A DOSSIER OF

SUSSEX MARINE SITES OF NATURE CONSERVATION IMPORTANCE

compiled by

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on behalf of the

Sussex Marine SNCI Steering Group

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Sea squirt
Ciona intestinalis

Brighton Marina

Photo:
Bill Hewitt

Slipper limpet shells
Crepidula fornicata

Kingmere Rocks,
off Littlehampton

Photo:
Bill Hewitt

Bib/Pout/Pouting
Trisopterus luscus

Outer Mulberry,
off Pagham

Photo:
Peter Hewitt

Tompot blenny
Parablennius gattorugine
on underwater chalk cliff

Worthing Lumps

Photo:
Bill Hewitt

Diver with recording slate

off Newhaven

Photo:
Peter Hewitt

Sunstar
Crossaster papposus

Pullar Bank, off Selsey Bill

Photo:
Peter Hewitt

Edible crab
Cancer pagurus

Waldrons reef, off Bognor

Photo:
Robert Irving

SUSSEX MARINE SITES OF NATURE CONSERVATION IMPORTANCE

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West Sussex County Council

East Sussex County Council

English Nature

World Wide Fund For Nature (

Environment Agency

west sussex county council

East Sussex County Council

ENGLISH NATURE

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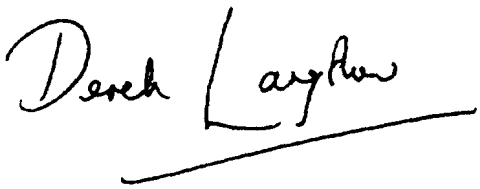
FOREWORD

Terrestrial nature conservation has at least 100 years of history behind it. By contrast, interest in and appreciation of the rich wildlife beneath our offshore waters has been restricted to relatively few people until the last quarter century. It is, though, now growing very rapidly indeed.

English Nature is as firmly committed to the promotion of wildlife in the marine environment as it is on land. Over the last decade, we have developed policies and programmes to conserve the best examples of natural marine habitats. Significantly, the European Union's 1992 Habitats and Species Directive includes both estuaries and reefs in the list of natural habitat types requiring special protection.

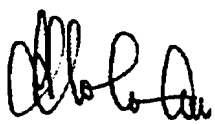
Our long experience of terrestrial conservation has taught us some valuable lessons. One is that legislation *alone* is not enough. Nor is it sufficient to focus attention on *just* the top tier of important sites. If conservation measures are really to succeed, we need wider knowledge and shared goals between all the organisations who value the natural environment.

The publication of this document is the culmination of a lengthy programme of survey and a fruitful collaboration between many people from volunteer divers to County Council Ecologists. This is the first time that marine Sites of Nature Conservation Importance have been explicitly identified in any county. I am sure that it will stimulate yet further interest in the marine heritage of Sussex and of other coastal counties. I am equally certain that it will encourage a better understanding of the problems which face us as we try to reconcile the conflicting demands which are being made on the marine environment.



Dr Derek Langslow
Chief Executive
English Nature

I am pleased to have been asked to contribute to this foreword because it is obvious that the more knowledge we can gain, from all sources, the greater will be the ability of my Committee to achieve its fishery and conservation aims. At a time when all fisheries are under threat, to some degree, it is essential that we know and understand the shallow seas around us and work together towards the development of sensible policies which will safeguard our wildlife, fisheries and fishermen. For this reason I applaud the efforts of all concerned in the production of this report.



Steve Holman
Clerk and Chief Fishery Officer
Sussex Sea Fisheries Committee

1. INTRODUCTION

For many people, the marine life that lives beneath the murky waters off the Sussex coast is out of sight and consequently out of mind. Perhaps the part of it which is most conspicuous to most - various species of fish and shellfish - is usually only seen on the fishmonger's slab or at the sea-front shellfish stall. Of course, we are aware there must be other things down there - seaweed, crabs and perhaps anemones - but few of us give them much thought. In recent years, the growing popularity of marine aquaria (often in the guise of Sea Life Centres) has helped to redress the balance somewhat, introducing people to the fascination of all forms of marine life.

However, it is only through the advent of SCUBA diving gear that we have had the opportunity to view this marine life *at first hand* in its natural environment, rather than simply viewing what trawls and grabs bring up from the sea bed. And it is not only marine biologists who have taken up this opportunity: SCUBA diving is one of the fastest growing recreational pursuits in Britain, and this expanding popularity has led to a much wider appreciation of the marine environment.

Hand in hand with this greater awareness of the marine life present in our coastal waters, we have also become more aware of the threats posed by certain activities which take place within the coastal zone. Destructive fishing practices, dredging for marine aggregates and the pumping of sewage effluent into near-shore waters all have a considerable effect on the marine life, not only in the immediate vicinity of where the activity takes place but also for some distance down current. Hidden threats, such as increased nutrient enrichment of coastal waters, are now warranting greater attention, with periodic blooms of plankton being of longer duration, of larger size and becoming more widespread. The natural resources of the sea bed are not just those we can extract and utilise. They include the plankton, the seaweeds and the small invertebrates as all these are essential components of the marine food web.

In this country, only a minute proportion of the marine environment within our territorial waters is protected on behalf of its nature conservation importance. Within the next few years however, larger areas will be added to the few statutory Marine Nature Reserves already in existence, when the European Community's Special Areas of Conservation (SACs) are introduced. The near-shore waters of almost 20% of the coast of England will then be covered by SACs. However, this still leaves a gap in the 'protection umbrella' for those sites deemed to be of regional or even national (as opposed to Europe-wide) importance, for the measures to designate Marine Nature Reserves have proved awkward and cumbersome to implement. In addition, only a small proportion of Sussex coastal waters (from Selsey Bill westwards) will be included within the proposed Solent SAC.

With the establishment of a number of marine Sites of Nature Conservation Importance off the Sussex coast, those sea bed areas of greatest interest will be highlighted and earmarked as being 'special'. These sites will not have statutory protection, but will rely on the voluntary co-operation of users to ensure that their features of special interest are respected, so that they may be conserved for future generations to enjoy.

2. THE NATURE CONSERVATION IMPORTANCE OF THE MARINE ENVIRONMENT OFF THE SUSSEX COAST

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, though to a far lesser degree, by water exiting from the North Sea. This maritime region lies within a transition zone between the east coast, with its relatively restricted diversity of habitats and species, and the more diverse south-west coast flora and fauna. The Solent area effectively separates the biogeographic provinces of the eastern and western parts of the English Channel.

In the next step down from these large-scale provinces, English Nature has divided the coast of England into 23 proposed Maritime Natural Areas which serve to identify coherent maritime wildlife systems based on major coastal sediment cells (see p 11). The Sussex coastline spans two coastal sediment cells: one from Folkestone, Kent to Selsey Bill; and the other from Selsey Bill to Durlston Head, Dorset.

The coastline of West Sussex begins just to the west of Emsworth at the northern end of Chichester Harbour, finishing at Portslade-by-Sea. The East Sussex coast runs from Portslade to Broomhill Sands, to the east of Rye.

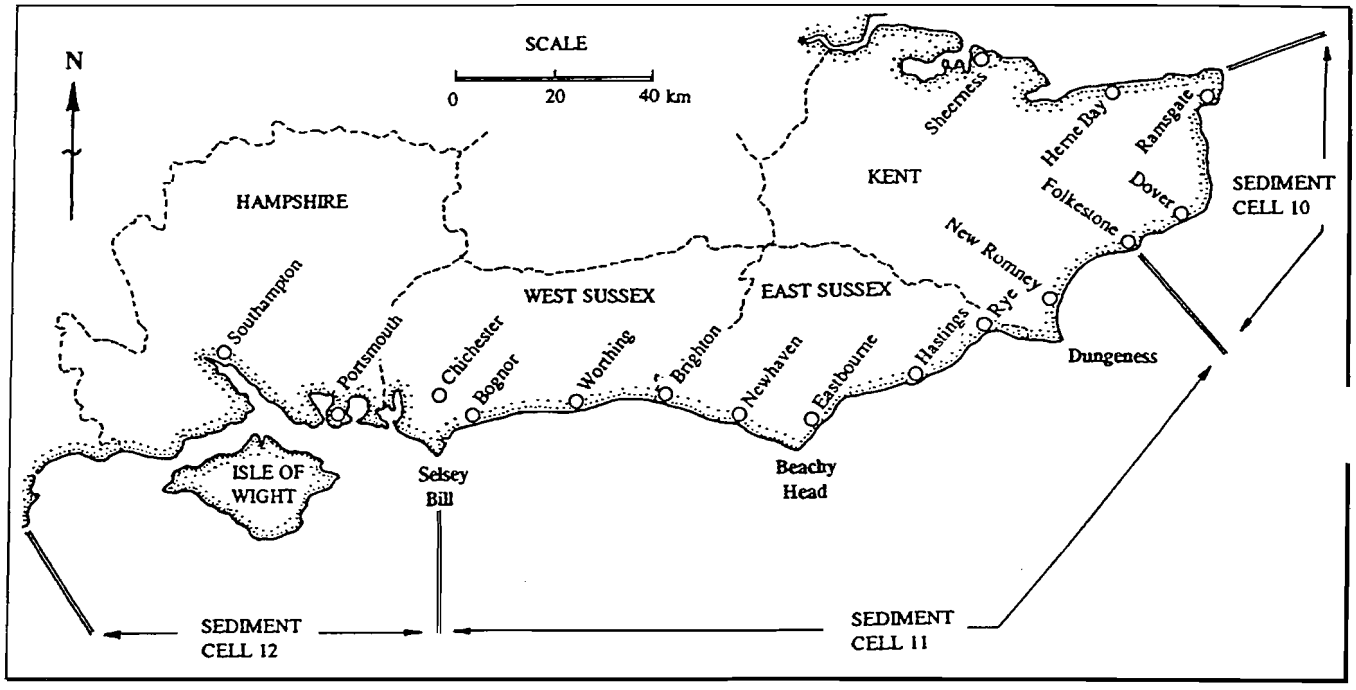


Fig. 1. The central southern and south-eastern counties of England with the location of major coastal towns. Also marked are the lateral boundaries to the major sediment cells (delineated by natural processes such as currents, sea bed movement, coastal and sea bed features) of English Nature's 'maritime natural areas'. See also section 3.3, p 12.

2.1 NEAR-SHORE GEOLOGY AND FEATURES

The sedimentary rocks which occur in the coastal zone of the south-east range from limestone, through clays to the chalk of the South Downs. These soft rocks are continually being eroded (except where there are sea defences) leading to the formation of wave-cut platforms 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 at Rottingdean and Peacehaven in East Sussex.

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 Bracklesham 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 off Eastbourne marks the presence of reefs of shallow sandstone (which Wood (1990) believes to be Upper Greensand, lying below the Lower Chalk in the geological succession, but which McDonald (1985) describes as 'oolitic ironstone'). Greensand certainly occurs as a small exposure at Head Ledge, Beachy Head, though diving here is difficult due to its inaccessibility and to the strong tidal streams.

Exposures of sea bed 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 metres high. The chalk bedrock is continually being broken into smaller pieces by the action of boring organisms, particularly piddocks.

Soft grey clay is present as an extensive vertical exposure at the Mixon Hole, off Selsey Bill. The site is one of the best known dive sites off Sussex, providing the most dramatic underwater cliff in the eastern half of the English Channel. It is thought that this is all that remains of an ancient river gorge, which is kept open by scouring action of strong tidal streams. The 25 metre high cliff on the northern side of the Hole consists of soft grey clay capped by an overhanging layer of stiffer blue clay.

2.2 BATHYMETRY

Much of the near-shore sea bed off West Sussex remains shallow for some distance as one travels away from the coast (Fig. 2 - at end of report). 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 sea bed increases, such that at Beachy Head the 20 m depth contour is barely 500 m from the foot of the cliffs. Of course, there are peculiarities within this generalisation: a complex sea bed topography is found off Selsey Bill where the Mixon Hole drops to a depth of 25 m just 1 km south-east of the headland, and this within an area of shallow shoals which extend over 6 km from the coastline to the Outer Owers. Here, a steeply-sloping gravel bank 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.

2.3 TIDAL STREAMS AND WAVE EXPOSURE

Moderately strong tidal streams (1-3 knots or 0.5-1.5 m/sec.) occur around the headlands of Selsey Bill and Beachy Head, and strong tidal streams (up to 6 knots) occur at the mouth of Chichester Harbour. Elsewhere, tidal streams are weak to moderate, flowing in a west → east or an east → west direction. The linear nature of most of the open coastline means that it is categorised as being exposed to wave action, though south-east facing shores are likely to be moderately exposed, prevailing winds being from the south-west.

The marine life off the Sussex coast is influenced considerably by the suspended and settled sediment, and by the softness of the rocks. The sea becomes increasingly murky towards the eastern end of the Channel, and the effect of this is clearly seen in the distribution of kelp forests in different areas. For comparison, in the clearer waters off Dorset, kelp extends to 12 metres below low-tide level, but in East Sussex, kelp hardly forms 'forests' at all and is limited to a depth of just 2.5 metres (Wood, 1988). The turbid waters are due in part to the continuous dissolution of chalk from the rocks; but rivers, sewage and other discharges also contribute. The unstable surface of the chalk makes it difficult for plant and animals to anchor firmly, and even when they are established they have to contend with silt settling on them from the water.

2.4 SEA BED TYPES, HABITATS AND COMMUNITIES

Sandstone & limestone reefs

In shallow water, exposed bedrock and boulder surfaces are covered (up to 80%) by foliose algae, with occasional kelp plants *Laminaria digitata* also being present. Encrusting coralline algae are common. In slightly deeper water, several species of sponge are conspicuous including the 'shredded carrot' sponge *Esperiopsis fucorum* and the 'goose bump' sponge *Dysidea fragilis*. Indeed, the sponge fauna of these reefs is particularly rich and diverse, with 24 species recorded from the Waldrons reef off Bognor and 21 from Bognor Rocks. Overhangs are dominated by a variety of sea squirts, bryozoans, hydroids, anemones and the soft coral *Alcyonium digitatum*. Crustacea, occasionally seen out in the open but more frequently found hiding in cracks, include edible crabs, spider crabs (*Maja squinado* and *Hyas araneus*), small lobsters and squat lobsters. Common fish include goldsinny, corkwing and ballan wrasse, two-spotted gobies, butterfish and long-spined sea scorpions.

