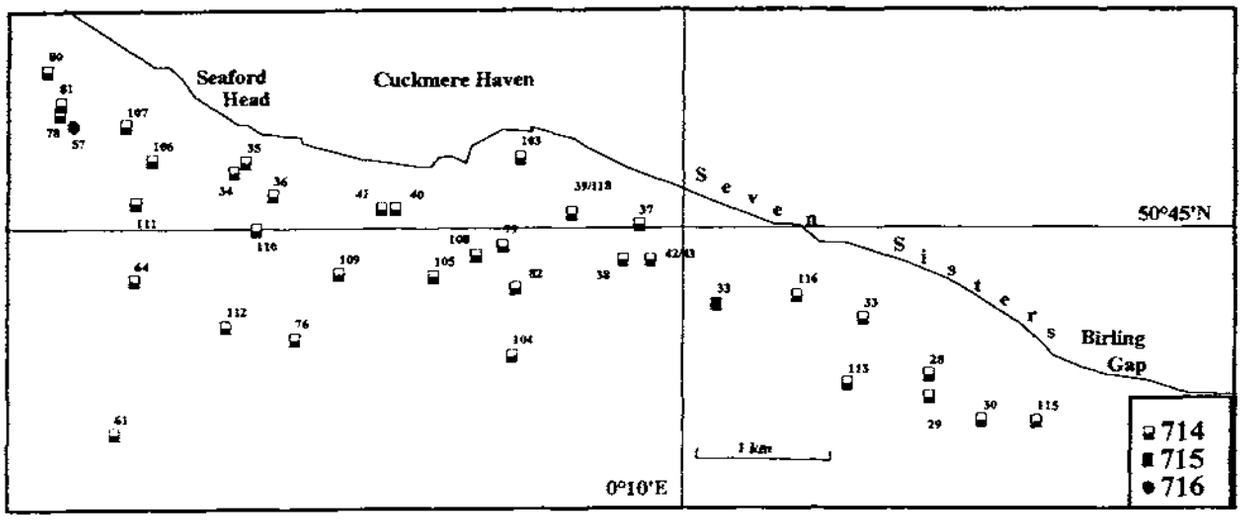

Fig. 35. Location of SEASEARCH *dives within the Cuckmere Haven sector, 1992-1998.*

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SECTOR: **CUCKMERE HAVEN**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	80	South of Seaford 2.	50 45.81'N 00 06.04'E	TV 481 981	1	Gullied chalk with silty sand and sponges at 4-6m BCD.	60					35	5	
714	78	South of Seaford 1.	50 45.57'N 00 06.10'E	TV 482 977	1	Bedrock and silty sand with mussels at 9m BCD.	45		2	3		40	10	
714	81	South of Seaford 3.	50 45.63'N 00 06.11'E	TV 482 978	1	Deeply gullied chalk with sponges and piddocks at 6-8m BCD.	70					25	5	
714	61	4km S of Seaford.	50 44.02'N 00 06.48'E	TV 487 948	1	Fine sand and mud with cobbles and hydroids at 20m BCD.			5		5	85	5	
714	107	Seaford Head 2.	50 45.52'N 00 06.57'E	TV 487 976	1	Chalk gullies with sponges at 3-5m BCD.	85		3			9	1	2
714	111	S of Seaford Head.	50 45.16'N 00 06.59'E	TV 488 969	1	Mussel bed on chalk at 10-11m BCD.	70						30	
					2	Level chalk with pebbles and cobbles at 10m BCD.	60		20	20				
					3	Fine clean sand with empty shells at 10m BCD.	5					93		2
					4	Chalk with sand and pebbles at 10m BCD.	75			5		20		
714	64	2km S of Seaford.	50 44.79'N 00 06.63'E	TV 488 962	1	Silty mud with cobbles and chalk with *Nemertesia* at 17m BCD.	2		20	3		10	65	
714	106	Seaford Head 1.	50 45.34'N 00 06.75'E	TV 489 973	1	Chalk gullies with mussels and *Alcyonium* at 3-5m BCD.	75					22		3
714	34	Below South Hill 1.	50 45.30'N 00 07.21'E	TV 495 972	1	Steep-sided chalk ridges with *Phoronis* and amphipods at 4m BCD.	100							
					2	Gullies with silt and some flints with *Hinia* at 5m BCD.			5	5			89	1
					3	Rippled silty sand with *Lanice* at 5m BCD.						90	10	
					4	Chalk with sponges and turf at 4-5m BCD.	100							
714	112	2km S of South Hill 2.	50 44.56'N 00 07.22'E	TV 495 958	1	Sand at 19m BCD.						100		
714	35	Below South Hill 2.	50 45.36'N 00 07.28'E	TV 496 973	1	Low chalk ridges with *Phoronis* and sand at 2m BCD.	50					50		
					2	Chalk ridges with amphipod tubes and *Phoronis* at 1-2m BCD.	98			2				
					3	Sand and muddy sand with *Hinia* flooring gullies at 2m BCD.			8			80	10	2
714	110	S of South Hill 2.	50 45.04'N 00 07.36'E	TV 497 967	1	Mussels on pebbles and cobbles at 10m BCD.	5		10	80				5
					2	*Cerastoderma* shells with pebbles and cobbles at 10m BCD.			10	39				51
					3	Rippled sand over chalk with hermit crabs at 10m BCD.	5		1	2	4	83	5	
714	36	Below South Hill 3.	50 45.19'N 00 07.48'E	TV 498 970	1	Chalk gullies with *Molgula* at 6m BCD.	80						20	
					2	*Fine* rippled sand/silt with *Lanice* at 6m BCD.		5				85	10	
714	76	2km S of South Hill 1.	50 44.48'N 00 07.64'E	TV 500 957	1	Cobbles in silt and fine sand over chalk at 19-20m BCD.	5		10			65	20	
714	109	S of South Hill 1.	50 44.82'N 00 07.90'E	TV 503 963	1	Mussel bed on chalk bedrock with silty sand at 13m BCD.	60					35	5	
714	41	W of Hope Point 2	50 45.12'N 00 08.12'E	TV 506 969	1	Silty sand over chalk in gullies at 3m BCD.			5			85	10	
					2	Vertical chalk with piddocks and *Bispira* at 0.5-2m BCD.	100							
					3	Chalk ridges with algae and sponges at 0.5m BCD.	100							
714	40	W of Hope Point 1	50 45.10'N 00 08.20'E	TV 507 969	1	Chalk ridges between gullies, with near-vertical sides, at 4-6m BCD.	100							
					2	Silt at bottom of gully at 6m BCD.							100	
					3	Chalk boulders and chalk & flint cobbles within gully at 4m BCD.		80	20					
714	105	S of Hope Point 1.	50 44.80'N 00 08.43'E	TV 510 963	1	Mud over coarse sand, shells and a few cobbles at 15-16m BCD.			2		8	75	10	5
714	108	S of Hope Point 2.	50 44.88'N 00 08.71'E	TV 513 965	1	Rippled silty sand with pebbles and sparse fauna at 9-11m BCD.				1	13	70	15	1
					2	Silty sand and pebbles with fish and *Pagurus* at 11-12m BCD.			1	49		44	5	1
					3	Gravel and small pebbles on silt with pogge at 12m.				40	49	8	2	1
714	79	S of Cuckmere Haven 1.	50 44.92'N 00 08.86'E	TV 515 966	1	Silty sand at 10m BCD.						90	10	
714	82	S of Cuckmere Haven 2.	50 44.72'N 00 08.97'E	TV 516 962	1	Pebbles and cobbles in compacted silt at 13m BCD.			10	20			68	2
714	103	Cuckmere Haven 2.	50 45.35'N 00 09.03'E	TV 516 974	1	Intertidal chalk platform with green and red algae above chart datum.	100							
					2	Gullies with sand or silt above chart datum.						90	10	
714	104	1.5km S of Cuckmere Haven.	50 44.42'N 00 08.99'E	TV 516 956	1	Silty sand, cobbles and pebbles with molluscs at 16m BCD.			20	20		55	5	

SECTOR: **CUCKMERE HAVEN** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	118	Cuckmere Haven 3.	50 45.09'N 00 09.30'E	TV 520 969	1	Chalk with shallow gullies and algae at chart datum level.	80					20		
					2	Chalk cobbles on sand with algae and shore fauna at chart datum level.			70			30		
					3	Sand with scarce pebbles at chart datum level.				5		95		
714	118	Cuckmere Haven 3.	50 45.09'N 00 09.30'E	TV 520 969	4	Rippled sand and scarce cobbles just above chart datum level.			5			95		
714	39	Cuckmere Haven 1.	50 45.12'N 00 09.31'E	TV 520 969	1	Gullied chalk platform with algae and *Nemertesia* at 0.5-2.5m BCD.	50						50	
714	38	E of Cuckmere Haven 2.	50 44.89'N 00 09.65'E	TV 524 965	1	Muddy sand over chalk with *Molgula* at 5-6m BCD.	15					40	45	
714	37	E of Cuckmere Haven 1.	50 45.02'N 00 09.79'E	TV 525 968	1	Angular flint cobbles with barnacles and ascidians at 2m BCD.		1	70	15	11		3	
					2	Flat piddock-bored chalk at 2m BCD.	99			1				
					3	Firm silt with *Lanice* and *Sabella* at 2m BCD.							100	
714	42	E of Cuckmere Haven 3.	50 44.86'N 00 09.87'E	TV 526 965	1	Chalk ridges and gullies at 6-7m BCD.	100							
					2	Silt with flatfish, *Urticina* and worms at 7m BCD.							100	
					3	Broken chalk at 6m BCD.		80	20					
714	43	E of Cuckmere Haven 4.	50 44.89'N 00 09.87'E	TV 526 965	1	Cobbles on muddy sand with *Tubularia* at 4m BCD.		3	60		15	15	5	2
					2	Silty sand with *Arenicola* at 4m BCD.						90	10	
715	33	1km S of Seven Sisters.	50 44.64'N 00 10.23'E	TV 531 961	1	Chalk bedrock with mud and piddocks at 10m BCD.	40						60	
					2	Flint cobbles with sponges and ascidians at 11m BCD.			100					
714	116	Seven Sisters 2.	50 44.71'N 00 10.78'E	TV 537 962	1	Cobbles, pebbles and gravel on chalk with *Molgula* at 4-5m BCD.	4		28	34	34			
714	113	SW of Birling Gap 3.	50 44.26'N 00 11.07'E	TV 541 954	1	Silty sand with flint cobbles, plaice and squid at 10-12m BCD.			30			65	5	
					2	Chalk gullies with *Nemertesia* at 8-9m BCD.	100							
714	33	Seven Sisters 1.	50 44.60'N 00 11.17'E	TV 542 960	1	Cobbles and pebbles on sand and gravel at 4m BCD.			25	25	25	25		
					2	Rippled silty sand with ?*Arenicola* and *Maja* at 4m BCD.						90	10	
714	29	SW of Birling Gap 2.	50 44.19'N 00 11.60'E	TV 547 953	1	Chalk ridges with sponges and *Tubularia* at 4-6m BCD.	100							
					2	Gully floors with sand and silt with worms at 6m BCD.				2		83	15	
714	28	SW of Birling Gap 1.	50 44.28'N 00 11.63'E	TV 547 955	1	Gullied chalk with algae and sponges at 3-6m BCD.	75		5				20	
					2	Cobbles on sand at 6.5m BCD.			10			90		
714	30	S of Birling Gap.	50 44.07'N 00 11.90'E	TV 551 951	1	Dissected chalk with sponges and amphipod tubes at 5-7m BCD.	100							
					2	Gully floors with mud and plaice at 7m BCD.	10		2	2			86	
					3	Gravel at 7m BCD.					70		30	
714	115	Belle Toute.	50 44.06'N 00 12.29'E	TV 555 951	1	Chalk gullies with algae and Filograninae worms at 3-5m.	90					8	2	
70 Records Processed														

7.11 Beachy Head

Overview

The stretch of coast bordering this section runs from the Belle Tout lighthouse in the west (OS northing line of TV565), to Sovereign Marina in the east (OS northing line of TQ645), a west-to-east distance of 8.0 km.

It is difficult to dive safely in the vicinity of Beachy Head on account of the strong currents which sweep past the headland. A shallow promontory extends out from the headland and overfalls are marked here on the Admiralty Chart. That said, a handful of dives have been undertaken here, though they have all been drift dives! To add to the difficulties experienced by the diver, underwater visibility is often very poor.

Features of interest (west to east)

The depth of the seabed increases rapidly from the shore within this sector (in comparison with the remainder of the Sussex coast): the 20 m depth contour comes within 800 m of the shore here. In the vicinity of **Beachy Head** itself, dives 714/31 & 32 recorded a seabed of rippled silty sand with lugworm casts at 4-6 m BCD. A short distance offshore (at 21-25 m BCD), dive site 715/25 recorded a gradually sloping seabed of chalk bedrock covered by small pebbles, flint cobbles and some gravel. It is interesting to note that some 2-300 m off the Beachy Head lighthouse, dive 715/28 recorded *five* distinct seabed habitats at a depth of 7-9 m BCD, giving an indication of how rapidly the underlying nature of the seabed changes within this area. A little further offshore, between a depth of 7 to 22 m BCD, both dives 715/26 & 27 record extensive mussel beds being present, with patches of deep silt/fine mud in between. The last dive in this sequence, 714/114, recorded angular greensand boulders embedded in a muddy, almost clay-like sand at 12 m BCD, characterised by patches of *Molgula* sp. sea squirts and *Mytilus edulis* mussels. There is known to be a small exposure of greensand extending a short distance from Head Ledge (a half-mile according to McDonald, 1985), about 800 m east of the Beachy Head lighthouse.

Holywell Bank is marked on the chart as lying approximately 1 km offshore, 2 km NE of Head Ledge. It appears to be a bank comprised entirely of sand, as both dives 716/38 & 39 record extensive areas of sand at 2.5 m depth (716/38) to 7 m BCD (716/39). The occurrence of mussels *Mytilus edulis* is common in this area. Less than 1 km off the Wish Tower at Eastbourne, dive 716/41 recorded the seabed as being of bedrock (presumably sandstone) and boulders, with mud at 3-4 m BCD, the rocks being covered by mussels. Additionally, extensive **mussel beds** were recorded on dives 715/29 & 30 & 716/40. Clearly, this is an area of high silt deposition (being in the lee of Beachy Head), as both the mussel beds recorded from 715/29 & 30 were growing on top of 0.5 m of fine, soft mud, at between 11-16 m BCD.

General 'look-see' dives at 715/31 & 32 revealed a mix of small cobbles, pebbles, gravel and silt at 16 m BCD on a level seabed from the former, and muddy sand at 12 m BCD at the latter (though the pitch black of the water at this site meant that the seabed was felt rather than seen!).

Noteworthy habitats and characterising communities

The two notable communities recorded from this sector (to date) are those associated with the tide-swept boulders off Head Ledge (in particular the presence of large numbers of the sea squirt *Molgula* sp.); and the *Mytilus edulis* mussel beds to the north and east of Holywell Bank (see also section 6.1.5.4).

BEACHY HEAD DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 18	Total no. of habitat records: 24
Total number of species (& higher taxa) recorded within this sector: 56	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Mytilus edulis	common mussel	8	40	C - S	A
Maja squinado	spiny spider crab	6	30	P - O	R
Urticina felina	dahlia anemone	4	20	P - O	O
Paguridae	unidentified hermit crabs	4	20	R - O	R
Pagurus bernhardus	large hermit crab	4	20	R - C	O

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

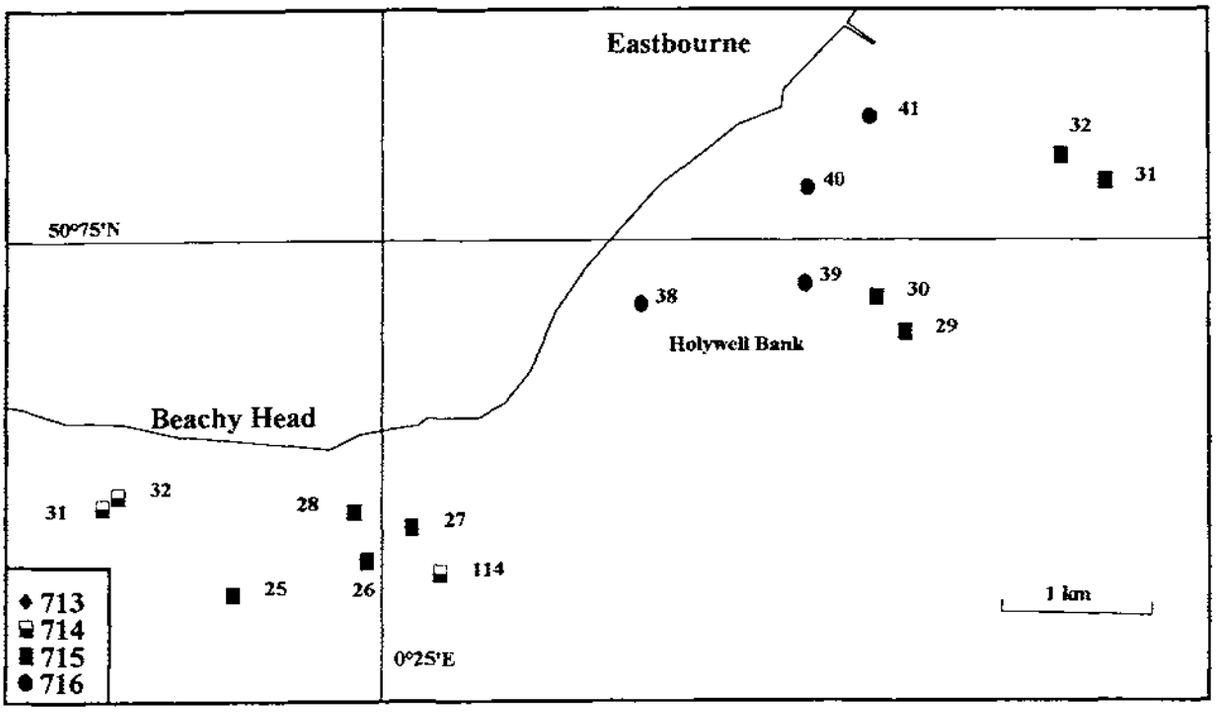

Fig. 36. Location of SEASEARCH *dives within the Beachy Head sector, 1992-1998.*

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SECTOR: BEACHY HEAD

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	31	E of Belle Toute 1.	50 43.84'N 00 13.46'E	TV 569 947	1	Rippled silty sand with sparse worm casts and *Arenicola* at 4-6m BCD.						90	10	
714	32	E of Belle Toute 2.	50 43.87'N 00 13.57'E	TV 570 948	1	Rippled silty sand with *Maja* and *Arenicola* at 4m BCD.						90	10	
715	25	off Beachy Head 1.	50 43.46'N 00 14.18'E	TV 578 940	1	Pebbles and cobbles with mussels at 21-25m BCD.	2		15	60	15		8	
715	28	off Beachy Head 4.	50 43.83'N 00 14.89'E	TV 586 947	1	Chalk or gault clay with *Sabellaria* and bryozoa at 7m BCD.	90					10		
					2	Soft sand and mud at 7m BCD.						80	19	1
					3	Chalk outcrops with mud, bryozoa and sponges at 7m BCD.	80						20	
					4	Mud at 7.7m BCD.	100							
					5	Chalk with mud-floored fissures and sponges at 8-9m BCD.	80						20	
715	26	off Beachy Head 2.	50 43.58'N 00 14.97'E	TV 587 943	1	Pebbles and gravel with sponges at 18-22m BCD.	2		5	45	46		2	
					2	Mussel bed with *Asterias* at 18-19m BCD.								
715	27	off Beachy Head 3.	50 43.76'N 00 15.26'E	TV 590 946	1	Mussel beds and silt patches at 7-16m BCD.			5	5	5	5	80	
714	114	Beachy Head.	50 43.50'N 00 15.40'E	TV 592 942	1	Greensand boulders with *Molgula* and *Mytilus* at 12m BCD.		90				5	5	
716	38	Holywell Bank Eastbourne 1.	50 44.73'N 00 16.53'E	TV 605 965	1	Sand with occasional shell fragments at 2.5m BCD.						99		1
716	40	Boulder Bank 1.	50 45.24'N 00 17.48'E	TV 616 975	1	Mussel bed with sand at 2m BCD.					90	10		
716	39	Holywell Bank Eastbourne 2.	50 44.85'N 00 17.50'E	TV 616 967	1	Level seabed of sand at 7m BCD.					5	85		10
716	41	Boulder Bank 2.	50 45.60'N 00 17.89'E	TV 620 981	1	Mud, bedrock and boulders with mussels at 3m BCD.	30	25					45	
715	30	2km SSE of Eastbourne 2.	50 44.77'N 00 17.90'E	TV 621 966	1	Mussel beds on mud with *Sagartiogeton* and dredging at 11-13m BCD.							100	
715	29	2km SSE of Eastbourne 1.	50 44.60'N 00 18.10'E	TV 623 963	1	Mussel bed on muddy silt at 14-16m BCD.							100	
715	32	2km SE of Eastbourne 2.	50 45.42'N 00 19.00'E	TV 633 978	1	Muddy sand at 11m BCD.					5	60	35	
715	31	2km SE of Eastbourne 1.	50 45.26'N 00 19.23'E	TV 636 976	1	Cobbles, pebbles, gravel and silt with turf at 16m BCD.			30	30	32		8	
20 Records Processed														

7.12 Pevensey Bay

Overview

The stretch of coast bordering this section runs from Sovereign Marina in the west (OS northing line of TQ645), to Bexhill in the east (OS northing line of TQ755), a west-to-east distance of 11.0 km.

This sector is of particular interest for its offshore sandstone reefs which lie between 5-12 km to the east of Eastbourne: Elphick Tree (5 km offshore), the Horse of Willingdon (6 km), Long Shoal (8 km), Royal Sovereign Shoals (10 km) and the Royal Sovereign Light at Southern Head (11 km). The reefs rise above the surrounding seabed which is typically flat, comprising mixed sediments of predominantly pebbles and sand. All of the reefs are affected by a high silt load, especially when they are compared to other sandstone reefs off the West Sussex coast (e.g. the Waldrons). A report describing these reefs off East Sussex by Chris Wood (1990) was written after a number of early *SEASEARCH* dives by SE MCS members during 1989. The dives undertaken during the current project (mostly during 1996) added to the earlier findings and helped to fill in gaps in the coverage.

Features of interest (west to east)

The reef known as **Elphick Tree** lies closest to the shore, rising in the form of a knoll to 8.3 m BCD from the surrounding seabed at 10-12 m BCD. Two dives (715/45 & 46) were carried out in the vicinity of this site. Though there is undoubtedly sandstone bedrock present, much of the reef comprises large and small slab-like boulders, in between which are mixes of cobbles, pebbles and sand. Dive 715/46 also recorded a small area of grey mudstone as being present; and dive 715/16, a little further to the north-west, recorded soft grey clay appearing amongst patches of sand, pebbles and empty mussel shells.

Far more dives (12 in all - 715/12-15, 52, 53, 55 & 59-62) were undertaken on the more extensive **Horse of Willingdon** reef, which is about 1 km in length and rises from 13 m to 5 m BCD. The sandstone bedrock is clearly liable to fracturing, dive 715/62 recording 'fissured sandstone with irregular vertical fissuring giving an effect like crazy paving'. At other sites the rock is described as being 'irregular' (715/62), forming 'horizontal ledges with overhangs' (715/13), or 'cut into large angular blocks by irregular gullies about 0.5 m deep' (715/14 & 61). The bedrock and boulders often had a covering of mussels.

A cluster of dives (715/10 & 11, & 714/55, 56 & 66) took place on the north side of **Long Shoal**, another reef which occurs between the Horse of Willingdon (and separated from it by a channel known as Kinsman's Nab) and the Royal Sovereign Shoals. Both drift dives which crossed the NW corner of Long Shoal (715/10 & 11) encountered sandstone bedrock covered by large numbers of mussels. Sandstone bedrock was also present a little to the north (714/55, 56), though here it was largely obscured by boulders, cobbles and pebbles. Of particular interest were the records from the other two dives from this cluster (714/54 & 66), the former describing "chalk(?) bedrock or boulders >1 m high" and the latter "limestone reef cut by gullies more than 1 m deep". These two descriptions could well be the same rock type: if that is limestone, then this would be an unusual and unexpected occurrence of this rock type so far east.

The **Royal Sovereign Shoals** lie between 10-12 km ENE of Beachy Head, and 8-10 km off Langney Point, NE of Eastbourne. The reason why the shoals are so named is not known (McDonald 1985). There is no record in the archives of a ship named the *Royal Sovereign* which may have come to grief here. Nine *SEASEARCH* dives (715/17-20, 50 & 51, & 716/42-44) were undertaken here in 1996 & 1997. The reef covers an area of about 1 km^2 and is marked by a buoy (the Royal Sovereign) at its southern end. It is interesting to note that, although most of the

Shoals are of sandstone (probably Upper Greensand), outcrops of chalk occur in the north-west part. Shallow sublittoral chalk bedrock has also been found at Oyster Reef (due north close to the shore at Bexhill) - see below. It is believed that these exposures are the easternmost outcrops of sublittoral chalk before it reoccurs at Abbot's Cliff, just east of Folkestone. The Royal Sovereign Shoals reef rises from a surrounding sea bed of gravel, muddy sand and sand, at 11-13 m BCD. The area is subject to strong tidal currents (marked as overfalls on the chart) which reach 2.6 knots at spring tides. The easternmost of the dives on the Shoals (715/18) (together with another further north, 715/24) noted the presence of Ross 'coral' *Pentapora foliacea*. These records are the furthest east up the Channel that this species has been recorded. The Royal Sovereign Shoals were identified as a Sussex marine Site of Nature Conservation Importance (mSNCI) in 1996 (Irving 1996).

Southern Head lies about 1 km to the south of the Royal Sovereign buoy, the reef being marked by the Royal Sovereign light tower. Four *SEASEARCH* dives were undertaken in 1996 on the north-west part of this reef (715/39, 40, 41 & 42). No sandstone bedrock was encountered, though slab-like sandstone boulders were present at all these dive sites, typically surrounded by a mix of sand, shell, pebbles and cobbles. In places, small horizontal areas of consolidated clay (?mudstone) were exposed, often pitted with piddock holes.

To the north of the sandstone reefs a few dives were undertaken elsewhere within Pevensey Bay to help 'fill in gaps'. Dive 717/28 recorded heavily silted mussels and slipper limpets forming a bed overlying bedrock at 5-6 m BCD. Approximately 500 m SSE of this site, dive 717/29 recorded a level seabed of sand and gravel with a few shell fragments at 7 m BCD. A further 1 km to the south, two dives (717/33 & 34) were undertaken at 8-9 m BCD, where 'overfalls' were marked on the chart. The dives were planned to coincide with slack water, though a slight current was encountered on both dives. The seabed at 717/33 was recorded as being sand, shells and pebbles with occasional low-lying bedrock outcrops; and that at 717/34 as being pebbles with gravel and slipper limpets. The presence of slipper limpets *Crepidula fornicata* at these sites east of Beachy Head is of interest, as this species, whilst dominating the seabed off West Sussex, has only rarely been recorded from off East Sussex.

Three investigative dives (716/45-47) were undertaken on **Oyster Reef**, close inshore off the western end of Bexhill, at 2-6 m depth BCD. Two of these dives (716/46 & 47) revealed discrete outcrops of low-lying chalk bedrock surrounded by sand between 2 and 6 m BCD. This occurrence of chalk, together with that which occurs in the north-west part of the Royal Sovereign Shoals, is the most easterly sublittoral outcrops in the Channel before chalk is encountered again just east of Folkestone. What makes the Oyster reef chalk outcrop of particular interest is that it seems to be quite separate (spatially) from that which constitutes Beachy Head and the Royal Sovereign Shoals outcrop.

Some 6 km due south of the west end of Bexhill lies the **Pevensey Shoals**. Four dives (715/21-24), from 8-13 m depth BCD, were undertaken here in order to determine what comprised the shoals. Only one record (715/24) described "very large boulders (constituting 60% coverage of the seabed) on coarse sand and pebbles", whilst a separate habitat encountered on the same dive had "large slabs of smooth-surfaced rock". The other records featured gravel, sand, pebbles and cobbles in varying proportions.

Noteworthy habitats and characterising communities

The following description summarises the types of communities present on the sandstone reefs east of Beachy Head. On the shallowest parts of the reefs, upward-facing rock surfaces have a covering of small foliose red algae, kelp being absent. Common animals include a variety of sponges, the white anemone *Actinothoë sphyrodeta*, sea squirts such as *Clavelina lepadiformis* and *Botryllus schlosseri*, the hydroid *Nemertesia antennina*, the erect bryozoans *Alcyonidium diaphanum* and *Flustra foliacea* and the starfish *Asterias rubens*. At depths of 7-14 m BCD,

rectangular slabs of sandstone bedrock may be encountered, with lengths of 2-3 m and vertical sides typically 40-50 cm high (these were typical of certain areas within the Royal Sovereign Shoals reef). In places, slabs are piled on one another with no consistent orientation, thus creating deep fissures, overhangs and caves up to 2 m deep and 50 cm high.

On under-slab surfaces the soft coral *Alcyonium digitatum* occurs together with colonies of the tubeworm *Filograna implexa* and small bushy bryozoans *Bugula* spp. The elephant's ear sponge *Pachymatisma johnstonia* may be present on the exposed edges of the slabs, which is probably the most easterly record for this species in the Channel. Similarly, this site may also provide the most easterly records in the Channel for the 'leafy' bryozoan *Pentapora foliacea*, the sea squirt *Pycnoclavella aurilucens* and the cuckoo wrasse *Labrus mixtus*. Large numbers of bib *Trisopterus luscus* and poor cod *Trisopterus minutus* frequent the area, together with goldsinny *Ctenolabrus rupestris*, ballan wrasse *Labrus bergylta* and, hiding in crevices, the tompot blenny *Parablennius gattorugine*. Where the edge of the reef meets the surrounding sediment (at 8-18 m depth), the bedrock is overlain by a covering of coarse sand and cobbles. The unstable nature of this substratum restricts the number of sessile species to those that can tolerate periodic inundation such as the 'chimney' sponges *Ciocalypta penicillus* and *Polymastia mamillaris*, and the anemones *Cereus pedunculatus* and *Urticina felina*.

The maximum depth at which foliose red algae were recorded at Southern Head, 12 km east of Beachy Head, was 14.3 m BCD (715/40).

PEVENSEY BAY DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 47	Total no. of habitat records: 76
Total number of species (& higher taxa) recorded within this sector: 150	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Alcyonium digitatum	dead man's fingers	43	56	P - A	F
Asterias rubens	common starfish	41	53	P - A	O
Flustra foliacea	hornwrack	34	44	P - A	O
Necora puber	velvet swimming crab	33	43	P - A	F
Cancer pagurus	edible crab	32	42	P - A	O
Esperiopsis fucorum	'shredded carrot' sponge	30	39	P - A	F
Mytilus edulis	common mussel	28	36	P - S	A
Trisopterus luscus	bib	28	36	P - A	O
Actinothoe sphyrodeta	anemone	24	31	P - C	O
-	foliose red algae	21	27	P - A	O
Nemertesia antennina	'antenna' hydroid	20	26	P - A	O
Ctenolabrus rupestris	goldsinny	19	25	P - C	F

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

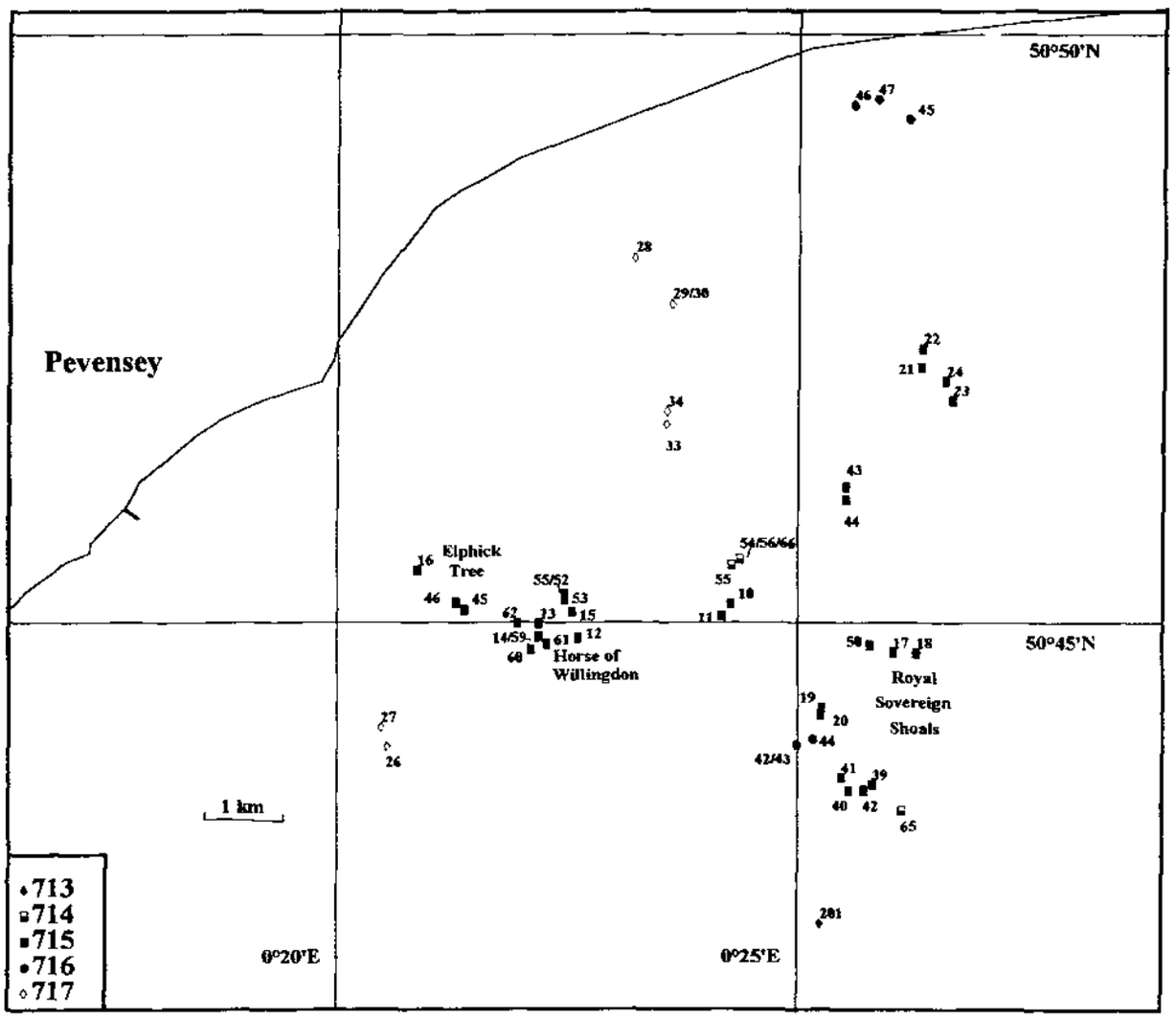

Fig. 38. Location of SEASEARCH *dives sites within the Pevensey Bay sector, 1992-1998.*

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SECTOR: **PEVENSEY BAY**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
717	27	SW of Horse of Willingdon.	50 44.12'N 00 20.48'E	TV 652 955	1	Mixed substratum of sand and gravel with a few small boulders at 19.7m BCD.		5			40	55		
717	26	Out from Eastbourne 1.	50 43.95'N 00 20.60'E	TV 653 952	1	Rippled sand with some broken shell and pebbles at 21m BCD.			3	17		80		
715	16	N of Elphick Tree.	50 45.49'N 00 20.96'E	TV 656 980	1	Sand, pebbles and mussel shells with ?*Bolocera* at 11-12m.				15		70		15
715	46	Elphick Tree 2.	50 45.21'N 00 21.35'E	TV 661 975	1	Boulders, cobbles, pebbles & sand with sponges at 10-12m BCD.	1	40	20	20		15		4
715	45	Elphick Tree 1.	50 45.15'N 00 21.44'E	TV 662 974	1	Sand and boulders with sponges and turf at 12-13m BCD.		40		10		45		5
					2	Sand, pebbles and cobbles with ophuiroids at 13-15m BCD.			40			60		
715	62	Horse of Willingdon 11.	50 45.00'N 00 21.99'E	TV 669 972	1	Fissured sandstone with *Asterias* and *Parablennius* at 10-14m BCD.	95	5						
715	60	Horse of Willingdon 9.	50 44.80'N 00 22.20'E	TV 671 968	1	Broken reef with sand, pebbles & young mussels at 10m BCD.	60			20		20		
					2	Mussel beds on bedrock with *Urticina* at 11-12m BCD.	100							
					3	Sandstone reef with sponges and crabs at 12-14m BCD.	99							1
715	13	Horse of Willingdon 2.	50 44.98'N 00 22.23'E	TV 672 972	1	Sandstone ledges, overhangs and gullies at 6-9m.	100							
					2	Gully floors with pebbles, sand and shell gravel at 6-9m.				50	10	40		
					3	Sandstone ledges and gullies with red algae at 5-6m.	100							
715	14	Horse of Willingdon 3.	50 44.88'N 00 22.27'E	TV 672 970	1	Gullied sandstone with *Alcyonium* and ascidians at 4-11m.	90			5		5		
715	59	Horse of Willingdon 8.	50 44.90'N 00 22.27'E	TV 672 970	1	Sandstone with shallow gullies and sponges at 10-13m BCD.								
					2	Mussel bed on sand with *Asterias* at 13-14m BCD.						100		
715	61	Horse of Willingdon 10.	50 44.87'N 00 22.31'E	TV 673 969	1	Dissected sandstone with mussels, crabs and *Asterias* at 11-13m BCD.	90			2		8		
715	52	Horse of Willingdon 5.	50 45.25'N 00 22.50'E	TV 675 977	1	Rock terraces & steps, with sponges & mussels at 8-11m BCD.	90					9		1
715	53	Horse of Willingdon 6.	50 45.20'N 00 22.50'E	TV 675 976	1	Sand and broken shell at 8m BCD.	10				10	70		10
					2	Bedrock shelves and steps with tiny mussels at 6-8m BCD.	95			1		4		
715	55	Horse of Willingdon 7.	50 45.25'N 00 22.50'E	TV 675 977	1	Rock slabs with mussels at 7-8m BCD.	90					10		
					2	Rock slabs with mussels at 6-8m BCD.	100							
					3	Coarse sand, small cobbles and pebbles at 6-8m BCD.			25		10	65		
					4	Rock slabs with mussels and sand at 9-10m BCD.	60		5		5	30		
715	15	Horse of Willingdon 4.	50 45.12'N 00 22.62'E	TV 676 974	1	Gullied bedrock with *Alcyonium* at 8-9m.	70					30		
					2	Bedrock with shallow gullies and *Asterias* at 9-10m.	90					10		
					3	Muddy sand at 10-11m BCD.						90	10	
715	12	Horse of Willingdon 1.	50 44.90'N 00 22.70'E	TV 677 970	1	Fissured sandstone with sponges at 6-8m.	100							
717	28	Out from Eastbourne 2.	50 48.14'N 00 23.29'E	TQ 682 030	1	Mussel and slipper limpet beds, heavily silted, at 5-6m BCD.							60	40
717	29	Pevensey Bay 1.	50 47.71'N 00 23.64'E	TQ 687 023	1	Sand and gravel with occasional small boulders at 7.1m BCD.		5		10	25	60		
717	30	Pevensey Bay 2	50 47.71'N 00 23.64'E	TQ 687 023	?	?								
717	34	Overfalls, W of Pevensey Shoal.	50 46.80'N 00 23.64'E	TQ 687 006	1	Pebbles with gravel and *Crepidula* at 8m BCD.		5		35	30	10		20
717	33	Out of Eastbourne.	50 46.72'N 00 23.66'E	TQ 687 004	1	Sand, shells, pebbles and bedrock at 8m BCD.	35	15		10		30		10
715	11	Long Shoal 2.	50 45.10'N 00 24.20'E	TV 695 974	1	Mussel bed with mud on sandstone at 8-12m.	20		2	3			75	
714	55	N of Long Shoal 2.	50 45.53'N 00 24.33'E	TV 696 982	1	Sand, cobbles, boulders & mussel shells with algae at 8-11m BCD.	10	30	30			25	5	
715	10	Long Shoal 1.	50 45.20'N 00 24.34'E	TV 696 976	1	Mussel bed on sandstone at 14m BCD.								