Chalk

A relatively soft rock which is characterised by burrowing species, most notably bivalve shells called piddocks. Two species are common in subtidal chalk. The largest is the common piddock *Pholas dactylus* which seems to prefer horizontal chalk and commonly bores vertically downwards. On boulders and vertical surfaces, the red-nose *Hiatella arctica* is much more common. In addition, rock surfaces are often riddled with the tiny burrows of the polychaete worm *Polydora ciliata*. Only the young boring phase of the yellow sponge *Cliona ciliata* is found in the central and eastern Channel, its massive form being present only further west. The breadcrumb sponge *Halichondria panicea* is common on current-swept chalk exposures, as is the 'shredded carrot' sponge *Esperiopsis fucorum*. Partially hidden within crevices, the tompot blenny *Parablennius gattorugine* is frequently seen together with the less bold leopard-spotted goby *Thorogobius ephippiatus*.

Clay

Soft clay is extremely unstable, especially where it occurs as vertical steps or cliffs, or it suffers from scouring by surrounding sediments. Thus attached life associated with it is sparse. Piddocks, and other species capable of boring into clay, are common but, as one might expect, mobile species such as squat lobsters, velvet swimming crabs, edible crabs, gobies and blennies are more often seen in these areas.

Mixed sediment grounds

Much of the sea bed off Sussex, from shallow water to depths of 30 metres or more, consist of mixtures of sand, gravel, pebbles and cobbles. Mostly these areas are flat but in some areas large gravel banks are found, usually related to raised rocky strata beneath. The Pullar Bank and Outer Owers off Selsey Bill are two examples and here, as elsewhere, extensive dredging takes place. In shallow waters during the summer months, mixed sediment grounds have a covering of algae, providing shelter for juvenile fish and several species of crustacea. In

deeper water, erect hydroids (such as *Nemertesia antenina* and *Nemertesia ramosa*), bryozoans (such as *Flustra foliacea* and *Alcyonidium diaphanum*) and burrowing anemones (such as *Urticina felina*) are more common. Some areas are dominated by slipper limpets *Crepidula fornicata* or by beds of mussels *Mytilus edulis*. Mobile animals include various species of crustacea - hermit, spider and edible crabs and squat lobsters.

Sand

Extensive areas of sand are found off the East Sussex coast and in areas such as the Medmery Bank in Bracklesham Bay. Much of the marine life of these sandy areas is hidden from view, consisting of burrowing organisms such as worms, shells and heart urchins. In areas that are not affected by strong currents, some animals such as netted dogwhelks, hermit crabs and the masked crab *Corystes cassivelaunus*, may be conspicuous. Common fish species include plaice, sole, sand gobies and sand eels.

Wrecks

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 surface on which marine organisms can settle. Many wrecks are found in areas of 'soft' sea bed and provide an 'oasis' effect, giving rise to rich communities with a different species composition to those on the surrounding sea bed. With parts raised above the sea bed, they also provide a colonising opportunity for species which prefer strong currents and individual species, such as plumose anemones *Metridium senile* or the hydroid *Tubularia indivisa*, may dominate certain wrecks.

2.5 NOTEWORTHY FEATURES

- **Offshore chalk cliffs** - Sussex is the only location in the British Isles where chalk strata appear as offshore cliffs; offshore chalk reefs, however, do occur off the Kent, Isle of Wight and Dorset coasts and off Flamborough Head. There are variations in the stability of chalk rock in these different areas (Wood 1992). The chalk exposed in the sublittoral off Kent and Sussex is soft and is 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 in the Seven Sisters area and also along parts of the offshore cliff sites further to the west. By contrast, the chalk in Dorset and the Isle of Wight is mostly covered with a tough outer coating of calcareous algae, resulting in a more resistant bedrock surface, which is not so easily broken or eroded (Wood 1992). The sublittoral chalk cliffs off Sussex are therefore of regional, if not national, importance.

- **Mixon Hole** - This 25 m high clay cliff, just 2 km SE of Selsey Bill, is a unique feature and as such merits special mention. Though the marine life associated with it is not particularly unusual (the species present are found on clay exposures elsewhere), it is certainly of regional geomorphological importance. A more detailed description of this site is given in the site description (#2) at the back of this dossier.

2.6 NOTEWORTHY SPECIES

- The encrusting sponges *Esperiopsis fucorum* (commonly known as the 'shredded carrot' sponge) and *Dysidea fragilis* (the 'goose bump' sponge) are probably the two commonest species of sponge to be found off the Sussex coast. The breadcrumb sponge *Halichondria panicea* is particularly common at the Seven Sisters where it forms extensive sheets. The yellow sponge *Ciona celata*, which has the ability to bore into rock, is usually found

where chalk is present, though it has only been reported in its 'boring' phase and not as 'massive' forms. As a general observation, the offshore chalk reefs in Sussex have a particularly rich sponge fauna (with 28 species recorded) when compared to other sublittoral chalk areas.

- The piddock *Pholas dactylus* is characteristic of chalk exposures, particularly of horizontal surfaces, and may be present in large numbers (several hundred per square metre). It bores into the soft rock, eventually causing the chalk to fracture and crumble.
- The horseshoe worm *Phoronis hippocrepia* is characteristic of chalk and limestone, commonly found on the current-swept lower sides of ridges where little else can survive.
- The anemone *Actinothoë sphyrodeta* is a widespread and common small white anemone, frequently found in small numbers on sandstone bedrock, boulders and large cobbles. By contrast, the plumose anemone *Metridium senile* is rarely seen on reefs, though it does occur on wrecks and other man-made habitats, e.g. pier pilings and floating pontoons in marinas.
- The jewel anemone *Corynactis viridis* is at the eastern limit of its distribution in the Channel off Sussex. It is rarely seen in near-shore areas, being occasionally found in small aggregations on deep offshore wrecks.
- The Devonshire cup coral *Caryophyllia smithii* is also at the eastern limit of its distribution here, with only a few individuals being seen on wrecks and reefs.
- The 'potato crisps' bryozoan *Pentapora foliacea* is at the eastern limit of this south-western species' distribution, the Royal Sovereign reefs being the furthest east from where colonies have being reported. This species is also known as 'ross' or 'rose' coral, but though it may bear some similarities to coral, it belongs to a completely different animal group.
- The heart urchin *Echinocardium cordatum* is a burrowing species of echinoderm commonly found in areas of fine sand particularly between Brighton and Newhaven.
- The commonest species of fish off Sussex is the bib *Trisopterus luscus* (also known as pout or pouting), whose shoals may number several hundred individuals around some of the wrecks. Also common are goldsinny wrasse *Ctenolabrus rupestris* and pollack *Pollachius pollachius*, together with smaller species such as gobies and the tompot blenny *Parablennius gattorugine*. A total of 35 species of fish have been recorded from Sussex offshore chalk reefs (Wood 1992).
- Certain fish species more usually associated with the warmer waters of the Mediterranean are now frequently reported from July to September off the Sussex coast. These include the triggerfish *Balistes capriscus*, black sea bream *Spondyliosoma cantharus* (which are commercially fished) and red mullet *Mullus surmuletus*.
- Recent *SEASEARCH* surveys have revealed several species of seaweeds which had not been recorded from the Sussex subtidal. These include the red algae *Phyllophora sicula* (formerly *P. palmettoides*), *Rhodomenia delicatula*, *Acrosorium venulosum* (formerly *A. uncinatum*), and the green alga *Cladophora pellucida*.
- Japweed *Sargassum muticum* was introduced accidentally into the Solent in the early 1970s and has since spread both eastwards (and westwards) along the coast. However, its distribution off the Sussex coast appears to be limited, being confined to relatively shallow and sheltered waters.
- The stalked sea squirt *Styela clava* is an alien species from the Far East, accidentally introduced (probably carried by shipping), which now thrives in areas of mixed sediment.
- The slipper limpet *Crepidula fornicata* is another alien species introduced into Essex from North America at the turn of the century. It has spread rapidly and is now found all along the south coast. Off the section of coast from Selsey Bill to Brighton it is particularly common.

3. MARINE CONSERVATION DESIGNATIONS IN ENGLAND BEYOND LOW WATER MARK

As is the case with sites on land, there is a growing number of designations for sites of nature conservation interest beyond the low water mark, some of which afford international recognition, some Europe-wide and some national. They may have statutory protection in the form of byelaws, or they may rely entirely on the voluntary co-operation of local user groups. Certain terrestrial sites of great nature conservation interest may be awarded several designations, reflecting the importance of the site in question. However, many of these terrestrial designations only extend as far as the low water mark. At present, it is only Marine Nature Reserves which afford any kind of statutory protection to marine benthic wildlife.

Some indication of the various protective mechanisms are given below. All of the descriptions (except for the last on mSNCIs which is offered by the author) are taken from English Nature's *Marine Information Note No. 7* (June 1994).

3.1 STATUTORY DESIGNATIONS - INTERNATIONAL

- **Special Area of Conservation (SAC).** Under the EC Habitats and Species Directive, Member States are required to set up a series of sites, known as Special Areas of Conservation, whose purpose is to contribute towards the maintenance or restoration of the favourable conservation status of selected habitats or species. This new designation will include marine habitats and species and, once in place, is likely to provide the most significant statutory protection for marine conservation. Designation of SACs is unlikely to occur before 1998. *Marine coverage: intertidal and subtidal.*

> The proposed Solent SAC extends westwards from a line extending approximately 12 km due south from Pagham, to include the whole of the Isle of Wight and the Solent, its western limit being Milford-on-Sea at the northern end of Hurst Spit, to high water mark. The Solent SAC is expected to be formally designated in 1998.

- **Special Protection Area (SPA).** Established under the EC Directive on the Conservation of Wild Birds (1979), which requires Member States to take special measures to conserve bird habitats, and wetlands in particular. A network of SPAs throughout the Community is seen as one of the means of achieving this. In the UK, government policy is that a terrestrial site must be an SSSI first before being designated an SPA. Following the Habitats and Species Directive, however, SPAs will also be applicable to marine concentrations of birds. It is anticipated that such marine SPAs will be designated and protected in the same manner as marine SACs. There are currently about 40 SPAs in England. *Marine coverage: intertidal, subtidal in the future (only potential at present).*

> The only confirmed SPAs on the coast in West and East Sussex are Chichester Harbour and Pagham Harbour. Dungeness to Pett Level (which include Rye Harbour) is currently a candidate SPA.

N.B. One of the main objectives of the EC Habitats and Species Directive 1992 is the creation of a series of marine and terrestrial protected areas across the European Community. This series, to be known as **'Natura 2000'**, will be formed from Special Areas of Conservation and Special Protection Areas.

- **Ramsar site.** Under the convention on Wetlands of International Importance especially as Waterfowl Habitat (signed at Ramsar, in Iran, in 1971), the UK government is committed to the conservation and wise use of wetlands, partly through the notification of wetlands of international importance. UK policy is that a Ramsar site must first be designated an SSSI. However, the Convention does allow Ramsar sites to be designated below low water to a depth of 6 metres. There are currently about 40 Ramsar sites in England, of which 75% are also SPAs. *Marine coverage: intertidal, potentially subtidal.*

Within West and East Sussex, the only Ramsar sites are Chichester Harbour and Pagham Harbour. Both Pevensey Levels and Dungeness to Pett Levels are currently proposed Ramsar sites.

3.2 STATUTORY DESIGNATIONS - NATIONAL

- **Site of Special Scientific Interest (SSSI).** An area of land notified under Section 28 of the Wildlife and Countryside Act 1981 (or formerly under the National Parks & Access to the Countryside Act 1949), as being of special nature conservation interest. The seaward limit of an SSSI depends on the definition of 'land' under the W & C Act 1981 and the limit of Local Planning Authority jurisdiction. This needs further clarification but in the meantime, in practice, SSSIs in England are generally considered to extend to mean low water. *Marine coverage: intertidal, possibly rare subtidal.*

The following coastal SSSIs in Sussex include areas of the foreshore extending to low water mark: Chichester Harbour; Bracklesham Bay; Selsey East Beach; Pagham Harbour; Bognor Reef; Felpham; Climping Beach; Adur estuary; Brighton to Newhaven Cliffs; Seaford to Beachy Head; Pevensey Levels; Hastings Cliffs to Pett Beach; Rye Harbour; Camber Sands.

- **National Nature Reserve (NNR).** Areas of high national conservation importance, designated under Section 19 of the National Parks & Access to the Countryside Act 1949, and generally managed by English Nature. Marine Coverage: intertidal, (limited) subtidal.

- **Local Nature Reserve (LNR).** Area of local conservation importance managed specifically for that purpose. Declared by Local Planning Authorities in consultation with English Nature under the National Parks & Access to the Countryside Act 1949. Seaward limit as for SSSIs. *Marine coverage: intertidal, possibly rare subtidal.*

The following coastal LNRs extend to low water mark: Nutbourne Marshes, Pilsea Island and East Head (all within Chichester Hbr.); Pagham Harbour; West Beach, Littlehampton; and Seaford Head.

- **Marine Nature Reserve (MNR).** Section 36 of the Wildlife & Countryside Act 1981 allows for designation of MNRs in areas between the high water mark and the 3 mile limit (restricted under the 1987 Territorial Waters Act). Sites are declared by the Secretary of State for the Environment on advice, in England, of English Nature. Protection operates through enactment of byelaws. MNRs are presently the only statutory mechanism that wholly, on nature conservation grounds, applies specifically to both the subtidal and the intertidal environment. The only MNR in England (at present) is around Lundy Island. *Marine coverage: intertidal and subtidal.*

3.3 OTHER DESIGNATIONS

- **Voluntary Marine Conservation Area (VMCA).** A generic term for sites where representatives of local groups and individuals establish a forum for the discussion of issues or concerns (these may also be known as voluntary marine nature reserves). The impetus is usually from an interest in the aesthetic or scientific value of the site and/or concern about possible user pressure. The main aim of such an area is to promote wise use without detriment to its conservation value. This may involve improving education on, and enjoyment of, the marine environment. protection of habitats and species within VMCAs is entirely dependent on voluntary means and therefore requires, and encourages, the co-operation and support of all potential users. *Marine coverage: intertidal and subtidal.*

The Seven Sisters Voluntary Marine Conservation Area is the only VMCA within Sussex. It extends eastwards from Seaford to Eastbourne (to include Beachy Head) and to 2 km offshore from the low water mark.