SECTOR: **PEVENSEY BAY** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
714	56	N of Long Shoal 3.	50 45.58'N 00 24.40'E	TV 697 983	1	Boulders, cobbles and pebbles with algae and invertebrates at 8-10m BCD.	1	12	35	40	5	5		2
					2	Sand, shells, gravel, pebbles & some cobbles at 10-11m BCD.			5	20	25	25		25
					3	Mussel bed on cobbles, pebbles and sand at 7-8m BCD.		2	40	38		10		10
714	54	N of Long Shoal 1.	50 45.56'N 00 24.45'E	TV 697 983	1	Gravel and shells with *Crossaster* and *Asterias* at 5-7m.					50			50
714	54	N of Long Shoal 1.	50 45.56'N 00 24.45'E	TV 697 983	2	Large irregular blocks with *Esperiopsis* and *Metridium* at 3-7m BCD.		100						
714	66	N of Long Shoal 4.	50 45.56'N 00 24.45'E	TV 697 983	1	Limestone(?) reef with gullies at 8-9m BCD.	80	3		7		10		
716	42	Royal Sovereign Shoals 1	50 43.97'N 00 25.04'E	TV 705 954	1	Bedrock with pebbles, cobbles and mud at 12-13m BCD.	75		5	3			15	2
716	43	Royal Sovereign Shoals 2	50 43.97'N 00 25.04'E	TV 705 954	1	Sandstone bedrock, boulders and some mud at 10-13m BCD.	40	40					20	
716	44	W of Royal Sovereign Shoal	50 44.04'N 00 25.18'E	TV 707 955	1	Bedrock, sand, cobbles & pebbles with some shells at 8m BCD.	50		10	10		10		20
					2	Chalk bedrock, boulders, sand and shells at 8-9m BCD.	50	20	5			5		20
715	19	Royal Sovereign Shoals 3.	50 44.30'N 00 25.29'E	TV 708 960	1	Boulders, sand and gravel at 7-16m.	5	60			20	15		
					2	Mix of cobbles, pebbles and gravel at 10-12m BCD.			50	25	20			5
715	20	Royal Sovereign Shoals 4.	50 44.24'N 00 25.32'E	TV 708 959	1	Sand, gravel and boulders with a *Crossaster* at 11m BCD.		10		10	10	65	5	
713	201	Unknown wreck.	50 42.47'N 00 25.30'E	TV 709 926	1	Wreck with *Corynactis* and *Crossaster* at 21-23m BCD.								100
					2	Cobbles and sand at 23m BCD.			50			50		
					3	Silt and sand within wreck.						80	20	
716	46	Oyster Reef 2.	50 49.44'N 00 25.66'E	TQ 709 055	1	Mud at 3-4m BCD.							100	
					2	Chalk bedrock and mud at 3-4m BCD.	50						50	
715	44	2km N of Royal Sovereign Shoals 2.	50 46.05'N 00 25.55'E	TV 710 993	1	Boulders, cobbles and sand with *Ciocalypta* at 11-12m BCD.		30	20	10		39		1
					2	Rippled sand & cobbles with *Alcyonium* and *Flustra* at 12m BCD.			10			90		
715	43	2km N of Royal Sovereign Shoals 1.	50 46.19'N 00 25.58'E	TV 710 995	1	Boulders, cobbles and sand with *Raspailia* at 11-13m BCD.		20	15		5	60		
715	41	Southern Head 3.	50 43.68'N 00 25.53'E	TV 711 949	1	Boulders and sand at 13-16m BCD.		60			5	35		
					2	Sand and pebbles at 14-15m BCD.				50		50		
					3	Sand, cobbles and pebbles with *Nemertesia* at 15-16m BCD.			15	35	5	45		
715	40	Southern Head 2.	50 43.61'N 00 25.59'E	TV 712 947	1	Boulders, pebbles and sand on clay at 15-17m BCD.	2	35	25	20		15		3
716	47	Oyster Reef 3.	50 49.47'N 00 25.91'E	TQ 712 056	1	Seabed of sand, bedrock and shells at 6m BCD.	10					80		10
715	42	Southern Head 4.	50 43.56'N 00 25.73'E	TV 714 947	1	Boulders and cobbles on sand and clay at 13-16m BCD.	5	30	20	10	5	25		5
715	50	Royal Sovereign Shoals 5.	50 44.85'N 00 25.80'E	TV 714 970	1	Boulders and pebbles with algae and sponges at 9-12m BCD.		60		35	5			
					2	Large boulders with algae and fish at 9m BCD.		70	15		15			
715	39	Southern Head 1.	50 43.65'N 00 25.86'E	TV 715 948	1	Flat boulders and sand with sponges at 17-19m BCD.		60	5	15		18		2
716	45	Oyster Reef 1.	50 49.32'N 00 26.20'E	TQ 716 053	1	Sand and mud at 3-4m BCD.						80	20	
					2	Chalk boulders at 2-3m BCD.		100						
					3	Sand, pebbles and shells at 2-3m BCD.				5		90		5
715	17	Royal Sovereign Shoals.	50 44.74'N 00 26.07'E	TV 717 969	1	Pebbles, gravel and boulders at 5-14m BCD.		30		50	10	10		
					2	Sand with *Asterias* at ?9m BCD.						100		
714	65	Royal Sovereign Light.	50 43.40'N 00 26.15'E	TV 719 944	1	Boulders, cobbles and pebbles on sand at 12-13m BCD.		50	20	15		15		
715	22	Pevensey Shoal 2.	50 47.34'N 00 26.37'E	TQ 719 017	1	Silt and gravel with pebbles at 12m BCD.				20	50		30	
715	21	Pevensey Shoal 1.	50 47.21'N 00 26.38'E	TQ 719 014	1	Gravel and sand with pebbles and cobbles at 12m BCD.			15	15	25	35	5	5

SECTOR: **PEVENSEY BAY** (cont.)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
715	18	Royal Sovereign Shoals 2.	50 44.74'N 00 26.29'E	TV 720 969	1	Gravel, cobbles, pebbles and ?*Pentapora* at 11-14m BCD.			30	35	35			
					2	Gravel with small cobbles and pebbles at 10-11m BCD.			10	10	80			
					3	Boulders, cobbles and pebbles with *Alcyonium* at 11-13m BCD.		50	25	25				
715	24	Pevensey Shoal 4.	50 47.10'N 00 26.63'E	TQ 722 012	1	Boulders, sand and pebbles at 11-12m BCD.		60		20		20		
					2	Gravel and sand with small rocks at 12-15m BCD.		5	5		45	45		
					3	Large rock slabs at 14-15m BCD.		100						
715	23	Pevensey Shoal 3.	50 46.90'N 00 26.67'E	TQ 723 009	1	Cobbles with pebbles and gravel on sand at 7-12m BCD.			60	10	10	20		
80 Records Processed														

7.13 Hastings

Overview

The stretch of coast bordering this section runs from Bexhill in the west (OS northing line of TQ755), to Fairlight Cove in the east (OS northing line of TQ880), a west-to-east distance of 12.5 km.

Very few dives have been undertaken within this sector: just 9 dives under the *SEASEARCH* project and a further 6 dives which took place in 1986 (Wood 1986). This is, in part, a reflection of the inaccessibility of this stretch of coast. The nearest launching sites are from Rye Harbour, 20 km to the east, or from Eastbourne's Sovereign Marina, 18 km to the west. As most of the seabed is of sand, the main interest of the seabed within this sector is of shipwrecks, though most of these lie some distance offshore. The protected wreck site of the *Amsterdam*, which sank in 1749, is exposed at low water spring tides off St Leonards-on-Sea.

Features of interest (west to east)

So far, no particular features of interest have been encountered within this sector.

Noteworthy habitats and characterising communities

The cluster of dives approximately 4 km south of Bexhill (96/47, 48, & 49) revealed a flat seabed of fine sand and broken shell fragments. Occasionally small cobbles and pebbles were present on the sand, and these had a greater diversity of species associated with them: dead man's fingers *Alcyonium digitatum*, plumose anemones *Metridium senile*, the white anemone *Actinothoë sphyrodeta*, mussels *Mytilus edulis*, slipper limpets *Crepidula fornicata*, and the bryozoan species *Flustra foliacea* and *Alcyonium diaphanum*. Hermit crabs *Pagurus bernhardus* appear to be the most numerous of the conspicuous animals present. The thornback ray *Raja clavata* has been noted on some dives. It is thought that this habitat extends over much of the seabed within this sector.

The '*Engine*' wreck some 6 km south of St Leonards-on-Sea is actually an unnamed wreck, of which all that stands proud of the seabed is the engine, though even this is widely scattered. Three dives were undertaken on this wreck in 1995 (95/51, 52 & 53) and they provide a useful record of the different community that can become established on a wreck surrounded by sand.

Of particular note were the mobile crustacean species such as edible crab *Cancer pagurus* (common), spiny spider crabs *Maja squinado* (abundant), velvet swimming crabs *Necora puber* (abundant), lobster *Homarus gammarus* (occasional). Fishes included bib *Trisopterus luscus*, poor cod *Trisopterus minutus* and tompot blennies *Parablennius gattorugine*. The black grape-like eggs of cuttlefish were found by one pair of divers towards the end of July attached to a rope.

The three dives some 6 km to the south of Hastings (96/56, 57 & 58) showed the seabed here to be of flat sand. The species recorded were the same as those found closer inshore (see below). In the vicinity of Hastings itself, Wood (1986) found the seabed to be of fine sand 2 km offshore, with mud dominating 1 km offshore. The sandmason worm *Lanice conchilega* was recorded as being frequent 1-2 km offshore, together with the sea mouse *Aphrodita aculeata*, the necklace shell *Euspira catena*, the netted dogwhelk *Hinia reticulata*, the hermit crab *Pagurus* sp., the common starfish *Asterias rubens* and the brittlestar *Ophiura ophiura*. The only fish recorded as frequent were the dragonet *Callionymus lyra* and juvenile flatfish, with flounder *Platichthys flesus* recorded as being present.

HASTINGS DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 10	Total no. of habitat records: 18
Total number of species (& higher taxa) recorded within this sector: 71	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Paguridae	unidentified hermit crabs	10	56	O - C	F
Flustra foliacea	hornwrack	9	50	P - C	O
Alcyonium digitatum	dead man's fingers	8	44	P - C	O
Arenicola marina	lugworm	8	44	P - C	O
Buccinum undatum	common whelk	6	33	R - O	O
Trisopterus luscus	bib	6	33	P - C	F
Callionymus lyra	dragonet	6	33	P - C	F
Lanice conchilega	sandmason worm	5	28	P - O	R
Cancer pagurus	edible crab	5	28	P - F	O
Metridium senile	plumose anemone	4	22	R - O	R
Mytilus edulis	common mussel	4	22	R - A	O
Alcyonidium diaphanum	'finger' bryozoan	4	22	P - F	P
Pollachius pollachius	pollack	4	22	P - C	P

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

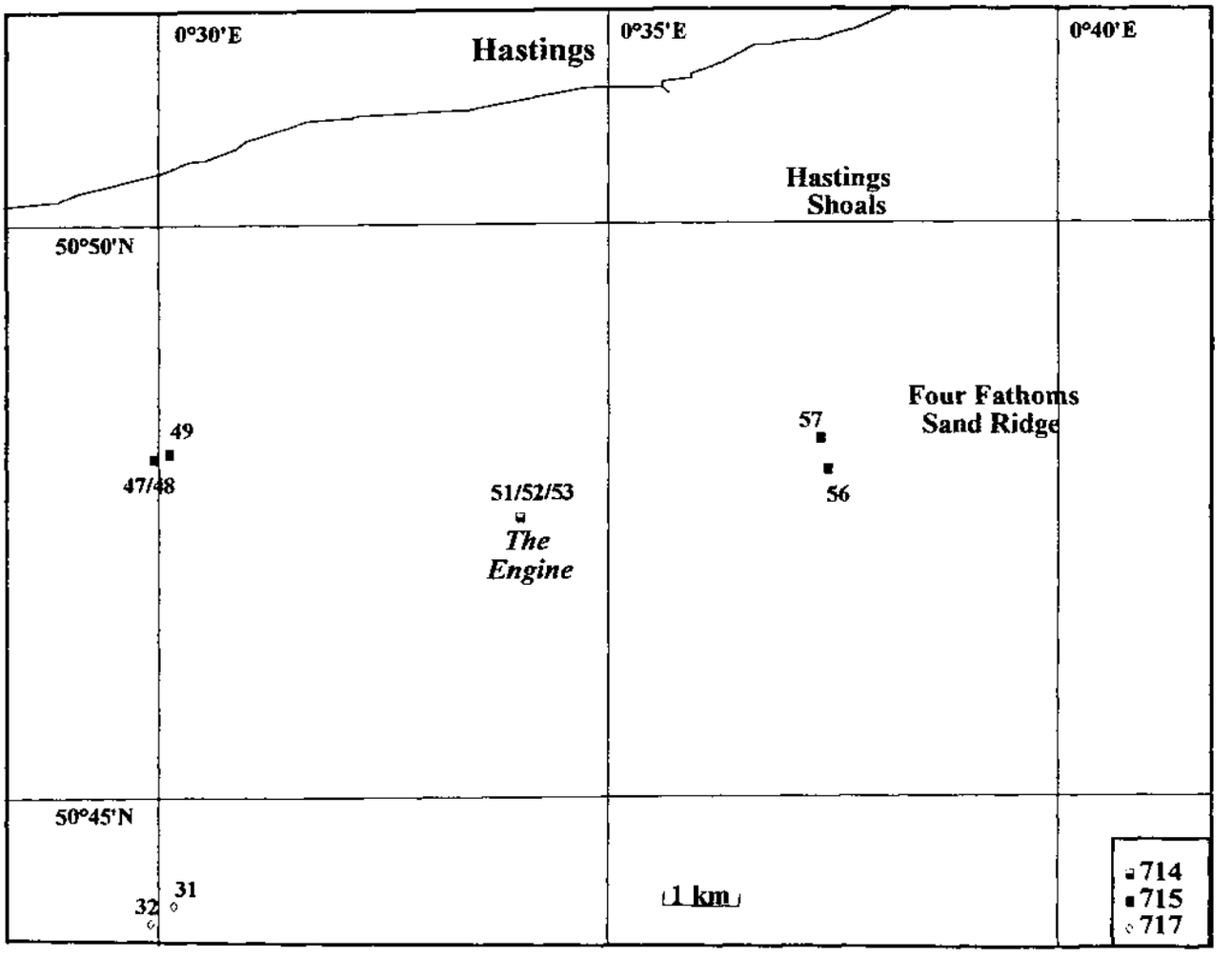

Fig. 39. Location of SEASEARCH *dives within the Hastings sector, 1992-1998.*

SECTOR: **HASTINGS**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
715	47	7km NE of Royal Sovereign Shoals 1.	50 47.98'N 00 29.99'E	TQ 761 030	1	Rippled silty sand with *Callionymus* at 13m BCD.					2	88	10	
					2	Silty sand, pebbles and small cobbles at 11m BCD.			10	10		70	10	
					3	Fine rippled sand with ?*Ensis* at 11-12m BCD.						90	10	
715	48	7km NE of Royal Sovereign Shoals 2.	50 47.95'N 00 29.99'E	TQ 761 030	1	Sand, shell and cobbles with bivalves at 12m BCD.			2		2	93		3
717	32	E of 'The Duchess'.	50 43.94'N 00 29.94'E	TV 763 955	1	Bedrock covered by medium-fine sand with mussels at 15-17m BCD.	30	20				50		
715	49	7km NE of Sovereign Shoals 3.	50 48.00'N 00 30.19'E	TQ 763 031	1	Muddy sand and cobbles with *Sabellaria* at 12-13m BCD.			5		10	70	15	
717	31	E of 'The Duchess'.	50 44.07'N 00 30.21'E	TV 766 958	1	Coarse sand with broken shell gravel at 17.1m BCD.					10	90		
					2	Occasional large boulders on coarse sand at 16-17m BCD.		30				70		
714	51	"The Engine" 1.	50 47.44'N 00 34.09'E	TQ 809 022	1	Broken wreckage with crustacea and fish at 8-12m BCD.								100
					2	Sand at 12m BCD.						100		
714	52	"The Engine" 2.	50 47.44'N 00 34.09'E	TQ 809 022	1	Sand with worm casts and *Lanice* at 12m BCD.						95	5	
					2	Wreckage with ?*Cellepora* at 12m BCD.								100
					3	Horizontal plate with *Tubularia* at 12m BCD.								100
714	53	"The Engine" 3.	50 47.44'N 00 34.09'E	TQ 809 022	1	Sand with shell debris at 11m BCD.					5	95		
					2	Wreckage with *Flustra* at 10-11m BCD.								100
715	57	Four Fathoms Sand Ridge 2.	50 48.15'N 00 37.45'E	TQ 848 038	1	Sand with sea spiders and *Aphrodite* at 8-13m BCD.						98	2	
715	56	Four Fathoms Sand Ridge 1.	50 47.85'N 00 37.45'E	TQ 849 031	1	Sand and silt with *Aphrodite* at 9-13m BCD.						90	10	
					2	Sand with ?solenettes at 9m BCD.						100		
18 Records Processed														

7.14 Rye Bay

Overview

The stretch of coast bordering this section runs from Fairlight Cove in the west (OS northing line of TQ880), to Jury's Gap in the east (OS northing line of TQ995) marking the East Sussex/Kent border, a west-to-east distance of 11.5 km.

To date, all of the records from this sector have come from dives made during 1997 (716/73-79). Although only a few dives have been undertaken, they show that the seabed is largely composed of fine sand with fragments of shell. In deeper water where there is little water movement affecting the seabed, suspended silt can settle out from the water column forming a layer of fine mud over the sand. Besides a general scattering of shipwrecks in the area, the protected wreck site of the *Anne*, which ran aground in 1690, lies on the lower shore at Cliff End to the south of Winchelsea.

Features of interest (west to east)

So far, no particular features of interest have been encountered within this sector.

Noteworthy habitats and characterising communities

On the whole, the seabed here is largely devoid of algae (due to a lack of suitable substrata to attach to), though some may attach to pebbles and shells in shallow water. Surface dwelling animal species include hermit crabs (particularly *Pagurus bernhardus*), netted dogwhelks *Hinia reticulata*, brittlestars (most commonly *Ophiura ophiura* or *Ophiura albida*), and the necklace shells *Euspira catena* and *Polinices pulchellus*. The crab *Liocarcinus* (*L. ?depurator* or *L. ?holsatus*) has been recorded from areas of fine sand but only as odd individuals. Attached species include the hydroids *Sertularia argentea* and *Obelia ?longissimus*, and the bryozoan *Flustra foliacea*, though all of these are uncommon. Shell debris indicates that the rayed trough shell *Macra stultorum* and thin tellin *Angulus tenuis* are present within the sand. Other infaunal species include heart urchins *Echinocardium cordatum*, sandmason worms *Lanice conchilega*, and lugworms *Arenicola marina* (only in shallow, silty sand).

RYE BAY - DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 7	Total no. of habitat records: 7
Total number of species (& higher taxa) recorded within this sector: 20	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Pagurus bernhardus	large hermit crab	4	57	F - C	F
Hinia reticulata	netted dogwhelk	3	43	O - C	C
Lanice conchilega	sandmason worm	2	29	C - C	C
Echinocardium cordatum	heart urchin	2	29	F - C	F

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

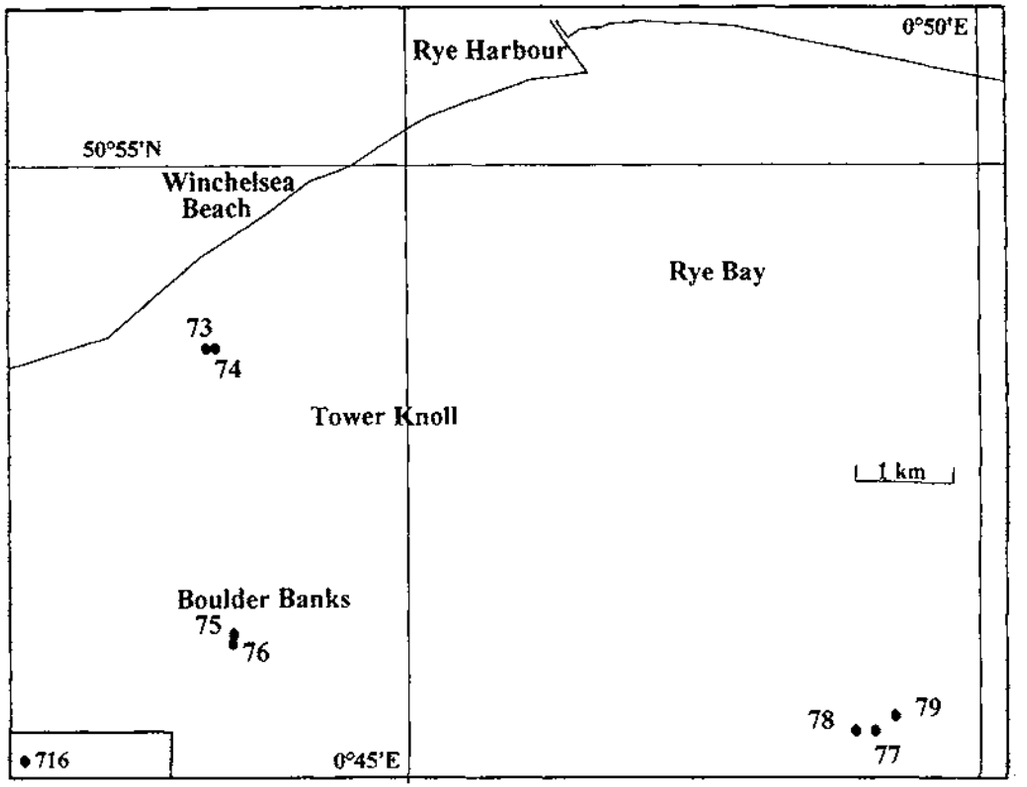

Fig. 40. Location of SEASEARCH *dive sites within Rye Bay, 1992-1998.*

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SECTOR: **RYE BAY**

(Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
716	73	SE of Pett Level.	50 53.85'N 00 43.31'E	TQ 913 144	1	Seabed of sand at 1.8m BCD.						100		
716	74	Off Pett Level.	50 53.84'N 00 43.33'E	TQ 914 144	1	Seabed of sand at 0.7m BCD.						100		
716	75	Nr Boulder Banks.	50 51.92'N 00 43.49'E	TQ 917 109	1	Seabed of sand at 9.4m BCD.						100		
716	76	E of Boulder Banks.	50 51.87'N 00 43.53'E	TQ 917 108	1	Seabed of sand at 8.5m BCD.						100		
716	78	Rye Bay 2.	50 51.31'N 00 48.93'E	TQ 981 100	1	Seabed of mud at 20.2m BCD.							100	
716	77	Rye Bay 1.	50 51.31'N 00 49.09'E	TQ 983 100	1	Seabed of mud at 18.2m BCD.							100	
716	79	Rye Bay 3.	50 51.41'N 00 49.30'E	TQ 985 102	1	Seabed of mud at 20.2m BCD.							100	
7 Records Processed														

7.15 Dungeness

Overview

The stretch of coast bordering this section runs from Jury's Gap in the west (OS northing line of TQ995) marking the East Sussex/Kent border, to Dungeness in the east (OS northing line of TR095), a west-to-east distance of 10.0 km.

Strictly speaking, this sector lies outside the area of interest covered by the project, as it lies off the Kent coast. However, 3 dives were undertaken in 1997 in the vicinity of Stephenson's Shoal (716/80-82), as this area looked to be of interest from the Admiralty chart.

Features of interest (west to east)

So far, no particular features of interest have been encountered from this sector.

Noteworthy habitats and characterising communities

As with the neighbouring sector of Rye Bay, the seabed here is also largely composed of fine sand with fragments of shell.

DUNGENESS DATABASE INFORMATION (1992-98)	
Total no. of dive site records: 3	Total no. of habitat records: 3
Total number of species (& higher taxa) recorded within this sector: 12	

Species recorded from over 20% of habitat records		Frequency of occurrence		Abundance *	
Species	Common name	No. of records	%	Range	Median
Ophiuroidea	unidentified brittlestars	3	100	O - C	F
Pagurus bernhardus	large hermit crab	2	67	O - C	O
Buccinum undatum	common whelk	2	67	O - O	O
Hydrozoa	unidentified hydroids	1	33	O - O	O
Actinaria	unidentified anemones	1	33	O - O	O
Paguridae	unidentified hermit crabs	1	33	C - C	C
Portunidae	unidentified swimming crabs	1	33	C - C	C
Necora puber	velvet swimming crab	1	33	R - R	R
Opisthobranchia	unidentified sea slugs	1	33	R - R	R
Echinocardium sp.	unidentified heart urchin	1	33	F - F	F
Pomatoschistus sp.	unidentified gobies	1	33	R - R	R

* Abundance scale: S: Superabundant A: Abundant C: Common F: Frequent O: Occasional R: Rare P: Present

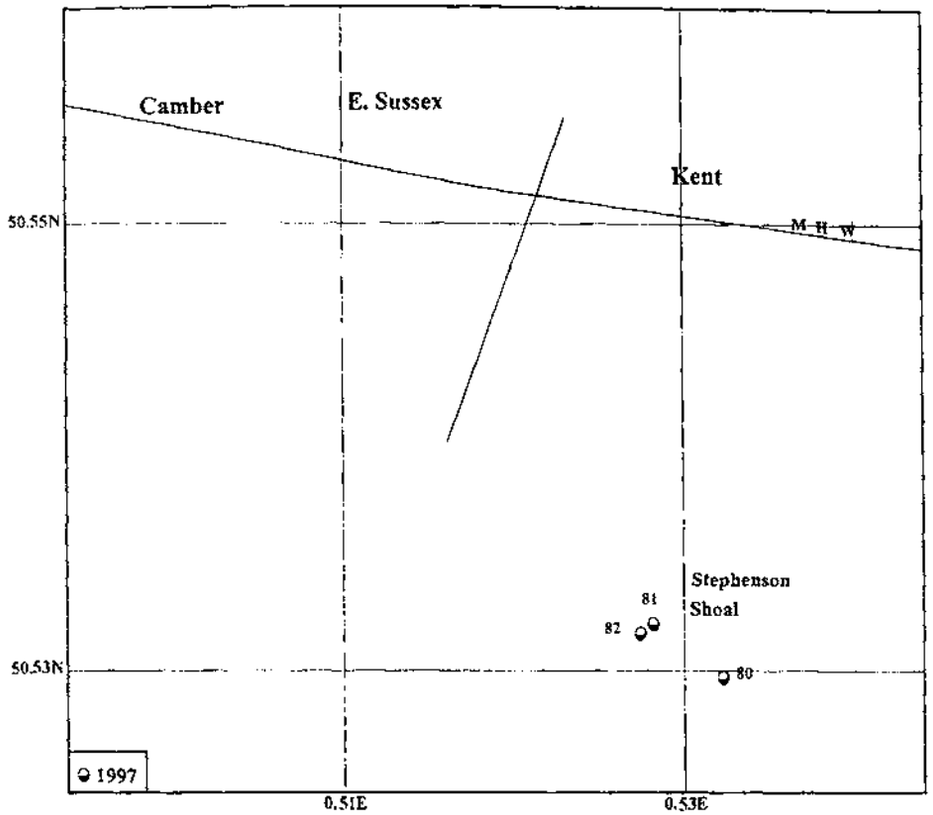

Fig. 41. Location of SEASEARCH *dive sites within the Dungeness sector, 1992-1998.*

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SECTOR: **DUNGENESS** (Sites arranged in order: West to East)

Survey	Site	SITE NAME	Position	Grid ref.	Hab	Habitat name	Substratum composition							
							Bed	Bld	Cob	Peb	Grv	Snd	Mud	Oth
716	82	Stephenson Shoal 3.	50 53.04'N 00 52.57'E	TR 022 133	1	Seabed of mud at 10m BCD.							100	
716	81	Stephenson Shoal 2.	50 53.05'N 00 52.60'E	TR 023 134	1	Seabed of sand at 10m BCD.						99		1
716	80	Stephenson Shoal 1.	50 52.77'N 00 53.14'E	TR 029 129	1	Seabed of mud with some shell at 11.4m BCD.						98		2
3 Records Processed														

8. Species of interest

SEASEARCH is primarily a methodology for recording seabed habitats. However, as a means of helping to distinguish separate biotopes associated with these habitats, participating divers are encouraged to record the characterising species from each habitat. Consequently, the emphasis on obtaining detailed species lists from each dive has been minimal. Of course, the limited ability of most divers to recognise many marine species means that most recording forms only have a few species listed. So a high degree of under-recording of species is likely to have happened. In addition, it tends to be the larger, more obvious and easily recognised species that are noted down in favour of less conspicuous, tricky-to-identify-*in situ* species.

A selection of species is given in Sections 8.2 - 8.12, some being particularly common and characteristic of a certain habitat; others being of note because of their rarity.

A complete list of species recorded from Sussex *SEASEARCH* dives is given in Appendix 7.

A list of the thirty most frequently recorded species is given in Table 13 below.

THE 30 MOST FREQUENTLY RECORDED SPECIES DATABASE INFORMATION (1992-1998)	
Total no. of dive site records: 636	Total no. of habitat records: 1019
Total no. of species (& higher taxa) recorded from all habitats:	

	Species recorded from all habitat records		Frequency of occurrence		Abundance *	
	Species	Common name	No. of records	%	Range	Median
1	Paguridae	unidentified hermit crabs	292	29	P - A	O
2	-	foliose red algae	271	27	P - S	O
3	*Crepidula fornicata*	slipper limpet	239	23	P - S	O
4	*Alcyonium digitatum*	dead man's fingers	237	23	P - A	O
5	*Necora puber*	velvet swimming crab	226	22	P - A	R
6	*Cancer pagurus*	edible crab	214	21	P - A	R
7	*Urticina felina*	dahlia anemone	207	20	P - C	O
8	*Flustra foliacea*	hornwrack	199	20	P - A	O
9	Hydrozoa	unidentified hydroids	176	17	P - A	O
10	*Trisopterus luscus*	bib	175	17	P - A	F
11	*Maja squinado*	spiny spider crab	167	16	P - A	R
12	*Lanice conchilega*	sandmason worm	163	16	P - S	O
13	*Ctenolabrus rupestris*	goldsinny wrasse	139	14	P - C	O
14	*Esperiopsis fucorum*	'shredded carrot' sponge	128	13	P - A	O
15	Cirripedia	unidentified barnacles	125	12	P - S	O
16	*Pagurus bernhardus*	large hermit crab	123	12	P - A	O
17	*Mytilus edulis*	common mussel	120	12	P - S	C
18=	Porifera indet. crusts	unidentified encrusting sponges	119	12	P - A	O
18=	*Pomatoschistus* spp.	unidentified gobies	119	12	P - A	O
20	*Hinia reticulata*	netted dogwhelk	114	11	P - A	O
21=	*Anemonia viridis*	snakelocks anemone	113	11	P - C	R
21=	*Labrus bergylta*	ballan wrasse	113	11	P - C	R
23	*Callionymus lyra*	dragonet	106	10	P - A	R
24	*Styela clava*	leathery sea squirt	105	10	P - A	O
25=	*Dysidea fragilis*	'goose bump' sponge	104	10	P - C	O
25=	*Parablennius gattorugine*	tompot blenny	104	10	P - A	O
27	*Buccinum undatum*	common whelk	96	9	P - C	O
28	*Calliblepharis ciliata*	red alga	91	9	P - A	O
29	*Calliostoma zizyphinum*	painted topshell	90	9	P - C	O
30	*Homarus gammarus*	lobster	86	8	P - C	R

Table 13. The 30 most frequently recorded species from Sussex SEASEARCH *dives.*

8.1 Biogeographical location of Sussex

The counties of West and East Sussex lie at the eastern end of the English Channel and their coastline is affected by a body of water moving up the Channel from the south-west and, to a far lesser degree, by water exiting the North Sea. The maritime region lies within a transition zone between England's east coast, with its relatively restricted diversity of habitats and species, and the more diverse south-west coast flora and fauna. The Solent area to the west of Sussex effectively separates the biogeographic provinces of the eastern and western parts of the English Channel.

Some species appear to reach the easternmost limit of their distributions off the Sussex coast. Examples include the jewel anemone *Corynactis viridis*, the Devonshire cup coral *Caryophyllia smithii* and the bryozoan *Pentapora foliacea*, all of which are more commonly encountered further west. It is interesting to note that both *Corynactis* and *Caryophyllia* have been recorded from wrecks off Sussex, typically deep water wrecks; they do not appear to be present on bedrock or boulder reefs, with which one would expect to find them further west. *Corynactis* was recorded on the 'Outer Mulberry' wreck off Pagham in the early 1980s, but it has not been recorded from there during the current survey. There are, however, quite a number (50 or more) of individual *Caryophyllia* cup corals present at this site (first recorded during *SEASEARCH* surveys in 1996). However, it is not certain whether these are actually *Caryophyllia smithii* individuals, as they appear from photographs to be somewhat different in appearance to those found further offshore. The easternmost records of Ross 'coral' *Pentapora foliacea* (a bryozoan) are from the Royal Sovereign Shoals sandstone reef, 12 km east of Beachy Head (715/18 & 715/24).

8.2 Algae (seaweeds)

Seaweeds are often under-recorded on surveys of this sort. This is largely because of their 'lack of appeal' to most divers, and because many are difficult to identify by the novice recorder (and even by the experienced marine biologist!). Indeed, some records have been returned by divers from shallow water habitats where seaweeds were bound to be present, yet there is no mention of them at all on the recording form. It is therefore likely that the total number of habitats from which seaweeds have been recorded is an underestimate.

Chlorophyta (green algae)

The most frequently recorded green algae were are set out in Table 14.

	Name	No. of habitat descriptions	% (1019 habitat descriptions)	Depth range (BCD)
1	foliose green algae (indet.)	28	3%	2-14 m
2	*Ulva lactuca* sea lettuce	19	2%	1-6 m
3	*Enteromorpha* spp.	8	<1%	0-6 m

Table 14. The most frequently recorded green algae from SEASEARCH dives, 1992-1998.

Phaeophyta (brown algae)

The most frequently recorded brown algae are set out in Table 15. It is interesting to note the maximum depth at which *Laminaria hyperborea* has been recorded (8 m BCD). This species of kelp occurs within shallow waters adjacent to much of the coastline of the British Isles (being absent from the north Kent coast to the Suffolk coast). The maximum depth at which it grows provides an indication of the clarity (or, conversely, the turbidity) of the water. In the Isles of Scilly, for instance, the deepest depth has been recorded as being 17.6 m BCD (Irving &

Mackenzie 1996), while at Shakespeare Cliff close to Dover (the Channel Tunnel site) the deepest depth has been recorded as 3 m BCD (Wood & Wood 1986).

	Name	No. of habitat descriptions	% (1019 habitat descriptions)	Depth range (BCD)
1	foliose brown algae (indet.)	43	4%	1-12 m
2	*Chorda filum* bootlace weed	34	3%	1-12 m
3	*Laminaria saccharina* sugar kelp	26	3%	+1-8 m
4	*Laminaria hyperborea* kelp/cuvie	17	2%	1-8 m
5	*Dictyota dichotoma*	17	2%	2-23 m [1]
6	*Halidrys siliquosa* podweed	15	2%	1-8 m
7	*Laminaria digitata* kelp/tangle	13	1%	0-7 m
8	*Desmerestia aculeata*	11	1%	1-7 m

Footnotes: [1] maximum depth recorded from the Outer Owers.

Table 15. The most frequently recorded brown algae from SEASEARCH *dives, 1992-1998.*

Rhodophyta (red algae)

The most frequently recorded red algae are set out in Table 16. The species listed here are relatively easy to recognise (when compared to many species of red algae) and this may have some bearing on the frequency with which they have been recorded. It is possible that other species may be more common than those listed here, but recorders have not identified them during dives. Instead, they have been grouped under the collective term of 'foliose red algae'.

	Name	No. of habitat descriptions	% (1019 habitat descriptions)	Depth range (BCD)
1	foliose red algae (indet.)	271	27%	1-25 m [1]
2	*Calliblepharis ciliata*	91	9%	1-23 m [2]
3	encrusting coralline algae (indet.)	65	6%	2-24 m
4	*Plocamium cartilagineum*	40	4%	0-23 m [2]
5	*Chondrus crispus*	37	4%	1-11 m
6	*Dilsea carnosa*	30	3%	1-11 m
7	*Delesseria sanguinea* sea beech	19	2%	1-12 m

Footnotes: [1] maximum depth recorded from the bottom of the Mixon Hole.
[2] maximum depth recorded from the Outer Owers.

Table 16. The most frequently recorded red algae from SEASEARCH *dives, 1992-1998.*

Efforts were made to encourage recorders to collect samples of seaweeds they did not recognise, for pressing and later identification by experts. However, unfortunately this suggestion was not widely taken up.

8.3 Porifera (sponges)

Sponges are often conspicuous to the diver due to their bright colours but, apart from a few species, they are notoriously difficult to identify. Consequently, certain species may well have been under-recorded on *SEASEARCH* dives, simply because they were not recognised *in situ*. Sussex has a good diversity of sponges: Ackers (in Wood 1984) recorded 24 species from the Waldrons, 20 species from the Outer Mulberry and 21 species from Bognor Reef. Where individual species were not recognised, they were recorded as 'Porifera indet.', of which there were 52 records.

***Esperiopsis fucorum* 'shredded carrot' sponge** – an orange encrusting sponge which may, given suitable conditions, develop tassels (hence the common name). The old generic name was *Amphilectis* and several *SEASEARCH* divers are still recording it as this. Relatively easy to spot and identify under water and hence well recorded. Found wherever the substratum is of

bedrock, boulders or stable cobbles. This was the most frequently recorded sponge species. Recorded from 128 (13%) habitat descriptions.

***Dysidea fragilis* 'goose bump' sponge** - this distinctive sponge was the second most frequently recorded sponge in Sussex near-shore waters (on 104 habitat descriptions = 10%), being found wherever the substratum is of bedrock, boulders or stable cobbles.

***Cliona celata* yellow boring sponge** – present as 'boring' phase (never as 'massive' phase) on/in limestone and dead shells. Recorded from 54 (5%) habitat descriptions.

Suberites ficus* and *S. carnosus – two species which are very similar in appearance and difficult to tell apart under water. *S. ficus* was recorded from 14 habitat descriptions and *S. carnosus* from 19. However, because of their similarity, individuals were often recorded as *Suberites* sp., on 68 (7%) of habitat descriptions. Until recently, *S. ficus* used to be known as *S. domuncula*.

8.4 Cnidaria

8.4.1 Hydrozoa (sea firs)

['Hydrozoa indet.' were recorded on 176 (17%) habitat descriptions.]

Several inexperienced *SEASEARCH* recorders may mistake hydroids for seaweeds, particularly those hydroid species which are long, limp and feather-like e.g. *Sertularia argentea*, *S. cupressina* or *Obelia longissima*. Only a few species can be identified *in situ* with any certainty (such as *Nemertesia*, *Tubularia* and *Hydrallmania*) and hence the recording of 'Hydrozoa indet.' on frequent occasions. This may also be the reason why these species are often recorded, though they may not necessarily be the most common hydroid species off Sussex.

Tubularia indivisa – more common on wrecks, where it may totally dominate any parts standing proud of the seabed, than on reefs. Favours sites with strong water movement. Recorded from the top edge of the Worthing Lumps chalk cliff. Tends to be more conspicuous early in the season, before its tentacular heads have been eaten off by predatory sea slugs and other organisms, so may have been under-recorded from dives later in the year. Recorded from just 8 (<1%) habitat descriptions.

Nemertesia antennina – the most frequently recorded hydroid, from 82 habitat descriptions (8%). Typically found on mixed areas of cobbles, pebbles and gravel. This species is conspicuous and easy to recognise.

Nemertesia ramosa – this species closely resembles *N. antennina* but it has branching stems. Relatively scarce in Sussex, being recorded from just 5 (<1%) habitat descriptions. In addition, *Nemertesia* sp. was recorded from 28 (3%) habitat descriptions.

Hydrallmania falcata – Another easy-to-recognise hydroid, frequently recorded from mixed substrata of pebbles, gravel and sand. Present on 46 (5%) habitat descriptions.

8.4.2 Anthozoa (sea anemones and their relatives)

['Actinaria' or simply 'anemones' were recorded on 82 (8%) of habitat descriptions.]

***Alcyonium digitatum* dead man's fingers** – easily recognised and commonly recorded from habitats which featured bedrock, boulders or large cobbles. Also present on deep water wrecks. Recorded from 237 (23%) of the 1019 habitat descriptions. The majority of specimens within Sussex are of the white variety, though a few orange coloured colonies have also been recorded.

Actinothoe sphyrodeta – a small though conspicuous anemone, frequently recorded attached to cobbles, small and large boulders and bedrock (typically of sandstone). Usually in small groups. All white individuals are very similar to white forms (var. *nivea*) of *Sagartia elegans*, and orange-centred forms can be confused with *S. elegans* var. *venusta*, so there may have

been some mis-identifications. However, all(?) records from Sussex *SEASEARCH* dives appear to have been of all-white *Actinothoe*. Recorded from 132 (13%) of the habitat descriptions.

***Urticina felina* dahlia anemone** – the most commonly recorded anemone present off the Sussex coast, appearing on 207 of the 1019 habitat descriptions (20%). Typically found in mixed sediment areas. The similar-looking, though usually larger, *Urticina eques* was not thought to be present in the English Channel, but it has now been recorded from Sussex waters. The tentacles of *U. eques* tend to be more stubby than those of *U. felina*. *U. eques* was recorded on 4 (<1%) habitat descriptions. One dubious record of *Bolocera tuediae* was made from NW of the Elphick Tree reef off Eastbourne at 13 m depth BCD (715/16). This anemone has a northern distribution around the British Isles, and whilst its presence here in the Eastern Channel is possible, its identification may have been confused with that of *Urticina eques*, which it closely resembles.

***Cereus pedunculatus* daisy anemone** – frequently recorded from areas of mixed sediments, particularly those with a high proportion of gravel and sand. Thought to be reaching the easternmost limits of its distribution off Sussex. Recorded from 58 (6%) habitat descriptions.

***Anemonia viridis* snakelocks anemone** – frequently encountered in shallow, mixed sediment areas. Both grey-brown individuals and those with green tentacles with pink tips have been recorded from Sussex waters. Recorded from 113 (10%) habitat descriptions. Also thought to be reaching the easternmost limits of its distribution off Sussex.

Cerianthus lloydii – a burrowing, tube-dwelling anemone typically associated with muddy sand and gravel. Recorded occasionally from suitable habitats – 30 (3%).

***Aureliana heterocera* imperial anemone** – this anemone does not appear on the database of *SEASEARCH* records from 1992-98, though it has been recorded in the past (Wood 1984) and it has recently been photographed from Sussex waters. It has unmistakable short, knobbed tentacles, though it is able to retract its disc and tentacles very fast. Rare.

8.5 Polychaeta (bristle worms)

Polydora ciliata – probably under-recorded due to its small size. In fact there are no *SEASEARCH* records of it occurring at all, though it is known to be present in vast numbers. The worm itself is rarely seen – it is usually only its small burrows within fractured pieces of chalk that are noticed.

***Lanice conchilega* sandmason worm** – an easily recognisable (and hence frequently recorded?) species, characteristic of shallow, sheltered and/or tideswept sand. The most frequently recorded polychaete, being present in 163 (16%) habitat descriptions.

Sabellaria spinulosa – probably overlooked at many sites, even by experienced recorders. It was recorded on just 7 habitat descriptions (<1%). This worm builds tubes out of sand grains which help to bind together pieces of gravel and pebbles. As such, large areas of what would otherwise be mobile substrata affected by wave action and/or tidal streams, can be stabilised. It has recently come to light that the honeycomb worm *Sabellaria alveolata* may also be found subtidally (within Morecambe Bay), so a closer look at the identification of individual worms may be necessary in future.

***Bispira volutacornis* fan worm** – another easy-to-recognise species and frequently recorded from reef areas. It was present on 69 habitat descriptions (7%).

***Sabella pavonina* peacock worm** – less frequently recorded than *Bispira volutacornis* (from 55 or 5% habitat descriptions), though also easy to recognise.

Filograna implexa* and *Salmacina dysteri – these two serpulid species are extremely difficult to tell apart under water, and consequently the numbers of habitat descriptions from which each was recorded should be viewed together - i.e. as 'Filograninae' (20 habitat descriptions or 2%). Indeed, in the majority of cases, both species have entered on to the database as Filograninae,

the sub-family to which both species belong. Found associated with both sandstone and chalk outcrops.

8.6 Minor phyla

8.6.1 Platyhelminthes (flatworms)

***Prostheceraeus vittatus* pyjama-striped flatworm** – a conspicuous species though not particularly frequently seen. Recorded from 19 (2%) habitat descriptions.

8.6.2 Phoronida (horseshoe worms)

***Phoronis hippocrepia* horseshoe worm** - found growing in colonies boring into limestone and chalk bedrock. To date, it has been recorded on 25 habitat descriptions (= 2%).

8.7 Crustacea

8.7.1 Cirripedia (barnacles) to Isopoda

Barnacles are difficult to identify by the inexpert eye when under water, so most recorders have made mention of 'barnacles' rather than specifying the species. When they have been positively identified, *Balanus crenatus* and *Semibalanus balanoides* have been the two most frequently recorded species.

Harpacticoid copepods have been recorded by David Ventham of Brighton from a variety of substrata brought to the surface by divers in polythene bags (see Appendix 8). On more than one occasion he has recorded more than 2,000 individuals of the same species from just a handful of seaweeds. See also section 10.2.

8.7.2 Decapoda (shrimps, crabs, etc.)

shrimps/prawns - tricky to identify to species with any certainty when under water, even by experienced recorders. Most records have been grouped under the Infraorder Caridea, to which all shrimps and prawns belong. 'Caridea' have been recorded from 21 (2%) habitat descriptions.

***Necora puber* velvet swimming crab** – formerly known as *Macropipus puber* and then *Liocarcinus puber*, this easy-to-recognise crab has been recorded frequently, being present on 226 habitat descriptions (22%).

***Cancer pagurus* edible crab** – an easy-to-recognise species though often hidden from view on daytime dives. Recorded from 214 habitat descriptions (21%). Most individuals encountered were smaller than the Sussex legal landing size (14 cm across the carapace).

***Maja squinado* spiny spider crab** – likely to be encountered on all habitat types, and occasionally found in very large numbers (believed to be mating aggregations). Recorded on 167 habitat descriptions (16%)

***Corystes cassivelaunus* masked crab** – a burrowing crab restricted to sandy areas. Present from 42 habitat descriptions (4%), though likely to have been under-recorded as the crabs are usually hidden from view, buried within the sand. Most records are from off the East Sussex coast.

hermit crabs – the most commonly recorded group during *SEASEARCH* dives, present on 423 habitat descriptions (42%). Typically, *P. bernhardus* has been most frequently seen (123 or 12%), found on mixed sediments and sand, though other smaller hermit crabs have also been recorded. These smaller hermit crabs are more difficult to identify under water and tend to be recorded as simply as 'small hermit crabs'. Where this has been the case, they have been entered onto the database as Family 'Paguridae' (292 or 29%).

***Homarus gammarus* lobster** – recorded from 86 habitat descriptions (8%), typically associated with bedrock reefs and boulder areas. They are usually well hidden during the day.

8.8 Mollusca

8.8.1 Gastropoda (sea snails)

***Calliostoma zizyphinum* painted topshell** – a conspicuous and frequently recorded species from reef and cobble areas. Recorded from 90 (9%) habitat descriptions. In some cases, the common name of 'topshell' was used by recorders, which could be *C. zizyphinum* but could also be several other species. These records have been entered under the Family 'Trochidae' from an additional 43 (4%) habitat descriptions.

***Hinia reticulata* netted dogwhelk** – frequently recorded from mixed substrata and sandy areas. Present on 114 (11%) of habitat records. The similar, but smaller, *Hinia incrassata* is also found off Sussex, but was only recorded on 5 (<1%) habitat descriptions. The two species may be confused by some. In addition, some recorders refer to *Hinia* sp. as a 'dogwhelk'. This term is usually reserved for the gastropod which occurs intertidally *Nucella lapillus*. When 'dogwhelk' is looked up in identification guides, it is given as *Nucella*. All of these *Nucella* records have been changed on the database to *Hinia* sp. (50 records).

8.8.2 Opisthobranchia (sea slugs, etc.)

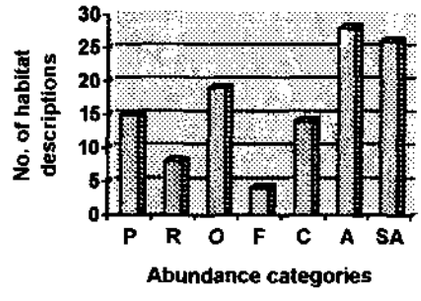
***Archidoris pseudoargus* sea lemon** – the most frequently recorded nudibranch, recorded from 36 habitat descriptions (4%). This sea slug feeds on sponges, particularly the breadcrumb sponge *Halichondria panicea*, and is typically found on shallow reefs. This was also the most frequently recorded nudibranch during the Sussex Sublittoral Survey (Wood 1984).

Thecacera pennigera - this very small nudibranch (maximum length 30 mm) was recorded from one dive off Beachy Head. As far as is known, this is the easternmost record for this species, which is usually found in the south-west to the west of the Isle of Wight (Picton & Morrow 1994).

Other nudibranchs recorded on more than one occasion include *Polycera faeroensis*, *Polycera quadrilineata*, *Janolus cristatus* and *Eubranchus ticolor*. Nudibranchs are notoriously ephemeral, being present in large numbers in one year yet absent the next, so little emphasis should be placed on these records.

8.8.3 Pelecypoda (bivalve shells)

***Mytilus edulis* common mussel** – may form extensive beds carpeting the sea floor, when their numbers would be recorded as abundant or even super-abundant. Elsewhere they are present as small clusters attached to pebbles, cobbles or boulders, or as clumps of small individuals (juveniles). The abundance range from all 120 records is represented opposite.



***Pholas dactylus* common piddock** – the most frequently recorded piddock, especially where exposures of chalk occur. Tends to favour making vertical burrows in horizontal clay or chalk exposures. Largely responsible for the 'natural' disintegration of chalk bedrock, especially underwater 'cliffs', together with the spionid polychaete worm *Polydora ciliata*. Recorded from 75 (7%) habitat descriptions.

Hiatella arctica - recorded infrequently, and far less than *Pholas dactylus* with just 4 records. It is smaller than *P. dactylus* and tends to favour making horizontal burrows on upraised areas of rock.

8.8.4 Cephalopoda (cuttlefish, etc.)

***Sepia officinalis* cuttlefish** - Recorded from 13 (1%) of habitat descriptions, often associated with areas of mixed sediment where there is shelter (e.g. a reef) nearby. Cuttlefish move inshore during the early summer, when they are most likely to be seen by divers.

***Sepiola atlantica* little cuttle** - This species has been recorded off the Sussex coast, though it is more likely to be seen on night dives in shallow water.

8.9 Bryozoa

Bryozoan turf – recorded by *SEASEARCH* recorders from many reef and wreck habitats, but not present as a distinct entity on the database as there is no category for it! Where it has been recorded on survey recording forms, it has been entered on to the database simply as 'Bryozoa indet.' (38 records). Bryozoan turf is likely to be dominated by species of *Bugula*, particularly *B. plumosa*. There are also 41 records of 'indet. bryozoan crusts'.

***Alcyonidium diaphanum* 'finger' bryozoan** – present on areas of mixed sediment, particularly those where gravel, pebbles, broken shell and sand predominate. Recorded from 55 (5%) habitat descriptions.

***Flustra foliacea* hornwrack** - attached to cobbles, boulders and bedrock. Able to tolerate sand-scour and appears to favour areas of high turbidity and moderate to strong water movement. Recorded from 199 (20%) habitat descriptions. The similar looking species *Securiflustra securifrons* has also been recorded, though samples were not taken and there is a possibility that this might have been *Chartella papyracea*.

8.10 Echinodermata

As Wood (1984) points out, the most noticeable feature about the Sussex echinoderm fauna is the extreme paucity of species. Less than 10 species have been recorded during diving projects over the years, which, when one considers the variety of suitable habitats, is surprising. Additional species have turned up in grab samples however.

8.10.1 Asteroidea (starfish)

***Asterias rubens* common starfish** – the most frequently recorded starfish, but not as common as one might expect. Likely to be present in high numbers (and as large individuals) on mussel beds (one of their main prey items). Recorded from 116 (11%) of habitat descriptions.

***Henricia oculata* bloody Henry** – present on sandstone reefs (sponges are its main prey items), though only seen rarely. Recorded from just 7 habitat descriptions (<1%).

***Crossaster papposus* sunstar** – found rarely, typically in medium depth waters and then only as single individuals. Just six separate records: from 7 km due south of Middleton-on-Sea (711/37) at 10-13 m BCD; west of the Royal Sovereign Light (713/201) at 15-17m BCD; Long Shoal, Royal Sovereign Reef, approx. 12 km east of Eastbourne (714/54) at 5-7 m BCD; Royal Sovereign Shoals (close to the previous site) (715/20) at 10-15 m BCD; Pevensey Bay (717/28) at 5-6m BCD; and off Eastbourne (717/33) at 8m BCD. All individuals, as far as can be ascertained, were relatively small. Picton (1993) refers to the occurrence of *Crossaster* as being 'common and widespread all round the British Isles but rare on the south coast'. It is interesting to note that five of the above six records are to the east of Beachy Head.

8.10.2 Ophiuroidea (brittlestars)

Ophiothrix fragilis - rare: only recorded on one habitat description.

Ophiura albida – occasionally recorded from the surface of muddy sand or muddy gravel. Recorded on just 8 (<1%) habitat descriptions.

Ophiura ophiura- occasionally recorded from the surface of muddy sand. Recorded on just 9 (1%) habitat descriptions. This species used to be known as *Ophiura texturata*.

8.10.3 Echinoidea (sea urchins) & Holothuroidea (sea cucumbers)

Psammechinus miliaris **small sea urchin** - likely to be found in areas of coarse sand mixed with gravel. It may be overlooked by divers due to its small size and habit of hiding away during daylight hours. It has only been recorded from 2 habitat records. Ventham (1992) recorded *Psammechinus* on the lower shore (1-2 m above chart datum) in the Brighton area.

Echinocardium cordatum **heart urchin** – Recorded from 64 habitat descriptions (= 6%). It is present in large numbers in sandy areas, though its presence may be under-recorded as a result of its burrowing habit. Many dead and dying individuals were found on the surface of the sandy seabed to the SE of Brighton during *SEASEARCH* dives on 6/7 May 1995, probably due to de-oxygenation of the water column from a decaying plankton bloom (see also section 9.8). As extensive sandy areas occur off the East Sussex coast, it is more likely that *Echinocardium* will be encountered here than off the West Sussex coast.

Only one holothurian (identified as *Aslia lefeveri* from Looe Gate off Shoreham – 713/172) was recorded off the Sussex coast during *SEASEARCH* dives between 1992-1996. None were found during the Sussex Sublittoral Survey, 1982-1983 (Wood 1984), but a small group of burrowing sea cucumbers was recorded as occupying empty piddock holes in chalk bedrock from South-West Rocks during the SE MCS Chalk Cliffs Project (Wood 1992). Though no specimens were taken at the time, it was thought that these were *Aslia lefeveri*. These are believed to be the easternmost records of burrowing sea cucumbers in the English Channel. In addition, Collins & Mallinson (1983) reported finding two species of holothurians, *Thyone* sp. and *Cucumaria* sp., associated with limestone bedrock during their survey of the East Solent to Selsey Bill. However, it is not known if these were found on limestone exposures east of the Bembridge Ledges or on the limestone reefs to the south of Selsey Bill.

8.11 Ascidiacea (sea squirts)

Clavelina lepadiformis **lightbulb sea squirt** – another easy-to-recognise species, but small enough to be missed by the inexperienced recorder. Recorded on 77 habitat descriptions (8%), typically from bedrock and boulder areas. *Clavelina lepadiformis* is a western species which is approaching its easterly limits along the Channel here.

Morchellium argus – Frequently found on reefs amongst faunal turf on vertical surfaces or under overhangs. Resembles *Aplidium punctum* with which it may have been confused by some recorders, as they are found in similar habitats. *M. argus* recorded on 35 habitat descriptions (3%), and *A. punctum* on 35 (3%).

Ascidiella aspersa – frequently recorded from shallow, sheltered areas. Recorded on 41 habitat descriptions (4%).

Molgula manhattensis - Only recorded from four habitat descriptions off East Sussex (e.g. off Beachy Head), where turbid fast-flowing water occurs. However, at these sites it was common. As a result of difficulties identifying this species with certainty, several descriptions (12 or 1%) simply have *Molgula* sp. recorded.

Botryllus schlosseri **star ascidian** – an easy-to-recognise colonial sea squirt, recorded on 50 habitat descriptions (5%).

Botrylloides leachi – another colonial sea squirt which is relatively straightforward to identify. Recorded on 11 habitat descriptions (1%).

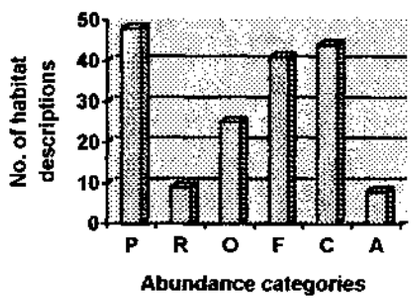
8.12 Fish

The ten most frequently recorded fish species on *SEASEARCH* dives between 1992 and 1998 were:

SPECIES	NO. OF HABITAT DESCRIPTIONS	ABUNDANCE RANGE *	MEDIAN *	HABITAT TYPE
Trisopterus luscus bib	175 (17%)	P - A	F	shoals on reefs & wrecks
Ctenolabrus rupestris goldsinny wrasse	139 (14%)	P - C	O	reefs
Pomatoschistus spp. gobies (indet.)	119 (12%)	P - A	R	mixed substrata
Labrus bergylta ballan wrasse	113 (11%)	P - C	R	shallow weedy areas
Callionymus lyra dragonet	107 (10%)	P - A	O	mixed substrata
Parablennius gattorugine tompot blenny	104 (10%)	P - A	O	reefs
Pleuronectes platessa plaice	58 (6%)	P - F	R	mixed substrata
Crenilabrus melops corkwing wrasse	43 (4%)	P - C	R	shallow reefs
Thorogobius ephippatus leopard-spotted goby	40 (4%)	P - C	R	mixed substrata / reefs
Pomatoschistus minutus sand goby	34 (3%)	P - C	R	sandy areas

* key to abundance scale: P: present; R: rare; O: occasional; F: frequent; C: common; A: abundant

***Trisopterus luscus* bib** – the most frequently recorded fish species. Typically present in shoals associated with reefs and wrecks. The abundance range from all 175 records is represented opposite. The 'P' (Present) category is used when no other indication of abundance is given by the recorder. If this category is overlooked, then the largest categories are Frequent and Common, reflecting this fish's habit of shoaling.



Labridae (wrasse) – all five species of wrasse found in British waters were recorded during Sussex *SEASEARCH* dives. The commonest three are mentioned in the table above. The cuckoo wrasse *Labrus mixtus* was recorded on 17 habitat descriptions (2%), typically from deep water reef areas in the western part of the survey area. The rock cook *Centrolabrus exoletus* was seen on just four dives (713/9; 713/138; 716/23; and 717/13). It is rarely encountered in the eastern Channel, and was only recorded once during the 1982/83 Sussex Sublittoral Survey (Wood 1984).

***Pollachius pollachius* pollack** – It is interesting to note that pollack were recorded on 39 habitat descriptions (4%), whereas saithe *Pollachius virens*, with which pollack can be easily mistaken and which is also present in Sussex waters, was not recorded at all. Large pollack are often seen on offshore wrecks, with small individuals occurring in shallower waters. Ventham (1992) recorded 'O' group *P. pollachius* in lower shore rockpools at Roedean, Brighton, trapped by the falling tide.

***Raniceps raninus* tadpole-fish** – a rarely seen fish and just recorded once from within a small cave at the base of the chalk cliff at South-West Rocks (713/162).

***Zeus faber* John Dory** – more typically found further west and scarce within Sussex waters. Encountered at two sites: Inner Waldrons off Bognor (712/58); and Ship Rock off Hove (713/187).

8.13 Species of particular nature conservation interest

A number of species are of particular interest, either because of their rarity or as a result of other reasons. Their rarity may be due to Sussex being at the edge of their geographical range, or because they are rarely found throughout the British Isles as a whole, or because they have strict habitat preferences. A number of examples are given below.

***Caryophyllia smithii* Devonshire cup coral** – rarely recorded with just 3 records: the Outer Mulberry (713/122); the *Zaanstroom* (713/32); and the *City of Waterford* (716/12). Though usually associated with reefs, this cup coral has only been found on wrecks in Sussex, and then as sparse individuals. Indeed, Sussex appears to be the further east along the English Channel from which *C. smithii* has been recorded. However, there is some doubt that the 50 or so individuals present on the Outer Mulberry are in fact *C. smithii*, as their appearance seems different to those found further offshore.

***Corynactis viridis* jewel anemone** – only recorded from vertical surfaces on deep water wrecks, from just 4 records. A small group of jewel anemones were present on the Outer Mulberry up until the early 1980s, but they were not recorded from there again until April 1999 (Jane Lilley, pers. comm.). Again, Sussex probably marks the easternmost limit of the distribution of this species. The easternmost record is from Pevensey Bay (713/201).

***Pentapora foliacea* Ross 'coral'** – This erect species of bryozoan is typically thought of as having a southern and western distribution within the British Isles, extending eastwards only as far as Dorset. However, Wood (1990) recorded it as being present on the Royal Sovereign Shoals, and this has been confirmed by the present survey (715/18), with it also being recorded from Pevensey Shoal (715/24). Interestingly, Wood (1990) states that *Pentapora foliacea* is not found on chalk; however, during the present survey it was recorded from the top (horizontal) section of the chalk cliffs of the Worthing Lumps. It has been recorded on 22 habitat descriptions (= 2%) in total.

***Balistes carolinensis* trigger fish** – a Mediterranean species which, in recent years, has regularly been reported from off the Sussex during the summer months by divers and anglers. It is probably close to the eastern limits of its summer distribution here. It has been suggested that its bio-geographical range may have been extended as a result of warmer sea temperatures, though whether this is linked with global warming or just a reflection that certain summers are warmer than others is open to dispute. It is not known whether trigger fish breed in the waters of the English Channel – there are no records of their larvae being present in the plankton. One triggerfish was recorded during a *SEASEARCH* dive at Ship Rock off Hove in 1993 (712/202).

Dolphins are occasionally seen off the Sussex coast. On one fortuitous occasion, in August 1994 off Littlehampton, a solitary **bottlenose dolphin *Tursiops truncatus*** came to investigate the small inflatable in which a group of *SEASEARCH* divers were returning to their launch site after completing their dives. As luck would have it, Matt Ruglys happened to be in the boat with his video camera, and he managed to record some footage of the dolphin which was later added on to the end of the Sussex *SEASEARCH* video. Porpoises, once common in these waters, are now very rarely seen.

8.13.1 Introduced species

The central English Channel, and in particular the Solent, is a focal point for many marine species which have been introduced to the British Isles, either accidentally or as purposeful introductions. The main reason why this area should have a high proportion of these species is primarily due to shipping activity, centred on the port of Southampton. There are a number of ways by which these non-native species may enter our waters. Many arrive as planktonic forms in ballast water which is discharged from a ship prior to the loading of a new cargo. Others may actually be attached to the hull of a ship[9]. Whilst many introduced species cannot survive to form viable populations, others have found our waters to their liking and have spread both eastwards and westwards from the Solent. Consequently, Sussex has a particularly high number of introduced marine species. A number are commented on below.

[9] A full report on introduced species by Dr Clare Eno has recently been published: Eno. N.C. 1997. *A review of non-native marine species in British waters.* Joint Nature Conservation Committee, Peterborough.

Attached plants of the non-native brown alga ***Sargassum muticum*** **japweed** were first noted in British waters at Bembridge on the east side of the Isle of Wight in 1973. Since then, despite early attempts to eradicate it, the plant has spread along the whole of the south coast. Interestingly, no attached plants have been recorded during *SEASEARCH* dives, but they have been seen in Chichester Harbour, Shoreham Harbour and within Brighton Marina. [In addition, *Sargassum muticum* is also present 'in local abundance' along a 100 m stretch of shore between Ovingdean Gap and Rottingdean (to the east of Brighton) in shallow pools around Mean Low Water Neaps (~ 1.9 m ACD) (David Ventham, pers. comm. 17.2.99). DV first noticed it here in quantity in March 1986.]

Crepidula fornicata **slipper limpet** - a non-native species, first appearing in this country from North America at the turn of the century. The species has now spread along much of the south coast and has been the most frequently recorded species of mollusc during *SEASEARCH* dives, particularly in areas of mixed sediment. It has been recorded on 240 habitat descriptions (= 24%). In some areas, the dead shells of slipper limpets collect to form large piles, forming a habitat in their own right.

Styela clava **leathery sea squirt** – a non-native introduced species from the Pacific which is now common in the central English Channel. Commonly recorded from areas of mixed substrata, especially gravel with pebbles and some muddy sand. Present on 105 habitat records (10%).

8.13.2 Other species of interest

The following information was supplied by David Ventham (pers. comm. 7.2.99), who lives in Brighton and who has a particular interest in harpacticoid copepods. Samples of substrata and of attached seaweed have been collected for him by *SEASEARCH* divers during 1994, 1995 and 1997 for the purpose of identifying algae, hydroids and bryozoans (see Appendix 8), and for extracting and examining associated harpacticoid copepods (and other fauna). Several interesting records of warm water species (other than copepods) are given below. His harpacticoid studies are on-going and the results will be published elsewhere.

Please note that the dive numbers given here are the Field Site numbers, whereas elsewhere in this report the Report Site numbers are used. In general, these are interchangeable, using the following substitutions:

92 (= 1992) ≡ 711 93 (= 1993) ≡ 713 94 (= 1994) ≡ 713 95 (= 1995) ≡ 714
96 (= 1996) ≡ 715 97 (= 1997) ≡ 716 98 (= 1998) ≡ 717

Hydrozoa

Clytia paulensis (Vanhöffen) - a temperate to warm water species recorded widely in both Atlantic and Indo-Pacific Oceans, but in British waters recorded only from south Devon and Suffolk (Cornelius 1995). Small colonies were found in six samples collected from various dive sites, ranging from the 'Outer Mulberry' to SE of Newhaven: on the hydroid *Obelia longissima* (94/65 & 94/166); on the red seaweed *Calliblepharis ciliata* and the hydroid *Tridentata distans* (95/- (55)); on the hydroid *Hydrallmania falcata* (95/61); and on the red seaweed *Spyridia filamentosa* (95/95 & 95/- (80)).

Crustacea

Synisoma lancifer (Leach) - an isopod with a Lusitanian distribution found in amongst two samples of red algae, one collected off Worthing (94/196), the other from Hope Point, Cuckmere Haven (95/41), the latter being the easternmost record for this species along the south coast. The only other Sussex records of this species are from the intertidal in the Brighton area at Roedean, Ovingdean and Saltdean (Ventham 1990).

Bryozoa

Lichenopora radiata (Audouin) - occurs widely throughout the Mediterranean, and probably only occurs along southern and south-western shores of the British Isles (Hayward & Ryland 1985). Found in three samples from the Worthing Lumps: on the stems of the hydroid *Tubularia indivisa* (94/136); as detached specimens (original substrate uncertain) in a mixed sample of red algae, *T. indivisa* and the bryozoan *Flustra foliacea* (94/138); and in a seaweed sample comprised of *Dictyota dichotoma* and various red algae (94/199).

Mimosella verticillata (Heller) - known from Lundy, Brittany and by old records from Roscoff and the Adriatic, as well as from Brazil and the Indo-Malayan region (Hayward 1985; pers. comm. Dr P.J. Hayward to DV, 2.2.99). Small growths found on the red seaweed *Spyridia filamentosa* and on the hydroid *Hydrallmania falcata*, both collected from South West Rocks (94/163).

Epistomia bursaria (L.) - known to range from south Devon to Cromer, but appears patchy, and reported several times from the north-western Mediterranean (Hayward & Ryland 1998). Found on *Spyridia filamentosa* from a dive site 5 km south of Selsey Bill (97/62).

Scupocellaria scrupea Busk - a wide-ranging warm water species recorded mainly from the south-west of the British Isles (Hayward & Ryland 1998), which probably ranges some way up the east coast, but has not been looked for (pers. comm. Dr P.J. Hayward to DV, 2.2.99). Found amongst hydroid/bryozoan turf from HMS *Northcoates* (94/121) and in two samples from the 'Outer Mulberry': algal/erect bryozoan mat smothered by silt (94/122); and bryozoan turf (a non-*SEASEARCH* dive 97/- (98), 27.7.97).

Haplopoma bimucronatum (Moll) - in British waters known only from the Channel Islands; also Bay of Biscay and the Mediterranean (Hayward & Ryland 1979; pers. comm. Dr P.J. Hayward to DV, 2.2.99). Small incrustations on the red alga *Halopithys incurvus* collected from a reef west of the Mixon Hole (?97/36).

9. Human activities and impacts

9.1 Marine aggregate dredging

The extraction of sands and gravels from off the south-east coast represents an important economic resource. Licensed and concession areas are awarded to commercial companies, subject to environmental impact assessment and monitoring programmes managed by the Marine Estates Division of the Crown Estate. Procedures have become more rigorous since the mid-1980s (Parrish 1988; Uren 1988) and involve an evaluation of possible impacts, particularly in relation to sediment transport and possible 'draw-down' of near-shore and beach sediments into depressions on the seabed created by dredging (Wood 1992b).

A large area to the south of Littlehampton, known as the Owers Licensed Dredging Area, has been earmarked by the Crown Estate for the purposes of extracting sand and gravel. Other areas exist to the east and south-east of the Isle of Wight, and also off Hastings. Extraction licences are only issued after a consultation process has been carried out, known as the Government View Procedure. This is administered by the Minerals and Land Reclamation Division of the Department of the Environment, Transport and the Regions (DETR). Only a small part of a given licensed 'block' will be worked at any one time.

Licensed extraction areas tend to be between 10 –20 km off the coast and so generally lie outside the area of interest of *SEASEARCH* dives. However, areas down-tide of the actual extraction site may well experience an increased sediment and/or silt loading and increased levels of turbidity. Particular concern has been expressed in some quarters should extraction take place close to areas of rich biological diversity such as reefs and wrecks, where increased sedimentation, siltation and turbidity might have severe consequences. As far as is known, there have not been any studies carried out in the area specifically on the nature conservation implications of aggregate extraction. To date, assessments have concentrated on impacts on coastal erosion and fisheries.

9.2 Spoil dumping

Maintenance dredging of navigation channels (particularly at the mouths of rivers/harbours and within marinas) takes place on a regular basis. Deposits of mud and silty sand build up in these areas and need to be cleared from time to time in order to maintain a deep water channel for the safe passage of ships. The dumping of dredge spoils at sea is licensed by the Ministry of Agriculture, Fisheries and Food. This activity may only be carried out in designated dumping grounds and amounts are controlled by the Dumping at Sea Act 1974. One of the main concerns when granting licences has been the effect on local fisheries.

The adverse effects of spoil dumping are similar to those for aggregate extraction, with the additional immediate impact on smothering the marine life in the dumping area. As a result of the finer material being dumped, water turbidity is likely to increase over a wider area.

9.3 Sewage outfalls

The main constituent of sewage is organic matter and it is generally believed that, given sufficient dilution, it is effectively broken down by the natural purifying action of the sea. This includes bacterial processes and the effect of salinity and exposure to ultraviolet light from the sun on the harmful bacteria present in the sewage. With the implementation of the EC Urban Waste Water Treatment Directive, much more stringent measures will come into force concerning the practice of disposing of untreated sewage directly into the sea, especially from coastal towns. Southern

Water plc have been upgrading all of their coastal sewage works in a major works programme ('Operation SeaClean).

No dives have been undertaken in the immediate vicinity of outfalls, as volunteer divers were not adequately equipped for this (use of full-face masks being recommended).

9.4 Litter

With the exception of odd bits of fishing gear and netting, items of litter are rarely seen on dives unless the dives are undertaken close to piers or harbour walls. Discarded fishing line (together with hooks and weights) adorns many inshore and offshore wrecks popular with sea anglers. These items can prove hazardous for divers as the line is often inconspicuous and can easily snag on diving gear. Occasional sightings of paper, plastic bags, polystyrene and driftwood have been recorded on the surface.

9.5 Mooring/anchoring of craft

Each time a boat drops an anchor over the side, there is an impact of some sort on the seabed below. The severity of this impact on the marine life present will depend on a number of factors: the weight of the anchor and chain; the type of seabed; and whether the anchor stays put or whether it drags over the seabed for some distance. Whatever the circumstances, the impact will only be felt on a very small area of seabed, and the damage done will be minimal (when viewed in the wider context of the habitat as a whole).

Fixed moorings prevent the need for repetitive anchoring in the same place to be undertaken, and so from an ecological viewpoint, it could be argued, are to be welcomed. In addition, moorings are often sited in locations where the seabed is of mud or muddy sand, such as within harbours or marinas. Thus they can provide a small amount of hard substratum on what is otherwise a soft and mobile seabed. Sessile species, which require a hard substratum in order to attach, will quickly colonise such sites through settlement of their planktonic larvae. If left undisturbed, a surprisingly diverse community can develop, as has been the case amongst moorings within Chichester Harbour (see section 6.1.4.5). However, moorings do need to be maintained, with lengths of chain and shackles being replaced periodically. These operations, when they take place, will have some impact on the seabed in the immediate vicinity of the mooring.

9.6 SCUBA Diving

Recreational SCUBA diving may also have an impact, albeit very small and localised, on the marine environment. No matter how diligent they try to be when under water, divers can land heavily on the seabed at the end of their descent; they may grab onto rocks or weed to help stabilise themselves; they may make furrows in soft sediments when trying to fight against a strong current; and they can inadvertently crunch organisms such as Ross coral with their fins. Thankfully, most marine organisms are pretty hardy creatures (especially those that over-winter) and can survive such events! An additional problem is of exhaust bubbles becoming trapped on the roofs of caves or within wrecks. If these are not swept away, the pocket of air that remains will kill any attached forms of marine life present.

9.7 Angling

Sea angling is a very popular recreational pastime, and the Sussex coast is no exception. Look along any harbour wall or pier during a summer weekend and dozens of anglers can be seen casting their lines. It is not known whether any studies have been undertaken to access what impact this activity has on near-shore fish populations. Discarded fishing gear, usually the result of hooks becoming snagged amongst rocks and/or weed, is certainly present adjacent to harbour walls and piers. On one dive within Brighton Marina, undertaken as part of the SEMCS survey in

1989 (Jenkins 1990), a lobster, found close to the western arm of the outer harbour wall, was observed to have nylon fishing line wrapped around its body and limbs. The lobster, though still alive, appeared emaciated and weak, indicating that the line was preventing it from feeding.

Many of the offshore wrecks are also popular with anglers, as well as with divers. Whilst there is no obvious clash of interests here, divers must be prepared to encounter tangled line and hooks snagged in parts of the wreckage. Responsible anglers will return large territorial fish (such as wrasse and conger) to the sea. However, it is now only on those deep water wrecks which lie some distance offshore (and which few anglers get to) that divers will see large individual fish.

9.8 Commercial fishing

The near-shore waters off the Sussex coast are heavily fished. In general, potting for crabs and lobsters is very important off West Sussex, whilst catches of white fish (e.g. plaice, brill, Dover sole, lemon sole, whiting and cod) are the main stay of boats operating off the East Sussex coast. The fishery is overseen by the Sussex Sea Fisheries Committee, and a report on fisheries activities is produced each year.

Certain fishing practices are known to damage the seabed and it is these which are of most concern from a nature conservation viewpoint.

9.8.1 Pair trawling

Pair trawling (two boats operating a single net) is carried out particularly during the spring and summer for bottom-dwelling (demersal) species such as plaice, brill, Dover sole, lemon sole, whiting and cod. Black bream are taken when they migrate inshore during the summer, and cuttlefish are caught during the spring. The use of 'rock hopper foot ropes' enables trawls to catch other species such as smelts, sprats, mackerel and horse-mackerel over areas not normally fished by orthodox trawlers.

Reports from local divers mention considerable damage being done to sections of the underwater chalk cliffs between Worthing and Brighton, with the blame being directed towards pair trawlers. Clean chalk rubble is piled high in places where the top of the cliff has been ripped away. It is not known whether the trawler skippers are aware of their nets being pulled over the cliffs. However, the damage they are doing is considerable. The importance of these sublittoral cliffs has been stressed elsewhere in this report, and it would be inexcusable not to make some effort at trying to protect them. The identification of most of these cliff sections as marine SNCIs in 1996 has helped to highlight their importance, but is this message getting through to the fishermen?

9.8.2 Potting

All reefs, sublittoral cliffs and areas of boulders off the Sussex coast are heavily potted for lobster *Homarus gammarus* and crab (edible *Cancer pagurus* and spiny spider *Maia squinado*). Some potting for whelks and prawns is also undertaken, but it is secondary to crab and lobster fishing.

The author is not aware of any reports indicating that damage is being done to the seabed and/or benthic communities by pots. Most concern centres on the numbers of pots being deployed and the belief that the fishery cannot support such numbers for long. Most of the edible crabs encountered by divers during *SEASEARCH* dives have been 'small to medium' in size, and probably below the minimum landing size.

9.8.3 Oyster dredging in Chichester Harbour

Oyster dredging has been carried out within the Harbour for a number of years during the winter months (November to April), and is regulated by a Sussex Sea Fisheries Committee byelaw. The dredges are pulled along the main drainage channels, disturbing the top few centimetres of mud/clay. Parallel scour marks were recorded in the channel north-east of East Head [93/37], presumably caused by dredging activity. As no other records of the bottom community typical of this habitat are available, it is not possible to comment on what effect the dredges may be having on the marine life (Irving 1994). Yields from oyster dredging are increasing each year (S. Holman, pers. comm., 1994). Rich bottom communities were recorded from shell and cobble areas in amongst moorings at the entrance to the Emsworth Channel [93/48]. These are likely to avoid damage from dredges (though dredging does take place very close to the moorings – P. Couchman, pers. comm., 1994).

9.9 Plankton blooms

Within the last ten years, there has been a growing interest in the apparent increase in the anthropogenic input of nutrients into rivers and lakes and also into coastal waters. Much of this has centred on the debate concerning the disposal of sewage waste into coastal waters. Unless secondary treatment or higher has been undertaken, the waste water which enters the sea from sewage outfall pipes contains a high proportion of liquidised organic matter. This will add a small but locally significant amount to the nutrient load. Another source of nutrient input is direct run-off from land, especially where this has drained off arable fields, likely to have been treated with fertilisers.

As a consequence of the vast diluting effect of the sea and the complex interactions of nutrient recycling which take place within the sea, it is very difficult to quantify the effects of adding excess nutrients to the marine environment (Irving 1993). The first organisms to make the most of enriched conditions are the primary producers, the attached macroalgae and the free-floating phytoplankton. Nutrient enrichment is implicated in the more frequent occurrence of surface phytoplankton blooms, and in their extended duration (Irving 1993).

One particular deoxygenation event, which it is thought had come about through the decay of a phytoplankton bloom, was witnessed during one SE MCS *SEASEARCH* diving weekend. On the weekend of the 6/7 May 1995, a number of dives took place off the Brighton/Peacehaven stretch of the East Sussex coast. Sea conditions were flat calm on both days, with clear skies and warm sunshine. Indeed, the weather had been like this for the whole of the previous week, with air temperatures in the low 20s °C. The sea temperature was 11 °C; no thermocline was detected. The water column, from the surface to a depth of 2 m, was noted as being particularly clear. Below this, however, a dense bloom of phytoplankton was present, consisting primarily of the biflagellate *Phaeocystis* sp., which extended to the seabed some 20 m below (a depth of 16.5 m BCD).

A large proportion of the seabed in this area is of fine sand with occasional fragments of shells, occasionally overlying low-lying exposures of chalk bedrock. For the dives which took place on sand, all divers reported seeing large numbers of heart urchins *Echinocardium cordatum* on the surface of the sand, many of which were dead or dying. These urchins, when in a healthy condition, are normally hidden from view, buried 10-15 cm below the sand surface. In addition, surprisingly large numbers of the masked crab *Corystes cassivelaunus* (about 3 per m^2) were present on the surface, some dead and others appearing extremely lethargic in their movements. The crabs showed no sign of burrowing as one might have expected them to do. The one other organism conspicuous by its large numbers was the netted dogwhelk *Hinia reticulata*. These snails are renowned scavengers and have the ability to home in on decaying organic matter from a considerable distance. Several were clumped on top of the heart urchin tests.

The breakdown by bacteria and other organisms of large quantities of plankton can lead to dissolved oxygen levels in the water column rapidly decreasing. This would be most noticeable on the seabed, partly because this is the least well-oxygenated zone of the water column during calm periods, and partly because the decaying plankton would sink to the seabed. It is here where most bacterial breakdown, and hence oxygen consumption, takes place.

Plankton blooms naturally occur during the spring months when there are more nutrients available in the water column (after the winter storms). Increasing day length and light intensity allow for an increase in photosynthetic activity by phytoplankton, which in turn leads to a sudden explosion in their numbers. There is then likely to be a bloom in zooplankton, making the most of this abundance of food. Plankton blooms typically occur during May and June, the duration and periodic extent of blooms varying from year to year depending on local conditions. However, there is growing circumstantial evidence that blooms in the eastern English Channel in recent years are becoming more widespread and of greater duration. It has yet to be proved whether this is linked to anthropogenic nutrient inputs.

10. Uses of the project

10.1 Raising the awareness of divers & others

An important part of the *SEASEARCH* project has been to inform and educate as many people as possible about what lies beneath the murky waters of the English Channel. This has been done by a variety of means: slide shows, lectures, the production of a video and poster, radio and TV interviews and magazine articles.

By so doing, it is hoped that people will acquire a greater understanding of the local marine environment, no matter how shallow or deep that understanding may be. By taking part in the project, divers are immediately made aware of the range of seabed types off Sussex, the various biological communities associated with each seabed type, and the key species found there. Even if their identification skills are basic at the start, they are bound to learn more about what they are seeing. What is particularly important, and this should be viewed as a way of keeping them interested in the project, is to ensure that they receive regular feedback about the project. The project Newsletter is designed, in part, to serve this function.

10.2 Collection of samples/data for scientific purposes

A number of samples and specimens of marine organisms have been collected by *SEASEARCH* divers on behalf of other parties.

- Jan Light (Conchological Society) has been particularly interested in records of sublittoral molluscs so that she can include them in the next edition of her Atlas of Molluscs for Sea Area Wight.

- David Ventham (an independent marine biologist based in Brighton) has been studying the distribution of marine harpacticoid copepods along the Sussex coast. These animals are barely visible to the naked eye. However, they occur in very large numbers on seaweeds, erect bryozoans, hydroids and within mixed sediments. Divers have collected over 50 bagged samples for David since 1993.

- Botanical Gardens, Edinburgh – a request in February 1996 for divers to collect samples for the British Marine Diatom Flora project. A positive, willing response was given to this request, but we heard nothing more about it!

10.3 Use of data by other parties

It is intended that the *SEASEARCH* data will be freely available to all of the project's funding partners. Other parties with a commercial interest in the information, such as environmental consultancies, will be required to pay a fee for access to the database. It is proposed that *SEASEARCH* information should be included in statutory documents such as Shoreline Management Plans wherever possible.

Other uses include contributing to environmental assessments in the management and planning of near-shore activities; the selection of further marine SNCIs; the provision of information on benthic habitats and communities associated with dredging licence applications.

10.4 Contributing to other publications

Shoreline Management Plans (as drawn up by local authorities)
Coastal Directories (Irving 1998b)

EN Natural Area summaries (English Nature 1997 & 1998)

10.5 Preparation of a database for marine algae in Sussex

Initial discussions have taken place amongst interested parties (Natural History Museum, Sussex Wildlife Trust, Booth Museum) to produce a database and/or an atlas of marine algae for Sussex. This project is being led by Ian Tittley of the Natural History Museum's Department of Botany.

10.6 Spreading the word

As a result of the experiences of establishing and running the project in Sussex, the project co-ordinator has been asked to give *SEASEARCH* training courses to a number of other groups in other parts of the country. These have included groups in:

Swanage, Dorset
Ilfracombe, North Devon
Fal estuary/Helford River, Cornwall
Jersey, Channel Islands
St Agnes, Cornwall
Diving groups visiting the Isles of Scilly (Coral Cay Conservation S-AC) and Lundy (MCS)

The new Recording Forms, designed by Robert Irving following his experience with the Sussex *SEASEARCH* project, have now been used by several other groups throughout the country.

Moves are now underway by the Marine Conservation Society to enlarge the *SEASEARCH* project nationally. Proposals for establishing a National Steering Group and a full-time National Co-ordinator were put forward in July 1999 (Irving 1999) - see also section 11.4.

11. Continuation of the project

11.1 On-going commitment of funding

It is most encouraging to note that many of the organisations that have contributed to the project since 1992 have expressed an interest in continuing to support the project beyond the year 2000. The driving force behind the project has been David Harvey, team leader of English Nature's Surrey and Sussex team, who has encouraged and cajoled his counterparts in the other organisations into finding funds to commit to the project.

All of the funding organisations have an interest in the findings of the project, foremost being the nature conservation interest of the near-shore seabed off Sussex.

11.2 Increased involvement of local diving clubs

One of the few disappointments of the project has been the poor take-up of the project by local diving clubs (see also section 2.4.3). This of course was unpredictable at the outset, and it is still not clear why this has been the case. In order to alleviate this, a number of alterations to the organising and execution of the project have been proposed. These include the appointment of a number of local co-ordinators who would be asked to make contact with local diving clubs within their area, inform them about the project, and encourage them to complete recording forms after their dives.

11.3 Re-design of the Recording Form in 1997

In light of the difficulty experienced in transferring information from both the Site and Diver Recording Forms onto the MNCR database, a new Recording Form was designed for use by volunteers during 1997. A copy of the new form is included in Appendix 5. It is also hoped that this new form will be accepted as the standard *SEASEARCH* recording form for use throughout the country.

11.4 The development of SEASEARCH as a national project

SEASEARCH was designed as a recording methodology which could be used by divers to record seabed habitats wherever they were diving. Indeed, projects have been undertaken throughout the country, although the Sussex Project is the longest running and has been responsible for developing the project to its present status. In a national context, limited financial support has come from the country conservation agencies (English Nature, Scottish Natural Heritage and the Countryside Council for Wales). However, up until early 1999, there has not been a co-ordinated approach to run the project on a nationwide scale.

In March 1999, English Nature contracted the Marine Conservation Society to undertake a Scoping Study into the future development and expansion of the *SEASEARCH* Project. At the time of writing, a draft report of this study (Irving 1999) is about to be circulated for comment to a selected number of individuals.

The main conclusions of the Scoping Study are:

1. Substantial funding should be sought to develop a tiered Diver Training Programme within MCS. The three suggested levels are *Habitat surveyor* (Beginner), *SEASEARCH surveyor* (Intermediate) and *Biotopes and Species surveyor* (Advanced).

2. In order to develop and manage the Diver Training Programme, a full-time National Project Co-ordinator should be appointed for a minimum of three years. In addition to this post, nine part-time Regional Co-ordinators are recommended (throughout the UK), who would be responsible for implementing the Training Programme. The Regional Co-ordinators would appoint a number of volunteer Local Project Leaders who would help run local *SEASEARCH* projects, as and where these were initiated.
3. Data acquired from the *Habitat surveyor* and *SEASEARCH surveyor* local projects would be fed into a main database, having undergone a series of quality assurance checks. These data would then be available to the country nature conservation agencies, and would be integrated into the National Biodiversity Network and *MarLIN*.

11.5 Creating a site on the World Wide Web

In order to promote the Sussex *SEASEARCH* project to a wider audience, an entry on the World Wide Web has been designed by Kim Jones and Robert Irving, which was launched in October 1997. The site has a number of access levels.

The Sussex *SEASEARCH* site was originally set up at:

http://www.bpsnet.co.uk/seasearch/sussex

The site is currently being re-designed by Robert Smith and is likely to be given a new address. The name *SEASEARCH* has been registered as a domain name.

12. Acknowledgements

Many organisations and individuals have been associated with the Sussex *SEASEARCH* project since its inception in 1992. I have attempted here to list all those who have helped in some way - apologies to anyone who has been overlooked!

Participants

Volunteer divers who have taken part in *SEASEARCH* dives & have submitted a recording form are listed below. Without the participation of these divers, the project would not have happened.