- **Important Area for Marine Wildlife (IAMW).** A site included under English Nature's initiative 'Managing England's Marine Wildlife' (August 1993) as being nationally important for its plant and animal communities, or because it provides ecological support to adjacent statutory sites such as SSSIs or MNRs. These areas are subject to some (or possibly, appreciable) user pressure and exploitation, or the effects of nearby large human populations, and hence are also referred to as '**Sensitive Marine Areas (SMAs)**'. 27 such areas have been identified to stimulate interest in their importance and possible management requirements.

There are two IAMWs off the Sussex coast: the Seven Sisters IAMW extending from Seaford to Eastbourne; and the Solent and Isle of Wight IAMW which extends westwards from Pagham.

- **Maritime Natural Area.** English Nature has divided the coast of England into 23 proposed Maritime Natural Areas (as explained in EN's August 1993 document *Conserving England's Marine Heritage - A Strategy*). These are non-statutory and serve to identify coherent maritime wildlife systems based on major sediment cells (coastal cells), sub-cells and geological and geographical features such as major estuarine or island systems. The seaward boundary of each is the 12 mile territorial limit. **Coastal cells** are defined as sections of the coastline within which any natural change or physical process does not affect adjacent sections, or which has a significantly different character to adjacent sections. These are based on a MAFF-commissioned analysis of sand and shingle movement along beaches for the purposes of coastal defence management. (See Fig. 2)

The Sussex coastline spans two coastal sediment cells: Cell No. 11 extends from Folkestone, Kent to Selsey Bill; and Cell No. 12 extends from Selsey Bill to Durlston Head, Dorset.

- **Marine Sites of Nature Conservation Importance (mSNCIs).** These are non-statutory sites identified on account of the special interest of their marine habitats, the fauna and flora, or for unusual geological and geomorphological features. They are an extension of a series of terrestrial SNCIs. The identification of these sites is to highlight their importance for marine wildlife and to emphasise the risks of certain operations damaging their interest. Many mSNCIs would merit SSSI status if this designation could be made below low water mark.

In March 1996, 12 mSNCIs were initially identified off the Sussex coast.

4. MSNCIs: THEIR PURPOSE

Local authorities in Sussex have together identified a large number (over 500) of terrestrial Sites of Nature Conservation Importance (SNCIs) since 1991. These sites fall outside the protective legislative umbrella provided by NNR or SSSI designations and yet they remain as being of considerable wildlife value. The prime objective of the identification of terrestrial SNCIs has been to protect their habitats and important wildlife from harmful land use and land management changes and to encourage sensitive management.

Prior to the initiation of the Sussex *SEASEARCH* project in 1992, there had been no systematic survey of the near-shore zone along the whole of the Sussex coast (see section 5.1). The descriptive biological information which the project has produced confirmed that a number of the sites visited, and several of the plant and animal species identified, were of nature conservation interest, some in a regional context and a few in a national context. If it were feasible to notify SSSIs below low water mark, then many of these sites would warrant this status and the accompanying statutory protection it affords. However, present legislation does not allow this to happen.

It was realised that there was nothing to prevent county-wide SNCI notification being extended to sites of interest below low water mark. By so doing, the importance of a site offered by the SNCI label could be emphasised, thereby raising general awareness. It is also hoped that this recognition will encourage those who carry out activities at or near them to act in a responsible manner, and thereby maintain the interest of the site.

Coastal district authorities and County Councils have certain responsibilities with regard to the coastal zone, though in general their statutory powers only extend to low water mark (Fig. 3). However, these authorities are consulted from time to time on such matters as near-shore marine aggregate extraction and marine oil spill contingency plans. In these situations, it is essential that planners know where there are sites of nature conservation interest and why they are important. Marine SNCIs will also provide a focus of attention in Sussex for the conservation of the marine environment.

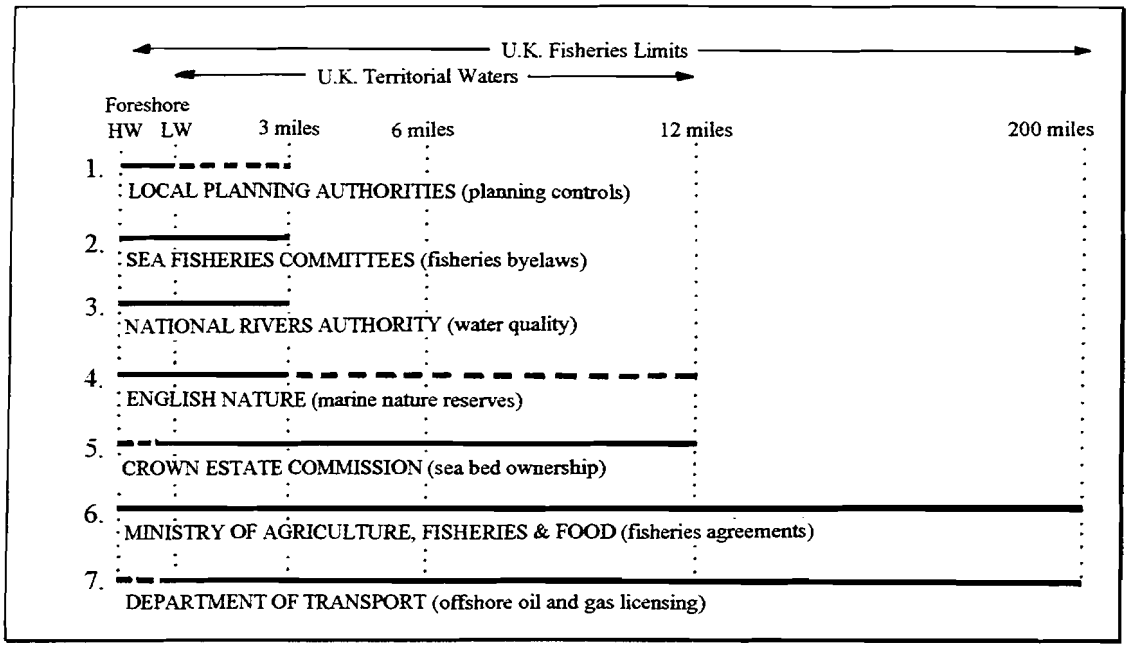


Fig. 3. Jurisdiction of various organisations (in England) in the coastal zone on specific issues.

5. THE IDENTIFICATION AND SELECTION OF MSNCIS

5.1 THE PROCESS

To date, it is believed that the system of SNCIs found elsewhere around the coast of England and Wales has not been extended to sublittoral sites (i.e. those found below low water mark). The *marine* SNCIs which are now being designated off Sussex are therefore novel and somewhat experimental in nature.

The flow diagram below (Fig. 4) provides an indication of the process which has been adopted prior to a site becoming a mSNCI.

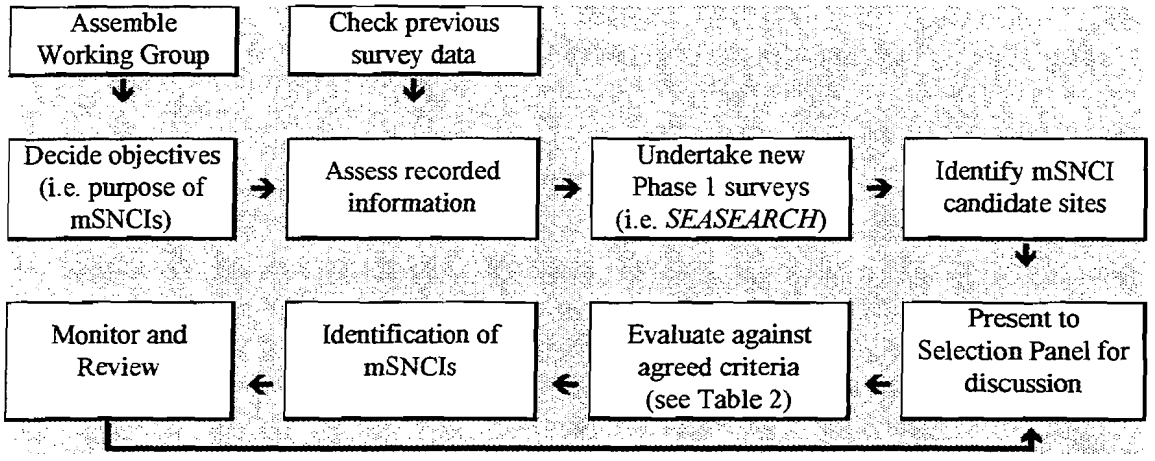


Fig. 4. The process of mSNCI selection

After an initial meeting of interested parties on 19 January 1995 at English Nature's offices in Lewes, East Sussex, the first meeting of the Selection Committee was held on 23 May 1995 at Wood's Mill, Henfield, West Sussex.

5.2 PREVIOUS STUDIES

Whilst the Sussex coast is a popular weekend diving destination for many dive clubs within the south-east, most dives are purely for recreational purposes and many excursions are orientated towards diving on wrecks. Relatively little 'professional' marine biological survey work has been undertaken, yet a considerable amount of information has been gathered by 'amateur' divers - that is, individuals who have acquired an extensive knowledge of marine species over the years. The majority of these individuals have been, and many still are, members of the Marine Conservation Society's South East Branch (SEMCS).

As a contribution to the 1977 Underwater Conservation Year's 'Adopt a Site' scheme, the Dolphins Underwater Club based in Aldershot decided to undertake a detailed study of one of the most dramatic sites off the Sussex coast, the Mixon Hole off Selsey Bill (Ackers 1977) (see Site Description #2). A full description of the site was made, together with information on the main habitat types and species encountered. This was followed by a more extensive study, undertaken by members of SEMCS during 1982/83, of the nearshore sublittoral zone between Selsey Bill and Beachy Head (Wood 1984). During this survey, dives were undertaken at 60 different sites, providing information on habitat and community types. This in turn led to the Seven Sisters Marine Survey in 1984 (Wood & Jones 1986), which was the

basis for the creation, in 1986, of the Seven Sisters Voluntary Marine Conservation Area between Seaford and Eastbourne. In 1982/83, Collins and Mallinson (1983) were commissioned by the Nature Conservancy Council (NCC) to survey the sublittoral area between Selsey Bill and the East Solent. During this survey, dives were undertaken at 27 sites, again with descriptions of sea bed habitats and communities.

A brief investigation was made of the near-shore sea bed off Hastings by MCS volunteers in 1986 (Wood 1986). Much of the sea bed here was found to be of sand with little evidence of reefs. A further survey by SEMCS of the sandstone reefs off Eastbourne (including the Royal Sovereign Shoals) took place in 1990 (Wood 1990). A total of ten sites were investigated on and around the reefs, with 15 habitat types being identified. This survey acted as a pilot for *SEASEARCH* sublittoral recording techniques.

A number of other sea bed surveys have been undertaken off the Sussex coast, often as commissioned surveys for commercial companies (e.g. Southern Water [Authority]; Southern Science), or as commissioned surveys for agencies such as the Nature Conservancy Council, English Nature, National Rivers Authority, and the Natural History Museum, London. A more comprehensive review of these studies has been compiled by Irving (in press).

5.3 SUSSEX *SEASEARCH* PROGRAMME

SEASEARCH is a nationwide project initially devised by the Marine Conservation Society in conjunction with the Nature Conservancy Council's Marine Nature Conservation Review (Earll 1992). As a 'Phase 1' ecological survey, it aims to describe the scenery, habitats and communities of the sea bed around the coast of the British Isles. The recording techniques allow this to be done by volunteer divers in a cost effective way.

The MCS Sussex *SEASEARCH* project began its 5-year programme in 1992. The project has been funded by a number of organisations* all of which have some interest in the results of the survey. Originally, it had been proposed to survey the stretch of near-shore waters between Chichester Harbour and Littlehampton over a period of two years. The success of this phase led the project's Steering Group to agree to the extension of the project, with the aim of covering the remainder of the near-shore sea bed off West Sussex and the whole of East Sussex as well, by the end of 1996. By the end of 1995, a total of 863 man-dives had been undertaken by 151 volunteers at over 250 sites between Chichester Harbour and Beachy Head.

As already stated, the project utilises the diving and recording skills of volunteer divers to record sea bed types and their associated marine animals and plants. This can involve the taking of photographs of habitats and species to help supplement written descriptions. They are also asked to record the presence of any human activities and possible impacts these might be having at the site. This latter part of the recording process has probably been less comprehensive than other parts, yet it has been most useful in assessing potential threats to those sites now being put forward as mSNCIs.

One of the main objectives of the *SEASEARCH* project is to highlight areas of nature conservation interest within a survey area, with a view to introducing certain measures which will help to protect vulnerable sites, and to inform and educate the populace regarding the importance of such sites. For the Sussex project, it has been agreed that this could best be done through the designation of the 'most interesting' sites as mSNCIs.

* To date, the following organisations have contributed to funding the Sussex *SEASEARCH* project:-
English Nature (Sussex & Surrey team); West Sussex County Council; East Sussex County Council; National Rivers Authority (Southern Region); Standing Conference on Problems Associated with the Coastline (SCOPAC); Arun District Council; Brighton Borough Council; Chichester Harbour Conservancy; Sussex Wildlife Trust; Hastings Borough Council.

5.4 THE IDENTIFICATION OF POSSIBLE MSNCIS

An initial selection of sites was undertaken by Robert Irving, the author of this report and the Co-ordinator of the Sussex *SEASEARCH* Project, on behalf of the mSNCI Selection Panel. Many of these sites are already well known to the diving fraternity and are popular because of their scenic value or because of the wildlife they possess. An attempt was made to include a reasonable variety of sites in this initial list, as indicated in Table 1, providing a range of physiographic features, sea bed substrata, habitats and species found off Sussex.