Graham Ackers
Grant Aitken
Carol Aldridge
Chris Allen
R. Amos
Rod Arnold
Bill Baldock
Lin Baldock
Dave Barnes
Sue Barton
Jeremy Batten
P. Batten
Bill Beckinsale
Jean Beckinsale
Andy Beer
Ben Benatt
Anne Berk
Tony Berk
Paul Bertorelli
Sue Bewsey
Paul Biggin
Vicki Billings
Beverly Boileau
Alison Bourne
Clare Bradshaw
Sue Burton
Jay Butler
K. Capper
Gerry Casey
Hal Celebi
Bryony Chapman
Steve Cherry
Pete Christmas
Claire Coughlan
Daniel Collier
Lucy Conway
Mark Crumplin
Tim Dakers
Paul Daltry
Rhian David
Karen Davies
Melanie Dixon
Tony Dobinson
Douglas Donaldson
John Doubleday
Cath Downie
Joanne Dyer
Paul Dyer
Carol Edwards
Nick Emsley
Bill Farnham
Sue Faulkner
Helene Fearon
Jenni Fleming
David Fletcher
Mark Foram
N. Ford
Sarah Fowler
Sue Fuller
Sue Gilbard
Neil Gilbert
Alan Glen
Adam Golberg
Daniel Golberg
Chris Grainger
Mike Grainger
Chris Griffiths
Martin Guard
James Guest
David Gunnersen
Richard Hall
David Harvey
Sue Heaps
Bill Hewitt
Peter Hewitt
M. Heywood
Dawn Hinton
Kay Ingleton
Jill Ireland
Robert Irving
Hazel Jacobs
Jo Jamieson
Ron Johnson
Gareth Jones
Kim Jones
Leigh Jones
S. Jones
Howard Kallender
David Kay
M. Keeping
Gordon Kennedy
Ray Kingshott
Colin Kinnear
John Kirby
Derek Knibb
Iain Knight
Jo Lewin
Chris Lewis
Jane Lilley
Julie Lintunen
Ron Luckett
David Lund
Neil Lynch
Joanna MacMillan
Anthony Male
Brod Mason
Stephen Mawle
A. McCarthy
Mike McCarthy
I. McDowall
Chris McTernan
Karen Meidlinger
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Paul Messiter
Simon Milling
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John Moore
Kevin Morgan
Melissa Morton
Kate Myers
Robin Nicholson
Jeannie Ninis
James Nokes
Kate Northen
J. Ormston
Jess Ostler
Adam Pamment
Nigel Paris
Andy Parkinson
Jon Parsons
Clive Pearce
Rachel Pears
Mary Pedder
Graham Pembleton
Tim Pickett
Marcus Polley
I. Pritchard
Geoff Reade
S. Rennie
Hilary Richardson
Jon Ridley
Clare Robinson
Ann Roobottom
Olive Rouse
Mark Rowe
Mark Ruball
Matt Ruglys
Ian Russell
Zal Rustom
Bill Sanderson
Laura Sandford-Johnson
Alan Sharpe
Terry Shaw
Geoff Shaxton
Leona Shepherd
Val Shepherd
Mark Sherwood
Jadzia Sieniienska
Nick Smart
D. Smith
Greg Smith
Ron Smith
Tom Springall
Chris Spurrier
Simon Stagnell
Damon Stanwell-Smith
Kevin Steadman
Elaine Stone
Paul Stratham
Alex Tait
Alison Taylor
Teresa Tellus
Dave Thomas
Jeremy Thomas
John Thomas
Nicky Thomas
Nigel Thomas
Andy Thompson
Kate Thorne
Jan Tomlinson
Mark Tomlinson
Linda Townley
Martin Tulett
Peter Van Leeuwen
Katherine Varvill
Robert Wade
John Watson
Daniel Waygood
Gail Webster

M. Webster
Ben Wells
Geoff Wells
Paul Westwood
Julian Whippy
Steve White
Rob Wilburn
M. Wilkinson
Andy Willett
Caroline Williams
Pat Williams
Bob Wilson
Matt Wilson
Paul Wilson
Chris Wood
Liz Wood
Chris Woodd-Walker
Liz Woodd-Walker

Loan of boats

Bill Baldock (inflatable)
Ian Duffill (PV *Kingfisher*)
Bill & Peter Hewitt (RIB *Jaffa*)
Sussex Diving Club (RIB)
Brighton Marina Yacht Club, Diving Section (RIB)
Marine Conservation Society, SE Group (inflatable)
Adam Pamment (RIB)
Wittering Divers (inflatable)

Photographers

Chris Allen
Bill Baldock
Vicki Billings
Gerry Casey
Tim Dakers
David Gunnersen
David Harvey
Bill Hewitt
Peter Hewitt
Robert Irving
Kim Jones
Bill Sanderson
Elizabeth Woodd-Walker

Local knowledge

Nick Fecher
Tony Dobinson
David Harvey
Kim Jones

Participation of dive clubs

Bricket Wood SAC
Brighton Marina Yacht Club (Diving Section)
Bromley SAC
Coral Cay Conservation SAC
Chichester SAC
Imperial College SAC
High Wycombe SAC
Orpington SAC
Stevenage SAC
Sussex Diving Club

Scientific assistance with recording, species identifications, and/or loan of photographs

Graham Ackers, Dorking
Dr Ken Collins, Dept. of Oceanography, University of Southampton
John Cooper, Booth Museum, Brighton
Dr Bill Farnham, Marine Labs., University of Portsmouth
Sarah Fowler, Nature Conservation Bureau Ltd., Newbury
Emmy Kelly, Hayling Island
Jenny Mallinson, Dept. of Oceanography, University of Southampton
Kate Northen, MNCR, Peterborough
Dr Bill Sanderson, MNCR, Peterborough
Chris Spurrier, Natural History Museum, London
Dr Nigel Thomas, Southern Science/EMU Environmental
David Ventham, Brighton
Dr Elizabeth Wood, Eversley, Hants.

Data verification, database input & database management

Clare Bradshaw (data verification from 1992 & 1993)
Christine Fotheringham (volunteer, data input)
Chris Grainger (volunteer, data input)
Keiren Houston (volunteer, data input)
Godfrey Jones (volunteer, data input)
Dr Gerald Legg (database supervisor, Booth Museum)
Jane Lilley (data verification & transcription of recording forms)
Dave McDonald (database management, MNCR)
Eleanor Murray (database management, MNCR)
Kate Northen (database management, MNCR)

Assistance with production of the project video 'Sussex *SEASEARCH*'

Matt Ruglys – cameraman/producer
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Andrew Lee, Sussex Wildlife Trust
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Assistance with the colour poster
'*Undersea Sussex*'

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Assistance with the Species ID Guide *Sussex Marine Life*

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Assistance with mapping

Dr Gerald Legg, Booth Museum
and with thanks to Alan Morton for *DMap*

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APPENDICES

1. Summary Report of BioMar/SeaMap studies by Dr Bob Foster-Smith
   + colour maps
2. The Project's 'Promptsheet'
3. Sample (completed) Dive Recording Form
4. Sample (completed) Site Recording Form
5. New (completed) Recording Form (1997 onwards) & Guidance Notes for its completion
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APPENDIX 1

Summary Report of BioMar/SeaMap studies

by Dr Bob Foster-Smith

Summary Report of BioMar/SeaMap studies by Dr Bob Foster-Smith

Section A: Survey of the sublittoral reefs

1. Methods

1.1. Use of the RoxAnn acoustic ground discrimination system

The principle behind the survey strategy is to use an acoustic ground discrimination system to generate a map of acoustic characteristics of the sea floor. Different ground types can then be distinguished and this information used to select locations for sampling the biota on the sea floor using remote viewing techniques. The acoustic data are then reanalysed using the ground truth data to classify the acoustic data according to sediment or community type. The methodology for mapping based on acoustic remote sensing and stratified ground truth sampling has been explained in some detail by Foster-Smith, Davies & Sotheran (1997) and only a brief description of the methodology is given below.

The equipment used by SeaMap for acoustic survey is based on a RoxAnn signal processor which samples the return echo from a 200kHz echo sounder. Apart from depth, RoxAnn produces two pieces of information derived from the first (E1) and second (E2) echoes that can be interpreted as a measure of roughness and hardness of the sea floor respectively. Information on position was provided by a GPS. These track data are collected and saved at set time intervals (5 sec) on a laptop computer, which also supplies time and date for each data point. The apparatus is entirely self-contained and portable so that it can be set up on a wide variety of craft.

Information is obtained from a limited area under the survey vessel as it proceeds and a map of the acoustic properties of the sea floor is built up from parallel tracks and the nature of the ground between tracks is interpolated during subsequent data processing. The real-time display of track data is extremely valuable in giving an initial impression of the distribution of different ground types and can be used to select sample sites. However, the main analysis that results in sediment and biological community maps are produced subsequent to the field survey.

1.2. Equipment for ground truthing

The main purpose of ground truthing in SeaMap surveys is to describe biotopes in sufficient detail for their identification together with additional data that might be used to qualify biotope descriptions. Remote video gives sufficient information for this purpose for hard substrata with more limited information from soft sediments. The main ground truthing equipment is a towed remote video. The towed video system consists of a Sony Hi-8 camera in an underwater housing fitted into a small stainless steel frame with runners. The camera is set to record before being lowered to the seafloor and, additionally, an umbilical relays pictures to a surface monitor. The camera is towed as the vessel drifts. The apparatus is low cost and extremely manoeuvrable over rough ground.

Soft sediments were not specifically targeted in the survey and no infaunal sampling was conducted.

The data from the *SEASEARCH* diving surveys has not been incorporated into the classification of the acoustic images to date.

1.3. Sidescan sonar

Sidescan sonar produces images of the topography of the sea floor that look very much like a monochrome photograph. The acoustic equipment is housed in a towed 'fish' and the data relayed to a computer on-board via an umbilical. Sidescan images scroll as the data is collected. Although parallel tracks can be pieced together to build up images of large areas, the sidescan sonar was used in this survey simply to produce a single scroll along representative transect lines. Analysis of these images is yet to be completed.

1.4. Data analysis and classification of the acoustic image

There are four stages in the analysis of the acoustic data when preparing biotope maps:-

1.4.1. Treatment of data prior to image processing

Data were examined and spurious data removed and then the depth data were corrected to chart datum. The data were also standardised, a procedure which successfully enabled data sets from three different surveys to be combined. These standardised values were used in place of the original values.

1.4.2. Interpolation

Interpolation is a key stage in data analysis which allows the use of digital image processing and profoundly affects the look of the resulting biotope map. Interpolation calculates a new data set of regularly spaced values in the form of a grid. Interpolation was performed with Surfer™ using the inverse distance interpolation algorithm provided. Interpolation results in a regular grid of E1, E2 and depth values covering the survey area. The grid values can be converted into a raster image necessary for image processing or used to produce contoured maps of the continuous variables. The analyst must determine what spacing between these grid values can be justified by the track data. For example, choosing to interpolate values every 50m when the tracks are separated by 500m will result in numerous interpolated values some distance from any real data. These interpolated values cannot be justified by the track data. In the analysis carried out with the Sussex data a spacing of 150m was used for interpolation for the whole dataset, although some sections of the survey area might be able to support closer track spacing.

1.4.3. Classification of the acoustic image

The ground truth data and incorporated into the analysis to reinterpret the acoustic image in terms of biotopes. The image resulting from analysis of gridded data is termed a raster image, consisting of rows and columns of tiles, or 'pixels'. Each pixel will have associated with it values for E1, E2, and depth. Image processing can utilise these values to classify each pixel according to its acoustic characteristics. Analysis of the data was performed using Idrisi (tm) (Clark University) image processing software and the maps transferred to MapInfo(tm) for presentation and overlaying coastlines.

1.5. Representation of biotopes and sediment types on maps

With pixel sizes of 150m x 150m, the ability to represent small biotope areas on a map are severely limited. Areas the size of the pixels may contain many biotopes. Representing biotopes at scales suitable for most broad scale sublittoral mapping requires either (a) that biotopes are arranged into suites that commonly occur together and are characteristic of some larger topographic feature and/or (b) that areas are coded according to the predominant biotope whilst subsidiary biotopes are noted.

Arranging biotopes into broad categories that share a similar overall appearance also helps to produce overview maps. These broader categories are termed life forms and this approach has been partially adopted by the MNCR as biotope complexes. These broad categories become important in cartography when areas are colour coded according to life form, showing visually the distribution of these major biological community types. This approach has been adopted for displaying the biological communities.

It is expected that the life forms will be qualified by their most appropriate biotope category in due course. However, before this can happen, the descriptions of biotopes and any necessary regional sub-divisions will need to be agreed between SeaMap and Seasearch.

Sediment type has been estimated from visual inspection of surface features and this is not sufficient to discriminate between different grades of fine sediment, but probably adequate for categorising coarser grades and mixtures (gravel, cobble, boulder and bedrock). Colour coding the sediment type has followed the conventions adopted by the British Geological Survey (BGS) in

their seabed quaternary sediment maps which is based on a modified Folks triangle. However, the BGS scheme concentrates on fine sediments and is inadequate for the proper representation of coarser sediments. The colours used by Seamap have, therefore, recourse to stronger hues to represent rock and rock/sediment mixtures.

2. Results of the acoustic survey

A full account of the acoustic survey from 1995-7 is in preparation (Foster-Smith, Sotheran and Walton, in prep). A summary is presented here to accompany the maps. The coverage of the survey area has not been consistent. Some areas, such as Worthing and Hastings, have been tracked over somewhat sparsely with the result that there are gaps in the coverage that are apparent on the maps. Nevertheless, the coverage is sufficient to give a general account of the distribution of seabed types and biota for the area.

2.1. Distribution of seabed types

Bedrock reefs fringe the chalk cliffs between Brighton and Eastbourne. Other rocky outcrops occur along a line south east of Brighton and off Eastbourne. These have been extensively ground truthed both by divers and video. However, other areas may also have bedrock outcrops, although their occurrence has yet to be confirmed.

The major areas of hard substratum consists of cobbles and shell, with possible bedrock outcrops. Areas of coarse sand and cobble would appear to be interspersed in this cobbley ground. There are extensive areas off Littlehampton and Shoreham and again off Eastbourne. Areas of deep boulder and cobble are found off Beachy Head in deep water (28m).

Large areas off Brighton are dominated by sand or silty sand. However, it is likely that these soft sediment biotopes are by no means as uniform as they appear from surface features and some sediment sampling is needed before a full description of these sediments can be attempted.

Silt is commonly found over hard surfaces throughout the area. It was found to be particularly prevalent off Beachy head and on the shallow chalk reefs below the cliffs between Eastbourne and Brighton. The shallow cobble area of Shoreham, however, was less silty. Whether this distribution of silt is stable is not known.

2.2. Life form distribution

The epifaunal/floral life forms are described briefly below.

1. Kelp and/or algal turf on bedrock: Shallow reefs, close in to cliffs, often with gullies. The surfaces have either kelp/algae or just algae whilst the vertical faces may have silty faunal turf with piddock holes. The kelp often appears to be *L. digitata*.
2. Rich faunal turf on bedrock: Similar topographically to the above, but deeper and may extend offshore some distance. Conspicuous tall faunal turf species include *Alcyonium digitatum*, *Nemertesia antennina*, *Flustra foliacea* and, occasionally, *Metridium senile*. A short turf of other hydroids and bryozoans together with sponges is mixed with a general silty turf of indeterminate composition.
3. Silty turf, mussels on bedrock: Some bedrock reefs are dominated by silty sand with mussels embedded in the sediment layer.
4. Mussels on bedrock: Chalk reefs support dense mussel beds in places. However, obvious *Asterias* depredation leaves many areas of bare chalk reef showing through.
5. Rich algal turf with *Chorda filum*/*Laminaria saccharina* on cobble: Shallow cobble plains support dense algal turf of red foliose weeds and brown weeds. The chord weed was found off Shoreham in 1995 whilst the sugar kelp was found off Littlehampton in 1997. The underlying substratum will often have a conspicuous and abundant shell component. These are mostly of

Crepidula fornicata. It is hard to determine how much of this shell substrata consists of live slipper limpets.

6. Mixed algal/faunal turf on cobbles: There is a transition between the well lit algal turf cobble and the faunal turf cobble (below). The mixed turf can be moderately dense or sparse. Many of the conspicuous species mentioned in "2" above may be present in low densities.

7. Sparse faunal turf on cobble: Many areas of cobble appear to be affected by disturbance in that they have a sparse turf of ephemeral hydroids. In these habitats, *Urticina* spp. are conspicuous. These habitats often have a significant sand mixture.

8. Silty faunal turf on boulders and cobble in deeper water: Conspicuous faunal turf species are heavily silt influenced and often very poor visibility made observation of the fauna difficult. However, some rocks were covered by sponge and possibly the ascidian ?*Molgula*.

9. Mussel beds: Mussel beds on sand were seen in localised patches.

10. Sand: No distinction has been made between possible biotopes, except that a sand and sparse cobble category has been created to account for a distinctive acoustic signature.

Map . Predicted sediment types.

The sediment types are predicted from an interpretation of the acoustic data based on observations made at specific point locations using a remote video.

The white areas are unsurveyed in that there is no acoustic data within 500m.

0 10 20

Kilometers

Point samples

Folks sediment categories

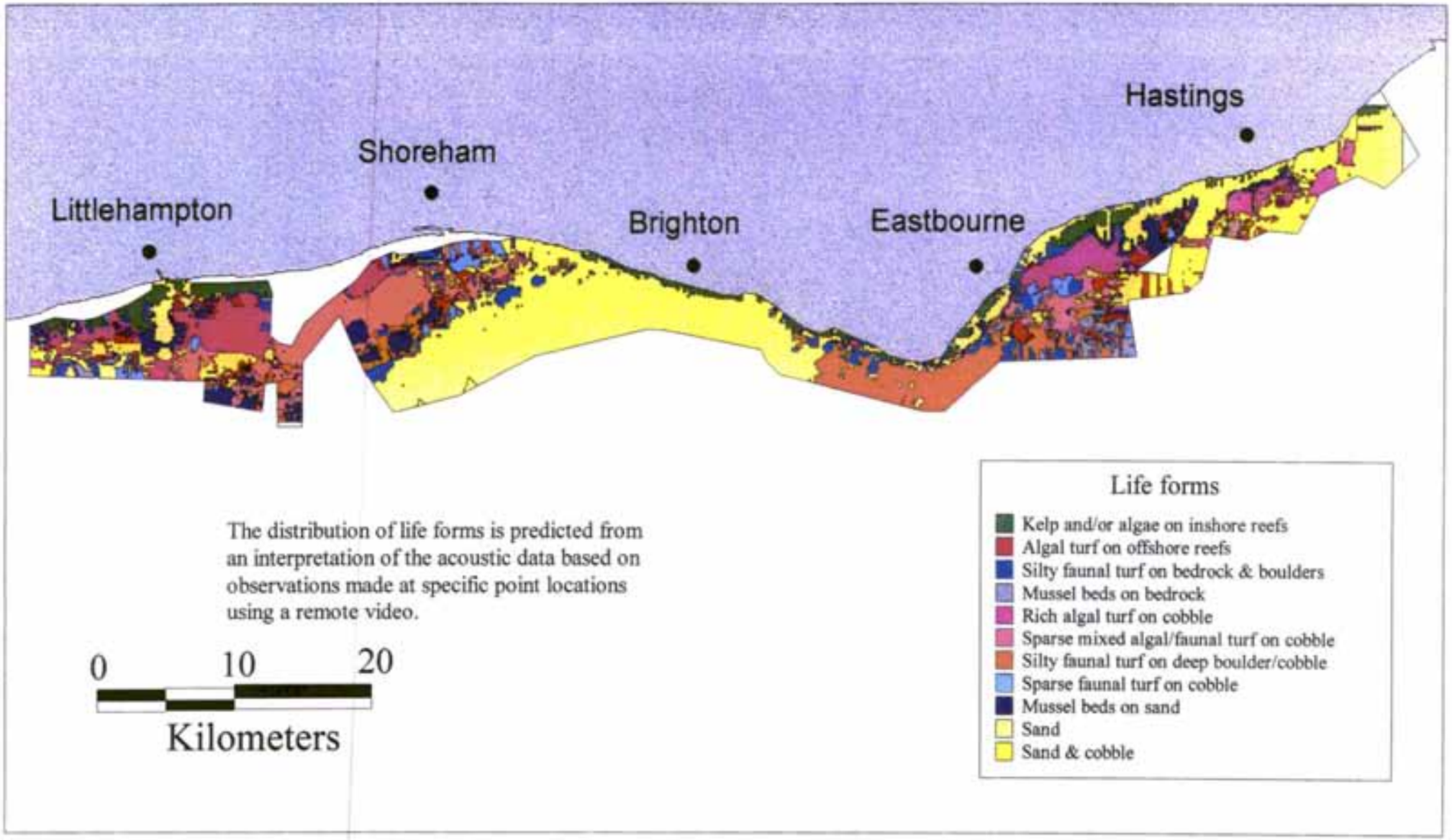
- Bedrock
- Boulder
- Bedrock & boulder
- Cobble
- Boulder & cobble
- Gravel & shell
- Cobble & gravel
- Sand
- Cobble & sand
- Silty sand
- Silty bedrock, cobble & sand

Predicted sediment types

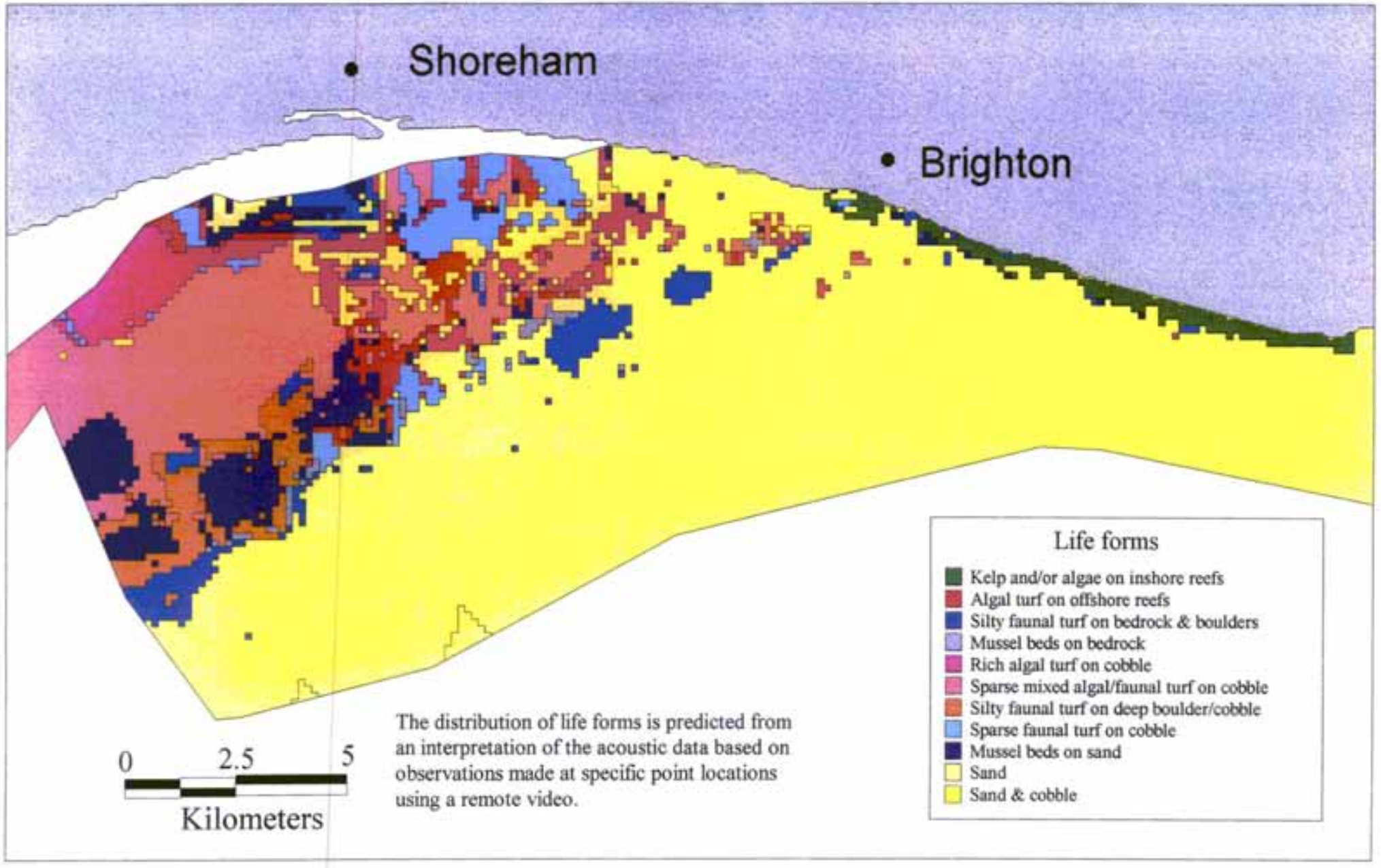
Colours based on BGS Folks

- Bedrock
- Bedrock & boulder
- Silty bedrock & boulder
- Cobble
- Gravel & shell
- Sand
- Cobble & gravel
- Silty sand
- Deep silty, shelly sand

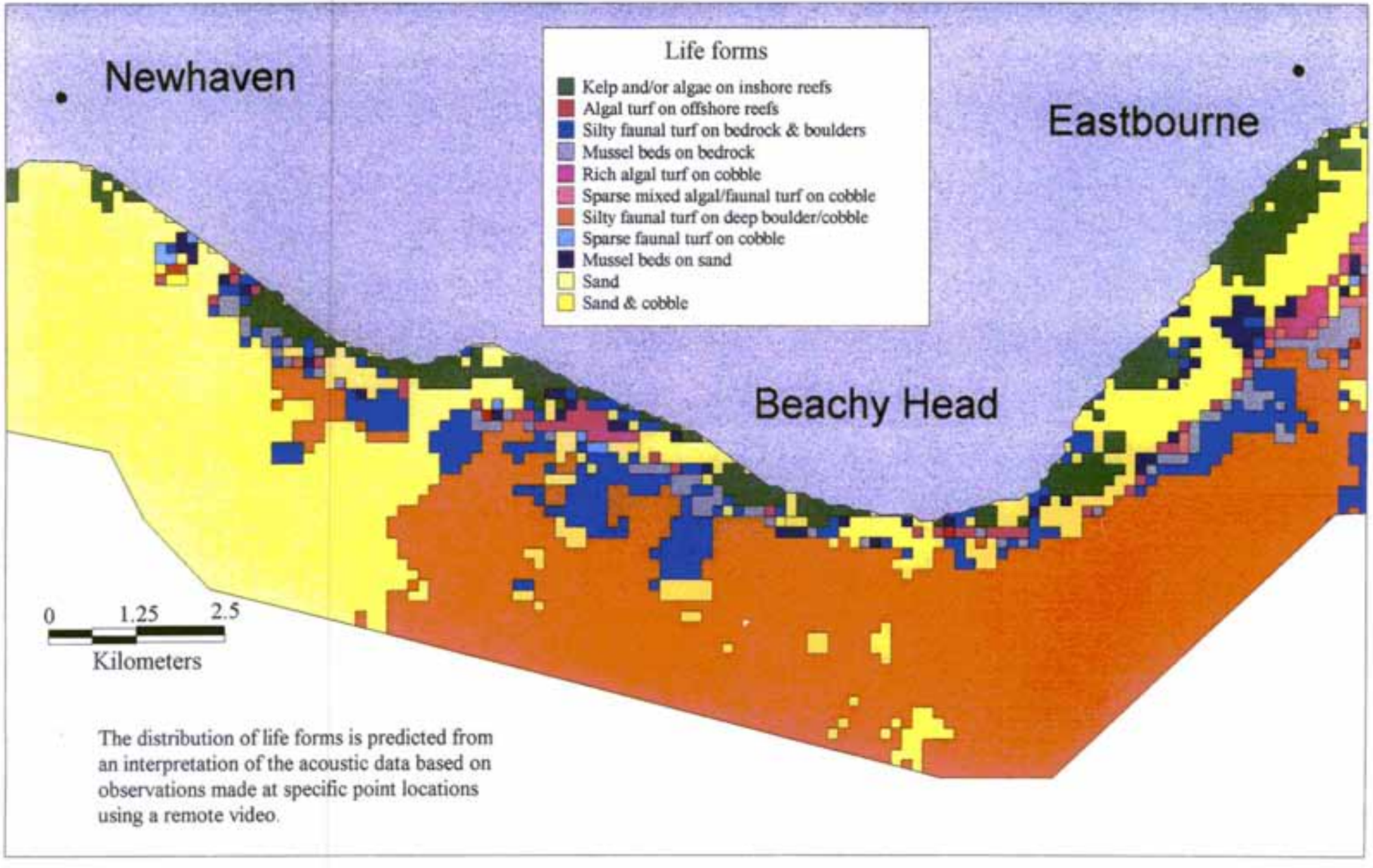
Map . Predicted life forms.



Map .Shoreham. Predicted life forms.



Map .Beachy Head. Predicted life forms.



APPENDIX 2

The Project's 'Promptsheet'

SEASEARCH PROMPTSHEET

MARINE CONSERVATION SOCIETY

What to do...

1. Note the **max. & min. depths** of *each* habitat encountered.
2. Describe the physical form of the sea bed using the definitions given. Estimate percentages if mixed.
3. Note down cover (& types) of **seaweeds** *(if present)*, ***attached animals*** **and mobile animals**. Give an indication of abundance where possible (**A**bundant; **C**ommon; **F**requent; **O**ccasional; **R**are)

PHYSICAL DETAILS

SUBSTRATUM *(estimate percentages for each habitat)*

Bedrock
(unknown / granite / slate / shale / sandstone / limestone / mudstone / chalk / clay)

Inclination?
level / steep / vertical / uneven / overhangs / ledges
direction of slope? *(use compass)*

Boulders - very large (> 1.0 m)
- large (0.5 - 1.0 m)
- small (0.25 - 0.5 m)

on bedrock? on sand? or on mixed sediments? spaces between boulders?

Cobbles (fist to head size)
Pebbles (50p to fist size)

Gravel (< 50p) - stone
- shell fragments

Sand - coarse
- medium
- fine

Mud - pure or present as muddy sand?

Shells - empty
- live (e.g. *Crepidula* or *Mytilus*)

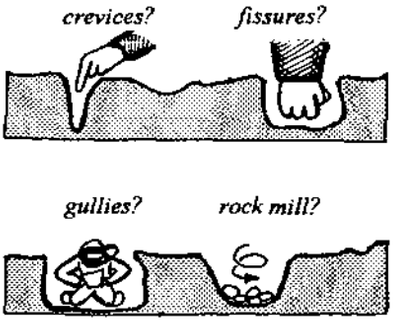
Artificial - metal
(wrecks) - concrete
- wood

Other - what?

Note a score of 1 - 5 as appropriate against each letter category.

Features - rock	1	⇒	5
I. sea bed relief	even		rugged
J. surface texture	smooth		pitted
K. stability	stable		mobile
L. scour	none		scoured
M. silt	none		v.silted
N. boulder/cobble shape	rounded		angular
O. sediment on rock	yes	/	no

Features - sediment	1	⇒	5
A. firmness	v. firm		soft
B. stability	stable		mobile
C. sorting	well		poor
D. mounds / casts	yes	/	no
E. burrows / holes	yes	/	no
F. waves (>10 cm high)	yes	/	no
G. ripples (<10 cm high)	yes	/	no
H. *subsurface layer?*	yes	/	no



BIOLOGICAL DETAILS

Are there seaweeds present? — **Yes** →

No

Estimate percentage of sea bed dominated by 'cover organisms' (e.g. seaweeds or hydroid/bryozoan turf)

very dense cover	= 75-100%
dense cover	= 50-75%
moderately dense	= 25-50%
sparse	= 5-25%
rare	= < 5%

Searching for animals...
- *Look around the base of boulders and also underneath them if they can be moved.*
- Dig into depressions in sand for bivalves & heart urchins.

kelps or other large brown algae?

• smooth, *flexible stipes (stalks), oval in section*	*Laminaria digitata*
• tough, rough stipes, circular in section	*Laminaria hyperborea*
• flattened, wavy stipe with bulbous holdfast	*Saccorhiza polyschides*
• short, thin stipe with ribbon-like, wavy blade	*Laminaria saccharina*
• short stem continuing as midrib within narrow, wavy blade	*Alaria esculenta*
• strap-like parts growing out of mushroom-like base	*Himanthalia elongata*
• long stem with irregular branches & spherical gas bladders	*Sargassum muticum*
• bushy plant with alternate branches & seed pod like bladders	*Halidrys siliqua*

other algae? [N.B. colour may not be true within groups]
- **browns** (see kelps too) - e.g. *Chorda, Dictyota, Dictyopteris*
- **greens** - e.g. *Ulva, Enteromorpha, Cladophora, Bryopsis*
- **reds** - potentially large number of foliose species (collect samples)
  - encrusting pink/purple coralline species

ATTACHED ANIMALS
- hydroid/bryozoan turf? ('crud')
- hydroids? (e.g. *Tubularia*)
- anemones (size; form of disc/column; colour)
- dead man's fingers?
- sponges? (encrusting or erect; size/colour)
- sea squirts? (solitary/colonial; form/colour)
- bivalves? (e.g. mussels, oysters)
- bryozoans? (erect or encrusting; form/colour)
- cup corals? sea fans?
- sea cucumbers/featherstars in crevices?
- burrowing species? (e.g. piddocks)

MOBILE ANIMALS
- crabs? (edible/velvet/spider/hermit/other)
- squat lobsters? (colour/size)
- lobsters/crayfish?
- topshells/whelks/other snails?
- sea slugs? (size/form/colour/egg ribbons)
- cuttlefish/octopus?
- *starfish/sunstars? (what type?)*
- brittlestars? (colour/disc pattern/spiney arms?)
- sea cucumbers?
- fish? flatfish? or others?

note: size; markings/colour; behaviour; no. & position of fins; shape of mouth; shape of lateral line, if obvious; size & position of eye.

Note down anything that strikes you as being unusual.

Estimate abundances
- **A**bundant
- **C**ommon
- **F**requent
- **O**ccasional
- **R**are - only one

APPENDIX 3

The original Dive Recording Form (1992-1996)

SEASEARCH

Marine Nature Conservation Review

SEASEARCH is run by the Marine Conservation Society on behalf of the Joint Nature Conservation Committee

DIVE RECORDING FORM

Survey name:_____ Date of dive:_____

Site name:_____ Site number:_____ Dive number:_____

Name and address of recorder:_____

_____

Site location: use one of the following:- OS grid reference; latitude/longitude; Decca:

_____

Time of dive (24hr clock please): Start:_____ Finish:_____ Duration:_____

Depth range below sea level: From:_____ To:_____

Depth range below chart datum (if known): From:_____ To:_____

Underwater visibility:_____

Sketch:

Please sketch your dive plan (map) and profile. Draw any habitats, communities or peculiar features marking depths. Indicate positions corresponding to your written habitat descriptions (see reverse side of form).

Dive Description:

Describe the following four points for each habitat you wish to describe. Try to use terms in the Guidance Notes. Please start with the shallowest (where applicable); number your habitats and indicate their positions on the sketch map and profile.

1. Sea floor type (substratum). **2. Depth** (range) of each habitat. **3. Communities** (describe conspicuous species and those which are most numerous; what is the general appearance of the community?). **4. Any special features** that might influence the community (e.g., silt, urchin grazing).

APPENDIX 4

The original Site Recording Form (1992-1996)

JOINT NATURE CONSERVATION COMMITTEE

SEASEARCH

Marine Nature Conservation Review

SEASEARCH is run by the Marine Conservation Society on behalf of the Joint Nature Conservation Committee

MARINE CONSERVATION SOCIETY

SITE RECORDING FORM

Survey name:_____ Date of survey:_____

Site name:_____ Site number:_____

Site location: use one of the following:- OS grid reference; latitude/longitude; Decca:

_____

Name and address of person completing this form:_____

_____

Map of area: Please insert a photocopy of a map or chart, or sketch map. Mark any rapids, areas of fast currents, offshore rocks and islands. Indicate transit marks where applicable. Please mark the dive locations on the map.

Reasons for site selection (see Guidance Notes):

If any specimens were collected, who has them?_____

If any photographs were taken, who has them?_____

Please fill in this section to the best of your knowledge:

A. Physical nature of the site.
Is the site one of the following:- Open coast; enclosed coast; lagoon; straits or narrows; shallow rapids; other?_____
Is the site:- Extremely exposed; very exposed; moderately exposed; sheltered; very sheltered; extremely sheltered?_____
Is the current:- very strong (6kn); strong (3-6kn); moderately strong (1-3kn); weak (less than 1kn); very weak; unknown?_____
Additional comments on the nature of the site:

B. Human usage and impact at the site.
Fishing (e.g., trawling, potting, angling):_____
Fish farming (e.g., salmon. shellfish):_____
Extraction (e.g., of sand. gravel, oil):_____
Waste disposal (e.g., sewage, industrial discharge):_____
Litter:_____
Coastal defence (e.g., groynes, sea wall, breakwater):_____
Port or marina:_____
Moorings:_____Launch site:_____
Watersports:_____Popular dive site:_____
Educational/scientific use:_____

Your comments on the human usage of the area:

Site protection at site or on nearby shore (e.g., Site of special scientific interest, owned by the National Trust):_____

C. Access
Is access easy, difficult or very difficult?_____

D. What is your assessment of the site, based on your experience?
1. Underwater scenery (e.g., typical, unusual, spectacular):_____
_____
2. Range of habitats (little variety, wide variety):_____
_____
3. Richness of marine life (sparse or dense in terms of numbers; poor or rich in terms of the variety of species):_____
_____

APPENDIX 5

The new Recording Form (1997 onwards)

&

Guidance Notes for completing the Recording Form

Leave blank	
Survey no.	
Site no.	