	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					✓	✓	✓	
H.M.S. Northcoates		✓						✓
Worthing 'Lumps'			✓				✓	
South-West Rocks			✓				✓	
Looe Gate			✓			✓		
Seaford Head Gullies					✓	✓		
Royal Sovereign Shoals	✓					✓	✓	

Table 1 . The range of physiographic and bathymetric features present within the initial list of mSNCIs.

5.5 THE SELECTION OF MSNCIS

A number of different criteria were proposed by Mitchell (1987) for the comparative evaluation of marine sites. These have been further developed by the MNCR and re-issued (in a draft form at present) as their 'Conservation Assessment Protocol' (Connor 1994). The protocol aims to provide a standard procedure for the assessment of field data obtained from ecological surveys using MNCR recording techniques (Hiscock 1990), with the subsequent identification of areas of high nature conservation importance. The protocol has been adapted for the selection of Sussex mSNCIs, as set out below in Fig. 5 .

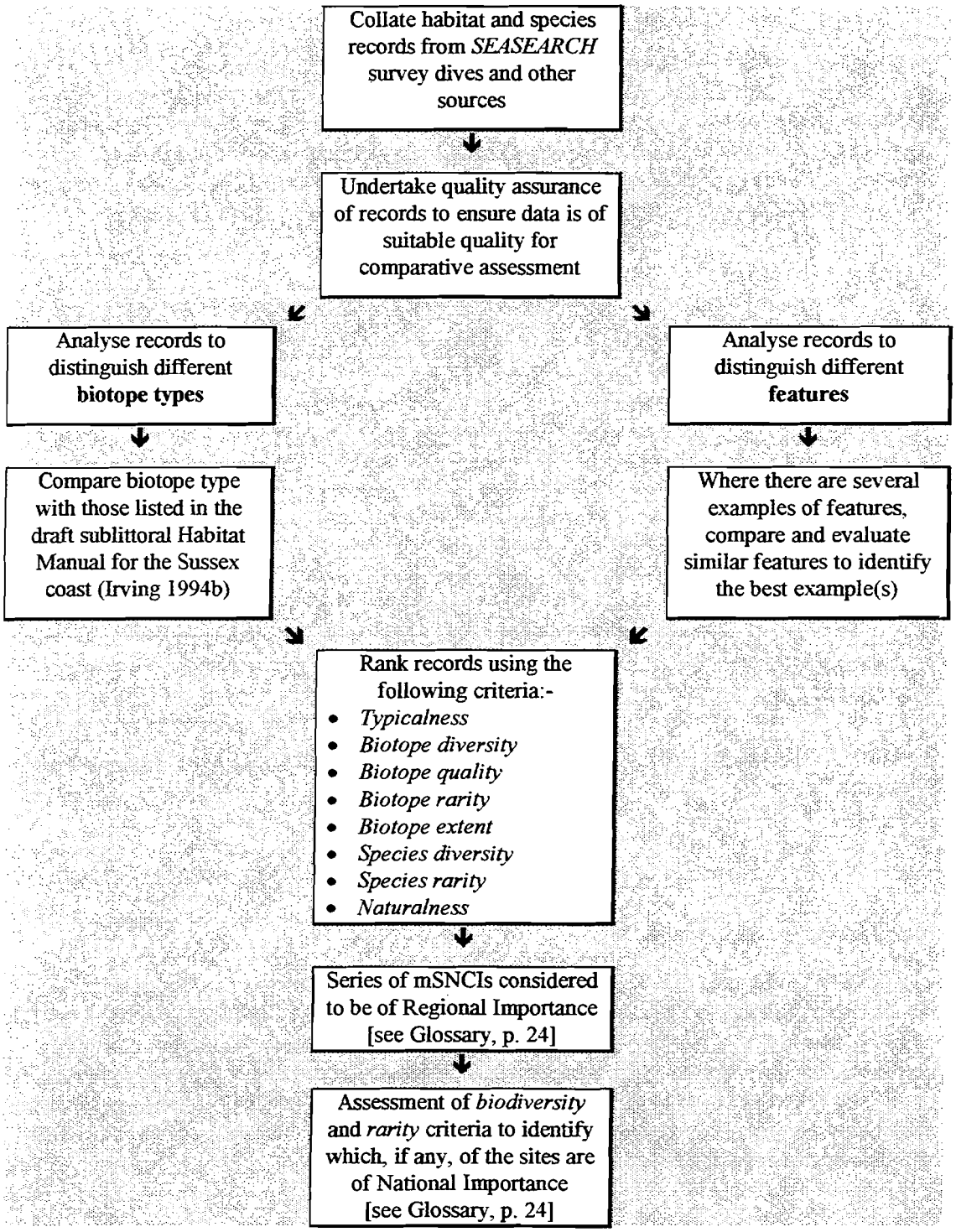


Fig. 5. Steps involved in the process of mSNCI evaluation. (For an explanation of terms see Table 2).

5.6 FOLLOW-UP: A CONTINUING PROCESS

The list of mSNCIs will be continually updated. New sites will be identified (and possibly others deleted) as ecological knowledge of the total resource, and of specific sites, increases. Indeed, it is quite likely that the number off the East Sussex coast will increase after 1996 once the results of the *SEASEARCH* survey programme have been analysed. It is also quite

possible that some areas have been overlooked which may merit re-examining. If you know of such sites, please inform the Sussex *SEASEARCH* Steering Group, c/o Howard House, 31 High Street, Lewes, East Sussex BN7 2LU.

CRITERION	EXPLANATION (adapted from Connor, 1994 & Mitchell, 1987)
Typicalness: features	Besides choosing areas which are in some way unusual or unique, it is also essential to represent typical and ordinary sites which contain features and habitats which occur commonly or are widespread. Such sites may also be desirable as benchmarks or controls in monitoring programmes.
Typicalness: biotope type	An assessment of how close a record is to the type biotope. Representation of commonly-occurring or widespread community types and species.
Biotope diversity	Variety in terms of species and communities is highly desirable and depends to a large extent on the physical diversity of an area, its geographical location and the number of different communities it supports. When appraising a complex site, diversity of habitat would rate highly. Would include biotope characteristic of an area - for instance chalk reefs and cliffs in the south-east.
Biotope quality	Where more than one biotope example exists within a given area, those that are in a better condition would rate more highly than those which have been damaged in some way or appear less impressive.
Biotope rarity	Unusual or unique habitats will receive a high rating. Rare species are to be regarded as a bonus on sites selected for other reasons. Rarity of species may reflect rarity of habitat, or be due to an organism occurring at the limits of its distribution in the biogeographical sense.
Biotope extent / size	In general, the bigger the area the better. Below a certain minimum size, the communities or species to be conserved may be adversely affected by adjacent activities - the 'edge effect'. There is therefore a certain minimum size necessary to ensure the integrity of the site - 'the viable unit' concept. An area large enough to contain a mosaic of different habitats will increase its interest. This criterion is particularly important for rare biotopes and species.
Species diversity	Sites which have greater species richness (and abundance) will be ranked higher (care is however needed here - consider in parallel to typicality, as atypical records can be highly diverse).
Species rarity	Sites which contain rare or scarce species will be favoured. This assessment should be carried out at a regional and national level, and the species should be conspicuous and reliably identified when present.
Naturalness	In general, an area which is unmodified by human influence is desirable, though semi-natural or artificial habitats will also be considered. As naturalness is found so widely in the marine environment, less emphasis is placed on this criterion than for terrestrial sites. As there is likely to be a wide choice of representative sites in a natural condition, practical considerations are likely to come to the fore in the site selection process.
Additional criteria	
Sensitivity / Vulnerability	Sensitivity to environmental change. Applies particularly to low energy systems (e.g. low turbidity estuaries and sheltered inlets) which might be easily degraded by pollution, physical destruction or natural events. Vulnerability recognises the susceptibility of a habitat to a potential threat.
Intrinsic appeal	This is likely to include high species diversity and 'impressive' physical features such as cliff formations. Usually, popular dive sites are an indication of high intrinsic appeal.
Feasibility	The availability of a site for its acquisition for conservation management. Also, its proximity to an area which is already protected.

Table 2 . Criteria used in the selection of mSNCIs.

5.7 ASSESSMENT OF THREATS/DAMAGING OPERATIONS TO SITES

Several mSNCIs are known to have been damaged by certain activities in the past and remain vulnerable to damage. It is hoped that by highlighting these sites as being of nature conservation importance, the damage caused by these activities can be reduced or even prevented. However, this will require considerable tact, diplomacy and persuasive powers as mSNCI designation has no statutory backing in the form of byelaws to prevent destructive practices from taking place. It is hoped that the powers that be (e.g. the Sussex Sea Fisheries Committee) may be able to assist with this. The following sections have been adapted from English Nature's Marine Conservation Handbook (Eno 1991).

Fishing practices

pot fishing - Potting for edible and spider crabs and lobsters is an important fishery in Sussex, particularly in West Sussex.

(1) Impact on target species: the removal of large detritivores/carnivores will influence natural fluctuations in a population of edible crab *Cancer pagurus* or lobster *Homarus gammarus*. However, the level of potting is likely to find its own level, with greater fishing effort leading to catches of smaller-sized individuals which are too small to be landed.

(2) Impact on habitats, communities and non-target species: there is an immediate, albeit local, impact on the benthos when a heavy pot lands on the sea bed. This may not be particularly significant in areas where no fragile species are present, but erect and delicate organisms (such as the bryozoan *Pentapora foliacea*) may be damaged or detached by such an impact. Mechanical pot haulers can cause strings of pots to be dragged along the sea bed, particularly in rough sea conditions, affecting a much larger area each time they are laid or retrieved.

bottom trawling/dredging - This takes place particularly during spring and summer for bottom-dwelling (demersal) species such as plaice, brill, Dover sole, lemon sole, cod and whiting. Black bream are taken (particularly by pair trawling) when they migrate inshore during the summer, and cuttlefish are caught during the spring. Certain groups of non-target invertebrates (e.g. large echinoderms and molluscs) are affected by trawling, particularly where heavy modern equipment is used.

Trawling also causes habitat destruction by removing dead shells and stones which provide attachment for epifauna. Ground chains and tickler chains can scrape off surface sediment layers to a depth of 6 cm. The overall effect of trawling is a change from natural benthic populations to those influenced by man, with a higher proportion of opportunistic species, particularly polychaetes, and fewer long-lived, slow-growing groups. It is in areas of high marine interest, or where trawling activity takes place close inshore, that conflict with nature conservation is likely to occur.

monofilament nets - when monofilament gill nets are lost (i.e. they break free from where they were set), there is the potential that they may continue to fish in the water column for some time. Eventually the net will sink to the sea bed; here they may entangle and damage erect species. These very fine nets also pose a problem to recreational divers who may inadvertently become entangled in them.

oyster dredging - known to occur within Chichester Harbour during the winter (November-March). Oyster dredges consist of a heavy blunt blade in front of a reinforced net which scoops the oysters off the sea bed.

Marine aggregate extraction

Dredging for marine aggregates can cause destruction of habitat and benthic invertebrate populations and have adverse effects on fish spawning grounds through both the removal of existing substrata and the smothering of organisms by material rejected overboard by the dredgers. Dredging causes the resuspension of fine sediment in the water column which may affect phytoplankton growth, clog fish gills and adversely affect filter feeding organisms, even some distance down-current of the extraction site. However, in areas of high turbidity, any additional sediment load caused by dredging is unlikely to have any significant effect on the environment. Recovery of dredged sites may take many years, though they may never achieve their former state/condition entirely.

Spoil dumping
Spoil material that is dredged from harbours (e.g. Littlehampton and Newhaven) and marinas (e.g. Brighton and Eastbourne), usually as a result of routine maintenance dredging activities, is deposited at licensed spoil dumping grounds. These are often quite close to the site in question, in shallow water close to the coast. Dumping of this material leads to the physical smothering of marine organisms, remobilisation of pollutants and increased turbidity over a wide area of sea bed.

Anchor damage
Though not posing a widespread threat to sites, anchors and heavy chains can damage cliff features if dragged over them, particularly where these are of soft rock, such as chalk or clay. Similarly, boats swinging at anchor with the tide can create small circles of 'cleared' sea bed, devoid of attached life.

Sea angling
Sea angling is a popular recreational activity with an estimated two million participants in the UK. The waters off the Sussex coast provide good fishing, particularly because of the large number of wrecks that are present. Though angling can take place from the shore and piers, marine SNCIs are only likely to be affected by angling from boats. Angling generally has a low impact on nature conservation. Problems arising are primarily associated with discarded and lost tackle: energetic dislodgement of entangled line may remove long-lived erect species such as sponges and bryozoans, as well as being a hazard to divers. There may also be problems with territorial species such as wrasse and conger eels being caught, as large individuals may exert an influence on the structure of sublittoral communities by their feeding activities. However, anglers often return these species to the sea.

Spear fishing
This activity is frowned upon by the majority of sub-aqua enthusiasts, though it is still undertaken by a small number of individuals. The impact on fish stocks by individual spearfishermen is negligible compared to anglers and commercial fishermen. However, spear fishing competitions present a more significant conflict with nature conservation. Removal of large, predatory fish can disrupt local marine ecosystems particularly by upsetting community structure. The few competitions still held by the British Spearfishing Association each year tend to take place in the west country. The threat to Sussex mSNCIs by spear fishing is very small indeed.

Sewage outfalls
A number of sewage outfalls occur off the Sussex coast, serving the large conurbations. In recent years, in line with EC Directives on Bathing Water Quality and Urban Waste Water Treatment, large investment programmes have been put in place which should lead to gradual improvements in the improved quality of sewage entering coastal waters. However there are still some notable black spots. Most effluent pumped out into Sussex coastal waters is simply screened (to remove litter items) and macerated (to break up solids). This is the minimum required by law before disposal to an 'area of high natural dispersion'.