Field site no.	
No. of biotopes	
Database entry	

SEASEARCH RECORDING FORM

~~~~~ INSTRUCTIONS FOR COMPLETING THIS FORM ~~~~~

1. *Please complete **all** sections of this form (unless otherwise instructed: * means complete if information known).*
2. *If any parts of the form are unclear, refer to the accompanying 'Guidance Notes'.*
3. *Every diving buddy pair should complete one form per dive.*
4. *Where asked, please give as much detail about the sea bed and the conspicuous marine life as you are able to.*

MARINE CONSERVATION SOCIETY

Survey name:

Name & address of person completing this form:
Name
Address

Tel. no. (Hm/Wk)

Name of buddy

Name of group (boat/club)

SITE INFORMATION

Site name *(if known)* *

Date (dd : mm : yy)	: :	
Time (24 hr : min) **start** :	**end** :	
Duration of dive (hr : min)	:	

Underwater visibility	m

Depth of sea bed (m) *(below sea level)*	Upper	Lower
Tidal correction *(chart datum)* *		
Corrected depth (m)* *(below chart datum)*	Upper	Lower

Position	LATITUDE (N)			LONGITUDE (W OR E) *(circle)*		
decimals of mins or seconds? (delete)	deg.	min.	(sec.)	deg.	min.	(sec.)
Centre of site						
For drift dives **From**						
To						

Position derived from *(circle)*:

GPS Decca Admiralty chart OS map Other

Physical details *(check Guidance Notes)* *	
Salinity	
Wave exposure	
Tidal streams	

Uses & impacts at the site *(tick as appropriate)* *			
Fishing - potting		Sand/gravel extraction	
- trawling		Marina/port	
- netting		Water sports	
Angling		Known dive site	
Sewage discharge		Other(s) (please state)	
Waste dumping			
Litter & debris			

Site description: *include general location of site (e.g. 4.5 km SE of Brighton); outline general sea bed type(s); & highlight any unusual or important features which you think may be of conservation interest.*

Have you taken any of the following? *(circle)* photographs (habitat and/or species) specimens for preservation seaweeds for pressing

DIVE INFORMATION: 1

*Complete a box below for each **biotope** (= **habitat** + **marine life**) you encountered on your dive. Each numbered description should tally with the information entered in the columns on the opposite page and with your diagram on the back page. If you encountered more than 3 biotopes, please continue your descriptions on another Recording Form. Use terms given in the Promptsheet. For each biotope, please make sure you mention the following:*

TYPE OF SEA BED DEPTH CONSPICUOUS/CHARACTERISTIC SPECIES SPECIAL INFLUENCES (e.g. SILT, URCHIN GRAZING)

No. 1

No. 2

No. 3

HABITAT & SPECIES INFORMATION

Each column below refers to a numbered biotope (relating to your descriptions on page 2). Tick boxes as indicated, or give percentages (please make sure these add up to 100%!), or award a number from 1-5 as appropriate. If you are uncertain about anything, leave the box blank.

1	2	3	
m			**DEPTH LIMITS**
			Upper (from sea level)
			Lower (from sea level)
			Upper (from chart datum) *
			Lower (from chart datum) *

✓✓			**DEPTH BAND**
			0-5 m
			5-10 m
			10-20 m
			20-30 m
			30+ m

(leave blank)			**BIOLOGICAL ZONE**
			Sublittoral fringe
			Infralittoral - upper
			- lower
			Circalittoral- upper
			- lower
			Not applicable

1	2	3	
%			**SUBSTRATUM**
			Bedrock (type?:)
			Boulders - very large > 1.0 m
			- large 0.5 - 1.0 m
			- small 0.25 - 0.5 m
			Cobbles (fist - head size)
			Pebbles (50p - fist size)
			Gravel - stone
			- shell fragments
			Sand - coarse
			- medium
			- fine
			Mud
			Shells (empty - or as large pieces)
			Shells (living) - e.g. *Crepidula*
			Artificial - metal
			- concrete
			- wood
			Other (state)
100	100	100	**Total**

1-5			**FEATURES - ROCK (all categories)**
			Relief of biotope (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)

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

	✓		
			Mounds / casts
			Burrows / holes
			Waves (>10 cm high)
			Ripples (< 10 cm high)
			Subsurface coarse layer
			Subsurface anoxic (black) layer

List the seaweeds & animals which you were able to identify positively from the different biotopes. Use latin or common names. 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. And don't worry if you only fill a few of the spaces - nobody's counting! Mark abundances: Abundant, Common, Frequent, Occasional & Rare. Continue on next page, or separate sheet, if necessary.

SPECIES	1	2	3	SPECIES	1	2	3

DIVE INFORMATION: 2

*Draw a **profile** of the sea bed you encountered on your dive in the space below. Mark (& 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). Indicate your direction of travel (compass bearing) and/or the direction of any current. You may also find it useful to draw a **plan** of the sea bed.*

SEASEARCH is run by the Marine Conservation Society on behalf of the Joint Nature Conservation Committee.
It is supported by English Nature, Scottish Natural Heritage and the Countryside Council for Wales.

Once completed, this form should be returned to:

GUIDANCE NOTES

FOR COMPLETION OF THE

SEASEARCH RECORDING FORM

MARINE CONSERVATION SOCIETY

These Guidance Notes are based on those used by JNCC's Marine Nature Conservation Review team, as published in Hiscock, K.*ed.* 1996. *Marine Nature Conservation Review: rationale and methods.* Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series).

SEASEARCH surveys are regarded as being Phase 1-type surveys - that is, recording is undertaken of sea bed habitats and their associated conspicuous species at an **intermediate** level of detail. Detailed recording of particular habitats with full species lists (Phase 2 surveys) is left to the professionals!

The *SEASEARCH* Recording Form (to which these Guidance Notes relate) has been designed to allow information to be entered directly onto the MNCR database - or another database should this be more appropriate for your project's needs. The new Recording Form replaces the old Site Recording Form and the Dive Recording Form, which were in use until the end of 1996.

PAGE 1

Survey name
Note that the Recording Form can be used for other *SEASEARCH* surveys undertaken elsewhere in the country.

Name & address of person completing this form
This information is likely to be entered on to a database of names & addresses of those who have participated in the project. By providing this information it will allow the Project Co-ordinator to question any parts of the form which are unclear. It will also allow us to send you project mailings. If your diving buddy would like to receive these as well, please enter his/her address at the bottom of page 1. Your name & address details will not be passed on to any other organisation or person without your permission. If you do not wish these details to be entered onto the database, please state this on the form.

Name of group (boat/club)
Please enter the name of your diving club (state whether BSAC, SAA, PADI or other), or, if not diving with a particular club, the name of the vessel from which you were diving.

Site name
The name allocated to the site must be clear and precise but not verbose. Use a distinctive feature named on the Admiralty chart, or make up what you consider to be an appropriate name:

e.g. SW of Selsey Bill *or* Close to the *Moldavia* wreck *or* Elphick Tree reef *or* off Seaford Head

Underwater visibility
This will be a personal assessment unless you were able to measure it accurately using a tape measure or a Secchi disc (in which case this should be stated). State a single distance, e.g. 5 m, and not somewhere between two distances, e.g. 3-4 m. Obviously, the better the visibility, the more you're likely to see and be able to record.

Depth of sea bed
The lower depth will be the maximum depth at which recording was undertaken; the upper depth will be the shallowest depth at which recording was undertaken. On a perfectly level sea bed, these will be the same.

Tidal correction
In order to standardise the depths at which records are made, it is necessary to remove the tidal component and relate all depths to chart datum. This is done by subtracting a given amount from the depth measured by the diver. The amount to be subtracted can be calculated from local tide tables (using the time of the mid-point of your dive and the 'rule of twelfths'), or by using appropriate computer software. Please leave this blank if you do not know how to work out the correction.

Corrected depth
Subtract the tidal correction (if known) from your recorded depth of the sea bed below the sea surface.

Physical details
The **salinity** of sea water is normally about 35‰ (parts of salt per thousand of water), usually referred to as *fully marine*, which falls within the range of 30-40‰. However, in estuaries, inlets or brackish water lagoons, the salinity may be *variable* (18-40‰) or *reduced* (18-30‰), or even *low* (<18‰) - the points of separation approximate to critical tolerance limits for marine species. If you're uncertain of the salinity, leave this blank.

The degree of **wave exposure** takes into account the aspect of the adjacent coast (related to the direction of prevailing or strong winds); the fetch (distance to nearest land); the degree of open water offshore; and the depth of water adjacent to the coast. Usually, determining the wave exposure at a given site requires inspection of Admiralty charts. The categories are:-

[P.T.O.]

[Extremely exposed]

Very exposed - open coasts which face into prevailing winds and receive oceanic swell without any offshore breaks (such as islands or shallows) for several hundred kilometres, but where deep water is not close (>300 m) to the shore.

Exposed - prevailing wind onshore although there is a degree of shelter because of extensive shallow areas offshore, offshore obstructions, or a restricted (<90°) window to open water. Not generally exposed to strong or regular swell. Can also include open coasts facing away from prevailing winds but where strong winds with a long fetch are frequent.

Moderately exposed - generally include open coasts facing away from prevailing winds and without a long fetch but where strong winds can be frequent.

Sheltered - restricted fetch and/or open water window. Coasts can face prevailing winds but with a short fetch (say <20 km) or extensive shallow areas offshore or may face away from prevailing winds.

Very sheltered - unlikely to have a fetch greater than 20 km (the exception being through a narrow [<30°] open water window). Face away from prevailing winds or have obstructions, such as reefs, offshore.

Extremely sheltered - fully enclosed with fetch no greater than about 3 km.

[Ultra sheltered]

Again, leave blank if uncertain.

Tidal streams - this refers to the maximum current strength at the surface during spring tides, which affects the actual area surveyed. The categories are:-

Very strong	> 6 knots (> 3 m/sec.)
Strong	> 3-6 knots (1.5-3 m/sec.)
Moderately strong	1-3 knots (0.5-1.5 m/sec.)
Weak	< 1 knot (< 0.5 m/sec.)
Very weak	negligible

Current strengths are given on Admiralty charts as tidal diamonds (keyed elsewhere on the chart), though it is uncommon to have a direct record for the site being surveyed and you may have to extrapolate considerably. Stronger currents will be experienced around headlands and within narrows.

Uses and impacts

These are generally self-explanatory. You should tick an activity if you know it occurs even if you do not see the activity while you were at the site. Some impacts will be direct and localised and should only be recorded if on the site. Others may be more diffuse (such as sewage discharge) and should be recorded if it is likely to occur at the site surveyed.

Position

Give degrees, minutes and decimal fractions of minutes (e.g. 50° 31.50' N) if possible - this is what most GPS and Decca units will show. Positions entered as degrees, minutes and seconds (e.g. 50° 31' 30" N) are also acceptable (say, when taken from a chart). As the Greenwich Meridian (0° longitude) crosses the coast at Peacehaven, E. Sussex, and through the Humber estuary, it is important that you state whether the site was **East** or **West** of this (delete as appropriate).

Site description

This should be a 'sketch in words' to describe the main characteristics of the site. An example would be:

"Site located approx. 3 km SW of Shoreham Power Station. The sea bed was a jumble of large boulders with level patches of sand and gravel in between. Boulders with assorted red algae growing on their tops and various encrusting animal species/turf on their sides, especially sponges, hydroids and bryozoans. Distinct circular hollows in the gravel may have been created by black sea bream (?)."

Page 3

FEATURES - ROCK (incl. boulders, cobbles & pebbles)

Relief of biotope - overall relief of the habitat from **very even** (unbroken bedrock with uniform slope) to **very rugged** (highly broken slope with wide range of surfaces, including fissures and gullies).

Surface texture - an indication of the smoothness of the rock type, from **very smooth** (a hard and well worn rock, or well rounded cobbles) to **highly pitted** (a highly pitted or bored rock such as chalk or limestone, or very fragmentary or jagged).

Stability - relating to wave action, from **very stable** (bedrock or very large boulders which are never moved by wave action) to **highly mobile** (frequently turned pebbles, cobbles or small boulders, where colonisation is affected because of such movement).

Scour - an indication of scour by sand, from **none** (no scouring apparent) to **highly scoured** (base of rocks likely to be smooth and without colonisation).

Silt - the amount of silt settled on the rocks, from **none** (very clean rock surfaces) to **highly silted** (thick layer of silt on all surfaces).

FEATURES - SEDIMENT (incl. gravel, sand & mud)

Firmness - the degree of softness or compactness of the sediment: 1 **very firm** (difficult to dig with fingers), 2 (fingers only in), 3 (hand in), 4 (can penetrate up to elbow), to 5 **very soft** (whole arm in!).

Stability - from **highly stable** (movement of sediment very unlikely) to **highly mobile** (sediment constantly being moved).

Sorting - an indication of the uniformity of the particle size, from **very well sorted** (sediment composed of a single grain size) to **very poorly sorted** (sediment with wide range of grain sizes).

Species abundance

The MNCR have a cunningly devised table for working out the abundances of various creatures depending on their size and the group to which they belong. However, it's rather complicated to get to grips with! Instead, you are asked to give an indication of a particular species' abundance in your own judgement. If you are not sure, just write down the name of the animal/plant and leave the abundance column(s) blank.

RJ June 1997

APPENDIX 6

Sample Project Newsletter

Sussex *SEASEARCH*

Issue 12 *November 1997*

Welcome to the Sussex *SEASEARCH* Newsletter

Whether you're an active participant in the project or whether you're just interested to know how the project's developing, this newsletter should bring you up to date with all the goings-on.

The past few months has seen the project taking stock of the information gathered by divers since 1992. Although it was originally envisaged that the project would have a lifespan of five years, the continued interest in it has meant that its life has been extended and it's now likely to see in the next millenium...

1997 MCS *SEASEARCH* Dive Weekends

Once again, these weekends provided most of the results from this summer's survey dives. The intention was to fill in some of the gaps of the whole survey coverage to date, particularly in the Selsey Bill area and along the Eastbourne to Rye stretch of coast.

Unfortunately, David Kay, who had been the Coastal Ranger at the Seven Sisters Country Park for a number of years and a keen supporter of the project, departed for a new job in Edinburgh during June. This left us without a co-ordinator for the dives off East Sussex, but Kim Jones and David Harvey kindly helped out organise the ones in August and September respectively.

Sadly, not all of the six 'ear-marked' weekends were successfully completed: adverse weather caused us to cancel the 30 May/1 June weekend; and the single days of Sat. 28 June; and Sat. 27 September. However, despite these setbacks, a total of 73 recording forms have been completed from *SEASEARCH* dives this summer.

A number of dives were undertaken around the Outer Owers and East Borough Head to the SE of Selsey Bill. The Outer Owers was confirmed as being a series of limestone outcrops, with layers of mudstone between the limestone strata. Another site of interest was Whirlpool Hole, to the SW of the Mixon, which is bounded by a steep slope of gravel and drops to 19 m depth (bcd), despite the chart showing just 11 m.

Sussex *SEASEARCH* on the Web

At last the project has come of age...Sussex *SEASEARCH* now has a home page on the World Wide Web. Thanks to Kim Jones at Bits Per Second in Brighton, anyone with a PC that has access to the Internet can find us on:

http://www.bpsnet.co.uk/seasearch/sussex

The site has lots of information about the project including newletters, blank recording forms (which can be down-loaded and printed), publications, details of how dive clubs can get involved, and the location of the Marine Sites of Nature Conservation Importance off the coast. The site will be updated on a regular basis. We're keen to hear what users think of the site, so please let us know your comments.

SEASEARCH on TV

A crew from the BBC's Countryfile programme came to film *SEASEARCH* volunteers on Sunday 13th July, during a dive out of Littlehampton. They were particularly interested in how the project has led to the identification of Marine Sites of Nature Conservation Importance off Sussex.

Having had to postpone their visit from two weeks before because of bad weather, we were blessed with calm seas and excellent u/w visibility (8+ m). The dives took place on the Worthing Lumps and the shallow wreck of the *Indiana*.

Many thanks to the Lensbury Diving Club from central London who drove their RIB round and round in circles just for the cameras, twiddled their thumbs whilst waiting for their dives, and, at the end of a very long day, were willing to say some kind words about the project to the interviewer.

The finished piece (all 7 minutes of it!) was broadcast on Sunday 17 August on BBC1. Soundbites from the interviews were also used on Radio 4's Today programme and on Southern Counties radio. Together, this publicity produced a considerable amount of interst in the project.

Underwater Nature Trail off Seaford

As announced in the last Newsletter, a temporary 80 m trail was set up amongst the chalk gullies off Seaford Beach on the weekend of 7/8 June. 16 brave (foolhardy?) divers turned up on the Sunday to swim along the trail, but were confronted by 1 m high waves being whipped up by a southerly wind, and u/w visibility of barely 30 cms! However, undeterred, they ventured into the murky depths...

The debriefing session afterwards revealed that only two people completed the trail and signed the visitors' book at the end; about six got about halfway along it before giving up; and two couldn't even find the start of the trail on the seabed and surfaced straight away! The intention is to re-lay the trail at the same site for the whole of next summer, and pray for better conditions!

Keeping the costs down

We are most grateful to English Nature and to East Sussex County Council for their assistance in photocopying and mailing this Newsletter to over 300 addresses.

If you are not already a member of MCS, please join! Membership entitles you to many more benefits besides coming along on SE MCS weekend dives. *Contact MCS HQ at 9 Gloucester Road, Ross-on-Wye, Herefordshire HR9 5BU (01989 566017) for a membership application form. Standard membership = £15 per annum.*

Input of data onto the Database

It's taken quite a while to achieve, but we've now got the data from all 516 *SEASEARCH* recording forms from 1992-1996 onto the database. Data from the further 73 forms from 1997's dives are being entered at the moment. The database is housed at the Booth Museum in Brighton under the watchful eye of Dr Gerald Legg, the Museum's Curator of Biology. We're very grateful to the following for volunteering to help with the task of data input: Keiren Houston; Godfrey Jones & Christine Fotheringham; Chris Grainger; & Gerald Legg. Thanks also to Jane Lilley who spent hours transfering information from the original recording forms onto more manageable and user-friendly forms.

The database being used is a copy of the Marine Nature Conservation Review team's database in Peterborough. This has been designed on an Advanced Revelation framework. One of the main objectives of the project has been to allow the MNCR team access to the data we have generated.

Plans are afoot for *SEASEARCH* to adopt a more widely accessible database format for other groups to use. Microsoft's ACCESS has been suggested for this purpose. Already, the *SEASEARCH* group in Dorset, co-ordinated by Peter Tindsley and Victoria Copley, has been entering their data onto ACCESS. Local groups could make use of the information they gather, as well as copies being downloaded to a central resource centre (which may be MCS HQ).

Top 12 species

One of the snippets of information that analysis of the database has provided is a list of the most frequently recorded species during *SEASEARCH* dives (from all habitat types). These are:-

- large hermit crab *Pagurus bernhardus*
- 'foliose red algae'
- slipper limpet *Crepidula fornicata*
- dead man's fingers *Alcyonium digitatum*
- velvet swimming crab *Necora puber*
- edible crab *Cancer pagurus*
- dahlia anemone *Urticina felina*
- hornwrack *Flustra foliacea*
- 'hydroids'
- spiny spider crab *Maja squinado*
- sandmason worm *Lanice conchilega*
- bib *Trisopterus luscus*

Who would have guessed that a hermit crab would come out top? However, it's worth pointing out that these are species which volounteers can easily recognise – they may not be the most common species off Sussex.

Final Report

Robert has been in the throes of writing this for some time now, which is one reason why he's been keeping a low profile. He's been trying to make sense of all of the information gathered over the past 6 summers (1992—1997), making use of the database for analysis purposes, and incorporating the remote sea bed mapping data gathered by the BioMar team during surveys in 1995, 1996 & 1997. The report is due to be completed early next year with a press launch in March (further details on this will appear in the next project Newsletter due out in February). Copies of the report will be available on request to all those who have participated in the project, at a nominal sum.

Species ID Guide

Preparation for this is now well underway. As well as including species common in Sussex coastal waters, we also intend to cover those found in Kent, Hampshire and the Isle of Wight, thus making it relevant to all of SE England. About 130 species will be featured, though not all will have accompanying photographs. However, it is hoped that the format will allow for more species to be added to the Guide at a later date, as and when photographs become available. If you take underwater photographs and would be willing to allow them to be used in the Guide (with full credit), please contact Robert for the up-to-date 'wanted list'.

It is also likely that this Guide will include information on characteristic habitats, thus amalgamating the proposed colour booklet on Sussex sublittoral habitats with the Species Guide. If all goes well, it is hoped the Guide will be published in time for next season's diving.

Local Co-ordinators being sought

Would you be interested in being a Local Co-ordinator for the Sussex *SEASEARCH* project? We would like to establish a network of people who live close to the coast who would be able to help promote the project over the next year or two. You would be asked to help organise dives with local clubs, give slide talks about the project, and collect completed survey forms. In return, you would receive 'out of pocket' expenses. All the necessary materials will be provided. Interested? If so, contact Robert for further details.

Where to now?

As mentioned above, it is intended that the Sussex *SEASEARCH* project will continue at least until the year 2000, thanks to a commitment from English Nature to continue sponsoring the project for a further three years. Other sponsoring organisations (see below) will also be encouraged to continue their funding of the project.

However, the way that the project will be run is likely to be a little different to how it has been run in the past. We're very keen to get more diving clubs involved (rather than just keen individuals), whose members can then organise their own *SEASEARCH* dives. These may be on wrecks or reefs, new sites or old, off Sussex – we'd be pleased to receive completed forms from anywhere! Of course, copies of the forms could be used to start a compendium of Club Dive Sites.

Further news on next year's dives will be announced in the next Newsletter.

Any enquiries about the Sussex *SEASEARCH* project should be addressed to:-
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The Sussex *SEASEARCH* project is supported by the following organisations: the County and District Councils of Sussex, Chichester Harbour Conservancy, English Nature, Environment Agency, Joint Nature Conservation Committee, Marine Conservation Society, Standing Conference On Problems Associated with the Coastline (SCOPAC), Sussex Downs Conservation Board, Sussex Sea Fisheries Committee, Sussex Wildlife Trust, and World Wide Fund for Nature.

APPENDIX 7

List of all flora & fauna (species and higher taxa) recorded on Sussex *SEASEARCH* dives, 1992-1998, and entered on to the database. [10]

[10] The authenticity of those species marked with an asterisk is dubious and until these records have been confirmed they should be regarded with suspicion. The list does not include invertebrate species added to recording forms after later microscopical examination of specimens.

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
PORIFERA	sponges	50	5	P	A	O
Clathrina coriacea		4	0	P	O	P
Leucosolenia		2	0	P	R	P
Leucosolenia complicata		1	0	O	O	O
Scypha sp.		1	0	O	O	O
Scypha ciliata		16	2	P	F	R
Leuconia aspera *		1	0	O	O	O
Leuconia nivea		1	0	O	O	O
Grantia compressa		3	0	P	C	R
Oscarella lobularis		1	0	O	O	O
Dercitus bucklandi	black tar sponge	11	1	P	O	R
Pachymatisma johnstonia	elephant's hide sponge	45	4	P	C	P
Tethya sp.		1	0	R	R	R
Tethya aurantium	golfball sponge	13	1	P	F	R
Suberites sp.		68	7	P	C	R
Suberites carnosus		19	2	P	F	R
Suberites ficus		14	1	P	C	R
Polymastia sp.		12	1	P	C	P
Polymastia boletiformis		13	1	P	F	R
Polymastia mamillaris		14	1	P	C	R
Cliona celata	yellow boring sponge	54	5	P	C	R
Raspailia ramosa		8	1	P	O	R
Halichondria sp.		16	2	P	C	P
Halichondria bowerbanki		20	2	P	A	R
Halichondria panicea	breadcrumb sponge	29	3	P	A	O
Ciocalypta penicillus		6	1	P	A	R
Hymeniacidon sp.		2	0	O	C	O
Hymeniacidon perleve		33	3	P	C	O
Mycale sp. *		2	0	R	O	R
Mycale macilenta		1	0	R	R	R
Esperiopsis fucorum	'shredded carrot' sponge	128	13	P	A	O
Myxilla sp.		7	1	P	C	O
Myxilla incrustans		4	0	P	F	P
Hemimycale columella		41	4	P	C	R
Haliclona spp. *		11	1	P	O	P
Haliclona cinerea		2	0	P	O	P
Haliclona oculata		6	1	P	O	P
Haliclona simulans		1	0	P	P	P
Dysidea fragilis	'goose bump' sponge	104	10	P	C	O
Porifera indet. crusts		119	12	P	A	O
CNIDARIA						

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Hydrozoa		176	17	P	A	O
Tubularia sp.		12	1	P	A	R
Tubularia indivisa		8	1	P	A	O
Coryne pusilla		1	0	C	C	C
Eudendrium ramosum		1	0	A	A	A
Bougainvillia principis *		1	0	P	P	P
Hydractinia echinata		12	1	P	F	O
Halecium sp.		4	0	P	F	P
Halecium beanii		1	0	P	P	P
Halecium halecinum		4	0	P	O	P
Aglaophenia sp. *		2	0	P	O	P
Aglaophenia pluma		1	0	O	O	O
Kirchenpaueria pinnata		2	0	O	F	O
Nemertesia sp.		28	3	P	A	O
Nemertesia antennina	'antenna' hydroid	82	8	P	A	O
Nemertesia ramosa		5	0	P	F	R
Hydrallmania falcata		45	4	P	A	O
Sertularella sp. *		1	0	P	P	P
Sertularella gaudichaudi		1	0	O	O	O
Sertularia sp.		7	1	P	C	R
Sertularia argentea		13	1	P	F	O
Sertularia cupressina		3	0	P	A	F
Obelia sp.		8	1	P	C	O
Obelia dichotoma		1	0	A	A	A
Obelia geniculata		2	0	C	C	C
Obelia longissima		9	1	P	O	O
Anthozoa		4	0	P	F	R
Alcyonium digitatum	dead man's fingers	237	23	P	A	O
Cerianthus sp.		2	0	P	O	P
Cerianthus lloydii		30	3	P	C	O
Epizoanthus couchii		3	0	P	O	O
Isozoanthus sulcatus		1	0	P	P	P
Actinaria	anemones	82	8	P	C	P
Actinia equina	beadlet anemone	3	0	P	O	O
Actinia fragacea *	strawberry anemone	1	0	P	P	P
Anemonia viridis	snakelocks anemone	113	11	P	C	R
Bolocera tuediae		1	0	P	P	P
Urticina sp.		7	1	R	A	O
Urticina felina	dahlia anemone	207	20	P	C	O
Urticina eques		4	0	P	F	O
Anthopleura ballii		1	0	P	P	P

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance			
		No. of records (Total 1019)	%	Range			Median
Metridium senile	plumose anemone	31	3	P	-	C	R
Sagartia sp.		19	2	P	-	F	O
Sagartia elegans		13	1	P	-	F	O
Sagartia troglodytes		20	2	P	-	F	R
Cereus pedunculatus		58	6	P	-	F	R
Actinothoe sphyrodeta		131	13	P	-	A	O
Sagartiogeton sp.		3	0	P	-	R	R
Sagartiogeton laceratus		4	0	P	-	C	R
Sagartiogeton undatus		3	0	R	-	O	R
Adamsia carciniopados	cloak anemone	3	0	P	-	R	R
Peachia cylindrica *		3	0	P	-	O	P
Halcampa chrysanthellum *		2	0	P	-	O	P
Corynactis viridis	jewel anemone	4	0	R	-	F	R
Caryophyllia sp.		1	0	R	-	R	R
Caryophyllia smithii	Devonshire cup coral	3	0	R	-	O	O
PLATYHELMINTHES	flatworms						
Prosthecereaus vittatus	candy-striped flatworm	19	2	P	-	O	R
NEMERTEA	ribbon worms						
Tubulanus annulatus		1	0	P	-	P	P
ANNELIDA		2	0	P	-	C	P
Polychaeta		5	0	P	-	A	P
Aphrodita aculeata	sea mouse	3	0	R	-	O	O
Eulalia viridis		3	0	R	-	F	R
Polydora sp.		4	0	P	-	A	F
Chaetopterus variopedatus		2	0	R	-	O	R
Spiochaetopterus bergensis		1	0	P	-	P	P
Arenicola sp.		2	0	P	-	O	P
Arenicola marina	lugworm	37	4	P	-	C	O
Terebellida		3	0	P	-	O	P
Lagis koreni		4	0	R	-	R	R
Sabellaria sp.		1	0	O	-	O	O
Sabellaria spinulosa		7	1	P	-	A	R
Terebellidae		16	2	P	-	O	R
Eupolymnia nebulosa		3	0	P	-	C	P
Lanice conchilega	sandmason worm	163	16	P	-	S	O
Sabellidae		5	0	P	-	O	P
Bispira volutacornis		67	7	P	-	C	R
Branchiomma bombyx *		3	0	P	-	O	O
Myxicola infundibulum		2	0	R	-	O	R

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance			
		No. of records (Total 1019)	%	Range			Median
Sabella sp.		1	0	R	-	R	R
Sabella pavonina	peacock worm	55	5	P	-	S	R
Serpulidae		1	0	O	-	O	O
Pomatoceros sp.	keelworm	47	5	P	-	C	O
Pomatoceros lamarcki	keelworm	1	0	O	-	O	O
Pomatoceros triqueter	keelworm	11	1	P	-	F	R
Filograninae		20	2	P	-	C	R
Filograna implexa		1	0	P	-	P	P
Spirorbidae		1	0	P	-	P	P
PYCNOGONIDA	sea spiders	2	0	O	-	F	O
CRUSTACEA		1	0	P	-	P	P
Cirripedia	barnacles	125	12	P	-	S	O
Lepas hilli	goose barnacle	1	0	P	-	P	P
Balanus sp.	barnacle	1	0	O	-	O	O
Semibalanus balanoides	barnacle	6	1	P	-	C	C
Balanus crenatus	barnacle	21	2	P	-	A	O
Mysida		3	0	P	-	O	O
Amphipoda		10	1	P	-	A	O
Caprellidae		1	0	F	-	F	F
Decapoda		2	0	P	-	C	P
Caridea	shrimps & prawns	23	2	P	-	C	O
Leander sp.		1	0	P	-	P	P
Palaemon serratus	common prawn	3	0	P	-	R	R
Pandalus montagui	Aesop prawn	2	0	O	-	F	O
Crangon sp.		1	0	R	-	R	R
Crangon crangon	common shrimp	1	0	O	-	O	O
Homarus gammarus	common lobster	86	8	P	-	C	R
Upogebia sp.	burrowing prawn	1	0	A	-	A	A
Paguridae	hermit crabs	292	29	P	-	A	O
Pagurus sp.		4	0	P	-	O	P
Pagurus bernhardus	large hermit crab	123	12	P	-	A	O
Pagurus prideaux	hermit crab	1	0	R	-	R	R
Galatheidae	squat lobster (indet.)	5	0	P	-	O	R
Galathea sp.		37	4	P	-	F	R
Galathea intermedia	squat lobster	1	0	O	-	O	O
Galathea squamifera	squat lobster	17	2	P	-	C	O
Galathea strigosa	squat lobster	4	0	P	-	F	P
Munida rugosa	long-clawed squat lobster	1	0	P	-	P	P
Pisidia longicornis	'bald' porcelain crab	5	0	P	-	O	P

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Porcellana sp.		2	0	P	F	P