Effluent emanating from an outfall pipe will have an effect on the biota in the immediate vicinity. The bacterial decomposition of fluids with a high organic load requires large quantities of oxygen. The resulting lack of oxygen in the water column can lead to a reduction in the number and variety of benthic plants and animals. Those species which can tolerate high organic loads and variable oxygen concentrations (e.g. mussels) tend to dominate, out-competing more sensitive organisms. The resulting decline in local biodiversity can have knock-on effects through various inter-related food chains. Elevated

levels of nutrients entering coastal waters through outfalls can also lead to localised eutrophication problems (see below).

Litter

Most sea bed litter comprises lost and discarded fishing gear - usually as fragmented nets or lengths of polypropylene rope. Plastic containers of various sorts are occasionally found rolling around on the sea bed, together with plastic bags or sacks. The latter may also be found in the water column, sometimes close to the surface. However, it should be pointed out that marine litter items are rarely encountered by divers at the majority of Sussex dive sites. Certain items of litter pose a threat to marine organisms: nets and line can become entangled in erect species, while bags and plastic sheeting can smother others on the sea bed.

Plankton blooms

An algal 'bloom' is a seasonal outburst of the growth of phytoplankton (microscopic plants drifting in the water column), which results in a high biomass of these organisms. These occur naturally in the temperate waters around the British Isles, with typically blooms occurring in spring and autumn. A bloom of zooplankton follows, feeding on the phytoplankton, with these in turn being eaten by small fish, and thus the productivity of the whole system is increased. The occurrence of *exceptional* algal blooms, as indicated by discolouration of the water, foam production, fish or invertebrate mortality, or toxicity (particularly of shellfish) to humans, may be linked to eutrophication. Eutrophication is the enrichment of the aquatic environment by nutrients (especially nitrogen, phosphorus and silica), which may be natural or anthropogenic in origin. There is growing concern that spring plankton blooms off the Sussex coast appear to be increasing in size, range and duration in recent years (D. Harvey, pers. comm.). This has been linked to increasing anthropogenic nutrient inputs from sewage outfalls and run-off from agricultural land directly into the sea or via rivers.

5.8 MANAGEMENT OF MSNCIS

It is envisaged that active management of mSNCIs will be minimal. Greater emphasis will be placed on interpretative materials so that local sea users will be aware of the existence of these sites and why they are of importance. It is hoped that by so doing, the sites will be self-policed by the users themselves.

Periodic monitoring of mSNCIs is to be recommended so that their overall status and well-being can be assessed over a period of time. Any damage, or change in the physical conditions affecting the site will be noted and remedial action taken if necessary.

The future promotion and well-being of mSNCIs will need to be considered by those organisations with marine interests and reponsibilities including the Sussex Sea Fisheries Committee, the National Rivers Authority, English Nature, and West and East Sussex County Councils.

6. ACKNOWLEDGEMENTS

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David Kay, Sussex Downs Conservation Board Ranger, Seven Sisters Country Park
Gerald Legg, Curator of Biology, Booth Museum, Brighton
Graham Roberts, Ecologist, West Sussex County Council
Matthew Thomas, Assistant Ecologist, East Sussex County Council
Chris Wood, Editor, Sussex Sublittoral Survey report
Dr Liz Wood, Marine Biological Consultant/MCS

The following also contributed to the initiation of the project at a meeting held in January 1995.

Geoff Bennett, Environment & Leisure Services, Brighton Borough Council
Caroline Crawley, Planning Department, West Sussex County Council
Andrew Lee, Director, Sussex Wildlife Trust
Dr Alex Tait, County Ecologist, East Sussex County Council

Robert Irving, in his role as Co-ordinator of the MCS Sussex *SEASEARCH* project, would like to acknowledge the contribution made by the many volunteer divers who have taken part in the Sussex *SEASEARCH* project since 1992. Without their enthusiasm and willingness to record what they observed on their dives, the possibility of establishing marine Sites of Nature Conservation Importance in Sussex may not have materialised.

Peter Hewitt, Bill Hewitt and Robert Irving are to be thanked for providing the photographs on the front cover of this dossier.

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- No. 2045 Outer Approaches to the Solent. 1:75,000. Small craft edition 1993
- No. 2050 Eastern Approaches to the Solent. 1:20,000. New edition Jan. 1991
- No. 3418 Langstone and Chichester Harbours. 1:20,000. New edition Dec. 1989
- No. 1991 Harbours on the South coast of England. 1:6,250. New edition Dec. 1987.

- Imray Chart No. C8 North Foreland to Beachy Head and Boulogne. 1:113,000

8. GLOSSARY

Biotope[1]	Combines habitat and community into the smallest physically defined unit supporting a more or less homogeneous assemblage of species.
Community[1]	A group of organisms occurring in a particular habitat, presumably interacting with each other and with the environment, and separable by means of ecological survey from other groups.
Environment	The complete range of external conditions, physical and biological, in which an organism lives.
Eutrophication	The process of enrichment of a water body by increasing nutrient inputs. Often used to mean human-induced (anthropomorphic) enrichment.
Foliose	With many leaves; leafy.
Habitat[1]	The particular type of local environment in which an organism lives.

[1] taken from Hiscock (1985)

Definitions for the evaluation of nature conservation importance of marine communities and species. Taken from Hiscock & Mitchell (1989).

International	*Communities* which are outstandingly good examples of their type in the north-east Atlantic. Communities recorded at only a very few locations in the north-east Atlantic. *Species* which are recorded at only a few locations in the north-east Atlantic. Species recorded in higher abundance in the area under consideration than anywhere else in the north-east Atlantic or where the area is one of only a few locations where large quantities are recorded.
National	*Communities* which are outstandingly good examples of their type in Britain. Communities recorded in only a very few similar physiographic situations in Britain. Both of these definitions refer to communities which are, or are likely to be, widely occurring in other similar physiographic situations in the north-east Atlantic. *Species* which are recorded at only a few locations in Britain but are more widespread in other parts of the north-east Atlantic. Species recorded in higher numbers at locations under consideration than elsewhere in Britain or where the site is one of a very few locations where large quantities are recorded in Britain.
Regional	*Communities* which are present in similar physiographic situations elsewhere in Britain but which are outstandingly good examples of their type in the location under consideration, or are as good examples of similar communities present elsewhere in Britain. Communities recorded at only a few locations in the same biogeographic region. *Species* which are unrecorded or recorded at only a few locations in similar physiographic situations in other parts of Britain. Species recorded in higher abundance in the site under consideration than in any other part of the region. *Communities or species* which are at the geographical limits of their distribution might be included in this category.
Local	*Communities or species* which are widespread in similar situations but for which this is a good example in the region under consideration.

8.1. ORGANISATIONS CONCERNED WITH THE MARINE ENVIRONMENT OFF THE SUSSEX COAST

ORGANISATION	ADDRESS	CONTACT AS AT APRIL 1996
Chichester Harbour Conservancy	The Harbour Office, Itchenor, Chichester, West Sussex PO20 7AW Tel. 01243 512301	Mr Philip Couchman
Crown Estate Commissioners	The Crown Estate, Marine Estates, 16 Carlton House Terrace, London SW1Y 5AH Tel. 0171 2104322	Dr AJ Murray
District Councils on the coast: Chichester District Council	Planning & Building Control Dept., 8 North Pallant, Chichester, West Sussex PO19 1TA Tel. 01243 785166	Mr Jeff Lander
Arun District Council	Directorate of Planning & Housing, Arun Civic Centre, Maltravers Road, Littlehampton, West Sussex BN17 5LF Tel. 01903 716133	Mr Andrew Blake
Worthing Borough Council	Planning & Development Services, Town Hall, Worthing BN11 1LF Tel. 01903 239999	Mr Mark Trevethan
Adur District Council	Development Services Dept., Civic Centre, Ham Road, Shoreham-by-Sea BN43 6PR Tel. 01273 455566	Mr Duncan Morrison
Hove Borough Council	Planning Dept., Hove Town Hall, Norton Road, Hove, E Sussex BN3 4AH Tel. 01273 775400	Dr John Packman
Brighton Borough Council	Environmental Services Dept., Bartholomew House, Bartholomew Square, Brighton, East Sussex BN1 1JP Tel. 01273 710000	Mr Geoff Bennett
Lewes District Council	Planning & Technical Services, 32 High Street, Lewes, E Sussex BN7 2LX Tel. 01273 471600	Mrs. Debbie Portchmouth
Eastbourne Borough Council	Planning & Technical Services, 66-68 Grove Road, Eastbourne, East Sussex BN21 1DF Tel. 01323 410000	Mr Tim Cookson
Wealden District Council	Planning Dept., Pine Grove, Crowborough, East Sussex TN6 1DH Tel. 01892 653311	Mr David Phillips
Hastings Borough Council	Planning & Estates Dept., Summerfields, Bohemia Road, Hastings TN34 1UT Tel. 01424 722023	Mr Murray Davidson
Rother District Council	Planning Dept., Town Hall, Bexhill-on-Sea, East Sussex TN39 3JX Tel. 01424 216321	Mr Frank Williams
English Nature (Surrey & Sussex Team)	Howard House, 31 High Street, Lewes, East Sussex BN7 2LU Tel. 01273 476595	Mr David Harvey,Team Manager
Environment Agency (formerly National Rivers Authority)	Rivers House, 3 Liverpool Gardens, Worthing, West Sussex BN11 1TF Tel. 01903 215835	Mr Phil Griffiths, Area Conservation & Recreation Officer
MAFF (Local Office: Hastings)	Fisheries Office, Rock-a-Nore Road, Hastings, East Sussex TN34 3DW Tel. 01424 424109	Mr Angus Radford
Marine Conservation Society	9 Gloucester Road, Ross-on-Wye, Herefordshire HR9 5BU. Tel. 01989 566017	Mr Chris Berry, Conservation Officer. The SE Group Regional Co-ordinator can be contacted through the MCS Ross-on-Wye office.
Sussex Downs Conservation Board (Seven Sisters Voluntary Marine Conservation Area)	Seven Sisters Country Park, Exceat, Seaford, East Sussex BN25 4AD Tel. 01323 729992	Mr David Kay, Coastal Ranger. The Seven Sisters VMCA has a Management Committee which meets regularly to discuss relevant issues.
Southern Science Ltd.	Sparrowgrove, Otterbourne, Winchester, Hants. SO21 2SW Tel. 01962 714585	Dr Nigel Thomas, Senior Marine Scientist. Involved with subtidal & intertidal environmental impact assessment studies, often on behalf of Southern Water plc.
Standing Conference On Problems Associated with the Coastline (SCOPAC)	Secretary to the Conference, Mr MJA Fisher, County Hall, Newport, Isle of Wight PO30 1UD Tel. 01983 823282	Mr R. McInnes, Chairman of the Officers' Working Group. Mostly concerned with coastal engineering matters in the central English Channel (West Sussex to Dorset).
Sussex Sea Fisheries Committee	106 Station Road, Hailsham, East Sussex BN27 2EG Tel. 01323 841912	Mr Stephen Holman, Clerk & Chief Fishery Officer
Sussex Wildlife Trust	Woods Mill, Henfield, West Sussex BN5 9SD Tel. 01273 492630	Dr Tony Whitbread, Conservation Officer
East Sussex County Council	Planning Dept., Southover House, Southover Road, Lewes, East Sussex BN7 1YA Tel. 01273 481621	Dr Alex Tait, County Ecologist
West Sussex County Council	Planning Dept., County Hall, Tower Street,	Mr Graham Roberts, Ecologist

8.2 mSNCIs CODE OF CONDUCT

- When diving in a nature conservation area, such as a marine Site of Nature Conservation Importance or within the Seven Sisters Voluntary Marine Conservation Area, show respect for the marine life and physical features which contribute to making the site special.
- Don't disturb or collect marine life unnecessarily anywhere. Remember that some animals are very delicate, or live in such a way that they will die if moved. Keep animals you collect wet and cool and always return them carefully to the sea, unless you have a well-established aquarium in which to keep them.
- Make sure you don't change the nature of the habitats where marine life lives. For example, if turning over cobbles or small boulders when under water to investigate what lies beneath them, return them to their original position when you have finished.
- If possible, try not to let exhaust bubbles become trapped as air pockets in the ceilings of holds in wrecks, or in small caves. Attached marine life will die if exposed to air for any length of time.
- Careless finning close to delicate species can easily cause damage. It can also stir up silt, smothering animals and preventing other divers (especially photographers) from seeing what you've just seen.
- Within mSNCIs, anglers should return to the sea alive all unwanted fish, especially territorial ones such as conger and species of wrasse (ballan, corkwing and goldsinny). The removal of large individuals of these long-lived species may have a profound effect on the local subtidal ecology.

9. SITE DESCRIPTIONS

The following 12 sites are those which have been initially selected by the mSNCIs Selection Panel in November 1995.

1 BRACKLESHAM BALLS, BRACKLESHAM BAY

2 MIXON HOLE

3 'INNER' MULBERRY HARBOUR UNIT

4 'OUTER' MULBERRY HARBOUR UNIT

5 THE WALDRONS REEF

6 SHELLEY ROCKS

7 H.M.S. NORTHCOATES

8 WORTHING LUMPS

9 SOUTH-WEST ROCKS

10 LOOE GATE

11 SEAFORD HEAD GULLIES

12. ROYAL SOVEREIGN SHOALS

Notes on the Site descriptions

- Each site description is presented on two sides of an A4 sheet: SIDE 1 gives written details of the site, with SIDE 2 providing location diagrams and some form of diagrammatic representation of the site.
- The information box at the start of each site description provides the following information:
  Site: Name of site (usually derived from the name most commonly used by diving groups)
  Ref. No.: Sequential reference number, initially from west to east, but thereafter chronologically.
  Location: Approximate location of the centre of the site.
  Sites vary considerably in the area they cover. An indication of the area of interest covered by a site is given in the Summary paragraph of text.
  Position of centre of site: Both latitude & longitude (GPS fixes) and OS grid references are given here. Please note, however, that as these systems are based on different projections, the positions they mark may not always coincide.
  Depth range (below chart datum): Depths of sea bed features will vary depending on the state of the tide (when they are given as depths below sea level). Depths below chart datum provide a standard reference.
- The **Summary** paragraph provides information relating to the geology and substratum type of a site; its length or area; and any special features.
- The **Biological Description** provides information on the common and rare species of flora and fauna to be found at or near the site.
- ***N.B.*** *Sections from charts indicating site locations should not be used for navigation purposes.*

9. SITE DESCRIPTIONS

The first tranche of sites (1-12) were selected by the mSNCIs Selection Panel in November 1995. A second tranche (sites 13-24) were selected in June 2001. The table below gives the name of each site and its *SEASEARCH* coastal sector.