Porcellana platycheles	'hairy' porcelain crab	2	0	P	R	P
Majidae		6	1	P	O	R
Maja squinado	spiny spider crab	167	16	P	A	R
Hyas sp.		7	1	P	R	P
Hyas araneus	spider crab / sea toad	48	5	P	C	R
Hyas coarctatus	spider crab	3	0	R	R	R
Inachinae		1	0	R	R	R
Inachus sp.		48	5	P	F	R
Inachus dorsettensis	scorpion spider crab	8	1	P	F	O
Inachus phalangium	Leach's spider crab	8	1	P	R	R
Macropodia sp.		55	5	P	F	R
Macropodia rostrata	long-legged spider crab	6	1	P	F	O
Macropodia temirostris	slender spider crab	4	0	P	F	R
Pisa sp.		1	0	R	R	R
Pisa armata	spider crab	2	0	R	R	R
Corystes cassivelaunus	masked crab	42	4	P	C	R
Cancer pagurus	edible crab	214	21	P	A	R
Portunidae		1	0	C	C	C
Liocarcinus sp.		6	1	R	F	O
Liocarcinus depurator	harbour crab	19	2	P	F	R
Liocarcinus holsatus		2	0	R	O	R
Necora puber	velvet swimming crab	226	22	P	A	R
Carcinus maenas	shore crab	42	4	P	A	O
Pilumnus hirtellus	hairy crab	3	0	P	P	P
Xantho incisus	furrowed crab	1	0	P	P	P
Pinnotheres sp.		3	0	P	R	P
Pinnotheres pisum	pea crab	3	0	P	R	P
MOLLUSCA		1	0	C	C	C
Polyplacophora	chitons	9	1	P	O	R
Gastropoda		1	0	R	R	R
Patella sp.	limpet	1	0	O	O	O
Helcion pellucidum	blue-rayed limpet	1	0	O	O	O
Trochidae	topshells	43	4	P	C	R
Gibbula sp.		9	1	P	C	F
Gibbula cineraria	grey topshell	39	4	P	A	O
Calliostoma zizyphinum	painted topshell	91	9	P	C	O
Turbinidae		1	0	R	R	R
Mesogastropoda		1	0	O	O	O
Turritella sp.		1	0	P	P	P
Crepidula fornicata	slipper limpet	239	23	P	S	O

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Trivia sp.	cowrie	34	3	P	F	R
Trivia arctica	northern cowrie	12	1	P	F	R
Trivia monacha	spotted cowrie	12	1	P	F	R
Polinices sp.	necklace shell	18	2	P	C	R
Euspira catena	necklace shell	11	1	P	F	R
Polinices pulchellus	Alder's necklace shell	18	2	P	C	R
Muricacea		1	0	R	R	R
Nucella lapillus	dogwhelk	4	0	R	F	R
Urosalpinx cinerea	American sting winkle	2	0	R	O	R
Ocenebra sp.	sting winkle	2	0	R	R	R
Ocenebra erinacea	European sting winkle	6	1	P	R	R
Buccinum undatum	common whelk	96	9	P	C	O
Hinia sp.	netted dogwhelk	50	5	P	A	O
Hinia incrassata	netted dogwhelk	5	0	P	C	R
Hinia reticulata	netted dogwhelk	114	11	P	A	O
Opisthobranchia		19	2	P	A	R
Nudibranchia		1	0	P	P	P
Doto sp.		1	0	P	P	P
Acanthodoris pilosa		1	0	R	R	R
Polycera sp.		3	0	P	O	P
Polycera faeroensis		2	0	R	R	R
Polycera quadrilineata		9	1	P	O	R
Thecacera pennigera		1	0	R	R	R
Archidoris pseudoargus	sea lemon	36	4	P	C	R
Jorunna tomentosa		1	0	P	P	P
Janolus cristatus		3	0	R	R	R
Coryphella sp.		1	0	R	R	R
Coryphella browni		1	0	R	R	R
Flabellina sp.		1	0	P	P	P
Flabellina pedata		4	0	R	O	R
Eubranchus sp.		2	0	R	O	R
Eubranchus tricolor		2	0	R	O	R
Facelina auriculata		1	0	R	R	R
Aeolidia papillosa		1	0	P	P	P
Dentaliidae	elephant's tusk shell	9	1	P	O	P
Antalis sp.	elephant's tusk shell	1	0	O	O	O
Antalis entalis	elephant's tusk shell	3	0	P	F	O
Pelecypoda		16	2	P	C	P
Mytilus edulis	common mussel	121	12	P	S	C
Glycymeris glycymeris		1	0	O	O	O
Ostrea sp.	oyster	1	0	O	O	O
Ostrea edulis	common oyster	73	7	P	S	O
Chlamys sp.	scallop	6	1	R	O	O

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance			
		No. of records (Total 1019)	%	Range			Median
Chlamys distorta		1	0	O	-	O	O
Chlamys varia		3	0	P	-	P	P
Aequipecten opercularis	queen scallop	15	1	P	-	F	R
Pecten maximus	(great) scallop	19	2	P	-	O	R
Anomiidae	saddle oysters	1	0	P	-	P	P
Anomia sp.	saddle oyster	1	0	R	-	R	R
Anomia ephippium	saddle oyster	3	0	P	-	O	R
Pododesmus patelliformis	saddle oyster	1	0	P	-	P	P
Acanthocardia sp.	spiny cockle	3	0	P	-	O	P
Acanthocardia aculeata	spiny cockle	2	0	P	-	R	P
Acanthocardia echinata	prickly cockle	3	0	P	-	O	R
Acanthocardia tuberculata	rough cockle	6	1	P	-	O	P
Cerastoderma edule	common cockle	8	1	P	-	A	O
Mactra sp.	trough shell	1	0	R	-	R	R
Mactra stultorum		2	0	O	-	F	O
Spisula sp.		1	0	P	-	P	P
Solenidae	razor shells	7	1	P	-	F	O
Ensis sp.	razor shell	31	3	P	-	A	O
Ensis ensis	common razor shell	1	0	P	-	P	P
Ensis siliqua	pod razor shell	2	0	F	-	C	F
Angulus sp.		3	0	P	-	C	R
Venerupis sp.		1	0	O	-	O	O
Mercenaria mercenaria	hard-shelled clam	1	0	R	-	R	R
Petricola pholadiformis	American piddock	1	0	R	-	R	R
Myoida		3	0	P	-	F	R
Mya sp.		4	0	O	-	O	O
Hiatella arctica	red nose (piddock)	4	0	P	-	R	P
Pholadidae	piddocks	9	1	P	-	A	F
Pholas sp.	piddock	53	5	P	-	A	P
Pholas dactylus	common piddock	75	7	P	-	A	F
Cephalopoda		1	0	R	-	R	R
Sepiodea		1	0	R	-	R	R
Sepia officinalis	cuttlefish	56	5	P	-	F	R
Sepiola atlantica	little cuttle	13	1	P	-	R	R
Loligo forbesii	squid	1	0	R	-	R	R
BRYOZOA		37	4	P	-	A	P
Crisiidae		3	0	O	-	C	C
Crisia sp.		1	0	F	-	F	F
Alcyonidium sp.		3	0	P	-	F	O
Alcyonidium diaphanum	'finger' bryozoan	54	5	P	-	A	O
Alcyonidium gelatinosum		1	0	P	-	P	P
Vesicularia spinosa		2	0	P	-	F	P

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance			
		No. of records (Total 1019)	%	Range			Median
Pentapora foliacea	Ross 'coral'	22	2	P	-	C	R
Schizomavella sp.		1	0	O	-	O	O
Cellepora pumicosa		30	3	P	-	C	P
Omalosecosa ramulosa		1	0	R	-	R	R
Membranipora sp.		1	0	R	-	R	R
Membranipora membranacea		3	0	O	-	F	O
Electra sp.		1	0	R	-	R	R
Electra pilosa		2	0	P	-	O	P
Flustridae		2	0	P	-	A	P
Flustra foliacea	hornwrack	199	20	P	-	A	O
Chartella papyracea		11	1	P	-	C	O
Securiflustra securifrons		9	1	P	-	C	O
Cellaria sp.		7	1	P	-	F	O
Scrupocellaria scruposa		2	0	P	-	P	P
Bicellariella sp.		1	0	O	-	O	O
Bugula sp.		27	3	P	-	C	P
Bugula plumosa		44	4	P	-	A	O
Bugula turbinata		19	2	P	-	A	O
Bryozoa indet crusts		41	4	P	-	A	P
PHORONIDA							
Phoronis hippocrepia	horseshoe worm	25	2	P	-	C	O
ECHINODERMATA							
ASTEROIDEA	starfish	3	0	P	-	O	O
Crossaster papposus	sunstar	6	1	P	-	R	R
Henricia oculata	bloody Henry	7	1	P	-	O	R
Asterias rubens	common starfish	116	11	P	-	A	O
OPHIUROIDEA	brittlestars	16	2	P	-	C	O
Ophiothrix fragilis		1	0	R	-	R	R
Ophiura sp.		3	0	R	-	O	O
Ophiura albida		8	1	P	-	O	O
Ophiura ophiura		9	1	R	-	C	R
ECHINOIDEA							
Psammechinus miliaris		2	0	P	-	O	P
Echinocardium sp.	heart urchin	2	0	F	-	F	F
Echinocardium cordatum	heart urchin	64	6	P	-	A	O
HOLOTHUROIDEA							
Aslia lefevrei		1	0	R	-	R	R
TUNICATA		8	1	P	-	O	P
ASCIDIACEA	sea squirts	20	2	P	-	A	O

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Clavelina lepadiformis	lightbulb sea squirt	77	8	P - F		R
Distaplia rosea		1	0	R - R		R
Morchellium sp.		18	2	P - F		O
Morchellium argus		35	3	P - C		R
Aplidium sp.		19	2	P - C		O
Aplidium densum		6	1	F - A		C
Aplidium pallidum		1	0	R - R		R
Aplidium proliferum		1	0	P - P		P
Aplidium punctum		35	3	P - C		O
Didemnidae		10	1	P - F		O
Didemnum sp.		5	0	P - O		P
Didemnum maculosum		5	0	P - O		R
Diplosoma sp.		11	1	P - A		P
Diplosoma listerianum		8	1	P - C		R
Diplosoma spongiforme		5	0	P - C		O
Lissoclinum sp.		3	0	P - P		P
Lissoclinum perforatum		2	0	P - R		P
Ciona intestinalis		13	1	P - A		O
Corella parallelogramma		1	0	O - O		O
Ascidiella sp.		2	0	R - F		R
Ascidiella aspersa		41	4	P - C		O
Ascidiella scabra		6	1	R - C		R
Ascidia sp.		2	0	P - R		P
Ascidia conchilega		5	0	P - O		R
Ascidia mentula		7	1	P - C		R
Styela clava	leathery sea squirt	105	10	P - A		O
Polycarpa sp.		3	0	P - C		P
Polycarpa scuba		4	0	P - A		P
Dendrodoa grossularia		20	2	P - A		R
Distomus variolosus		1	0	P - P		P
Botryllus schlosseri	star ascidian	50	5	P - C		R
Botrylloides leachi		11	1	P - F		R
Molgula sp.		12	1	P - C		F
Molgula manhattensis		4	0	P - A		C
PISCES	fish	20	2	P - A		O
Scyliorhinus sp.	dogfish (indet.)	12	1	P - O		R
Scyliorhinus canicula	lesser-spotted dogfish	33	3	P - F		R
Scyliorhinus stellaris	nursehound	1	0	R - R		R
Mustelus mustelus		1	0	R - R		R
Raja	ray (indet.)	11	1	R - F		R
Raja clavata	thornback ray	8	1	R - F		R

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Raja montagui		1	0	R - R		R
Anguilla anguilla	common eel	2	0	P - O		P
Conger conger	conger eel	13	1	P - R		R
Apletodon dentatus	small-headed clingfish	1	0	O - O		O
Lepadogaster lepadogaster	shore clingfish	3	0	P - R		R
Gadidae	cod family	2	0	P - P		P
Ciliata mustela	five-bearded rockling	3	0	P - P		P
Gadus morhua	cod	7	1	P - C		O
Merlangius merlangus	whiting	7	1	P - C		O
Molva molva	ling	1	0	R - R		R
Pollachius pollachius	pollack	39	4	P - C		O
Raniceps raninus	tadpole fish	1	0	R - R		R
Trisopterus luscus	bib, pout or pouting	175	17	P - A		F
Trisopterus minutus	poor cod	24	2	P - C		R
Ophidiidae		1	0	O - O		O
Zeus faber	John Dory	2	0	P - R		P
Syngnathidae	pipefish	7	1	R - R		R
Syngnathus sp.	pipefish (indet.)	2	0	R - R		R
Syngnathus acus	greater pipefish	12	1	P - R		R
Triglidae	gurnard (indet.)	2	0	P - R		P
Aspitrigla cuculus	red gurnard	1	0	R - R		R
Eutrigla gurnardus	grey gurnard	4	0	R - R		R
Myoxocephalus scorpius	bull rout	3	0	R - R		R
Taurulus bubalis	long-spined sea scorpion	28	3	P - F		R
Agonus cataphractus	pogge	2	0	R - R		R
Cyclopterus lumpus	lumpsucker	4	0	P - R		P
Liparis sp.	sea snail (indet.)	2	0	R - R		R
Dicentrarchus labrax	bass	6	1	P - O		P
Trachurus trachurus	horse mackerel	1	0	O - O		O
Spondyliosoma cantharus	black sea bream	12	1	P - F		P
Mullus surmuletus	red mullet	1	0	R - R		R
Chelon labrosus	thick-lipped grey mullet	1	0	R - R		R
Labridae	wrasse	26	3	P - A		P
Centrolabrus exoletus	rock cook	4	0	P - O		R
Crenilabrus melops	corkwing	43	4	P - C		R
Ctenolabrus rupestris	goldsinny	139	14	P - C		O
Labrus bergylta	ballan wrasse	113	11	P - C		R
Labrus mixtus	cuckoo wrasse	17	2	P - C		R
Blenniidae	blennies	22	2	P - C		P
Lipophrys pholis	shanny	5	0	P - O		R
Parablennius gattorugine	tompot blenny	104	10	P - A		O
Chirolophis ascanii	Yarrell's blenny	3	0	R - O		R
Pholis gunnellus	butterfish	15	1	P - C		R

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Ammodytidae	sand eels	2	0	P	- O	P
Callionymus	dragonet (indet.)	1	0	P	- P	P
Callionymus lyra	dragonet	106	10	P	- A	R
Gobiidae	gobies	6	1	P	- C	R
Gobius niger	black goby	3	0	P	- O	O
Gobius paganellus	rock goby	6	1	P	- F	P
Gobiusculus flavescens	two-spotted goby	18	2	P	- A	O
Pomatoschistus sp.	goby (indet.)	119	12	P	- A	O
Pomatoschistus microps	common goby	6	1	P	- O	P
Pomatoschistus minutus	sand goby	34	3	P	- C	P
Pomatoschistus pictus	painted goby	13	1	P	- C	R
Thorogobius ephippiatus	leopard-spotted goby	40	4	P	- C	R
Pleuronectiformes	flatfish	13	1	R	- O	R
Scophthalmus sp.		1	0	R	- R	R
Scophthalmus rhombus	brill	1	0	R	- R	R
Zeugopterus punctatus	topknot	7	1	R	- R	R
Pleuronectidae	flatfish (indet.)	8	1	R	- O	R
Limanda limanda	dab	7	1	R	- O	O
Microstomus kitt	lemon sole	1	0	O	- O	O
Platichthys flesus	flounder	2	0	P	- R	P
Pleuronectes platessa	plaice	58	6	P	- F	R
Solea solea	sole	23	2	P	- O	R
Balistes carolinensis	triggerfish	1	0	R	- R	R
MAMMALIA						
Tursiops truncatus	bottlenose dolphin	1	0	R	- R	R
ALGAE		9	1	P	- S	R
RHODOPHYCOTA	red algae	15	1	P	- A	P
Erythropeltis sp.		2	0	O	- A	O
Erythrotrichia carnea		2	0	R	- O	R
Porphyra purpurea		1	0	R	- R	R
Audouinella endophytica		3	0	P	- R	R
Audouinella endozoica		1	0	O	- O	O
Audouinella rosulata		1	0	P	- P	P
Scinaia furcellata		1	0	R	- R	R
Atractophora hypnoides		1	0	R	- R	R
Naccaria sp.		1	0	R	- R	R
Naccaria wiggii		2	0	P	- R	P
Asparagopsis armata		3	0	R	- O	O
Bonnemaisonia asparagoides		1	0	R	- R	R
Bonnemaisonia hamifera		5	0	P	- F	O

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Palmaria palmata		9	1	P	- F	R
Dilsea carnosa		30	3	P	- C	R
Dudresnaya verticillata		2	0	P	- F	P
Grateloupia doryphora		2	0	R	- C	R
Grateloupia filicina		2	0	P	- R	P
Kallymenia reniformis		4	0	O	- C	O
Peyssonnelia sp.		2	0	R	- R	R
Hildenbrandia sp.		4	0	P	- O	R
Hildenbrandia rubra		1	0	O	- O	O
Corallinaceae	encrusting coralline algae	65	6	P	- A	O
Corallina sp.		3	0	P	- F	P
Corallina officinalis		4	0	P	- C	R
Lithophyllum incrustans		2	0	P	- R	P
Phymatolithon lamii		1	0	P	- P	P
Phymatolithon laevigatum		5	0	P	- C	R
Phymatolithon lenormandii		3	0	P	- O	R
Phymatolithon purpureum		2	0	R	- O	R
Titanoderma pustulatum		1	0	P	- P	P
Gracilaria sp.		3	0	P	- R	P
Gracilaria bursa-pastoris		1	0	F	- F	F
Gracilaria gracilis		1	0	P	- P	P
Phyllophora sp.		2	0	P	- R	P
Phyllophora crispa		8	1	R	- A	O
Phyllophora pseudoceranoides		8	1	P	- F	R
Mastocarpus stellatus		1	0	C	- C	C
Chondrus crispus	carragheen / Irish moss	37	4	P	- A	O
Polyides sp.		2	0	P	- F	P
Polyides rotundus		12	1	P	- A	O
Plocamium sp.		2	0	R	- F	R
Plocamium cartilagineum		40	4	P	- A	R
Sphaerococcus coronopifolius		1	0	R	- R	R
Furcellaria lumbricalis		1	0	P	- P	P
Halarachnion ligulatum		4	0	R	- C	O
Calliblepharis ciliata		91	9	P	- A	O
Cystoclonium sp.		1	0	P	- P	P
Cystoclonium purpureum		5	0	R	- F	O
Rhodophyllis divaricata		6	1	R	- R	R
Cordylecladia erecta		7	1	R	- O	O
Rhodymenia sp.		1	0	P	- P	P
Rhodymenia delicatula		1	0	R	- R	R

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Rhodymenia holmesii		6	1	P	C	O
Rhodymenia pseudopalmata		2	0	P	R	P
Chylocladia verticillata		2	0	O	F	O
Lomentaria orcadensis		1	0	R	R	R
Antithamnion sp.		1	0	R	R	R
Antithamnionella spirographidis		1	0	R	R	R
Callithamnion sp.		2	0	P	F	P
Callithamnion corymbosum		1	0	P	P	P
Ceramium sp.		4	0	P	P	P
Ceramium pallidum		1	0	P	P	P
Ceramium diaphanum		1	0	O	O	O
Ceramium nodulosum		4	0	O	C	F
Griffithsia sp.		6	1	P	F	O
Griffithsia corallinoides		2	0	R	R	R
Griffithsia devoniensis		2	0	P	O	P
Halurus flosculosus		15	1	P	A	O
Halurus equisetifolius		5	0	P	F	R
Monosporus pedicellatus		1	0	F	F	F
Pterothamnion plumula		1	0	R	R	R
Spyridia filamentosa		8	1	R	A	O
Acrosorium sp.		1	0	R	R	R
Apoglossum ruscifolium		1	0	R	R	R
Cryptopleura ramosa		8	1	P	O	O
Delesseria sanguinea	sea beech	19	2	P	C	O
Drachiella spectabilis		2	0	P	O	P
Erythroglossum		1	0	P	P	P
Hypoglossum hypoglossoides		7	1	P	F	R
Membranoptera alata		1	0	R	R	R
Nitophyllum punctatum		1	0	P	P	P
Dasya punicea		1	0	R	R	R
Heterosiphonia plumosa		4	0	R	O	O
Brongniartella byssoides		9	1	P	F	O
Chondria dasyphylla		13	1	P	C	R
Halopithys incurvus		1	0	O	O	O
Polysiphonia sp.		8	1	P	C	P
Polysiphonia atlantica		1	0	P	P	P
Polysiphonia brodiei		1	0	P	P	P
Polysiphonia elongata		3	0	R	O	R
Polysiphonia fibrata		1	0	C	C	C
Polysiphonia lanosa		2	0	R	O	R
Polysiphonia nigra		1	0	P	P	P

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance		
		No. of records (Total 1019)	%	Range		Median
Polysiphonia stricta		3	0	P	R	P
Rhodomela confervoides		4	0	R	C	R
Filamentous red algae		5	0	O	C	O
Foliose red algae		271	27	P	S	O
Rhodophycota indet. (non-calc.crusts)		18	2	P	A	P
CHROMOPHYCOTA	brown algae	12	1	P	A	P
Ectocarpus sp.		2	0	R	R	R
Pseudolithoderma extensum		4	0	O	O	O
Chordaria flagelliformis		1	0	R	R	R
Myriocladia sp.		1	0	R	R	R
Cutleria multifida		1	0	R	R	R
Aglaozonia (asexual *Cutleria*)		2	0	O	O	O
Sphacelaria sp.		1	0	F	F	F
Sphacelaria cirrosa		2	0	R	O	R
Cladostephus spongiosus		4	0	R	O	R
Dictyota dichotoma		17	2	P	C	O
Taonia atomaria		2	0	R	O	R
Sporochnus pedunculatus		3	0	P	R	R
Desmarestia sp.		1	0	F	F	F
Desmarestia aculeata		11	1	P	C	O
Arthrocladia villosa		4	0	P	O	R
Asperococcus bullosus		1	0	P	P	P
Punctaria latifolia		1	0	R	R	R
Scytosiphon lomentaria		1	0	R	R	R
Chorda filum	bootlace weed	34	3	P	A	O
Laminaria sp.		26	3	P	C	O
Laminaria digitata	kelp/tangle	13	1	P	F	O
Laminaria hyperborea	kelp/cuvie	17	2	P	A	O
Laminaria saccharina	sugar kelp	26	3	P	C	O
Saccorhiza polyschides		4	0	O	F	F
Fucus serratus	toothed wrack	4	0	F	F	F
Halidrys siliquosa	podweed	15	1	P	A	O
Filamentous brown algae		5	0	P	C	C
Chromophycota indet.(crusts)		2	0	P	O	P
Foliose brown algae		43	4	P	S	O
CHLOROPHYCOTA	green algae	5	0	P	O	O
Enteromorpha sp.	gut weed	8	1	P	F	R
Enteromorpha intestinaloides		1	0	O	O	O
Enteromorpha linza		1	0	P	P	P

Species name (& higher taxa)	Common name	Frequency of occurrence		Abundance			
		No. of records	%	Range			Median
		(Total 1019)					
Ulva sp.		3	0	P	-	O	R
Ulva lactuca	sea lettuce	19	2	P	-	C	R
Ulva olivascens		1	0	R	-	R	R
Ulva tenera		1	0	F	-	F	F
Cladophora sp.		2	0	O	-	O	O
Cladophora pellucida		1	0	R	-	R	R
Bryopsis sp.		1	0	P	-	P	P
Bryopsis hypnoides		2	0	R	-	R	R
Bryopsis plumosa		2	0	R	-	O	R
Derbesia sp.		1	0	P	-	P	P
Derbesia marina		4	0	R	-	R	R
Filamentous green algae		2	0	P	-	R	P
Foliose green algae		28	3	P	-	S	O
Total no. of plant taxa =	148						
Total no. of animal taxa =	452						

APPENDIX 8

Species recorded from collected samples

The following species of algae, hydroids and bryozoans have been identified by David Ventham (a marine biologist based in Brighton) from samples of substratum and seaweed collected by *SEASEARCH* divers (for the primary purpose of identifying associated harpacticoid copepods).

Nomenclature follows that of the Species Directory (Howson & Picton eds. 1997).
Dive Nos. (=Field Site Nos.) given plus benthic sample no. in parentheses. Note that the Dive Nos. are divided into year categories, which correspond to the database survey nos. (given elsewhere in this report) as follows:

1992 = 711	1993 = 712	1994 = 713	1995 = 714	1996 = 715	1997 = 716	1998 = 717

ALGAE

Chlorophycota - green algae

Species	Field Site No. (sample no.)		Notes
Bryopsis sp.	95/- (53)		
Cladophora sp.	95/- (54)	95/92 (75)	

Chromophycota - brown algae

Species	Field Site No. (sample no.)					Notes
Arthrocladia villosa	94/133 (28)					
Ectocarpales indet.	95/- (53)	95/- (54)	97/27 (96)	97/33 (90)		
Cladostephus spongiosus	94/84 (22) 97/33 (90)	94/196 (37) ?97/36 (91)	95/- (53) 97/49 (99)	95/97 (77)	97/20 (88)	f. *verticillatus*
Dictyota dichotoma	94/136 (29) 97/49 (99)	94/199 (38) 97/62 (101)	95/97 (77) 97/64 (84)	97/23 (86)	97/33 (90)	
Taonia atomaria	95/48 (63)	97/20 (88)	97/65 (83)	97/- (97)		
Desmarestia aculeata	97/20 (88)	97/27 (96)	97/33 (90)	97/64 (84)	97/- (97)	
Desmarestia ligulata	94/- (23)					
Halidrys siliquosa	95/- (39)	95/- (53)				
Halopteris scoparia	95/- (53)	95/97 (77)				
Sporochnus pedunculatus	94/133 (28)	94/136 (29)	94/145 (32)			
Laminaria sp(p). (young)	97/20 (88)	97/33 (90)				
Saccorhiza polyschides (young)	?97/36 (91)					

Rhodophycota - red algae

Species	Field Site No. (sample no.)					Notes
Bonnemaisonia asparagoides	97/- (97)					
Palmaria palmata	97/62 (101)					
Jania rubens	?97/36 (91)					
Calliblepharis ciliata	94/14 (2) 94/82 (21) 94/196 (37) 95/93 (76) 97/62 (101)	94/41 (11) 94/133 (28) 94/199 (38) 95/97 (77) 97/65 (83)	94/41 (12) 94/136 (29) 95/04 (41) 97/27 (96) 97/- (97)	94/78 (19) 94/138 (30) 95/- (53) ?97/36 (91)	94/80 (20) 94/152 (31) 95/95 (74) 97/49 (99)	
Cystoclonium purpureum	97/49 (99)					
Rhodophyllis divaricata	94/- (23)	94/196 (37)	97/37 (93)			
Dilsea carnosa	97/62 (101)					
Chondrus crispus	94/196 (37)	95/48 (63)	?97/36 (91)	97/49 (99)		
Phyllophora crispa	95/- (53)					
Phyllophora pseudoceranoides	94/09 (1) 94/152 (31)	94/14 (2) 94/199 (38)	94/25 (3) 95/- (53)	94/73 (18) 97/23 (86)	94/- (23) 97/62 (101)	
Gracilaria gracilis	97/33 (90)					

Species	Field Site No. (sample no.)					Notes
Gracilaria sp.	94/138 (30)	94/199 (38)	95/48 (63)	95/92 (75)	95/- (80)	*G. ?bursa-pastoris* or *G. ?gracilis*
Plocamium cartilagineum	94/14 (2) 94/122 (27) 95/04 (41) 95/74 (72) 97/23 (86) 97/64 (84)	94/25 (3) 94/152 (31) 95/- (53) 95/75 (73) 97/27 (96) 97/- (97)	94/35 (10) 94/166 (34) 95/- (54) 95/97 (77) 97/33 (90)	94/41 (12) 94/196 (37) 95/41 (58) 95/- (80) 97/37 (93)	94/84 (22) 95/- (39) 95/48 (63) 97/20 (88) 97/62 (101)	
Chylocladia verticillata	94/- (23)	97/33 (90)				
Cordylecladia erecta	95/74 (72)					
Lomentaria orcadensis	95/- (53)					
Rhodymenia holmesii	95/41 (58) 95/54 (66)	95/48 (63)	95/74 (72)	95/75 (73)	95/- (80)	
Antithamnion villosum	95/- (54)					
Apoglossum ruscifolium	94/138 (30)	95/- (53)				
Ceramium spp.	94/84 (22) 95/- (53) 95/95 (74) ?97/36 (91)	94/- (23) 95/- (54) 95/97 (77) 97/49 (99)	94/133 (28) 95/48 (63) 95/- (80) 97/64 (84)	94/152 (31) 95/74 (72) 97/27 (96) 97/65 (83)	94/196 (37) 95/75 (73) 97/33 (90) 97/- (97)	
Griffithsia corallinoides	95/- (54)					
Griffithsia devoniensis	95/- (54)					
Halurus equisetifolius	94/25 (3)	95/97 (77)	97/62 (101)			
Halurus flosculosus	95/- (53) 97/- (97)	97/20 (88)	97/27 (96)	97/33 (90)	97/65 (83)	
Monosporus pedicellatus	94/133 (28)	97/49 (99)				
Pterothamnion plumula	94/138 (30)[1]	97/49 (99)[2]				[1] tristichous form [2] distichous form
Spermothamnion repens	95/- (53)					
Sphondylothamnion multifidum	94/136 (29)	95/- (54)				
Spyridia filamentosa	94/14 (2) 94/133 (28) 95/48 (63) 95/95 (74) 97/- (97)	94/25 (3) 94/152 (31) 95/74 (72) 97/33 (90)	94/80 (20) 94/194 (36) 95/97 (77) 97/62 (101)	94/82 (21) 94/196 (37) 95/- (80) 97/64 (84)	94/122 (27) 95/- (54) 94/163 (33) 97/65 (83)	
Heterosiphonia plumosa	94/- (23) 94/199 (38) 97/23 (86)	94/122 (27) 95/- (53) 97/27 (96)	94/152 (31) 95/- (54) 97/- (97)	94/163 (33) 95/97 (77)	94/165 (35) 97/20 (88)	
Cryptopleura ramosa	94/84 (22) 97/23 (86) 97/64 (84)	94/- (23) 97/27 (96)	95/- (53) 97/33 (90)	95/97 (77) ?97/36 (91)	97/20 (88) 97/62 (101)	* var. *uncinata*
Delesseria sanguinea	95/- (53)	97/20 (88)	97/23 (86)	97/62 (101)		
Erythroglossum laciniatum	95/- (53)					
Hypoglossum hypoglossoides	94/152 (31) 95/48 (63) ?97/36 (91)	94/196 (37) 95/74 (72) 97/62 (101)	95/- (53) 95/97 (77) 97/- (97)	95/- (54) 95/- (80)	95/41 (58) 97/20 (88)	
Brongniartella byssoides	94/73 (18) 94/133 (28) 97/27 (96)	94/78 (19) 94/136 (29) 97/33 (90)	94/80 (20) 95/- (53) 97/65 (83)	94/82 (21) 95/- (54) 97/- (97)	94/- (23) 97/20 (88)	
Chondria dasyphylla	94/80 (20) 95/48 (63)	94/136 (29) 97/33 (90)	94/152 (31) 97/65 (83)	94/194 (36) 97/- (97)	95/- (54)	
Halopithys incurvus	?97/36 (91)					
Polysiphonia elongata	95/- (53)	95/- (54)	95/48 (63)	97/33 (90)	97/65 (83)	
Polysiphonia fucoides	95/- (53)	95/- (54)	95/48 (63)	97/33 (90)	97/49 (99)	
Polysiphonia nigra	95/48 (63)	95/74 (72)	95/- (80)	97/65 (83)		
Polysiphonia spp.	94/80 (20) 94/194 (36)	94/82 (21) 95/- (54)	94/133 (28) 95/97 (77)	94/152 (31) 97/27 (96)	94/145 (32) 97/- (97)	
Rhodomela confervoides	94/80 (20) 95/- (53)	94/82 (21) 95/48 (63)	94/133 (28) 95/97 (77)	94/166 (34) 97/33 (90)	94/196 (37) 97/49 (99)	

HYDROZOA

Species	Field Site No. (sample no.)					Notes
Tubularia indivisa	94/121 (24) 95/29 (56)	94/136 (29) 95/42 (60)	94/138 (30)	95/- (53)	95/28 (55)	
Coryne muscoides	94/199 (38)	95/97 (77)				
Eudendrium capillare	94/166 (34)					
Eudendrium rameum	95/61 (67)					
Eudendrium ramosum	97/- (98)					
Phialella quadrata	95/- (53)					
Calycella syringa	94/78 (19)	95/61 (67)	95/97 (78)			
Halecium beanii	95/42 (61)	95/61 (67)				
Halecium halecinum	94/49 (14)	95/53 (65)	95/61 (67)			
Halecium lankesteri	94/166 (34)	94/165 (35)	95/61 (67)	95/75 (73)	95/- (80)	
Amphisbetia operculata	95/- (54)	97/64 (84)				
Diphasia attenuata	95/97 (78)	97/64 (84)				
Diphasia rosacea	94/166 (34)	95/61 (67)				
Diphasia ?rosacea	95/- (53)					infertile
Hydrallmania falcata	94/49 (13) 95/28 (55)	94/145 (32) 95/43 (62)	94/163 (33) 95/97 (78)	94/165 (35) 95/61 (67)	95/- (53)	
Sertularella 'gaudichaudi'	94/163 (33) 95/54 (66) 97/27 (96)	94/165 (35) 95/61 (67) 97/50 (102)	95/29 (56) 95/74 (72) 97/- (98)	95/40 (59) 95/75 (73)	95/42 (61) 95/- (80)	
Sertularia argentea	94/09 (1)	94/14 (2)	95/97 (78)			
Sertularia (?argentea/cupressina)	94/165 (35)	95/28 (55)	95/43 (62)	95/97 (78)		
Sertularia cupressina	95/61 (67)					
Tridentata distans	94/09 (1) 95/- (53) 97/20 (88) 97/65 (83)	94/82 (21) 95/97 (77) 97/27 (96)	94/133 (28) 95/97 (78) 97/33 (90)	94/138 (30) ?97/36 (91) 97/62 (101)	94/166 (34) 97/49 (99) 97/64 (84)	
Monotheca obliqua	95/97 (77)	97/23 (86)				
Nemertesia antennina	94/56 (15) 95/43 (62)	94/141 (26) 95/53 (65)	95/28 (55) 95/54 (66)	95/40 (59)	95/42 (60)	
Plumularia setacea	94/26 (4)	94/82 (21)	95/- (53)	95/75 (73)	95/97 (78)	
Aglaophenia pluma	95/- (39)	95/- (53)	95/97 (77)	97/23 (86)		
Orthopyxis integra	95/48 (63) 95/- (80) 97/65 (83)	95/74 (72) 97/20 (88)	95/75 (73) 97/33 (90)	95/97 (77) 97/49 (99)	95/97 (78) 97/62 (101)	
Rhizocaulus verticillatus	95/61 (67)					
Clytia hemisphaerica	94/121 (24) 94/163 (33) 95/- (53) 95/97 (78)	94/141 (26) 94/166 (34) 95/61 (67) 95/- (80)	94/133 (28) 94/165 (35) 95/74 (72) 97/49 (99)	94/136 (29) 94/196 (37) 95/75 (73) 97/65 (83)	94/152 (31) 94/199 (38) 95/95 (74)	
Clytia paulensis	94/65 (8) 95/- (80)	94/166 (34)	95/- (53)	95/61 (67)	95/95 (74)	see 8.13.2
Obelia geniculata	95/- (53)	95/- (54)	97/33 (90)	?97/36 (91)	97/64 (84)	
Obelia longissima	94/65 (8)	94/166 (34)	95/07 (42)	95/61 (67)		
Obelia sp(p). (small colonies)	95/- (53) 95/74 (72)	95/- (54) 95/75 (73)	95/29 (56) 95/92 (75)	95/43 (62) 95/- (80)	95/61 (67) 97/65 (83)	

BRYOZOA

Species	Field Site No. (sample no.)					Notes
Filicrisia geniculata	94/122 (27)	97/- (97)	97/- (98)			
Crisidia cornuta	94/- (23) 97/- (97)	94/121 (24)	94/122 (27)	95/- (53)	97/23 (86)	
Crisia aculeata	94/25 (3) 94/163 (33) 95/54 (66)	94/73 (18) 94/199 (38) 95/97 (77)	94/- (23) 95/- (39) 97/20 (88)	94/122 (27) 95/- (53) 97/23 (86)	94/136 (29) 95/- (54) 97/- (98)	
Crisia denticulata	94/121 (24)	95/- (53)	97/23 (86)	97/- (97)		
Lichenopora radiata	94/136 (29)	94/138 (30)	94/199 (38)			see 8.13.2
Disporella hispida	95/- (54)					

Species	Field Site No. (sample no.)					Notes
Alcyonidium diaphanum	97/27 (96)					
Nolella dilatata	97/- (98)					
Walkeria uva	94/133 (28)	95/- (53)	97/49 (99)			
Mimosella verticillata	94/163 (33)					see 8.13.2
Vesicularia spinosa	95/61 (67)					
Amathia lendigera	94/09 (1) 95/97 (78) 97/- (97)	94/82 (21) 95/- (80) 97/- (98)	95/- (39) 97/33 (90)	95/- (53) ?97/36 (91)	95/95 (74) 97/49 (99)	
Bowerbankia pustulosa	95/- (54)					
Escharoides coccinea	94/122 (27)	94/136 (29)				
Smittina landsborovii	94/122 (27)					
Schizomavella linearis	94/122 (27) 97/64 (84)	94/136 (29)	94/199 (38)	95/97 (77)	97/50 (102)	
Schizomavella hastata	97/50 (102)					
Haplopoma impressum	94/199 (38)	97/20 (88)	97/27 (96)	97/- (97)		
Haplopoma bimucronatum	?97/36 (91)					see 8.13.2
Celleporella hyalina	94/41 (12) 94/199 (38) 95/75 (73) 97/23 (86) 97/64 (84)	94/73 (18) 95/- (53) 95/97- (77) 97/27 (96) 97/65 (83)	94/80 (20) 95/48 (63) 95/97 (78) ?97/36 (91)	94/- (23) 95/54 (66) 95/- (80) 97/49 (99)	94/196 (37) 95/74 (72) 97/20 (88) 97/62 (101)	
Cellepora pumicosa	97/50 (102)					
Celleporina hassallii	94/199 (38)					
Aetea anguina	94/- (23) 97/64 (84)	95/- (53) 97/- (98)	95/97 (77)	97/23 (86)	97/62 (101)	
Scruparia ambigua	94/121 (24) 95/61 (67) 97/37 (93)	94/133 (28) 97/20 (88) 97/64 (84)	94/163 (33) 97/23 (86) 97/65 (83)	94/166 (34) 97/27 (96) 97/- (97)	94/196 (37) ?97/36 (91)	
Scruparia chelata	94/122 (27) 97/20 (88) 97/49 (99) 97/- (98)	94/163 (33) 97/23 (86) 97/62 (101)	95/- (53) 97/27 (96) 97/64 (84)	95/97 (77) 97/33 (90) 97/65 (83)	95/97 (78) ?97/36 (91) 97/- (97)	
Electra pilosa	94/09 (1) 94/82 (21) 94/163 (33) 95/41 (58) 95/75 (73) 97/20 (88) 97/37 (93) 97/- (97)	94/35 (9) 94/- (23) 94/165 (35) 95/48 (63) 95/95 (74) 97/23 (86) 97/49 (99)	94/41 (12) 94/121 (24) 95/04 (41) 95/54 (66) 95/92 (75) 97/27 (96) 97/62 (101)	94/73 (18) 94/136 (29) 95/- (53) 95/61 (67) 95/97 (77) 97/33 (90) 97/64 (84)	94/80 (20) 94/145 (32) 95/29 (56) 95/74 (72) 95/- (80) ?97/36 (91) 97/65 (83)	
Flustra foliacea	94/25 (3) 95/61 (67)	94/26 (4) 97/27 (96)	94/73 (18)	94/138 (30)	94/141 (26)	
Chartella papyracea	94/141 (26)					
Scrupocellaria reptans	97/23 (86)	97/62 (101)	97/- (97)			
Scrupocellaria scrupea	94/121 (24)	94/122 (27)	97/- (98)			see 8.13.2
Scrupocellaria scruposa	94/26 (4) 95/61 (67)	94/121 (24) 97/20 (88)	94/122 (27) 97/37 (93)	95/- (53) 97/- (97)	95/42 (61) 97/- (98)	
Bicellariella ciliata	94/82 (21) 97/23 (86) 97/- (97)	95/42 (61) 97/27 (96) 97/- (98)	95/54 (66) 97/49 (99)	95/61 (67) 97/64 (84)	97/20 (88) 97/65 (83)	
Beania mirabilis	94/138 (30)	97/20 (88)				
Bugula flabellata	94/73 (18)					
Bugula fulva	94/73 (18) 95/74 (72) 97/- (98)	94/122 (27) 95/75 (73)	94/136 (29) 95/97 (78)	94/138 (30) 97/50 (102)	95/54 (66) 97/64 (84)	
Bugula plumosa	94/82 (21) 97/- (98)	94/141 (26)	95/42 (61)	95/61 (67)	97/65 (83)	
Bugula turbinata	94/78 (19)	94/121 (24)	95/97 (78)	97/65 (83)	97/- (98)	
Epistomia bursaria	97/62 (101)					see 8.13.2

Details for those benthic samples lacking dive nos. [Note - these samples were taken during non-*SEASEARCH* dives]

No.	Date	Location	Depth (BCD)	Sample type
94/- (23)	31.07.94	*Outer Mulberry*, off Pagham	4.5 m	weed
95/- (39)	25.03.95	*Outer Mulberry*	7.1 m	weed
95/- (53)	21.05.95	*Outer Mulberry*	5.0 m	weed
95/- (54)	21.05.95	*Outer Mulberry*	6.0 m	silt + small algal & bryozoan growths
95/- (80)	22.09.95	Just W of Brighton Marina	4.0-4.9 m	weed
97/- (97)	27.07.97	*Outer Mulberry*	6.4 m	silt smothering a turf of small algae & associated bryozoans
97/- (98)	27.07.97	*Outer Mulberry*	6.6 m	bryozoan turf

APPENDIX 9

List of all Sussex *SEASEARCH* dives
undertaken between 1992 to 1998
(in chronological order)

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
711	1	Inner Waldrons reef 1, Bognor Regis.	50°45.1'N 00°38.8'W	SZ 954 957	Sue Burton / Bill Baldock	11.04.92
711	2	Inner Waldrons reef 2, Bognor Regis.	50°45.1'N 00°38.8'W	SZ 954 957	David Gunnersen	11.04.92
711	3	Inner Waldrons reef 3, Bognor Regis.	50°45.1'N 00°38.8'W	SZ 954 957	David Gunnersen	11.04.92
711	4	Inner Waldrons Reef 4, Bognor Regis.	50°45.2'N 00°38.8'W	SZ 953 958	Sue Burton / Bill Baldock	11.04.92
711	5	Inner Waldrons reef 5, Bognor Regis.	50°43.1'N 00°38.7'W	SZ 955 919	Nigel Paris / Hal Celebi	06.06.92
711	6	Inner Waldrons reef 6, Bognor Regis.	50°45.0'N 00°38.7'W	SZ 955 955	Jane Lilley / David Harvey	06.06.92
711	7	Inner Waldrons reef 7, Bognor Regis.	50°45.1'N 00°38.7'W	SZ 955 956	Linda Townley / Vicki Billings	06.06.92
711	8	Outer Waldrons reef 1, Bognor Regis.	50°44.7'N 00°37.5'W	SZ 969 949	Clare Coghlan / Greg Smith	07.06.92
711	9	Central Waldrons reef 1, Bognor Regis.	50°44.8'N 00°38.3'W	SZ 959 952	Clare Coghlan / Greg Smith	07.06.92
711	10	Outer Waldrons reef 2, Bognor Regis.	50°44.8'N 00°37.5'W	SZ 969 951	Bill Baldock / Alison Bourne	07.06.92
711	11	Central Waldrons reef 2, Bognor Regis.	50°44.9'N 00°38.4'W	SZ 958 953	Bill Baldock / Alison Bourne	07.06.92
711	12	Outer Waldrons reef 3, Bognor Regis.	50°44.8'N 00°37.6'W	SZ 968 951	Jane Lilley / Ben Benatt	07.06.92
711	13	Central Waldrons 3, Bognor Regis.	50°44.9'N 00°38.4'W	SZ 959 953	Nigel Paris / Hal Celebi	07.06.92
711	14	Inner Waldrons Reef 8, Bognor Regis.	50°45.1'N 00°38.7'W	SZ 955 956	Ben Benatt / Jane Lilley	07.06.92
711	15	Central Waldrons 4, Bognor Regis.	50°45.0'N 00°38.4'W	SZ 958 955	Andy Willett / Peter Hewitt	07.06.92
711	16	Outer Waldrons 4, Bognor Regis.	50°44.7'N 00°37.3'W	SZ 972 949	Peter Hewitt	07.06.92
711	17	SW of Middleton Ledge, Bognor Regis.	50°46.3'N 00°37.6'W	SZ 967 979	Jane Lilley / Nigel Paris / Hal Celebi	06.06.92
711	19	S of Bognor Rocks 1, Bognor Regis.	50°45.8'N 00°39.7'W	SZ 943 969	Ben Benatt / Peter Hewitt	06.06.92
711	20	S of Bognor Rocks 2, Bognor Regis.	50°45.8'N 00°39.9'W	SZ 941 969	Clare Coghlan / Greg Smith	06.06.92
711	21	S of Bognor Rocks 3, Bognor Regis.	50°45.9'N 00°40.0'W	SZ 940 970	Clare Coghlan / Greg Smith	06.06.92
711	22	S of Bognor Rocks 4, Bognor Regis.	50°45.6'N 00°40.1'W	SZ 939 965	Bill Baldock / Alison Bourne	06.06.92
711	23	S of Bognor Rocks 5, Bognor Regis.	50°45.8'N 00°39.5'W	SZ 945 970	Bill Baldock / Alison Bourne	06.06.92
711	24	S of Bognor Rocks 6, Bognor Regis.	50°45.6'N 00°40.3'W	SZ 935 966	Bill Hewitt / Jon Parsons	06.06.92
711	25	S of Bognor Rocks 7, Bognor Regis.	50°45.9'N 00°39.7'W	SZ 942 971	Ben Benatt / Jon Parsons	06.06.92
711	26	S of Bognor Rocks 8, Bognor Regis.	50°45.9'N 00°39.6'W	SZ 944 971	Bill Hewitt	06.06.92
711	27	S of Bognor Rocks 9, Bognor Regis.	50°45.9'N 00°39.9'W	SZ 941 971	Peter Hewitt	06.06.92
711	28	S of Bracklesham 1, Bracklesham Bay.	50°44.8'N 00°51.0'W	SZ 811 948	Jean Beckinsale	29.07.92
711	29	S of Bracklesham 2, Bracklesham Bay.	50°44.2'N 00°51.0'W	SZ 811 937	Jean Beckinsale / Bill Beckinsale	23.09.92
711	30	Betty Peeleys, Bracklesham Bay.	50°44.4'N 00°50.3'W	SZ 818 942	Jean Beckinsale / Hilary Richardson	21.10.92
711	31	S of East Pole Sands 1, Bracklesham Bay.	50°44.7'N 00°55.2'W	SZ 761 945	Martin Tulett / Robert Irving	23.09.92
711	32	W of Hounds Reef 1, Bracklesham Bay.	50°44.3'N 00°50.9'W	SZ 812 939	Andy Willett / Jane Lilley	23.09.92
711	33	W of Hounds Reef 2, Bracklesham Bay.	50°44.4'N 00°51.1'W	SZ 809 941	Robert Irving / Martin Tulett	23.09.92
711	34	S of East Pole Sands 2, Bracklesham Bay.	50°44.7'N 00°55.2'W	SZ 761 945	Nigel Thomas	23.09.92
711	35	W of Hounds Reef 3, Bracklesham Bay.	50°44.4'N 00°51.1'W	SZ 809 941	Nigel Thomas	23.09.92
711	36	Kingmere Rocks 5, Littlehampton.	50°43.3'N 00°28.0'W	TV 082 926	Jane Lilley	03.06.92
711	37	1km NW of 'HMS Pine', Bognor Regis.	50°43.4'N 00°38.1'W	SZ 962 924	Jane Lilley	26.07.92
711	197	Worthing Lumps 1.	50°43.9'N 00°24.3'W	TV 124 937	Robert Irving / Kate Northen	15.10.94
712	1	SW of Shelley Rocks 1, Bognor Regis.	50°45.3'N 00°37.5'W	SZ 969 961	Jadzia Siemienska / Richard Hall	07.03.93
712	2	SW of Shelley Rocks 2, Bognor Regis.	50°45.3'N 00°37.5'W	SZ 969 960	Laura S-Johnson / Robert Irving	07.03.93
712	3	SW of Shelley Rocks 3, Bognor Regis.	50°45.5'N 00°37.5'W	SZ 969 965	Sue Bewsey / Kate Thorne	07.03.93
712	4	SW of Shelley Rocks 4, Bognor Regis.	50°45.5'N 00°37.4'W	SZ 970 964	Sue Gilbard / Antony Male	07.03.93
712	5	Spoon Reef 1, Littlehampton.	50°44.2'N 00°34.0'W	TV 011 942	David Gunnersen / Nigel Paris	27.03.93
712	6	Spoon Reef 2, Littlehampton.	50°44.2'N 00°33.9'W	TV 011 941	Laura Sandford-J / Tony Dobinson	h 27.03.93
712	7	Nr wreck of HMS Pine, Bognor Regis.	50°42.9'N 00°37.6'W	SZ 968 917	David Gunnersen / Nigel Paris	27.03.93
712	8	Nr wreck of HMS Pine 2, Bognor Regis.	50°42.9'N 00°37.6'W	SZ 968 917	Laura Sandford-J / Tony Dobinson	h 27.03.93
712	9	S side of Mixon Hole, Selsey Bill.	50°42.4'N 00°45.9'W	SZ 871 904	David Gunnersen	28.03.93
712	10	Selsey Lifeboat Station 1, Selsey Bill.	50°43.5'N 00°46.7'W	SZ 862 925	Daniel Golberg / Adam Golberg	17.04.93
712	11	Selsey Lifeboat Station 2, Selsey Bill.	50°43.5'N 00°46.7'W	SZ 862 925	Val Shepherd / Jon Parsons	17.04.93
712	12	Sluice Rocks, East Selsey 1, Selsey Bill.	50°43.7'N 00°46.2'W	SZ 867 929	Val Shepherd	18.04.93
712	13	Sluice Rocks, East Selsey 2, Selsey Bill.	50°43.8'N 00°46.2'W	SZ 868 931	Karen Davies / Mark Rowe	18.04.93
712	15	Nr Intact Mulberry 1, Selsey Bill.	50°43.6'N 00°43.2'W	SZ 902 927	Laura Sandford-J / Mark Sherwood	h 09.04.93
712	16	S of Shelley Rocks 1, Bognor Regis.	50°45.4'N 00°36.6'W	SZ 979 962	David Gunnersen	17.04.93
712	17	S of Shelley Rocks 2, Bognor Regis.	50°45.4'N 00°36.6'W	SZ 979 962	Nigel Paris / Laura Sandford-J	17.04.93
712	18	E of Boulder Buoy, Selsey 1, Selsey Bill.	50°41.5'N 00°47.9'W	SZ 848 887	David Gunnersen	17.04.93
712	19	E of Boulder Buoy, Selsey 2, Selsey Bill.	50°41.5'N 00°47.4'W	SZ 853 888	Laura Sandford-J / Nigel Paris	h 17.04.93
712	20	Near Mulberry Tops, Bognor Regis.	50°45.1'N 00°41.5'W	SZ 922 957	Hal Celebi / Nigel Paris	07.05.93
712	21	Shelley Rocks 1, Bognor Regis.	50°46.1'N 00°37.0'W	SZ 975 975	Jo Jamieson / Chris McTernan	29.05.93
712	22	Shelley Rocks 2, Bognor Regis.	50°46.0'N 00°37.0'W	SZ 975 974	Jon Parsons / Sarah Fowler	29.05.93
712	23	Shelley Rocks 3, Bognor Regis.	50°46.2'N 00°36.9'W	SZ 976 977	Robert Irving / Clare Bradshaw	29.05.93
712	24	Shelley Rocks 4, Bognor Regis.	50°46.1'N 00°36.7'W	SZ 977 975	Jane Lilley / Bill Farnham	29.05.93
712	25	Shelley Rocks 5, Bognor Regis.	50°46.2'N 00°36.6'W	SZ 979 978	Chris Wood / Andy Willett	27.05.93
712	26	S of Barn Rocks 1, Bognor Regis.	50°46.0'N 00°42.0'W	SZ 916 973	Jo Jamieson / Chris McTernan	29.05.93
712	27	S of Barn Rocks 2, Bognor Regis.	50°45.9'N 00°42.0'W	SZ 916 971	Sarah Fowler / Jon Parsons	29.05.93
712	28	S of Barn Rocks 3, Bognor Regis.	50°45.6'N 00°41.9'W	SZ 917 965	Clare Bradshaw / Robert Irving	29.05.93
712	29	S of Barn Rocks 4, Bognor Regis.	50°46.0'N 00°42.3'W	SZ 912 973	Jane Lilley / Bill Farnham	29.05.93
712	30	S of Barn Rocks 5, Bognor Regis.	50°46.0'N 00°42.6'W	SZ 909 973	Chris Wood	29.05.93
712	31	Outer Mulberry 1, Bognor Regis.	50°44.7'N 00°42.1'W	SZ 914 948	Katherine Varvill / Jon Parsons	12.06.93
712	32	Outer Mulberry 2, Bognor Regis.	50°44.7'N 00°42.2'W	SZ 914 949	Chris Wood / John Doubleday	12.06.93
712	33	Outer Mulberry 3, Bognor Regis.	50°44.7'N 00°42.1'W	SZ 915 949	Clare Bradshaw / Zal Rustrom	12.06.93

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
712	34	E of Outer Mulberry, Bognor Regis.	50°44.7'N 00°42.0'W	SZ 916 949	Robert Irving / Bill Farnham	12.06.93
712	35	W of Outer Mulberry, Bognor Regis.	50°44.2'N 00°42.2'W	SZ 914 940	Jess Ostler / Jay Butler	12.06.93
712	36	S of Outer Mulberry 1, Bognor Regis.	50°44.2'N 00°42.2'W	SZ 914 940	Bill Farnham / John Doubleday	12.06.93
712	37	S of Outer Mulberry 2, Bognor Regis.	50°44.4'N 00°42.0'W	SZ 916 942	Clare Bradshaw / Zal Rustrom	12.06.93
712	38	Nr Intact Mulberry 2, Selsey Bill.	50°43.7'N 00°43.1'W	SZ 903 929	Martin Tulett / John Doubleday	13.06.93
712	39	Nr Intact Mulberry 3, Selsey Bill.	50°43.3'N 00°43.1'W	SZ 903 923	Chris Spurrier / Kay Ingleton	13.06.93
712	40	The Park 1, Bognor Regis.	50°43.3'N 00°41.4'W	SZ 924 922	Chris Wood / Jon Parsons	13.06.93
712	41	The Park 2, Bognor Regis.	50°43.3'N 00°41.2'W	SZ 926 923	Clare Bradshaw / Robert Irving	13.06.93
712	43	S of Middleton Ledge, Bognor Regis.	50°44.4'N 00°37.1'W	SZ 974 943	Chris Spurrier / Kay Ingleton	13.06.93
712	44	E of Shelley Rocks 1, Bognor Regis.	50°45.9'N 00°36.8'W	SZ 977 972	Clare Bradshaw / Robert Irving	13.06.93
712	45	E of Shelley Rocks 2, Bognor Regis.	50°45.9'N 00°36.5'W	SZ 981 971	Jon Parsons / Chris Wood	13.06.93
712	46	Chichester Channel, Chichester Harbour.	50°47.5'N 00°54.1'W	SZ 773 998	Hillary Richardson / Jean Beckinsale / Jane Lilley	n 22.06.93
712	47	Emsworth Channel, Chichester Harbour.	50°47.3'N 00°56.2'W	SZ 749 995	Robert Irving / Clare Bradshaw	22.06.93
712	48	Bracklesham Bay 1.	50°44.9'N 00°52.3'W	SZ 795 950	Jean Beckinsale / Hillary Richardson / Jane Lilley	22.06.93
712	49	Bracklesham Bay 2.	50°43.8'N 00°53.1'W	SZ 786 930	Clare Bradshaw / Robert Irving	22.06.93
712	50	S of Bracklesham, Bracklesham Bay.	50°44.6'N 00°50.9'W	SZ 812 945	Mike Grainger	01.07.93
712	51	N of Spoon Reef 1, Littlehampton.	50°44.3'N 00°33.9'W	TV 012 943	Chris Wood / Brod Mason	10.07.93
712	52	N of Spoon Reef 2, Littlehampton.	50°44.2'N 00°33.8'W	TV 012 941	Katherine Varvill / Andrew Beer	10.07.93
712	53	N of Spoon Reef 3, Littlehampton.	50°44.5'N 00°33.8'W	TV 012 947	Jon Parsons / Robert Irving	10.07.93
712	54	NE of Spoon Reef 1, Littlehampton.	50°44.5'N 00°32.8'W	TV 024 946	Vicki Billings / Bill Farnham	10.07.93
712	55	NE of Spoon Reef 2, Littlehampton.	50°44.6'N 00°33.4'W	TV 017 949	Bill Baldock / Jane Lilley	10.07.93
712	56	E end of Spoon Reef 2, Littlehampton.	50°44.2'N 00°33.6'W	TV 015 941	Peter Hewitt / Zal Rustrom	10.07.93
712	57	E end of Spoon Reef 3, Littlehampton.	50°44.2'N 00°33.7'W	TV 013 940	Bill Hewitt / Chris McTernan	10.07.93
712	58	NW edge of Inner Waldrons Reef, Bognor Regis.	50°45.5'N 00°39.0'W	SZ 951 963	Vicki Billings / Bill Farnham	10.07.93
712	59	NW of Inner Waldrons Reef, Bognor Regis.	50°45.5'N 00°39.3'W	SZ 947 964	Bill Baldock / Jane Lilley	10.07.93
712	60	S side of Outer Waldrons 1, Bognor Regis.	50°44.7'N 00°37.7'W	SZ 966 949	Peter Hewitt / Zal Rustrom	10.07.93
712	61	S side of Outer Waldrons 2, Bognor Regis.	50°44.8'N 00°38.0'W	SZ 964 950	Chris McTernan / Bill Hewitt	10.07.93
712	62	3km S of Inner Waldrons Reef, Bognor Regis.	50°43.6'N 00°38.6'W	SZ 956 928	Chris Wood / Bill Baldock	11.07.93
712	63	E of the Park 4, Bognor Regis.	50°43.4'N 00°40.3'W	SZ 936 925	Carol Edwards / Andy Willett / Chris Spurrier	11.07.93
712	64	Bognor Mussel Beds 1, Bognor Regis.	50°41.5'N 00°42.6'W	SZ 910 890	Bill Hewitt / Jon Parsons	11.07.93
712	65	Bognor Mussel Beds 2, Bognor Regis.	50°41.7'N 00°42.7'W	SZ 908 892	Peter Hewitt / Graham Ackers	11.07.93
712	66	W of the Outer Waldrons Reef, Bognor Regis.	50°44.7'N 00°39.2'W	SZ 949 950	Bill Baldock / Chris Wood	11.07.93
712	67	3km S of Bognor Regis.	50°45.0'N 00°40.5'W	SZ 934 953	Chris Spurrier / Carol Edwards / Andy Willett	11.07.93
712	68	Stetson Reef 1, Bognor Regis.	50°42.5'N 00°36.3'W	SZ 984 909	Bill Hewitt / Jon Parsons	11.07.93
712	69	Stetson Reef 2, Bognor Regis.	50°42.6'N 00°36.5'W	SZ 982 911	Peter Hewitt / Graham Ackers	11.07.93
712	70	E of the Park 1, Bognor Regis.	50°42.6'N 00°39.7'W	SZ 944 909	Andrew Thompson / Chris Spurrier	17.07.93
712	71	E of The Park 2, Bognor Regis.	50°43.2'N 00°39.5'W	SZ 946 921	Chris Lewis / Dawn Hinton	17.07.93
712	72	E of The Park 3, Bognor Regis.	50°44.7'N 00°40.0'W	SZ 940 949	Kay Ingleton / C Allen	17.07.93
712	73	W of The Park 2, Selsey Bill.	50°42.3'N 00°43.5'W	SZ 900 904	Chris Spurrier / Andrew Thompson	17.07.93
712	74	W of The Park 2, Selsey Bill.	50°43.0'N 00°43.7'W	SZ 896 916	Chris Lewis / Dawn Hinton	17.07.93
712	75	2km SSE of Pagham Hbr Entrance, Selsey Bill.	50°44.4'N 00°44.0'W	SZ 893 943	Kay Ingleton / C Allen	17.07.93
712	76	Bracklesham Bay 3.	50°44.6'N 00°52.5'W	SZ 793 944	Jean Beckinsale	01.08.93
712	77	Bracklesham Bay 4.	50°44.7'N 00°52.1'W	SZ 797 946	Jean Beckinsale	01.08.93
712	78	The Swashway & Middle Ground, Selsey Bill.	50°40.0'N 00°44.1'W	SZ 893 861	Jane Lilley / Brod Mason	14.07.93
712	79	Middle Ground, Selsey Bill.	50°40.0'N 00°44.9'W	SZ 884 860	Carol Aldridge / Peter Hewitt	14.08.93
712	80	W end of Middle Ground, Selsey Bill.	50°40.2'N 00°46.2'W	SZ 868 865	Kevin Morgan / Bill Baldock	14.08.93
712	81	Pullar Bank 4, Selsey Bill.	50°40.3'N 00°47.9'W	SZ 849 865	Caroline Williams / Bill Hewitt	14.08.93
712	82	W end of Pullar Bank 1, Selsey Bill.	50°40.9'N 00°48.9'W	SZ 837 877	Jane Lilley / Brod Mason	14.08.93
712	83	Boulder Bank, Selsey Bill.	50°41.1'N 00°49.4'W	SZ 830 879	Peter Hewitt / Carol Aldridge	14.08.93
712	84	West Head, Bognor Regis.	50°40.6'N 00°42.4'W	SZ 913 872	Bill Baldock / Kevin Morgan	14.08.93
712	85	W end of Pullar Bank 2, Selsey Bill.	50°40.7'N 00°49.6'W	SZ 828 872	Caroline Williams / Bill Hewitt	14.08.93
712	86	Stepping Stones 1, Bognor Regis.	50°43.8'N 00°35.1'W	SZ 998 933	Brod Mason / Andy Willett	15.08.93
712	87	Stepping Stones 2, Bognor Regis.	50°43.5'N 00°35.3'W	SZ 996 928	Bill Hewitt / Jane Lilley	15.08.93
712	88	Stepping Stones 3, Bognor Regis.	50°43.3'N 00°35.9'W	SZ 989 923	Bill Baldock / Carol Aldridge	15.08.93
712	89	Stepping Stones 4, Bognor Regis.	50°42.9'N 00°36.3'W	SZ 984 917	Carol Edwards / Peter Hewitt	15.08.93
712	90	Reef 7km S of Littlehampton 1.	50°44.0'N 00°32.6'W	TV 027 937	Andy Willett / Brod Mason	15.08.93
712	91	Stepping Stones 5, Bognor Regis.	50°42.6'N 00°36.8'W	SZ 978 911	Jane Lilley / Bill Hewitt	15.08.93
712	92	Reef 7km S of Littlehampton 2.	50°43.9'N 00°32.5'W	TV 028 936	Carol Aldridge / Bill Baldock	15.08.93
712	93	Reef 7km S of Littlehampton 3.	50°43.9'N 00°31.8'W	TV 037 936	Peter Hewitt / Carol Edwards	15.08.93
712	94	5km S of Littlehampton 1.	50°45.2'N 00°31.6'W	TV 038 960	Robert Irving / James Nokes	30.08.93
712	95	5km S of Littlehampton 2.	50°45.3'N 00°32.2'W	TV 032 961	Bill Baldock / Daniel Colyer	30.08.93
712	96	E of Winter Knoll 1, Littlehampton.	50°46.0'N 00°32.4'W	TV 029 975	James Nokes / Robert Irving	30.08.93
712	97	E of Winter Knoll 2, Littlehampton.	50°46.1'N 00°33.0'W	TV 022 977	Bill Baldock / Daniel Colyer	30.08.93
712	100	N of Lobster Grounds 4, Littlehampton.	50°43.9'N 00°29.9'W	TV 058 937	Bill Baldock	08.08.93
712	101	"The Frode", Littlehampton.	50°46.1'N 00°28.7'W	TV 072 977	Bill Baldock	08.08.93
712	102	Kingmere Rocks 6, Littlehampton.	50°43.5'N 00°27.9'W	TV 083 929	Bill Baldock	08.08.93

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
713	1	Palace Pier Reef 1, Brighton.	50°47.9'N 00°08.5'W	TQ 309 017	Ray Kingshott	20.03.94
713	2	Palace Pier Reef 2, Brighton.	50°47.9'N 00°08.3'W	TQ 311 016	John Doubleday / Robert Wilburn	20.03.94
713	3	Palace Pier Reef 3, Brighton.	50°47.9'N 00°08.5'W	TQ 308 016	Dave Lund / Joanne Dyer	20.03.94
713	4	Palace Pier Reef 4, Brighton.	50°47.9'N 00°08.5'W	TQ 308 016	Rodney Arnold / David Barnes	20.03.94
713	5	Palace Pier 5, Brighton.	50°48.1'N 00°08.4'W	TQ 309 019	Nicky Fenton / Jeremy Thomas	20.03.94
713	6	Palace Pier Reef 6, Brighton.	50°47.9'N 00°08.3'W	TQ 311 016	Tim Dakers / Kim Jones	20.03.94
713	7	5km S of Angmering-on-Sea 1, Littlehampton.	50°45.4'N 00°28.0'W	TV 081 964	John Doubleday / Jane Lilley	14.05.94
713	8	5km S of Rustington 1, Littlehampton.	50°45.2'N 00°29.9'W	TV 058 960	Kevin Morgan / Chris Wood	14.05.94
713	9	5km S of Angmering-on-Sea 2, Littlehampton.	50°45.4'N 00°28.0'W	TV 081 965	Robert Irving / Kate Northen	15.05.94
713	10	5km S of Angmering-on-Sea 3, Littlehampton.	50°45.4'N 00°27.9'W	TV 081 964	David Barnes	14.05.94
713	11	1km SE of Winter Knoll 1, Littlehampton.	50°45.8'N 00°32.9'W	TV 023 971	Bill Baldock / Jenni Fleming / Sue Fuller	14.05.94
713	12	5km S of Littlehampton 1.	50°45.1'N 00°32.5'W	TV 027 957	John Doubleday / Jane Lilley	14.05.94
713	13	1km SE of Winter Knoll 2, Littlehampton.	50°45.9'N 00°32.8'W	TV 024 973	Kevin Morgan / Chris Wood	14.05.94
713	14	5km S of Littlehampton 2.	50°45.1'N 00°32.1'W	TV 033 957	Robert Irving / Kate Northen	14.05.94
713	15	5km S of Littlehampton 3.	50°45.1'N 00°32.0'W	TV 033 959	Rodney Arnold	14.05.94
713	16	5km S of Rustington 2, Littlehampton.	50°45.3'N 00°29.6'W	TV 061 962	Bill Baldock / Jenni Fleming / Sue Fuller	14.05.94
713	17	Kingmere Rocks 1, Littlehampton.	50°43.5'N 00°27.0'W	TV 093 929	Chris Wood / Jon Parsons	15.05.94
713	18	W of Kingmere Rocks 1, Littlehampton.	50°43.8'N 00°28.7'W	TV 073 935	Rodney Arnold / David Barnes	15.05.94
713	19	1km S of Winter Knoll, Littlehampton.	50°45.7'N 00°33.6'W	TV 015 968	Rodney Arnold / David Barnes	15.05.94
713	20	W of Kingmere Rocks 2, Littlehampton.	50°43.7'N 00°28.8'W	TV 072 932	Jane Lilley / David Fletcher	15.05.94
713	21	Kingmere Rocks 2, Littlehampton.	50°43.5'N 00°27.6'W	TV 086 929	Jenni Fleming / Sue Fuller	15.05.94
713	22	Kingmere Rocks 3, Littlehampton.	50°43.5'N 00°27.4'W	TV 088 930	Kevin Morgan / Bill Farnham	15.05.94
713	23	N of Lobster Grounds 1, Littlehampton.	50°43.5'N 00°29.4'W	TV 064 930	Bill Baldock / Andy Willett	15.05.94
713	24	6km S of Rustington 1, Littlehampton.	50°44.8'N 00°30.9'W	TV 047 952	Chris Wood / Jon Parsons	15.05.94
713	25	Kingmere Rocks 4, Littlehampton.	50°43.6'N 00°27.0'W	TV 092 932	Robert Irving / Kate Northen	15.05.94
713	26	6km S of Rustington 2, Littlehampton.	50°44.6'N 00°31.0'W	TV 045 950	Robert Irving / Kate Northen	15.05.94
713	27	1km SE of Winter Knoll 3, Littlehampton.	50°45.9'N 00°32.9'W	TV 023 973	Jane Lilley / David Fletcher	15.05.94
713	28	6km S of Littlehampton.	50°44.8'N 00°31.9'W	TV 035 952	Jenni Fleming / Sue Fuller	15.05.94
713	29	5km S of Littlehampton 4.	50°45.1'N 00°32.1'W	TV 033 958	Kevin Morgan / Bill Farnham	15.05.94
713	30	5km S of Littlehampton 5.	50°45.1'N 00°32.2'W	TV 031 958	Bill Baldock / Andy Willett	15.05.94
713	31	The "Miown" 1, Shoreham.	50°48.3'N 00°15.4'W	TQ 228 021	Dave Lund / Joanne Dyer	01.05.94
713	32	The 'Zanstroom', Bognor Regis.	50°39.1'N 00°36.9'W	SZ 978 845	Robert Irving / Jon Ridley	18.06.94
713	33	Itchenor Channel, Chichester Harbour.	50°48.5'N 00°51.9'W	SU 798 016	Chris Wood / Liz Wood	19.06.94
713	34	Itchenor Moorings, Chichester Harbour.	50°48.5'N 00°52.2'W	SU 795 017	Robert Irving / Liz Wood	19.06.94
713	35	Looe Gate 1, Shoreham.	50°47.7'N 00°11.6'W	TQ 272 011	Kim Jones / Chris Grainger	02.07.94
713	36	Looe Gate 2, Shoreham.	50°47.7'N 00°11.5'W	TQ 273 011	Peter Christmas / Katherine Varvill	02.07.94
713	37	Looe Gate 3, Shoreham.	50°47.7'N 00°11.5'W	TQ 273 011	Jon Parsons / Paul Bertorelli	02.07.94
713	38	NW of Looe Gate 1, Shoreham.	50°47.8'N 00°11.8'W	TQ 269 013	Robert Irving / Mel Dixon	02.07.94
713	39	NW of Looe Gate 2, Shoreham.	50°47.7'N 00°12.0'W	TQ 268 012	Rodney Arnold / David Barnes	02.07.94
713	40	NW of Looe Gate 3, Shoreham.	50°47.8'N 00°12.1'W	TQ 266 013	Brod Mason / Paul Westwood	02.07.94
713	41	S of Jenny Ground 1, Shoreham.	50°49.0'N 00°12.2'W	TQ 264 035	Kim Jones / Chris Grainger	02.07.94
713	42	S of Jenny Ground 2, Shoreham.	50°49.0'N 00°12.2'W	TQ 264 035	Peter Christmas / Katherine Varvill	02.07.94
713	43	S of Jenny Ground 3, Shoreham.	50°49.0'N 00°12.2'W	TQ 264 035	Jon Parsons / Paul Bertorelli	02.07.94
713	44	"Position approximate" off Hove 1, Brighton.	50°48.0'N 00°10.3'W	TQ 287 018	Robert Irving / Mel Dixon	02.07.94
713	45	"Position approximate" off Hove 2, Brighton.	50°48.0'N 00°10.2'W	TQ 288 017	Rodney Arnold / David Barnes	02.07.94
713	46	Looe Gate 4, Shoreham.	50°47.6'N 00°11.6'W	TQ 272 010	Rodney Arnold / David Barnes	03.07.94
713	47	Looe Gate 5, Shoreham.	50°47.7'N 00°11.7'W	TQ 271 011	Jeremy Thomas / Nicola Thomas	03.07.94
713	48	SW of Looe Gate Shoreham.	50°47.5'N 00°11.9'W	TQ 269 008	Kim Jones / Brod Mason	03.07.94
713	49	Ship Rock 1, Brighton.	50°47.9'N 00°09.8'W	TQ 293 016	Bill Farnham / Andy Willett	03.07.94
713	50	Ship Rock 2, Brighton.	50°48.0'N 00°10.0'W	TQ 291 017	Jon Parsons / Clare Robinson	03.07.94
713	51	Ship Rock 3, Brighton.	50°47.9'N 00°09.7'W	TQ 294 016	Robert Irving / Robin Nicholson	03.07.94
713	52	Nr Marina Reef 1, Brighton.	50°47.5'N 00°06.5'W	TQ 332 010	Jeremy Thomas / Nicola Thomas	03.07.94
713	53	Marina Reef 1, Brighton.	50°47.5'N 00°06.7'W	TQ 330 009	Rodney Arnold / David Barnes	03.07.94
713	54	Marina Reef 2, Brighton.	50°47.6'N 00°06.6'W	TQ 331 011	Kim Jones / Brod Mason	03.07.94
713	55	Marina Reef 3, Brighton.	50°47.6'N 00°06.5'W	TQ 332 011	Bill Farnham / Andy Willett	03.07.94
713	56	Nr Marina Reef 2, Brighton.	50°47.4'N 00°06.5'W	TQ 332 007	Jon Parsons	03.07.94
713	57	Nr Marina Reef 3, Brighton.	50°47.5'N 00°06.3'W	TQ 335 010	Robert Irving / Robin Nicholson	03.07.94
713	58	Marina Reef 4, Brighton.	50°47.6'N 00°06.7'W	TQ 330 011	Robert Irving / Steve White	14.07.94
713	59	Palace Pier Reef 7, Brighton.	50°48.0'N 00°08.5'W	TQ 309 018	Robert Irving / Chris Grainger	17.07.94
713	60	Palace Pier Reef 8, Brighton.	50°47.9'N 00°08.3'W	TQ 310 017	Kim Jones / Steve White	17.07.94
713	61	Palace Pier Reef 9, Brighton.	50°47.9'N 00°08.4'W	TQ 310 017	Paul Dyer / Paul Bertorelli	17.07.94
713	63	Nr Intact Mulberry, Selsey Bill.	50°43.9'N 00°43.4'W	SZ 900 934	Sue Burton / Paul Wilson	29.05.94
713	64	"Ammo Barge", Brighton.	50°47.0'N 00°06.9'W	TQ 327 001	Robert Wilburn / Tim Dakers	08.05.94
713	65	The Manors 1, Brighton.	50°47.8'N 00°08.0'W	TQ 315 015	Kim Jones / Ron Luckett	18.06.94
713	66	The Manors 2, Brighton.	50°47.8'N 00°08.0'W	TQ 315 015	Paul Dyer / M Keeping	18.06.94
713	67	The "Miown" 2, Shoreham.	50°48.3'N 00°15.4'W	TQ 228 021	Andy Willett	02.06.94
713	68	College Rocks, Worthing.	50°45.7'N 00°18.7'W	TV 190 973	Andy Willett	28.06.94
713	69	South West Rocks 1, Shoreham.	50°47.6'N 00°12.3'W	TQ 264 009	Andy Willett	20.07.94
713	70	"Billy Boy", Shoreham.	50°47.5'N 00°13.2'W	TQ 253 007	Andy Willett	22.07.94
713	71	"Spanner Reef" 1, Littlehampton.	50°44.0'N 00°31.5'W	TV 040 939	Jon Parsons / Clare Robinson	30.07.94

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
713	72	"Spanner Reef" 2, Littlehampton.	50°44.0'N 00°31.8'W	TV 036 938	Katherine Varvill / Leigh Jones	30.07.94
713	73	"Spanner Reef" 3, Littlehampton.	50°43.9'N 00°32.1'W	TV 033 936	Bill Baldock / Kevin Morgan	30.07.94
713	74	5km S of Littlehampton 6.	50°45.2'N 00°31.5'W	TV 040 960	Jon Parsons / Clare Robinson	30.07.94
713	75	5km S of Littlehampton 7.	50°45.4'N 00°31.1'W	TV 044 963	Katherine Varvill / Leigh Jones	30.07.94
713	76	4km SE of Littlehampton.	50°45.8'N 00°30.8'W	TV 047 972	Bill Baldock / Jon Parsons	30.07.94
713	77	7km S of Worthing 1.	50°44.7'N 00°22.2'W	TV 149 953	Bill Hewitt / Nicola Thomas	30.07.94
713	78	7km S of Worthing 2.	50°44.9'N 00°21.7'W	TV 155 956	Peter Hewitt / Jeremy Thomas	30.07.94
713	79	5km SW of Worthing.	50°45.6'N 00°23.3'W	TV 135 970	Bill Hewitt / Nicola Thomas	30.07.94
713	80	5km S of Goring-by-Sea, Worthing.	50°45.6'N 00°25.3'W	TV 112 970	Peter Hewitt / Jeremy Thomas	30.07.94
713	81	Close to "The Frode", Littlehampton.	50°46.1'N 00°28.7'W	TV 072 977	Rodney Arnold / David Barnes / Matt Ruglys	30.07.94
713	82	5km S of Angmering-on-Sea 4, Littlehampton.	50°45.3'N 00°27.9'W	TV 082 962	Robert Irving / Paul Biggin	30.07.94
713	83	3km SE of Angmering-on-Sea, Littlehampton.	50°46.9'N 00°27.2'W	TV 089 993	Rodney Arnold / David Barnes / Matt Ruglys	30.07.94
713	84	2km SSW of Angmering-on-Sea, Littlehampton.	50°47.0'N 00°29.3'W	TV 065 993	Robert Irving / Dave Biggin	30.07.94
713	85	N of Kingmere Rocks 1, Littlehampton.	50°44.3'N 00°27.2'W	TV 090 943	Jon Parsons / Clare Robinson	31.07.94
713	86	2km SE of Angmering-on-Sea, Littlehampton.	50°46.4'N 00°28.1'W	TV 079 983	Bill Farnham / Paul Biggin	31.07.94
713	87	Worthing Lumps 1.	50°44.0'N 00°24.7'W	TV 120 939	Robert Irving / Anita Moffatt	31.07.94
713	88	Nr Worthing Lumps 1.	50°44.0'N 00°24.8'W	TV 119 939	James Guest / Nick Emsley	31.07.94
713	89	Nr Worthing Lumps 2.	50°44.3'N 00°24.6'W	TV 121 946	Mike McCarthy / Adele McCarthy	31.07.94
713	90	3km S of Goring-by-Sea 1, Worthing.	50°46.4'N 00°25.5'W	TV 110 983	Anne Berk / Tony Berk	31.07.94
713	91	3km S of Goring-by-Sea 2, Worthing.	50°46.5'N 00°25.0'W	TV 116 985	Robert Irving / Anita Moffatt	31.07.94
713	92	3km S of Goring-by-Sea 3, Worthing.	50°46.5'N 00°24.8'W	TV 118 985	James Guest / Nick Emsley	31.07.94
713	93	3km S of Goring-by-Sea 4, Worthing.	50°46.5'N 00°24.5'W	TV 122 985	Mike McCarthy / Adele McCarthy	31.07.94
713	94	3km S of Goring-by-Sea 5, Worthing.	50°46.6'N 00°24.1'W	TV 126 987	Anne Berk / Tony Berk	31.07.94
713	95	SE of Kingmere Rocks 1, Worthing.	50°43.0'N 00°26.0'W	TV 105 920	Rodney Arnold / Matt Ruglys	31.07.94
713	96	SE of Kingmere Rocks 2, Worthing.	50°42.7'N 00°26.1'W	TV 104 915	Bill Baldock / David Barnes	31.07.94
713	97	S of Kingston Rocks, Worthing.	50°46.0'N 00°26.9'W	TV 094 975	David Barnes / Matt Ruglys	31.07.94
713	98	Kingston Rocks, Worthing.	50°47.1'N 00°26.3'W	TV 099 996	Bill Baldock / Rodney Arnold	31.07.94
713	99	SE of Kingmere Rocks 3, Worthing.	50°42.9'N 00°25.4'W	TV 112 919	Peter Hewitt / Jeremy Thomas	31.07.94
713	100	SE of Kingmere Rocks 4, Worthing.	50°42.8'N 00°25.3'W	TV 113 916	Bill Hewitt / Nicola Thomas	31.07.94
713	101	4km SW Worthing.	50°46.3'N 00°23.4'W	TV 135 982	Peter Hewitt / Jeremy Thomas	31.07.94
713	102	NE of Worthing Lumps.	50°44.4'N 00°23.9'W	TV 129 946	Bill Hewitt / Nicola Thomas	31.07.94
713	103	4km SE of Middleton-on-Sea 1, Bognor Regis.	50°45.8'N 00°34.9'W	SZ 999 970	Tim Pickett / Rhian David	30.07.94
713	104	4km SE of Middleton-on-Sea 2, Bognor Regis.	50°45.7'N 00°34.9'W	SZ 999 969	John Moore / Douglas Donaldson	30.07.94
713	105	4km SE of Middleton-on-Sea 3, Bognor Regis.	50°45.7'N 00°34.9'W	SZ 999 968	Paul Messiter / Gareth Jones	30.07.94
713	106	Nr Winter Knoll 1, Littlehampton.	50°46.2'N 00°33.8'W	TV 012 978	Pippa Batten / Gordon Kennedy	30.07.94
713	107	Nr Winter Knoll 2, Littlehampton.	50°46.2'N 00°33.8'W	TV 012 978	Jeremy Batten / Ian Russell	30.07.94
713	108	Nr Winter Knoll 3, Littlehampton.	50°46.2'N 00°33.8'W	TV 012 978	Terry Shaw / Simon Milling	30.07.94
713	109	2km SSW of Littlehampton 1.	50°47.1'N 00°33.1'W	TV 020 995	Paul Messiter / Gareth Jones	30.07.94
713	110	2km SSW of Littlehampton 3.	50°47.1'N 00°33.1'W	TV 020 995	Tim Pickett / Rhian David	30.07.94
713	111	2km SSW of Littlehampton 2.	50°47.1'N 00°33.1'W	TV 020 995	John Moore / Douglas Donaldson	30.07.94
713	112	Close to Winter Knoll 1, Littlehampton.	50°46.1'N 00°34.0'W	TV 010 975	Jeremy Batten / Ian Russell	31.07.94
713	113	Close to Winter Knoll 2, Littlehampton.	50°46.1'N 00°34.0'W	TV 010 975	Pippa Batten / Gordon Kennedy / Jeremy Batten / Terry Shaw	31.07.94
713	114	2km S of Rustington 1, Littlehampton.	50°46.8'N 00°30.8'W	TV 048 989	Tim Pickett / Rhian David	31.07.94
713	115	2km S of Rustington 2, Littlehampton.	50°46.8'N 00°30.7'W	TV 048 989	John Moore / Douglas Donaldson	31.07.94
713	116	2km S of Rustington 3, Littlehampton.	50°46.8'N 00°30.6'W	TV 049 989	Paul Messiter / Gareth Jones	31.07.94
713	117	3km S of Littlehampton 1.	50°46.9'N 00°31.9'W	TV 034 992	Pippa Batten / Gordon Kennedy	31.07.94
713	118	3km S of Littlehampton 2.	50°46.9'N 00°31.9'W	TV 034 991	Terry Shaw / Simon Milling	31.07.94
713	119	3km S of Littlehampton 3.	50°46.9'N 00°31.9'W	TV 034 992	Jeremy Batten / Ian Russell	31.07.94
713	120	3km S of Littlehampton 4.	50°46.9'N 00°31.9'W	TV 034 991	John Moore / Paul Messiter / Gareth Jones	31.07.94
713	121	"H.M.S. Northcoates", Bognor Regis.	50°39.7'N 00°35.3'W	SZ 996 857	Robert Irving	14.08.94
713	122	Outer Mulberry 7, Bognor Regis.	50°44.7'N 00°42.1'W	SZ 915 949	Robert Irving	21.08.94
713	123	"Lancer 2", Newhaven.	50°44.1'N 00°01.1'E	TV 424 949	Bill Baldock	24.07.94
713	124	1km N of West Head 1, Selsey Bill.	50°41.2'N 00°43.8'W	SZ 896 883	Bill Baldock	06.08.94
713	125	1km N of West Head 2, Selsey Bill.	50°40.9'N 00°43.7'W	SZ 898 878	Bill Baldock	06.08.94
713	126	Nr East Borough Head, Bognor Regis.	50°46.6'N 00°41.0'W	SZ 927 983	Bill Baldock	06.08.94
713	127	East of The Waldrons, Bognor Regis.	50°44.9'N 00°36.2'W	SZ 985 954	John Doubleday / Bill Farnham	03.09.94
713	128	NW of Spoon Reef, Littlehampton.	50°45.0'N 00°34.6'W	TV 004 955	Rodney Arnold / David Barnes	03.09.94
713	129	South-East of Shelley Rocks, Bognor Regis.	50°45.6'N 00°35.9'W	SZ 988 966	John Doubleday / Bill Farnham	03.09.94
713	130	North-East of Shelley Rocks, Bognor Regis.	50°46.5'N 00°36.1'W	SZ 985 982	Rodney Arnold / David Barnes	03.09.94
713	131	NW of Worthing Lumps.	50°44.9'N 00°25.7'W	TV 108 957	Jane Lilley / Colin Kinnear	03.09.94
713	132	NNE of Kingmere Rocks, Worthing.	50°44.9'N 00°26.7'W	TV 096 956	Bill Baldock / Chris McTernan / Carol Aldridge	03.09.94
713	133	N of Kingmere Rocks 2, Littlehampton.	50°44.6'N 00°27.6'W	TV 085 950	Jane Lilley / Colin Kinnear	03.09.94
713	134	NW of Kingmere Rocks, Littlehampton.	50°44.6'N 00°28.6'W	TV 074 950	Bill Baldock / Carol Aldridge / Chris McTernan	03.09.94
713	135	Nr Worthing Lumps 3.	50°44.1'N 00°24.1'W	TV 127 941	Bill Hewitt / Vicki Billings	03.09.94
713	136	Worthing Lumps 2.	50°43.9'N 00°24.6'W	TV 121 937	Peter Hewitt / Val Shepherd	03.09.94

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
713	137	Worthing Lumps 3.	50°43.9'N 00°24.4'W	TV 123 937	Bill Hewitt / Vicki Billings	03.09.94
713	138	Worthing Lumps 4.	50°43.9'N 00°24.8'W	TV 119 938	Peter Hewitt / Val Shepherd	03.09.94
713	139	The Manors 3, Brighton.	50°48.0'N 00°07.7'W	TQ 318 018	Bob Wilson / Matt Wilson	14.08.94
713	140	The Manors 4, Brighton.	50°48.0'N 00°07.5'W	TQ 320 018	Robert Wilburn / Paul Daltry	14.08.94
713	141	Nr Brighton Marina 1.	50°48.5'N 00°06.5'W	TQ 332 028	Kim Jones / Bob Wilson	14.08.94
713	142	Nr Brighton Marina 2.	50°48.4'N 00°06.7'W	TQ 329 025	Robert Wilburn / Paul Daltry	14.08.94
713	143	4km S of Shoreham-by-Sea 1.	50°46.7'N 00°14.5'W	TV 239 992	Bill Baldock / Mary Peddar	04.09.94
713	144	4km S of Shoreham-by-Sea 2.	50°46.6'N 00°15.3'W	TV 230 989	Jon Parsons / Clare Robinson	04.09.94
713	145	4km S of Shoreham-by-Sea 3.	50°47.0'N 00°15.2'W	TV 230 997	Carol Aldridge / Colin Kinnear	04.09.94
713	146	N of Kingmere Rocks 3, Littlehampton.	50°43.8'N 00°27.4'W	TV 088 936	Kevin Morgan / Daniel Waygood / James Guest	04.09.94
713	147	N of Kingmere Rocks 4, Littlehampton.	50°43.9'N 00°27.5'W	TV 087 936	Denise Smith / Steve Webster	04.09.94
713	148	W of Kingmere Rocks 3, Littlehampton.	50°43.8'N 00°28.4'W	TV 076 934	Gail Webster / Mark Rubell	04.09.94
713	149	N of Lobster Grounds 2, Littlehampton.	50°43.6'N 00°29.6'W	TV 062 931	Kevin Morgan / Daniel Waygood / James Guest	04.09.94
713	150	N of Lobster Grounds 3, Littlehampton.	50°43.6'N 00°29.7'W	TV 061 930	Denise Smith / Steve Webster	04.09.94
713	151	W of Lobster Grounds, Littlehampton.	50°43.6'N 00°30.9'W	TV 048 931	Gail Webster / James Guest	04.09.94
713	152	3km SW of Shoreham-by-Sea 1.	50°48.0'N 00°16.7'W	TQ 213 015	Andy Willett / Neil Gilbert	04.09.94
713	153	NW of Lobster Grounds 1, Littlehampton.	50°44.3'N 00°28.5'W	TV 075 944	Bill Hewitt / Jane Lilley	04.09.94
713	154	NW of Lobster Grounds 2, Littlehampton.	50°44.2'N 00°29.0'W	TV 069 943	Peter Hewitt / Vicki Billings	04.09.94
713	155	6km S of Rustington 3, Littlehampton.	50°44.5'N 00°30.0'W	TV 057 948	Bill Hewitt / Jane Lilley	04.09.94
713	156	6km S of Rustington 4, Littlehampton.	50°44.4'N 00°30.8'W	TV 048 946	Peter Hewitt / Vicki Billings	04.09.94
713	157	2km S of East Wittering 1, Bracklesham Bay.	50°44.7'N 00°52.5'W	SZ 793 946	Robert Irving / Kate Northen	24.09.94
713	158	2km S of East Wittering 2, Bracklesham Bay.	50°44.7'N 00°52.1'W	SZ 797 946	Bill Baldock / Mary Peddar	24.09.94
713	159	W of Hounds Reef 1, Bracklesham Bay.	50°44.1'N 00°50.6'W	SZ 815 936	Robert Irving / Kate Northen	24.09.94
713	160	W of Hounds Reef 2, Bracklesham Bay.	50°44.0'N 00°50.4'W	SZ 817 934	Bill Baldock / Mary Peddar	24.09.94
713	161	South-West Rocks 2, Shoreham.	50°47.5'N 00°12.5'W	TQ 261 008	Chris Wood / Liz Wood	01.10.94
713	162	South-West Rocks 3, Shoreham.	50°47.5'N 00°12.4'W	TQ 262 008	Robert Irving / Kate Northen	01.10.94
713	163	South-West Rocks 4, Shoreham.	50°47.6'N 00°12.4'W	TQ 263 009	Kim Jones / Bill Sanderson	01.10.94
713	164	5km S of Shoreham-by-Sea.	50°47.0'N 00°15.3'W	TV 229 997	Chris Wood / Liz Wood	01.10.94
713	165	7km S of Shoreham-by-Sea.	50°45.7'N 00°15.3'W	TV 230 973	Robert Irving / Kate Northen	01.10.94
713	166	4km S of Shoreham-by-Sea 4.	50°47.4'N 00°15.2'W	TQ 230 006	Kim Jones / Bill Sanderson	01.10.94
713	167	Looe Gate 8, Shoreham.	50°47.7'N 00°11.6'W	TQ 273 011	Ray Kingshott / Teresa Tellus	01.10.94
713	168	Ship Rock 4, Brighton.	50°47.9'N 00°09.9'W	TQ 293 016	Ray Kingshott / Teresa Tellus	01.10.94
713	169	Ship Rock 5, Brighton.	50°47.9'N 00°09.8'W	TQ 293 016	Brod Mason / Clive Pearce	01.10.94
713	170	Ship Rock 6, Brighton.	50°47.9'N 00°09.9'W	TQ 292 016	Sue Fuller / Carol Aldridge	01.10.94
713	171	Looe Gate 6, Shoreham.	50°47.6'N 00°11.5'W	TQ 273 010	Brod Mason / Clive Pearce	01.10.94
713	172	Looe Gate 7, Shoreham.	50°47.6'N 00°11.5'W	TQ 273 010	Sue Fuller / Carol Aldridge	01.10.94
713	173	6km SSW of Shoreham-by-Sea 1.	50°46.4'N 00°17.3'W	TV 205 985	Rodney Arnold / Neil Gilbert	01.10.94
713	174	6km SSW of Shoreham-by-Sea 2.	50°46.1'N 00°17.5'W	TV 204 980	Bill Baldock / Kevin Morgan	01.10.94
713	175	4km SW of Shoreham-by-Sea 1.	50°47.3'N 00°16.9'W	TQ 210 002	Rodney Arnold / Neil Gilbert	01.10.94
713	176	4km SW of Shoreham-by-Sea 2.	50°47.8'N 00°17.1'W	TQ 207 013	Bill Baldock / Kevin Morgan	01.10.94
713	177	SE of Ship Rock 1, Brighton.	50°47.5'N 00°09.0'W	TQ 303 009	Ray Kingshott / Bill Farnham	02.10.94
713	178	SE of Ship Rock 2, Brighton.	50°47.5'N 00°08.7'W	TQ 306 008	Kevin Morgan / Geoffrey Reade	02.10.94
713	179	SE of Ship Rock 3, Brighton.	50°47.5'N 00°08.9'W	TQ 304 008	Alex Tait / Alan Sharpe	02.10.94
713	180	"Palace Pier Barge" 1, Brighton.	50°48.8'N 00°08.1'W	TQ 313 033	Alex Tait / Alan Sharpe	02.10.94
713	181	"Palace Pier Barge" 2, Brighton.	50°48.8'N 00°08.1'W	TQ 313 033	Ray Kingshott / Kevin Morgan / Bill Farnham / Geoffrey Reade	02.10.94
713	182	S of Ship Rock 1, Brighton.	50°47.5'N 00°09.4'W	TQ 298 009	Rodney Arnold / Neil Gilbert	02.10.94
713	183	S of Ship Rock 2, Brighton.	50°47.6'N 00°10.0'W	TQ 291 010	Tim Dakers / Sue Fuller	02.10.94
713	184	S of Ship Rock 3, Brighton.	50°47.6'N 00°09.7'W	TQ 294 011	Hazel Jacobs / Stephen Mawle	02.10.94
713	185	Ship Rock 7, Brighton.	50°48.0'N 00°09.9'W	TQ 291 018	Rodney Arnold / Neil Gilbert	02.10.94
713	186	Ship Rock 8, Brighton.	50°48.0'N 00°09.9'W	TQ 292 017	Tim Dakers / Sue Fuller	02.10.94
713	187	Ship Rock 9, Brighton.	50°48.0'N 00°10.0'W	TQ 290 018	Hazel Jacobs / Stephen Mawle	02.10.94
713	188	S of College Rocks 1, Worthing.	50°45.3'N 00°18.7'W	TV 189 966	Brod Mason / Clive Pearce	02.10.94
713	189	S of College Rocks 2, Worthing.	50°45.4'N 00°19.0'W	TV 187 966	Bill Baldock / Andy Willett	02.10.94
713	190	S of College Rocks 3, Worthing.	50°45.4'N 00°19.1'W	TV 185 966	Chris Wood / Liz Wood	02.10.94
713	191	Grass Banks, Worthing.	50°47.5'N 00°20.9'W	TQ 163 005	Bill Baldock / Andy Willett / Brod Mason	02.10.94
713	192	Elbow, Worthing.	50°47.5'N 00°19.4'W	TQ 180 005	Chris Wood / Liz Wood	02.10.94
713	193	W of College Rocks 1, Worthing.	50°45.6'N 00°20.5'W	TV 169 970	Robert Wilburn / Bill Sanderson	02.10.94
713	194	W of College Rocks 2, Worthing.	50°45.7'N 00°21.9'W	TV 152 972	Robert Irving / Kate Northen	02.10.94
713	195	W of Grass Banks 1, Worthing.	50°47.3'N 00°21.4'W	TQ 157 002	Robert Wilburn / Bill Sanderson	02.10.94
713	196	W of Grass Banks 2, Worthing.	50°47.6'N 00°21.6'W	TQ 155 007	Robert Irving / Kate Northen	02.10.94
713	197	Worthing Lumps 5.	50°43.9'N 00°24.3'W	TV 124 937	Robert Irving / Kate Northen	15.10.94
713	198	Worthing Lumps 6.	50°43.9'N 00°24.5'W	TV 122 937	Bill Hewitt / Peter Hewitt	15.10.94
713	199	Worthing Lumps 7.	50°43.9'N 00°24.8'W	TV 119 938	Robert Irving / Kate Northen	15.10.94
713	200	Worthing Lumps 8.	50°43.9'N 00°24.6'W	TV 121 938	Bill Hewitt / Peter Hewitt	15.10.94