1	**Bracklesham Balls**	Bracklesham Bay	13	**The Hounds**	Bracklesham Bay
2	**Mixon Hole**	Selsey Bill	14	**Whirlpool Hole**	Selsey Bill
3	**'Inner' Mulberry Harbour Unit**	Bognor Regis	15	**Outer Owers**	Bognor Regis
4	**'Outer' Mulberry Harbour Unit**	Bognor Regis	16	**Kingsmere Rocks**	Littlehampton
5	**The Waldrons Reef**	Bognor Regis	17	**Ship Rock**	Brighton
6	**Shelley Rocks**	Bognor Regis	18	**Brighton Marina**	Brighton
7	**H.M.S. Northcoates**	Bognor Regis	19	**Marina Reef**	Brighton
8	**Worthing Lumps**	Worthing	20	**Brighton-Newhaven Platform**	Brighton/Newhaven
9	**South-West Rocks**	Shoreham	21	**City Of Waterford**	Brighton
10	**Looe Gate**	Shoreham	22	**Hope Point-Beachy Head Platform**	Cuckmere Haven
11	**Seaford Head Gullies**	Cuckmere Haven	23	**Beachy Head**	Beachy Head
12	**Royal Sovereign Shoals**	Pevensey Bay	24	**Horse Of Willingdon**	Pevensey Bay

Notes on the Site descriptions

- Each site description is presented on two sides of an A4 sheet: SIDE 1 gives written details of the site, with SIDE 2 providing location diagrams and some form of diagrammatic representation of the site.

- The information box at the start of each site description provides the following information:

  Site: Name of site (usually derived from the name most commonly used by diving groups)

  Ref. No.: Sequential reference number, initially from west to east, but thereafter chronologically.

  Location: Approximate location of the centre of the site.

  Sites vary considerably in the area they cover. An indication of the area of interest covered by a site is given in the Summary paragraph of text.

  Position of centre of site: Both latitude & longitude (GPS fixes) and OS grid references are given here. Please note, however, that as these systems are based on different projections, the positions they mark may not always coincide.

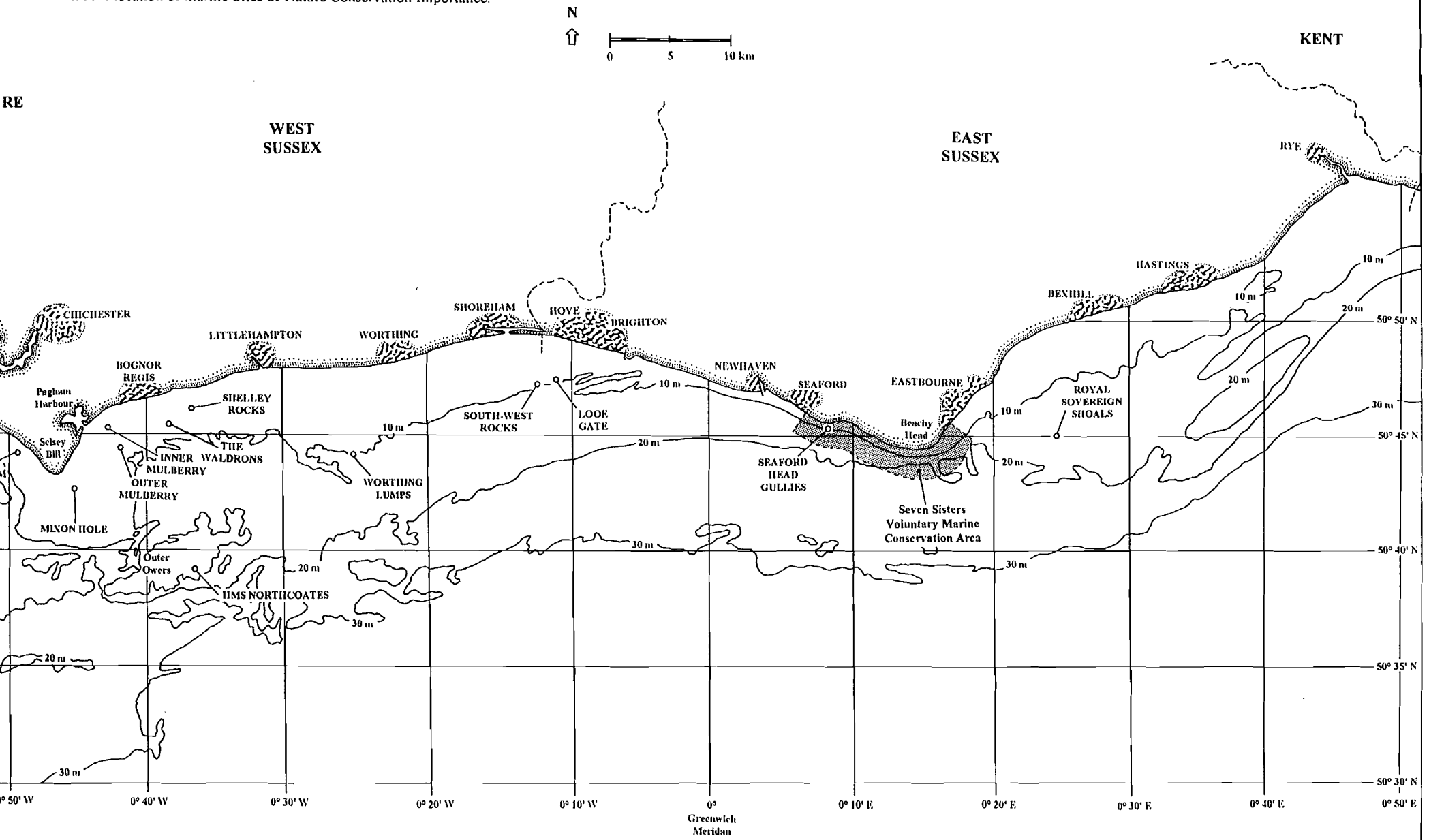
  Depth range (below chart datum): Depths of sea bed features will vary depending on the state of the tide (when they are given as depths below sea level). Depths below chart datum provide a standard reference.

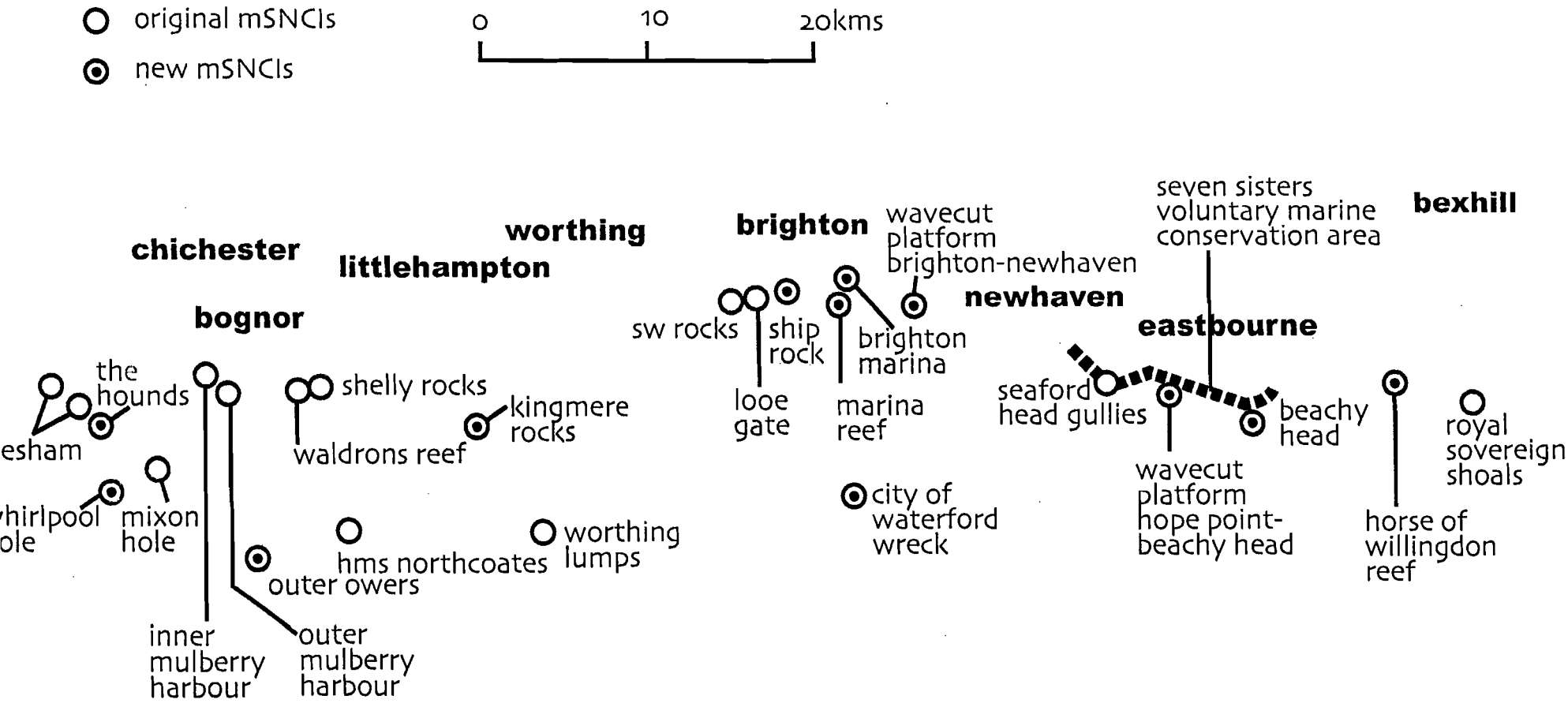
- The **Summary** paragraph provides information relating largely to the geology and substratum type of a site; its length or area; and any special features.

- The **Biological Description** provides information on the communities to be found at or near the site, together with common and rare species of flora and fauna.

- *N.B. Sections re-drawn from charts indicating site locations should not be used for navigation purposes.*

URE 2 Representation of the near-shore bathymetry off the Sussex coast, together with the location of marine Sites of Nature Conservation Importance.




original mSNCIs
new mSNCIs
0
10
20kms
chichester
worthing
littlehampton
bognor
brighton
wavecut platform brighton-newhaven
seven sisters voluntary marine conservation area
bexhill
newhaven
eastbourne
sw rocks
ship rock
brighton marina
looe gate
marina reef
the hounds
esham
shelly rocks
kingmere rocks
waldrons reef
whirlpool ole
mixon hole
hms northcoates
worthing lumps
outer owers
city of waterford wreck
seaford head gullies
beachy head
wavecut platform hope point-beachy head
royal sovereign shoals
horse of willingdon reef
inner mulberry harbour
outer mulberry harbour

Site: **The Bracklesham Balls**		*Ref. No.* 1
Location: Bracklesham Bay: (i) 1.5 km SW of end of Bracklesham Road (ii) 2 km SE of end of Bracklesham Road.		*Other conservation designation?* Within proposed Solent SAC
Lat./Long. position of centre of site: (i) 50° 44.90' N 0° 52.10' W (ii) 50° 44.50' N 0° 50.80' W	*OS grid ref. of centre of site:* SZ 798 949 SZ 813 942	*Author:* Robert Irving
Sea bed type: Boulder-sized concretions embedded in level, mixed sediment.	*Depth range (below chart datum):* 5 - 7 m	*Date Identified:* November 1995

Summary

The 'Bracklesham Balls', as they are popularly known, are spherical and hemispherical boulders up to 1.5 m in diameter, which are located in two areas close to the shore within Bracklesham Bay in approximately 6 m depth. 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 sea bed. The balls provide a most unusual, though not unique, geological feature: similar boulders have been reported from Southampton Water (H. Wallace, pers. comm.).

Biological description

The tops of the shallowest boulders may have occasional kelp plants *Laminaria* sp. growing on them, together with an assortment of red foliose algae (*Calliblepharis ciliata* and *Griffithsia flusculosa* being found frequently). In deeper water, growths of the hydroid *Nemertesia antenina* and of 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 *Actinothoë 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 *Dysidia fragilis*, *Hymeniacedon perleve* and *Halichondria bowerbanki*. Less common are the sponges *Tethya aurantium*, *Suberites domuncula* and *Polymastia mammilaris*. The boulders tend to have a covering of fine silt. There are signs of scouring around their bases.

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

References:

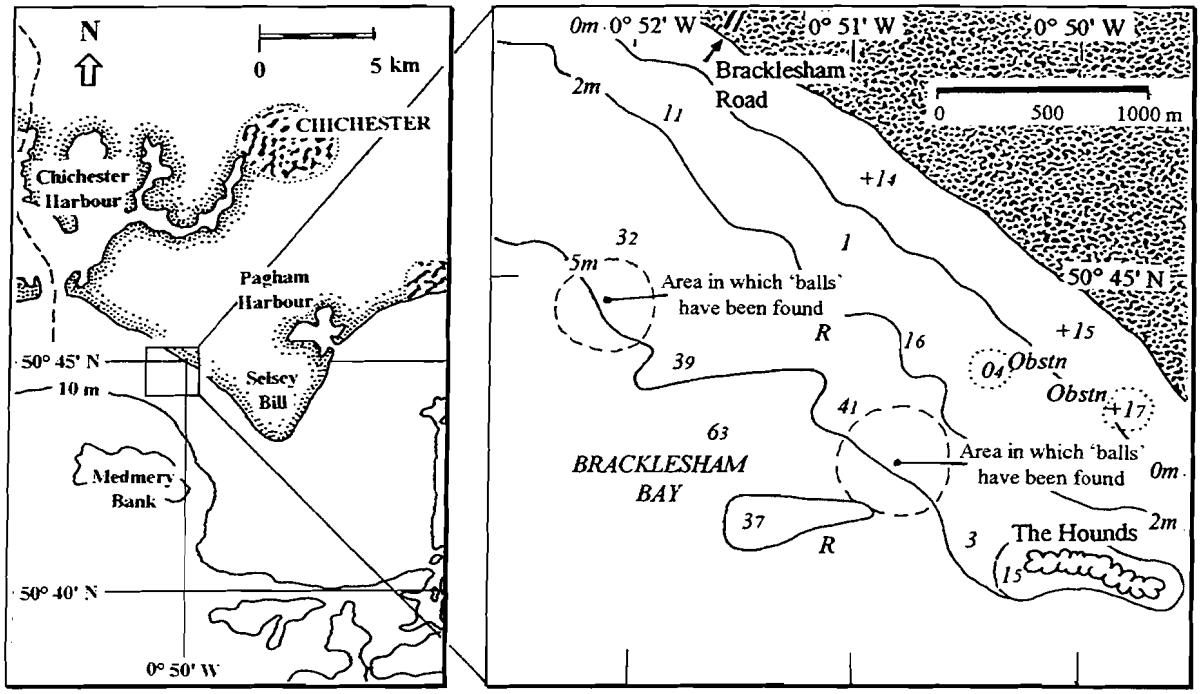
Irving, R.A. 1994. *Report of the West Sussex Seasearch Project, 1992-1993: Chichester Harbour to Littlehampton.* Unpublished report. Coldwaltham, West Sussex.

McDonald, K. 1985. *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

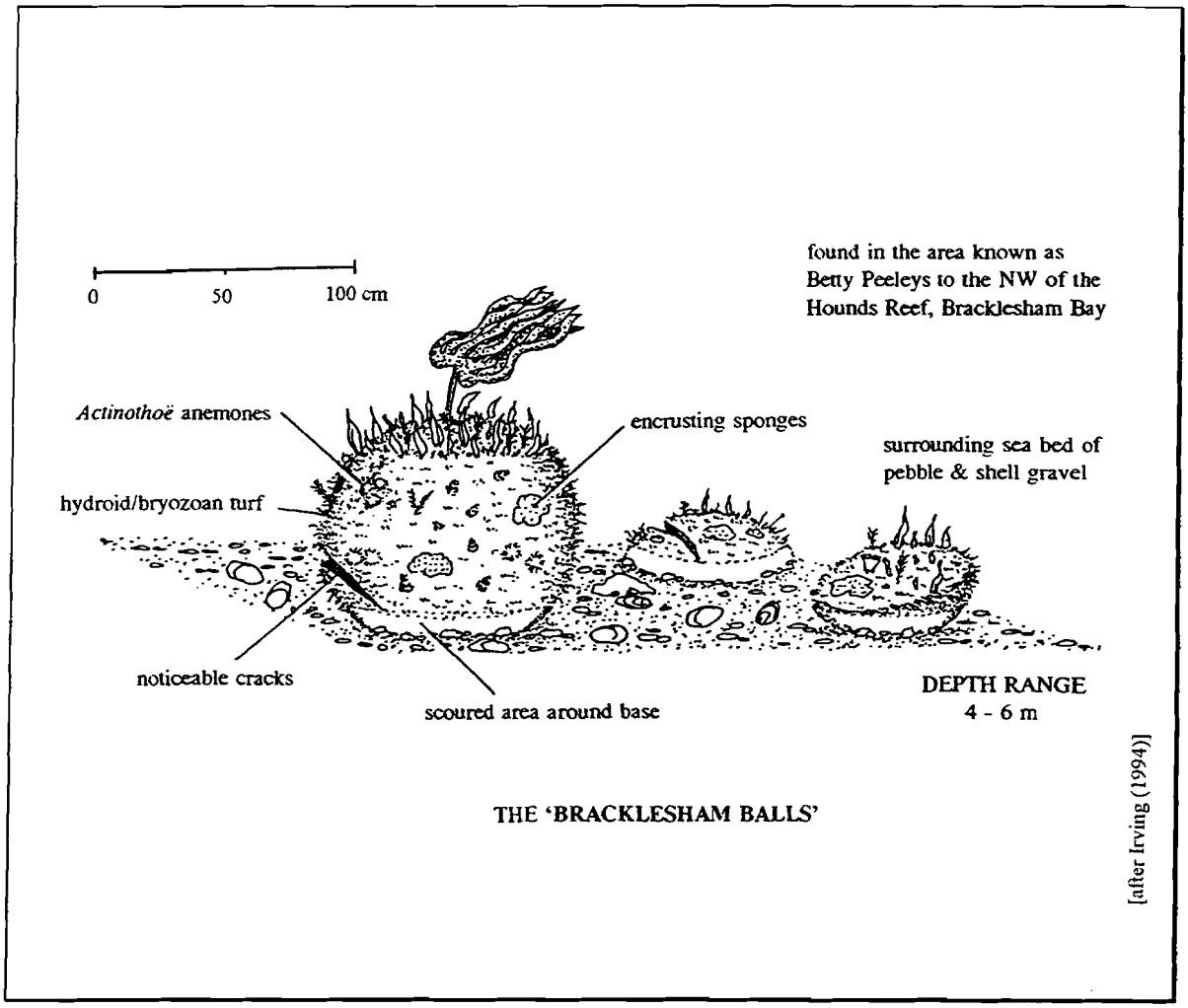
Wood, E.M. 1992. *Coastal zone planning: information review and survey proposals for the sublittoral zone between Arun and Chichester.* A report for English Nature, West Sussex County Council, National Rivers Authority, Arun District Council and the Chichester Harbour Conservancy.

Sussex *SEASEARCH* dive nos.: 93/52 & 79; 94/157

Site location



Diagrammatic representation of site: BRACKLESHAM BALLS



Site: **'Outer' Mulberry Harbour unit**		*Ref. No.* 4
Location: 4 km SE of Pagham village	*Other conservation designation?* Just outside proposed Solent SAC boundary	
Lat./Long. position of centre of site: 50° 44.76.' N 0° 42.18' W	*OS grid ref. of centre of site:* SZ 915 949	*Author:* Robert Irving
Sea bed type: Wreckage of concrete and rusted steel. Surrounding sea bed of pebbles, gravel & silty sand.	*Depth range (below chart datum):* 4 -11 m	*Date Identified:* November 1995

Summary

The 'Outer' Mulberry Harbour unit (sometimes referred to as the 'Far' Mulberry) is the most popular wreck dive site in the Pagham box area, if not off the West Sussex coast. It was one of 80 'caissons' temporarily parked off the Selsey-Bognor coast in the early summer of 1944, but broke its back when being raised from the sea bed. It now lies in relatively shallow water, providing a hard and stable substratum as an artificial reef, which rises above the surrounding flat sea bed of gravel, sand, shells and pebbles. The wreck provides a variety of inclined surfaces as well as sheltered and exposed locations. Surveys of the wreck were undertaken by members of the Marine Conservation Society and the Nautical Archaeological Society in 1995 & 1996.

Biological description

The wreckage consists of concrete slabs and rusting steel rods. It remains partially intact, with horizontal, vertical and overhanging surfaces being present. The uppermost kelp-covered surfaces of the main (highest) part of the wreck may be visible from the surface at low tide. All three species of kelp (*Laminaria digitata, L. hyperborea* and *L. saccharina*) are present, with foliose red algae dominating horizontal, unshaded surfaces. Brown algae (including *Halidrys siliqua*) and some green algae (e.g. *Ulva lactuca*) also occur. Vertical and shaded surfaces are usually heavily colonised (~70-80% cover) by a low faunal turf of hydroids and bryozoans. Occasional discrete sponges, such as *Dysidea fragilis* and *Esperiopsis fucorum*, and the white anemone *Actinothoë sphyrodeta* are present in amongst the turf. There is less cover on some of the inward-facing walls, which are silty and virtually bare, though certain organisms such as the sponge *Polymastia boletiforme*, are found here. The overhanging wall at the northern end is dominated by plumose anemones *Metridium senile* (absent from naturally-occurring hard substrata in the vicinity), together with dead man's fingers *Alcyonium digitatum*. In 1983, the jewel anemone *Corynactis viridis* was recorded as being on this wall, though there was no sign of it in 1993. Devonshire cup corals *Caryophyllia smithii* make a rare appearance here too.

McDonald (1985) reports this wreck as being one of the best sites along the Sussex coast for those who want to see fish. Large shoals of bib *Trisopterus luscus*, numbering several hundred individuals, gather in amongst the superstructure, while pollack *Pollachius pollachius* and bass *Dicentrarchus labrax* hover above it. Other commonly seen fish include tompot blennies *Parablennius gattorugine*, goldsinny wrasse *Ctenolabrus rupestris*, two-spotted gobies *Gobiusculus flavescens* and butterfish *Pholis gunnellus*.

References:

Diver magazine article, June 1994.

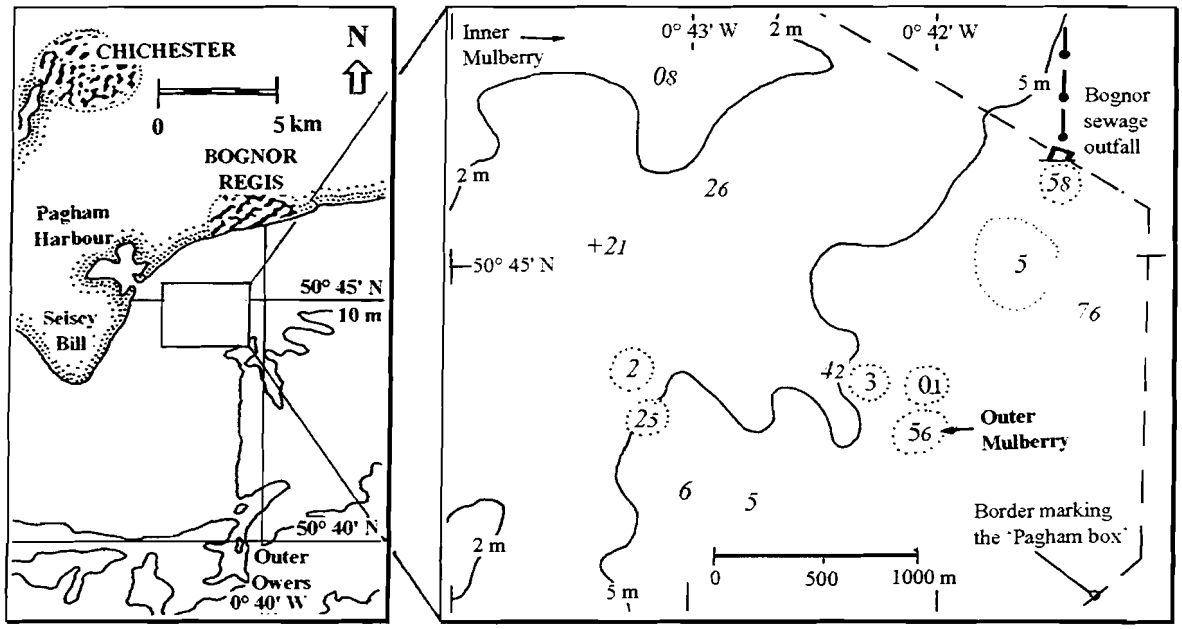
Irving, R.A. 1994. *Report of the West Sussex Seasearch Project, 1992-1993: Chichester Harbour to Littlehampton.* Unpublished report. Coldwaltham, West Sussex.

McDonald, K. 1985. *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

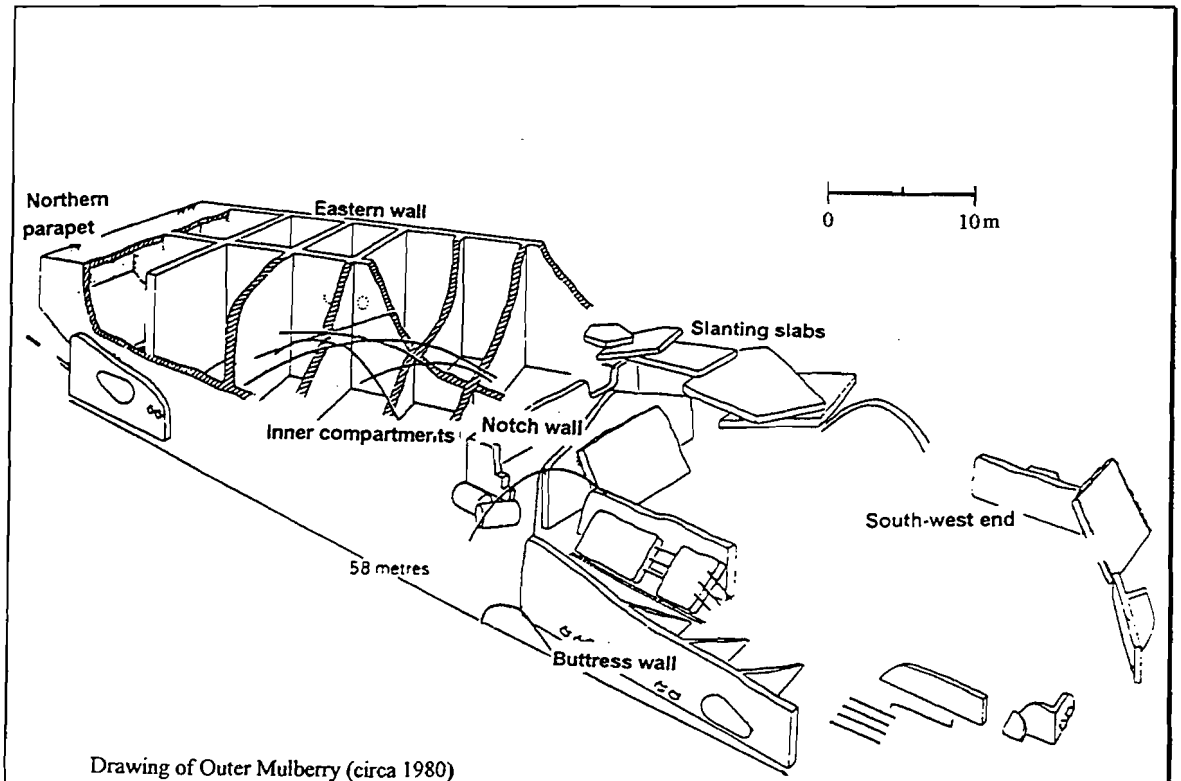
Wood, C. (ed.) 1992. *Sussex Sublittoral Survey: Selsey Bill to Beachy Head.* Marine Conservation Society, SE Branch.