713	201	Unknown wreck, Pevensey Bay.	50°42.4'N 00°25.3'E	TV 709 926	Bill Baldock	15.10.94
713	202	Ship Rock 10, Brighton.	50°48.1'N 00°09.8'W	TQ 293 020	David Harvey / Alex Tait	03.09.94
713	203	4km SW of Shoreham-by-Sea 3.	50°47.9'N 00°17.3'W	TQ 205 014	Rodney Arnold / Matt Ruglys	04.09.94
714	1	Inner Marina Brighton.	50°48.7'N 00°05.6'W	TQ 342 032	Joanna MacMillan / David Kay	24.04.95
714	2	1.5km SSE of Roedean School 1, Brighton.	50°48.1'N 00°04.9'W	TQ 350 020	Paul Biggin / Martin Guard	06.05.95

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
714	3	1.5km SSE of Roedean School 2, Brighton.	50°48.0'N 00°04.8'W	TQ 352 019	Brod Mason / Lucy Conway	06.05.95
714	4	1.5km SSE of Roedean School 3, Brighton.	50°47.9'N 00°04.4'W	TQ 356 017	David Barnes / Jo Lewin	06.05.95
714	5	2km SSE of Roedean School 1, Brighton.	50°47.6'N 00°04.1'W	TQ 360 012	Paul Biggin / Martin Guard	06.05.95
714	6	2km SSE of Roedean School 2, Brighton.	50°47.6'N 00°04.2'W	TQ 359 013	Brod Mason / Lucy Conway	06.05.95
714	7	2km SSE of Roedean School 3, Brighton.	50°47.7'N 00°04.3'W	TQ 358 014	David Barnes / Jo Lewin	06.05.95
714	8	2km SE of Brighton Marina 1.	50°47.8'N 00°05.1'W	TQ 348 015	Joanna MacMillan / David Kay	06.05.95
714	9	2km SE of Brighton Marina 2.	50°47.7'N 00°05.1'W	TQ 348 013	Beverley Boileau / Adam Pamment	06.05.95
714	10	1.5km SSE of Roedean School 4, Brighton.	50°47.9'N 00°04.5'W	TQ 355 016	Joanna MacMillan / Adam Pamment	06.05.95
714	11	1.5km SSE of Roedean School 5, Brighton.	50°48.2'N 00°04.7'W	TQ 353 022	David Kay / Beverley Boileau	06.05.95
714	12	SE of Palace Pier Reef 1, Brighton.	50°47.4'N 00°07.6'W	TQ 320 008	Carol Aldridge / Nicky Thomas / Jeremy Thomas	06.05.95
714	13	SE of Palace Pier Reef 2, Brighton.	50°47.4'N 00°07.4'W	TQ 321 006	Kate Northen / Robert Irving	06.05.95
714	14	2.5km SSE of Brighton Marina 1	50°47.3'N 00°05.6'W	TQ 343 006	Carol Aldridge / Nicky Thomas / Jeremy Thomas	06.05.95
714	15	2.5km SSE of Brighton Marina 2	50°47.2'N 00°05.8'W	TQ 340 004	Kate Northen / Robert Irving	06.05.95
714	16	2.5km S of Rottingdean 1, Brighton.	50°46.9'N 00°03.2'W	TV 372 999	Nicky Thomas / Jeremy Thomas	07.05.95
714	17	2.5km S of Saltdean, Brighton.	50°46.7'N 00°02.4'W	TV 380 996	David Barnes / Jo Lewin	07.05.95
714	18	2km S of Rottingdean 2, Brighton.	50°46.9'N 00°03.2'W	TV 371 999	Lucy Conway / Carol Aldridge	07.05.95
714	19	1km S of Rottingdean 1, Brighton.	50°47.8'N 00°03.5'W	TQ 367 016	Nicky Thomas / Jeremy Thomas	07.05.95
714	20	1km S of Rottingdean 2, Brighton.	50°47.9'N 00°03.8'W	TQ 363 018	David Barnes / Jo Lewin	07.05.95
714	21	1km S of Rottingdean 3, Brighton.	50°47.8'N 00°03.6'W	TQ 366 016	Lucy Conway / Carol Aldridge	07.05.95
714	22	4km S of Peacehaven 1, Newhaven.	50°45.4'N 00°00.0'E	TV 410 973	Joanna MacMillan / Paul Biggin / Brod Mason	07.05.95
714	23	4km S of Peacehaven 2, Newhaven.	50°45.2'N 00°00.1'E	TV 412 969	David Kay / Alison Taylor	07.05.95
714	24	4km S of Peacehaven 3, Newhaven.	50°45.5'N 00°00.6'W	TV 402 974	Kate Northen / Robert Irving	07.05.95
714	25	5km S of Saltdean 1, Brighton.	50°46.0'N 00°01.6'W	TV 390 983	Joanna MacMillan / Paul Biggin / Brod Mason	07.05.95
714	26	5km S of Saltdean 2, Brighton.	50°45.9'N 00°01.6'W	TV 390 981	David Kay / Alison Taylor	07.05.95
714	27	4.5km S of Saltdean, Brighton.	50°46.1'N 00°02.4'W	TV 381 984	Kate Northen / Robert Irving	07.05.95
714	28	SW of Birling Gap 1, Cuckmere Haven.	50°44.2'N 00°11.6'E	TV 547 955	David Kay / Kim Jones	24.06.95
714	29	SW of Birling Gap 2, Cuckmere Haven.	50°44.1'N 00°11.6'E	TV 547 953	Sue Fuller / Jenni Fleming	24.06.95
714	30	S of Birling Gap, Cuckmere Haven.	50°44.0'N 00°11.9'E	TV 551 951	Jane Lilley / Chris Wood	24.06.95
714	31	E of Belle Toute 1, Beachy Head.	50°43.8'N 00°13.4'E	TV 569 947	David Kay / Kim Jones	24.06.95
714	32	E of Belle Toute 2, Beachy Head.	50°43.8'N 00°13.5'E	TV 570 948	Sue Fuller / Jenni Fleming	24.06.95
714	33	Seven Sisters 1, Cuckmere Haven.	50°44.6'N 00°11.1'E	TV 542 960	Jane Lilley / Chris Wood	24.06.95
714	34	Below South Hill 1, Cuckmere Haven.	50°45.3'N 00°07.2'E	TV 495 972	Jane Lilley / Dave Fletcher	25.06.95
714	35	Below South Hill 2, Cuckmere Haven.	50°45.3'N 00°07.2'E	TV 496 973	Chris Wood / Nick Smart	25.06.95
714	36	Below South Hill 3, Cuckmere Haven.	50°45.1'N 00°07.4'E	TV 498 970	David Kay / Bill Baldock	25.06.95
714	37	E of Cuckmere Haven 1.	50°45.0'N 00°09.7'E	TV 525 968	Jane Lilley / Dave Fletcher	25.06.95
714	38	E of Cuckmere Haven 2.	50°44.8'N 00°09.6'E	TV 524 965	Chris Wood / Nick Smart	25.06.95
714	39	Cuckmere Haven 1.	50°45.1'N 00°09.3'E	TV 520 969	David Kay / Bill Baldock	24.06.95
714	40	W of Hope Point 2, Cuckmere Haven.	50°45.1'N 00°08.2'E	TV 507 969	Bob Wilson / Kevin Steadman	25.06.95
714	41	W of Hope Point 2, Cuckmere Haven.	50°45.1'N 00°08.1'E	TV 506 969	Kim Jones / Geoff Wells	25.06.95
714	42	E of Cuckmere Haven 3.	50°44.8'N 00°09.8'E	TV 526 965	Geoff Wells / Bob Wilson	25.06.95
714	43	E of Cuckmere Haven 4.	50°44.8'N 00°09.8'E	TV 526 965	Kim Jones / Kevin Steadman	25.06.95
714	44	Selsey Lifeboat Station 3, Selsey Bill.	50°43.4'N 00°46.7'W	SZ 861 923	Andy Willett	04.07.95
714	45	5km SSE of Brighton Marina.	50°46.1'N 00°04.6'W	TV 355 985	Robert Irving	22.07.95
714	46	4km SSE of Brighton Marina.	50°46.6'N 00°04.4'W	TV 357 994	David Harvey	22.07.95
714	47	3.5km SE of Brighton Marina.	50°47.1'N 00°04.2'W	TQ 359 003	Liz Wood	22.07.95
714	48	S of Peacehaven, Newhaven.	50°47.1'N 00°00.6'W	TQ 402 004	Robert Irving	22.07.95
714	49	W of Peacehaven, Brighton.	50°47.5'N 00°01.2'W	TQ 394 011	David Harvey	22.07.95
714	50	S of Saltdean, Brighton.	50°47.6'N 00°02.0'W	TQ 385 013	Liz Wood	22.07.95
714	51	"The Engine" 1, Hastings.	50°47.4'N 00°34.0'E	TQ 809 022	Brod Mason / Dave Thomas	22.07.95
714	52	"The Engine" 2, Hastings.	50°47.4'N 00°34.0'E	TQ 809 022	Sue Fuller / Kevin Morgan	22.07.95
714	53	"The Engine" 3, Hastings.	50°47.4'N 00°34.0'E	TQ 809 022	David Kay / Neil Gilbert	22.07.95
714	54	N of Long Shoal 1, Pevensey Bay.	50°45.5'N 00°24.4'E	TV 697 983	David Kay / Neil Gilbert	22.07.95
714	55	N of Long Shoal 2, Pevensey Bay.	50°45.5'N 00°24.3'E	TV 696 982	Brod Mason / Dave Thomas	22.07.95
714	56	N of Long Shoal 3, Pevensey Bay.	50°45.5'N 00°24.4'E	TV 697 983	Sue Fuller / Kevin Morgan	22.07.95
714	57	3km SW of Newhaven 1.	50°45.3'N 00°01.9'E	TV 433 971	Lucy Conway / David Barnes / Jo Lewin	22.07.95
714	58	3km SW of Newhaven 2.	50°45.7'N 00°01.9'E	TV 433 979	Bill Baldock / Lin Baldock	22.07.95
714	59	2.5km WSW of Newhaven.	50°46.0'N 00°01.7'E	TV 430 983	Lucy Conway / David Barnes / Jo Lewin	22.07.95
714	60	3km WSW of Newhaven.	50°46.0'N 00°01.0'E	TV 422 983	Bill Baldock / Lin Baldock	22.07.95
714	61	4km S of Seaford, Cuckmere Haven.	50°44.0'N 00°06.4'E	TV 487 948	Kate Northen / Robert Irving	23.07.95
714	62	3km SSW of Seaford, Newhaven.	50°44.3'N 00°05.4'E	TV 475 953	Bill Baldock / Lin Baldock	23.07.95
714	63	4km SSW of Seaford, Newhaven.	50°44.1'N 00°04.8'E	TV 468 950	Kate Northen / Robert Irving	23.07.95
714	64	2km S of Seaford, Cuckmere Haven.	50°44.7'N 00°06.6'E	TV 488 962	Bill Baldock / Lin Baldock	23.07.95
714	65	Royal Sovereign Light, Pevensey Bay.	50°43.4'N 00°26.1'E	TV 719 944	Lucy Conway / David Barnes / Jo Lewin	23.07.95

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
714	66	N of Long Shoal 4, Pevensey Bay.	50°45.5'N 00°24.4'E	TV 697 983	Lucy Conway / David Barnes / Jo Lewin	23.07.95
714	67	S of Palace Pier Reef, Brighton.	50°47.6'N 00°08.2'W	TQ 312 010	Jill Ireland / Kevin Morgan	23.07.95
714	68	1km S of Palace Pier Reef, Brighton.	50°47.1'N 00°08.4'W	TQ 311 000	Chris Wood / David Kay / Carol Aldridge	22.07.95
714	69	1km SSE of Palace Pier, Brighton.	50°48.3'N 00°07.5'W	TQ 320 023	Jill Ireland / Kevin Morgan	23.07.95
714	70	N of Palace Pier Reef, Brighton.	50°48.3'N 00°08.5'W	TQ 308 024	Chris Wood / David Kay	23.07.95
714	71	"City of Waterford", Brighton.	50°40.5'N 00°06.6'W	TV 334 880	Tim Dakers	31.07.95
714	72	NE of Palace Pier Reef 1, Brighton.	50°48.2'N 00°08.1'W	TQ 313 022	Adam Pamment / Kate Northen	16.09.95
714	73	NE of Palace Pier Reef 2, Brighton.	50°48.2'N 00°08.1'W	TQ 313 021	Beverley Boileau / Robert Irving	16.09.95
714	74	W of Brighton Marina 1.	50°48.5'N 00°06.6'W	TQ 331 027	Adam Pamment / Kate Northen	16.09.95
714	75	W of Brighton Marina 2.	50°48.4'N 00°06.5'W	TQ 332 026	Beverley Boileau / Robert Irving	16.09.95
714	76	2km S of South Hill 1, Cuckmere Haven.	50°44.4'N 00°07.6'E	TV 500 957	Cath Downie / Andy Mell	16.09.95
714	77	W of Seaford, Newhaven.	50°45.9'N 00°05.1'E	TV 470 984	Cath Downie / Andy Mell	16.09.95
714	78	South of Seaford 1, Cuckmere Haven.	50°45.5'N 00°06.1'E	TV 482 977	Cath Downie / Andy Mell	16.09.95
714	79	S of Cuckmere Haven 1.	50°44.9'N 00°08.8'E	TV 515 966	Lucy Conway / David Barnes	16.09.95
714	80	South of Seaford 2, Cuckmere Haven.	50°45.8'N 00°06.0'E	TV 481 981	Lucy Conway / David Barnes	16.09.95
714	81	South of Seaford 3, Cuckmere Haven.	50°45.6'N 00°06.1'E	TV 482 978	Bill Baldock / Neil Gilbert	16.09.95
714	82	S of Cuckmere Haven 2.	50°44.7'N 00°08.9'E	TV 516 962	Bill Baldock / Neil Gilbert	16.09.95
714	83	1.5km SE of Brighton Marina 1.	50°47.0'N 00°05.5'W	TQ 344 001	Sue Fuller / Jenni Fleming	16.09.95
714	84	1.5km SE of Brighton Marina 2.	50°47.8'N 00°05.8'W	TQ 341 015	Jane Lilley / Jill Ireland	16.09.95
714	85	1.5km SE of Brighton Marina 3.	50°48.1'N 00°05.7'W	TQ 342 020	Sue Fuller / Jenni Fleming	16.09.95
714	86	1.5km SE of Brighton Marina 4.	50°47.9'N 00°05.7'W	TQ 342 016	Jane Lilley / Jill Ireland	16.09.95
714	87	E of Jenny Ground 1, Shoreham.	50°49.1'N 00°11.7'W	TQ 271 037	Lucy Conway / David Barnes	17.09.95
714	88	E of Jenny Ground 2, Shoreham.	50°49.1'N 00°11.9'W	TQ 267 037	David Harvey / Neil Gilbert	17.09.95
714	89	W of Jenny Ground 1, Shoreham.	50°49.1'N 00°12.7'W	TQ 259 038	Lucy Conway / David Barnes	17.09.95
714	90	W of Jenny Ground 2, Shoreham.	50°49.2'N 00°12.8'W	TQ 258 039	David Harvey / Neil Gilbert	17.09.95
714	91	South-West Rocks 1, Shoreham.	50°47.5'N 00°12.5'W	TQ 262 007	Lucy Conway / David Barnes / Neil Gilbert	17.09.95
714	92	S of Hove 1, Brighton.	50°48.2'N 00°10.3'W	TQ 287 022	Sue Fuller / Jenni Fleming	17.09.95
714	93	S of Hove 2, Brighton.	50°48.6'N 00°10.4'W	TQ 286 029	Joanna MacMillan / Andy Willett	17.09.95
714	94	S of Hove 3, Brighton.	50°49.0'N 00°10.2'W	TQ 287 035	Andy Willett	17.09.95
714	95	Nr Jenny Ground 1, Shoreham.	50°49.1'N 00°12.2'W	TQ 264 038	Sue Fuller / Jenni Fleming	17.09.95
714	96	Nr Jenny Ground 2, Shoreham.	50°49.2'N 00°12.2'W	TQ 264 039	Joanna MacMillan / Andy Willett	17.09.95
714	97	Mixon Hole 1, Selsey Bill.	50°42.2'N 00°46.2'W	SZ 867 901	Kate Northen / Robert Irving	17.09.95
714	98	W of Brighton Marina 3.	50°48.4'N 00°06.6'W	TQ 331 027	Kim Jones	22.09.95
714	99	"Inverclyde", Brighton.	50°46.5'N 00°03.7'W	TV 366 991	Andy Willett	28.08.95
714	100	"Lancer 2", Newhaven.	50°44.2'N 00°01.0'E	TV 423 950	Andy Willett	28.08.95
714	101	Mixon Hole 2, Selsey Bill.	50°42.2'N 00°46.2'W	SZ 867 901	Bill Baldock	17.09.95
714	102	Newhaven Harbour Outer Wall 1.	50°46.7'N 00°03.2'E	TV 448 997	David Kay	19.08.95
714	103	Cuckmere Haven 2.	50°45.3'N 00°09.0'E	TV 516 974	David Kay	19.08.95
714	104	1.5km S of Cuckmere Haven.	50°44.4'N 00°08.9'E	TV 516 956	Bill Hewitt / Matt Ruglys	16.09.95
714	105	S of Hope Point 1, Cuckmere Haven.	50°44.8'N 00°08.4'E	TV 510 963	David Kay / Peter Hewitt	16.09.95
714	106	Seaford Head 1, Cuckmere Haven.	50°45.3'N 00°06.7'E	TV 489 973	Bill Hewitt / Matt Ruglys	16.09.95
714	107	Seaford Head 2, Cuckmere Haven.	50°45.5'N 00°06.5'E	TV 487 976	David Kay / Peter Hewitt	16.09.95
714	108	S of Hope Point 2, Cuckmere Haven.	50°44.8'N 00°08.7'E	TV 513 965	Jane Lilley / Peter Hewitt	17.09.95
714	109	S of South Hill 1, Cuckmere Haven.	50°44.8'N 00°07.9'E	TV 503 963	Bill Hewitt / Matt Ruglys	17.09.95
714	110	S of South Hill 2, Cuckmere Haven.	50°45.0'N 00°07.3'E	TV 497 967	Jane Lilley / Peter Hewitt	17.09.95
714	111	S of Seaford Head, Cuckmere Haven.	50°45.1'N 00°06.5'E	TV 488 969	Bill Hewitt / Matt Ruglys	17.09.95
714	112	2km S of South Hill 2, Cuckmere Haven.	50°44.5'N 00°07.2'E	TV 495 958	Lucy Conway / David Barnes	16.09.95
714	113	SW of Birling Gap 3, Cuckmere Haven.	50°44.2'N 00°11.0'E	TV 541 954	Peter Hewitt / Bill Hewitt	14.10.95
714	114	Beachy Head.	50°43.5'N 00°15.4'E	TV 592 942	Kate Northen / Robert Irving	14.10.95
714	115	Belle Toute, Cuckmere Haven.	50°44.0'N 00°12.2'E	TV 555 951	Peter Hewitt / Bill Hewitt	14.10.95
714	116	Seven Sisters 2, Cuckmere Haven.	50°44.7'N 00°10.7'E	TV 537 962	Kate Northen / Robert Irving	14.10.95
714	117	Kingmere Rocks arch, Worthing.	50°43.3'N 00°26.4'W	TV 100 926	Peter Hewitt	23.07.95
714	118	Cuckmere Haven 3.	50°45.0'N 00°09.3'E	TV 520 969	Adam Pamment	30.07.95
714	119	Newhaven Outer Harbour Wall 2.	50°46.5'N 00°03.4'E	TV 449 993	Adam Pamment	19.08.95
715	1	Marina Reef 1, Brighton.	50°47.6'N 00°06.5'W	TQ 332 011	Helene Fearon / Rachel Pears	27.04.96
715	2	E of Marina Reef 1, Brighton.	50°47.5'N 00°06.4'W	TQ 334 010	Derek Knibb / Neil Lynch	27.04.96
715	3	E of Marina Reef 2, Brighton.	50°47.5'N 00°06.3'W	TQ 334 010	Pat Williams / Paul Stratham	27.04.96
715	4	Nr The Manors 1, Brighton.	50°47.8'N 00°07.8'W	TQ 317 015	Melissa Morton / Iain Knight	28.04.96
715	5	Nr The Manors 2, Brighton.	50°47.8'N 00°07.9'W	TQ 315 015	Elaine Stone / Robert Wade	28.04.96
715	6	Nr The Manors 3, Brighton.	50°47.9'N 00°07.8'W	TQ 317 016	Marcus Polley / Howard Kallender	28.04.96
715	7	N of Marina Reef, Brighton.	50°47.7'N 00°06.5'W	TQ 332 013	Chris Griffiths	28.04.96
715	8	Marina Reef 2, Brighton.	50°47.6'N 00°06.6'W	TQ 331 012	Ron Smith / John Kirby / Matt Ruglys	28.04.96
715	9	Outer Mulberry 8, Bognor Regis.	50°44.7'N 00°42.1'W	SZ 915 949	Julian Whippy / Mark Crumplin	16.06.96
715	10	Long Shoal 1, Pevensey Bay.	50°45.2'N 00°24.3'E	TV 696 976	Adam Pamment / Beverley Boileau	22.06.96
715	11	Long Shoal 2, Pevensey Bay.	50°45.1'N 00°24.2'E	TV 695 974	Derek Knibb / Neil Lynch	22.06.96
715	12	Horse of Willingdon 1, Pevensey Bay.	50°44.9'N 00°22.7'E	TV 677 970	Helene Fearon / Julie Lintunen	22.06.96
715	13	Horse of Willingdon 2, Pevensey Bay.	50°44.9'N 00°22.2'E	TV 672 972	Vicki Billings / Ben Wells	23.06.96

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
715	14	Horse of Willingdon 3, Pevensey Bay.	50°44.8'N 00°22.2'E	TV 672 970	Adam Pamment / Beverley Boileau	23.06.96
715	15	Horse of Willingdon 4, Pevensey Bay.	50°45.1'N 00°22.6'E	TV 676 974	Derek Knibb / Neil Lynch	23.06.96
715	16	N of Elphick Tree, Pevensey Bay.	50°45.4'N 00°20.9'E	TV 656 980	Vicki Billings / Ben Wells	23.06.96
715	17	Royal Sovereign Shoals, Pevensey Bay.	50°44.7'N 00°26.0'E	TV 717 969	Jo Lewin / Damon Stanwell-Smith	20.07.96
715	18	Royal Sovereign Shoals 2, Pevensey Bay.	50°44.7'N 00°26.2'E	TV 720 969	Jenni Fleming / Sue Fuller	20.07.96
715	19	Royal Sovereign Shoals 3, Pevensey Bay.	50°44.3'N 00°25.2'E	TV 708 960	Helene Fearon / David Kay	20.07.96
715	20	Royal Sovereign Shoals 4, Pevensey Bay.	50°44.2'N 00°25.3'E	TV 708 959	Lucy Conway / Karen Meidlinger	20.07.96
715	21	Pevensey Shoal 1, Pevensey Bay.	50°47.2'N 00°26.3'E	TQ 719 014	Jenni Fleming / Sue Fuller	20.07.96
715	22	Pevensey Shoal 2, Pevensey Bay.	50°47.3'N 00°26.3'E	TQ 719 017	Jo Lewin / Damon Stanwell-Smith	20.07.96
715	23	Pevensey Shoal 3, Pevensey Bay.	50°46.9'N 00°26.6'E	TQ 723 009	Helene Fearon / David Kay	20.07.96
715	24	Pevensey Shoal 4, Pevensey Bay.	50°47.1'N 00°26.6'E	TQ 722 012	Lucy Conway / Karen Meidlinger	20.07.96
715	25	off Beachy Head 1.	50°43.4'N 00°14.1'E	TV 578 940	Chris McTernan / Jane Lilley	20.07.96
715	26	off Beachy Head 2.	50°43.5'N 00°14.9'E	TV 587 943	Robert Irving / Leona Shepherd	20.07.96
715	27	off Beachy Head 3.	50°43.7'N 00°15.2'E	TV 590 946	Chris McTernan / Jane Lilley	20.07.96
715	28	off Beachy Head 4.	50°43.8'N 00°14.8'E	TV 586 947	Robert Irving / Leona Shepherd	20.07.96
715	29	2km SSE of Eastbourne 1, Beachy Head.	50°44.6'N 00°18.1'E	TV 623 963	Lucy Conway / Jo Lewin	21.07.96
715	30	2km SSE of Eastbourne 2, Beachy Head.	50°44.7'N 00°17.9'E	TV 621 966	Damon Stanwell-Smith / Karen Meidlinger	i 21.07.96
715	31	2km SE of Eastbourne 1, Beachy Head.	50°45.2'N 00°19.2'E	TV 636 976	Jenni Fleming / Sue Fuller	21.07.96
715	32	2km SE of Eastbourne 2, Beachy Head.	50°45.4'N 00°19.0'E	TV 633 978	Helene Fearon / Carol Aldridge	21.07.96
715	33	1km S of Seven Sisters, Cuckmere Haven.	50°44.6'N 00°10.2'E	TV 531 961	Helene Fearon / Carol Aldridge	21.07.96
715	34	1km from Seaford 1, Newhaven.	50°45.7'N 00°05.4'E	TV 474 979	Lucy Conway / Jo Lewin	21.07.96
715	35	1km from Seaford 2, Newhaven.	50°45.7'N 00°05.2'E	TV 472 980	Damon Stanwell-Smith / Karen Meidlinger	i 21.07.96
715	36	2km SE of Newhaven.	50°46.1'N 00°04.5'E	TV 463 988	Jenni Fleming / Sue Fuller	21.07.96
715	37	off Burrow Head 1, Newhaven.	50°46.4'N 00°02.5'E	TV 440 993	Helene Fearon / Carol Aldridge	21.07.96
715	38	off Burrow Head 2, Newhaven.	50°46.5'N 00°02.2'E	TV 435 994	Jenni Fleming / Sue Fuller	21.07.96
715	39	Southern Head 1, Pevensey Bay.	50°43.6'N 00°25.8'E	TV 715 948	Sue Fuller / Alan Glen	11.08.96
715	40	Southern Head 2, Pevensey Bay.	50°43.6'N 00°25.5'E	TV 712 947	Jenni Fleming / Jane Lilley	11.08.96
715	41	Southern Head 3, Pevensey Bay.	50°43.6'N 00°25.5'E	TV 711 949	Lucy Conway / Jo Lewin	11.08.96
715	42	Southern Head 4, Pevensey Bay.	50°43.5'N 00°25.7'E	TV 714 947	Neil Gilbert / David Kay / Bill Baldock	11.08.96
715	43	2km N of Royal Sovereign Shoals 1, Pevensey Bay.	50°46.1'N 00°25.5'E	TV 710 995	Sue Fuller / Alan Glen	11.08.96
715	44	2km N of Royal Sovereign Shoals 2, Pevensey Bay.	50°46.0'N 00°25.5'E	TV 710 993	Jenni Fleming / Jane Lilley	11.08.96
715	45	Elphick Tree 1, Pevensey Bay.	50°45.1'N 00°21.4'E	TV 662 974	Lucy Conway / Jo Lewin	11.08.96
715	46	Elphick Tree 2, Pevensey Bay.	50°45.2'N 00°21.3'E	TV 661 975	Neil Gilbert / David Kay / Bill Baldock	11.08.96
715	47	7km NE of Royal Sovereign Shoals 1, Hastings.	50°47.9'N 00°29.9'E	TQ 761 030	Lucy Conway / Karen Meidlinger	07.09.96
715	48	7km NE of Royal Sovereign Shoals 2, Hastings.	50°47.9'N 00°29.9'E	TQ 761 030	Helene Fearon / Keith Belgrove	07.09.96
715	49	7km NE of Sovereign Shoals 3, Hastings.	50°48.0'N 00°30.1'E	TQ 763 031	Brod Mason / Bill Sanderson	07.09.96
715	50	Royal Sovereign Shoals 5, Pevensey Bay.	50°44.8'N 00°25.8'E	TV 714 970	Adam Pamment / Beverley Boileau	07.09.96
715	52	Horse of Willingdon 5, Pevensey Bay.	50°45.2'N 00°22.5'E	TV 675 977	Brod Mason / Bill Sanderson	07.09.96
715	53	Horse of Willingdon 6, Pevensey Bay.	50°45.2'N 00°22.5'E	TV 675 976	Helene Fearon / Keith Belgrove	07.09.96
715	55	Horse of Willingdon 7, Pevensey Bay.	50°45.2'N 00°22.5'E	TV 675 977	Lucy Conway / Karen Meidlinger	07.09.96
715	56	Four Fathoms Sand Ridge 1, Hastings.	50°47.8'N 00°37.4'E	TQ 849 031	Alan Glen / Brod Mason	08.09.96
715	57	Four Fathoms Sand Ridge 2, Hastings.	50°48.1'N 00°37.4'E	TQ 848 036	Helene Fearon / Keith Belgrove	08.09.96
715	59	Horse of Willingdon 8, Pevensey Bay.	50°44.9'N 00°22.2'E	TV 672 970	Elaine Stone / Robert Wade	08.09.96
715	60	Horse of Willingdon 9, Pevensey Bay.	50°44.8'N 00°22.2'E	TV 671 968	Helene Fearon / Keith Belgrove	08.09.96
715	61	Horse of Willingdon 10, Pevensey Bay.	50°44.8'N 00°22.3'E	TV 673 969	Alan Glen / Brod Mason	08.09.96
715	62	Horse of Willingdon 11, Pevensey Bay.	50°45.0'N 00°21.9'E	TV 669 972	Adam Pamment / Beverley Boileau	08.09.96
715	63	S of the Hounds, Selsey Bill.	50°44.0'N 00°49.5'W	SZ 828 934	Jane Lilley	18.08.96
716	1	100m N of Palace Pier Reef, Brighton.	50°48.5'N 00°08.3'W	TQ 310 026	David Kay / M Heywood	12.04.97
716	2	150m N of Palace Pier Reef, Brighton.	50°48.5'N 00°08.4'W	TQ 310 027	Liz Woodd-Walker / Chris Woodd-Walker	12.04.97
716	3	200m N of Palace Pier Reef, Brighton.	50°48.5'N 00°08.4'W	TQ 310 027	Sue Heaps / Olive Rouse	12.04.97
716	4	Palace Pier 1, Brighton.	50°48.8'N 00°08.0'W	TQ 314 033	A. Nahajski / S. Faulkner	26.04.97
716	5	Palace Pier 2, Brighton.	50°48.8'N 00°08.0'W	TQ 314 033	Bryony Chapman / Robert Irving	26.04.97
716	6	E of Palace Pier 1, Brighton.	50°48.8'N 00°08.0'W	TQ 314 033	Bryony Chapman / John Thomas	26.04.97
716	7	Nr Palace Pier, Brighton.	50°48.8'N 00°07.7'W	TQ 317 033	I. Pritchard / I. McDowall	27.04.97
716	8	Palace Pier 3, Brighton.	50°48.8'N 00°08.0'W	TQ 314 033	Jeannie Ninis / Gerry Casey	24.04.97
716	9	Palace Pier 4, Brighton.	50°48.8'N 00°08.0'W	TQ 314 033	Ron Johnson / Geoff Shaxton	27.04.97
716	10	E of Palace Pier 2, Brighton.	50°48.8'N 00°07.9'W	TQ 315 033	Nick Evans / Tom Springall	27.04.97
716	11	Looe Gate, Shoreham.	50°47.7'N 00°11.7'W	TQ 271 012	Vicki Billings / Ben Wells	15.06.97
716	12	City of Waterford, Brighton.	50°40.5'N 00°06.6'W	TV 334 880	Vicki Billings / Ben Wells	15.06.97
716	13	Peacehaven Gullies 3, Newhaven.	50°47.0'N 00°00.2'E	TQ 412 002	Mark Tomlinson	29.06.97
716	14	7km SSW of Newhaven 2.	50°43.1'N 00°00.3'E	TV 416 930	Mark Tomlinson	29.06.97
716	15	7km SSW of Newhaven 1.	50°43.3'N 00°00.3'E	TV 415 934	Helene Fearon / Keith Belgrove	29.06.97
716	16	Peacehaven Gullies 1, Newhaven.	50°47.1'N 00°00.1'E	TQ 410 003	Helene Fearon / Keith Belgrove	29.06.97
716	17	5km S of Newhaven.	50°43.6'N 00°04.1'E	TV 459 940	Grant Aitken / Beverley Boileau	29.06.97

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
716	18	Peacehaven Gullies 2, Newhaven.	50°47.1'N 00°00.1'E	TQ 410 003	Beverley Boileau / Adam Pamment	29.06.97
716	19	Friars Bay, Peacehaven, Newhaven.	50°46.9'N 00°01.1'E	TQ 423 000	Robert Irving / Grant Aitken	29.06.97
716	20	Outer Mulberry 4, Bognor Regis.	50°44.7'N 00°42.1'W	SZ 915 949	Jane Lilley / M. Wilkinson	12.07.97
716	21	Mixon Hole 3, Selsey Bill.	50°42.2'N 00°46.2'W	SZ 868 901	Jeannie Ninis / Gerry Casey	12.07.97
716	22	The Grounds 1, Selsey Bill.	50°42.8'N 00°49.2'W	SZ 832 911	Jeannie Ninis / Gerry Casey	12.07.97
716	23	500m NE of Outer Owers buoy, Bognor Regis.	50°39.0'N 00°41.0'W	SZ 930 842	Robert Irving / Helene Fearon	12.07.97
716	24	S of Winter Knoll, Littlehampton.	50°45.2'N 00°34.4'W	TV 005 960	Robert Irving / Helene Fearon	12.07.97
716	25	Outer Mulberry 6, Bognor Regis.	50°44.6'N 00°42.3'W	SZ 913 946	Brod Mason / Mark Foram	12.07.97
716	26	Shoal of the Lead 1, Bognor Regis.	50°39.9'N 00°40.6'W	SZ 935 859	Gerry Casey / Brod Mason	13.07.97
716	27	East Bank 1, Bognor Regis.	50°41.5'N 00°38.9'W	SZ 954 889	Gerry Casey / Brod Mason	13.07.97
716	28	Shoal of the Lead 2, Bognor Regis.	50°40.1'N 00°39.5'W	SZ 947 863	Jeannie Ninis / Grant Aitken	13.07.97
716	29	East Bank 2, Bognor Regis.	50°41.4'N 00°39.3'W	SZ 949 888	Jeannie Ninis / Grant Aitken	13.07.97
716	30	Shoal of The Lead 3, Bognor Regis.	50°39.2'N 00°39.3'W	SZ 950 846	Liz Woodd-Walker / Chris Woodd-Walker	13.07.97
716	31	East Bank 3, Bognor Regis.	50°41.5'N 00°38.8'W	SZ 955 890	Liz Woodd-Walker / Chris Woodd-Walker	13.07.97
716	32	W end of Mixon Hole, Selsey Bill.	50°42.1'N 00°46.4'W	SZ 866 900	Jane Lilley / Rod Arnold	13.07.97
716	33	1km SSE of Selsey Bill.	50°42.7'N 00°46.9'W	SZ 859 911	Jane Lilley / Rod Arnold	13.07.97
716	34	The Waldrons 1, Bognor Regis.	50°44.9'N 00°37.7'W	SZ 967 953	Robert Irving	27.07.97
716	35	The Waldrons 2, Bognor Regis.	50°44.9'N 00°37.8'W	SZ 966 952	Graham Pembleton / N. Ford	27.07.97
716	36	W of Mixon Hole, Selsey Bill.	50°42.2'N 00°46.4'W	SZ 866 900	Helene Fearon / Keith Belgrove	13.07.97
716	37	W side of Mixon Hole, Selsey Bill.	50°42.2'N 00°46.4'W	SZ 865 900	Helene Fearon / Keith Belgrove	13.07.97
716	38	Holywell Bank Eastbourne 1, Beachy Head.	50°44.7'N 00°16.5'E	TV 605 965	Beverley Boileau / Adam Pamment	09.08.97
716	39	Holywell Bank Eastbourne 2, Beachy Head.	50°44.8'N 00°17.5'E	TV 616 967	Grant Aitken / Brod Mason / Steve Cherry	09.08.97
716	40	Boulder Bank 1, Beachy Head.	50°45.2'N 00°17.4'E	TV 616 975	Beverley Boileau / Adam Pamment	09.08.97
716	41	Boulder Bank 2, Beachy Head.	50°45.6'N 00°17.8'E	TV 620 981	Grant Aitken / Brod Mason / Steve Cherry	09.08.97
716	42	Royal Sovereign Shoal 1, Pevensey Bay.	50°43.9'N 00°25.0'E	TV 705 954	Grant Aitken / Steve Cherry	10.08.97
716	43	Royal Sovereign Shoal 2, Pevensey Bay.	50°43.9'N 00°25.0'E	TV 705 954	Brod Mason	10.08.97
716	44	W of Royal Sovereign Shoal, Pevensey Bay.	50°44.0'N 00°25.1'E	TV 707 955	Beverley Boileau / Adam Pamment	10.08.97
716	45	Oyster Reef 1, Pevensey Bay.	50°49.3'N 00°26.2'E	TQ 716 053	Brod Mason	10.08.97
716	46	Oyster Reef 2, Pevensey Bay.	50°49.4'N 00°25.6'E	TQ 709 055	Grant Aitken / Steve Cherry	10.08.97
716	47	Oyster Reef 3, Pevensey Bay.	50°49.4'N 00°25.9'E	TQ 712 056	Beverley Boileau / Adam Pamment	10.08.97
716	48	1km S of Mixon Beacon, Selsey Bill.	50°41.4'N 00°46.5'W	SZ 865 887	Robert Irving / Lucy Conway	06.09.97
716	49	2.5km E of Selsey Bill.	50°43.3'N 00°45.0'W	SZ 882 922	Robert Irving / Lucy Conway	06.09.97
716	50	Whirlpool Hole 1, Selsey Bill.	50°41.4'N 00°48.8'W	SZ 837 885	Robert Irving / Lucy Conway	07.09.97
716	51	1km SW of Selsey Bill.	50°43.7'N 00°48.6'W	SZ 838 929	Robert Irving / Lucy Conway	07.09.97
716	52	2.5km off Selsey Bill.	50°43.0'N 00°48.5'W	SZ 841 915	Grant Aitken / Steve Cherry	06.09.97
716	53	W side of Thorney Channel 1, Chichester Harbour.	50°49.0'N 00°54.1'W	SU 773 025	Grant Aitken / Steve Cherry	06.09.97
716	54	W side of Thorney Channel 2, Chichester Harbour.	50°49.0'N 00°54.3'W	SU 771 026	Beverley Boileau / K. Capper	06.09.97
716	55	E side of North Emsworth Channel 1, Chichester Harbour.	50°49.7'N 00°56.7'W	SU 742 039	Beverley Boileau / Adam Pamment	07.09.97
716	56	E side of North Emsworth Channel 2, Chichester Harbour.	50°49.8'N 00°56.7'W	SU 742 039	Grant Aitken / Julie Lintunen	07.09.97
716	57	Seaford Head Gullies, Cuckmere Haven.	50°45.5'N 00°06.1'E	TV 483 976	Robert Irving	03.05.97
716	58	Whirlpool Hole 2, Selsey Bill.	50°41.3'N 00°48.7'W	SZ 838 884	Robert Wade / Elaine Stone	07.09.97
716	59	S of Selsey Bill.	50°43.8'N 00°48.6'W	SZ 839 931	Robert Wade / Elaine Stone	07.09.97
716	60	1.5km E of Selsey Bill.	50°43.3'N 00°45.4'W	SZ 876 922	Jane Lilley / Rod Arnold	06.09.97
716	61	1km E of Mixon Beacon, Selsey Bill.	50°42.1'N 00°45.1'W	SZ 880 900	Jane Lilley / Rod Arnold	06.09.97
716	62	3km S of Selsey Bill.	50°40.5'N 00°47.1'W	SZ 857 869	Jane Lilley / Rod Arnold	07.09.97
716	63	2km SSW of Selsey Bill.	50°42.0'N 00°47.7'W	SZ 850 898	Jane Lilley / Rod Arnold	07.09.97
716	64	S of Mixon Hole, Selsey Bill.	50°42.3'N 00°46.7'W	SZ 862 903	Rod Arnold / Paul Biggin	12.07.97
716	65	The Grounds 2, Selsey Bill.	50°44.0'N 00°49.0'W	SZ 835 933	Rod Arnold / Paul Biggin	12.07.97
716	66	Outer Mulberry 5, Bognor Regis.	50°44.7'N 00°42.1'W	SZ 915 949	Brod Mason / Mark Foram	12.07.97
716	67	Pullar Bank 1, Selsey Bill.	50°40.5'N 00°48.4'W	SZ 842 869	Tom Springall / John Watson	06.09.97
716	68	Pullar Bank 2, Selsey Bill.	50°40.5'N 00°48.8'W	SZ 837 870	I. Pritchard / Peter van Leeuwen / S. Rennie	06.09.97
716	69	Pullar Bank 3, Selsey Bill.	50°40.3'N 00°48.2'W	SZ 844 866	I. Pritchard / S. Rennie	07.09.97
716	70	Nr The Grounds, 2km SW of Selsey Bill 1.	50°42.7'N 00°48.0'W	SZ 847 910	I. Pritchard / S. Rennie	07.09.97
716	71	Nr The Grounds, 2km SW of Selsey Bill 2.	50°42.6'N 00°48.6'W	SZ 839 908	Tom Springall / John Watson / Peter van Leeuwen	07.09.97
716	72	Nr The Grounds, 2km SW of Selsey Bill 3.	50°42.4'N 00°48.6'W	SZ 839 904	Tom Springall / John Watson	07.09.97
716	73	SE of Pett Level, Rye Bay.	50°53.8'N 00°43.3'E	TQ 913 144	J. Ormston / Simon Stagnell	27.09.97
716	74	Off Pett Level, Rye Bay.	50°53.8'N 00°43.3'E	TQ 914 144	Steve Cherry / David Harvey	27.09.97
716	75	Nr Boulder Banks, Rye Bay.	50°51.9'N 00°43.4'E	TQ 917 109	J. Ormston / Simon Stagnell	27.09.97
716	76	E of Boulder Banks, Rye Bay.	50°51.8'N 00°43.5'E	TQ 917 108	Steve Cherry	27.09.97
716	77	Rye Bay 1.	50°51.3'N 00°49.0'E	TQ 983 100	L. Mills	28.09.97
716	78	Rye Bay 2.	50°51.3'N 00°48.9'E	TQ 981 100	Geoff Shaxton / Steve Cherry	28.09.97
716	79	Rye Bay 3.	50°51.4'N 00°49.3'E	TQ 985 102	J. Ormston / Simon Stagnell	28.09.97
716	80	Stephenson Shoal 1, Dungeness.	50°52.7'N 00°53.1'E	TR 029 129	J. Ormston / Simon Stagnell	28.09.97

Sur	Site	Site name & coastal sector	Latitude & Longitude	Grid ref.	Surveyors	Date
716	81	Stephenson Shoal 2, Dungeness.	50°53.0'N 00°52.6'E	TR 023 134	L. Mills	28.09.97
716	82	Stephenson Shoal 3, Dungeness.	50°53.0'N 00°52.5'E	TR 022 133	Geoff Shaxton / Steve Cherry	28.09.97
717	1	Marina Reef 1, Brighton.	50°47.6'N 00°06.7'W	TQ 329 011	Steve Cherry / Jim Wakeley	16.05.98
717	2	Marina Reef 2, Brighton.	50°47.6'N 00°06.7'W	TQ 329 011	Tim Burdsey / Chloe Bocking	16.05.98
717	3	Just W of Marina Reef, Brighton.	50°47.6'N 00°06.7'W	TQ 329 011	Chloe Bocking / Tim Burdsey	16.05.98
717	4	Marina Reef 3, Brighton.	50°47.6'N 00°06.6'W	TQ 330 011	Gareth Evans / Simone Lowson	17.05.98
717	5	Marina Reef 4, Brighton.	50°47.6'N 00°06.7'W	TQ 330 011	Andy Brigham / Nicola Davies	17.05.98
717	6	Nr Marina Reef, Brighton.	50°47.6'N 00°07.1'W	TQ 326 012	Gordon Bird / Mark Burgess	17.05.98
717	7	Seaford Gullies, Newhaven.	50°45.8'N 00°05.8'E	TV 479 982	Joanna Macmillan	04.07.98
717	8	Black Ledge, Littlehampton.	50°44.6'N 00°31.3'W	TV 042 949	William Hewitt	27.07.98
717	9	The Barge 1, Bracklesham Bay.	50°43.9'N 00°53.7'W	SZ 778 931	Chris Wood	01.08.98
717	10	The Barge 2, Bracklesham Bay.	50°43.9'N 00°53.7'W	SZ 778 931	Bill Baldock / Simon Stagnell	01.08.98
717	11	Bullock Patch, Bracklesham Bay.	50°42.3'N 00°54.7'W	SZ 767 901	Peter Hewitt / Kevin Morgan	01.08.98
717	12	Nr wreck of 'Corbet Woodall', Bracklesham Bay.	50°41.4'N 00°53.6'W	SZ 781 885	Joanna Macmillan / William Hewitt	01.08.98
717	13	Old Wall Amphitheatre?, Bracklesham Bay.	50°44.2'N 00°51.2'W	SZ 808 938	Peter Hewitt / Kevin Morgan	01.08.98
717	14	Bracklesham Bay 7.	50°44.3'N 00°52.3'W	SZ 795 940	Simon Stagnell / Bill Baldock	01.08.98
717	15	Bracklesham, Bracklesham Bay.	50°44.6'N 00°51.3'W	SZ 806 945	Joanna Macmillan / William Hewitt	01.08.98
717	16	Bracklesham Bay 8.	50°44.2'N 00°52.5'W	SZ 793 938	Chris Wood	01.08.98
717	17	Bracklesham Bay 9.	50°41.6'N 00°53.3'W	SZ 784 889	Chris Wood	02.08.98
717	18	'Edenwood' wreck, Bracklesham Bay.	50°40.6'N 00°54.1'W	SZ 775 870	Joanna Macmillan / William Hewitt	02.08.98
717	19	Bracklesham Bay 10.	50°41.6'N 00°53.3'W	SZ 784 889	Simon Stagnell / Carol Aldridge	02.08.98
717	20	Near wreck of 'Edenwood', Bracklesham Bay.	50°40.5'N 00°54.2'W	SZ 774 868	Peter Hewitt	02.08.98
717	21	Bracklesham Bay 5.	50°44.3'N 00°51.6'W	SZ 803 938	Carol Aldridge / Simon Stagnell	02.08.98
717	22	The Hounds, Bracklesham Bay.	50°44.1'N 00°50.5'W	SZ 817 936	Joanna Macmillan / William Hewitt	02.08.98
717	23	Bracklesham Bay 6.	50°44.2'N 00°51.8'W	SZ 801 937	Chris Wood	02.08.98
717	24	Extn. of 'Balls' area, Bracklesham Bay.	50°44.8'N 00°53.1'W	SZ 786 947	Peter Hewitt	02.08.98
717	25	Bracklesham Balls, Bracklesham Bay.	50°44.6'N 00°51.0'W	SZ 811 944	Peter Hewitt	29.08.98
717	26	Out from Eastbourne 1, Pevensey Bay.	50°43.9'N 00°20.6'E	TV 653 952	Alan Glen / Susan Fuller	15.08.98
717	27	SW of Horse of Willingdon, Pevensey Bay.	50°44.1'N 00°20.4'E	TV 652 955	Brod Mason / Steve Cherry	15.08.98
717	28	Out from Eastbourne 2, Pevensey Bay.	50°48.1'N 00°23.2'E	TQ 682 030	Alan Glen / Susan Fuller	15.08.98
717	29	Pevensey Bay 1.	50°47.7'N 00°23.6'E	TQ 687 023	Brod Mason / Steve Cherry / Gareth Evans	15.08.98
717	30	Pevensey Bay 2.	50°47.7'N 00°23.6'E	TQ 687 023	Gareth Evans / Brod Mason / Steve Cherry	15.08.98
717	31	E of 'The Duchess', Hastings.	50°44.0'N 00°30.2'E	TV 766 958	Elaine Stone / Robert Wade	16.08.98
717	32	E of 'The Duchess', Hastings.	50°43.9'N 00°29.9'E	TV 763 955	Brod Mason / Susan Fuller / Steve Cherry	16.08.98
717	33	Out of Eastbourne, Pevensey Bay.	50°46.7'N 00°23.6'E	TQ 687 004	Robert Wade / Elaine Stone	16.08.98
717	34	Overfalls, W of Pevensey Shoal, Pevensey Bay.	50°46.8'N 00°23.6'E	TQ 687 006	Brod Mason / Susan Fuller / Steve Cherry	16.08.98
717	35	Chichester Harbour Entrance 1.	50°46.8'N 00°55.9'W	SZ 752 985	Jane Lilley / Robert Irving	15.10.98
717	36	Chichester Harbour Entrance 2.	50°47.1'N 00°55.9'W	SZ 752 990	Chris Wood / Nigel Thomas	15.10.98
717	37	Chichester Harbour Entrance 3.	50°46.8'N 00°56.0'W	SZ 751 985	Nigel Thomas / Chris Wood	15.10.98
717	38	Black Point, Chichester Harbour Entrance.	50°47.2'N 00°55.9'W	SZ 752 992	Jane Lilley / Robert Irving	15.10.98
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