Sussex Sublittoral Survey site no.: 6	Sussex *SEASEARCH* dive nos.: 93/31, 32a&b, 33; 94/122.

Site location



Diagrammatic representation of site: OUTER MULBERRY



Drawing of Outer Mulberry (circa 1980)

Diagram taken from Wood (1984)

Site: **The Waldrons reef**		*Ref. No.* 5
Location: 3-5 km SE of Bognor	*Other conservation designations?* No	
Lat./Long. position of centre of site: 50° 45.05' N 0° 38.10' W	*OS grid ref. of centre of site:* SZ 962 955	*Author:* Robert Irving
Sea bed type: Sandstone reef with large boulders	*Depth range (below chart datum):* 4 - 11 m	*Date Identified:* November 1995

Summary

The Waldrons reef covers an extensive area of sandstone bedrock outcrops which occur in shallow to medium depths off Bognor. There are also large sandstone boulders, some rounded and others angular, with areas of cobbles, pebbles, gravel and sand in between. The approximate location of the reef is marked by two crescent shapes on the chart, indicating the 5 m depth contour. The rock has eroded to form many fissures, crevices, overhangs and variously shaped holes. The site is regarded as portraying many features of sandstone reefs.

Jumbled masses of large angular boulders can be found in certain areas, providing a range of horizontal, vertical and undercut surfaces. These boulders, known as 'sarcens', have a debatable origin: one theory is that they were deposited as drift-ice melted during a glacial phase; another that they are discarded ballast stones from early shipping.

Biological description

Much of the sandstone bedrock has a covering of encrusting pink calcareous algae (*Phymatolithon* sp. and/or *Lithothamnia* sp.). The uppermost surfaces are dominated by foliaceous algae with sparse, stunted kelp plants *Laminaria hyperborea* and *L. digitata*. Common red algae include *Delesseria sanguinea*, *Calliblepharis ciliata* and *Plocamium cartilagineum*. Sponges are the most conspicuous component of the attached fauna, especially in shaded areas on vertical rock. Indeed, the site is particularly rich in sponges with 24 species being recorded on the Sussex Sublittoral Survey (Wood 1984). Common species include *Esperiopsis fucorum*, *Dysidea fragilis* and *Hemimycale columella*. Rarities include the black tar sponge *Dercitus bucklandi*. Other conspicuous attached species include the soft coral *Alcyonium digitatum*, the hydroid *Tubularia indivisa*, white anemones *Actinothoë sphyrodeta*, various sea squirts and the tube worm *Bispira volutacornis*. In other respects, the variety of invertebrates recorded from the site is poorer than one might expect. A number of crustacean species are common including lobster *Homarus gammarus*, edible crabs *Cancer pagurus*, velvet swimming crabs *Necora puber* and spider crabs *Maja squinado*, the area being heavily potted. Cuttlefish *Sepia officinalis* have been seen by divers on numerous occasions. Common fishes seen close to the reef include ballan wrasse *Labrus bergylta*, goldsinny *Ctenolabrus rupestris* and tompot blennies *Blennius gattorugine*.

Between the formations of bedrock reef and boulders are areas of mixed sediment, with cobbles, pebbles, gravel and sand in varying proportions. Here may be found burrowing anemones such as *Cereus pedunculatus* and *Urticina felina*, chains of slipper limpets *Crepidula fornicata*, tufts of the bryozoan *Flustra foliacea*, stalked sea squirts *Styela clava* and hermit crabs *Pagurus bernhardus*. Common fishes include the dogfish *Scyliorhinus canicula*, dragonet *Callionymus lyra* and plaice *Pleuronectes platessa*.

References:

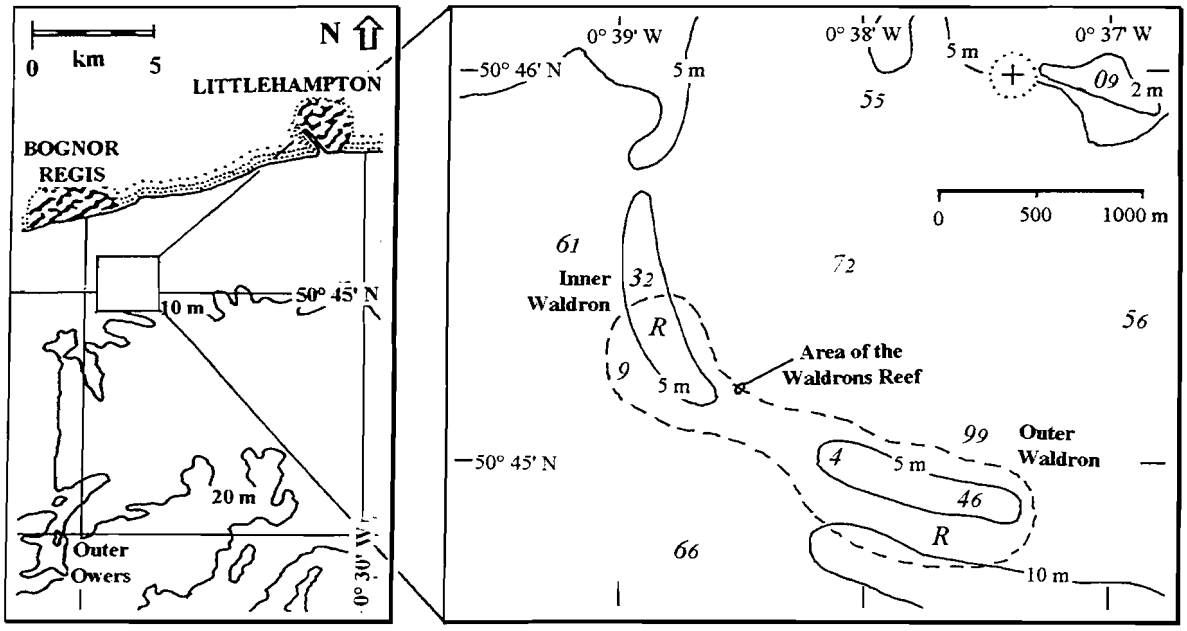
Irving, RA 1994. *Report of the West Sussex Seasearch Project, 1992-1993: Chichester Harbour to Littlehampton.* Unpublished report. Coldwaltham, West Sussex.

McDonald, K. 1985. *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

Wood, C. (ed.) 1984. *Sussex Sublittoral Survey: Selsey Bill to Beachy Head.* Marine Conservation Society, SE Branch.

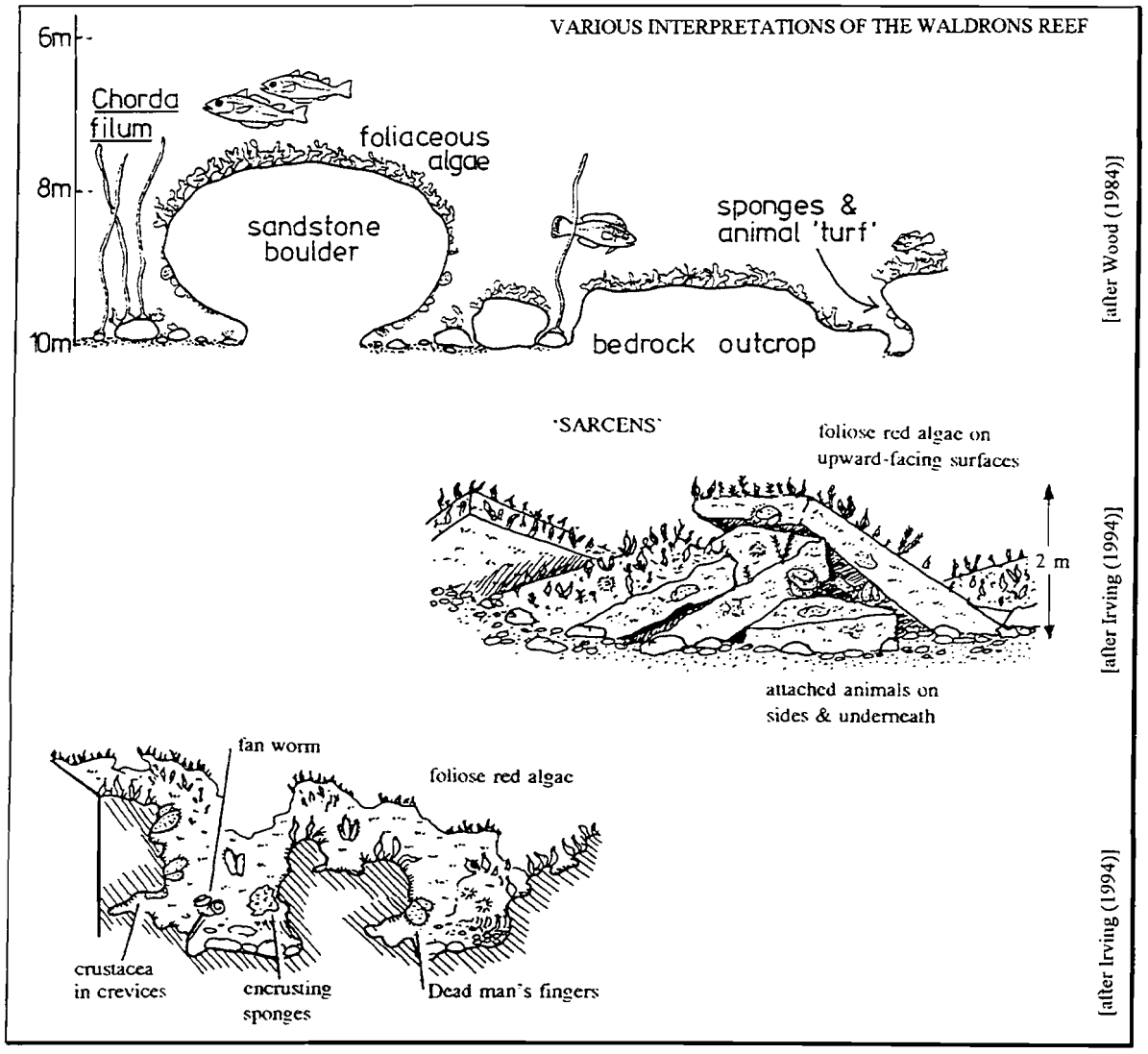
Sussex Sublittoral Survey site no.: 10	Sussex *SEASEARCH* dive nos.: 92/01-16; 93/60-63a&b

Site location



Diagrammatic representation of site:

WALDRONS REEF



Site: **Shelley Rocks**		*Ref. No.* 6
Location: 2 km S of Middleton-on-Sea	*Other conservation designation?* No	
Lat./Long. position of centre of site: 50° 46.00' N 0° 37.00' W	*OS grid ref. of centre of site:* SZ 975 955	*Author:* Robert Irving
Sea bed type: Mixed sediment of boulders, cobbles, gravel and sand	*Depth range (below chart datum):* 4 - 5 m	*Date Identified:* November 1995

Summary

Shelley Rocks comprises an extensive shallow area of boulders, cobbles and a mix of gravel/sand/shell overlying chalk bedrock or exposures of grey clay. Mixed sediment areas such as these dominate much of the sea bed off West Sussex and this area has been selected on account of the wide range of sea bed types found in a relatively small area. Where these mixtures appear stable (from disturbance by wave action in particular), a rich variety of sessile animal species can occur. By contrast, where the ground is mobile, there are patches of clean gravel and pebbles with very little attached life present. The Shelley Rocks area appears to be a site of high deposition of silt from the water column.

Biological description

The marine life associated with this site is typical of broken, mixed sediment grounds in shallow and medium depths. In general, the larger the particle size (and hence its greater stability), the greater the density and diversity of marine life associated with it. In shallow areas, kelp plants *Laminaria digitata* (and occasionally *L. hyperborea* and *L. saccharina*) may be found attached to larger cobbles. Strands of the bootlace weed *Chorda filum* are also likely to be found here. Other typical algae include *Chondrus crispus*, *Plocamium cartilagineum*, *Palmaria palmata*, *Brogniartella byssoides* and *Halarachnion lingulatum*. Algae may provide 80-90% cover of the sea bed during the summer months, though this cover decreases over winter as the fronds of many species decay. Occasional chalk cobbles and small boulders may be present, often with signs of boring organisms including piddocks, spionid worms and the sponge *Cliona celata*. Other, flint cobbles are dominated by growths of the 'leafy' bryozoan *Flustra foliacea*, the sea squirt *Dendrodoa grossularia* and the sponges *Dysidea fragilis* and *Esperiopsis fucorum*.

The areas of pebbles, gravel, shell and sand may be dominated by chains of slipper limpets *Crepidula fornicata*, with tubes of sandmason worms *Lanice conchilega* and stalked sea squirts *Styela clava*. Here too are found the dahlia anemone *Urticina felina*, less commonly the snakelocks anemone *Anemonia sulcata*, and patches of the reef-forming polychaete *Sabellaria spinulosa*. Mobile life includes hermit crabs (typically *Pagurus bernhardus*), the common whelk *Buccinum undatum*, the netted dogwhelk *Hinia reticulata*, small edible crabs *Cancer pagurus*, and occasionally shore crabs *Carcinus maenas* and spider crabs *Maja squinado*. Fishes to be seen include butterfish *Pholis gunnellus*, small juvenile gobies, and flatfish such as plaice *Pleuronectes platessa* and sole *Solea solea*. From February until April, lumpsuckers *Cyclopterus lumpus* come into these shallow waters to lay their eggs, which the males will guard for four weeks or more until they hatch. At the same time of year, cuttlefish *Sepia officinalis* may also be found here.

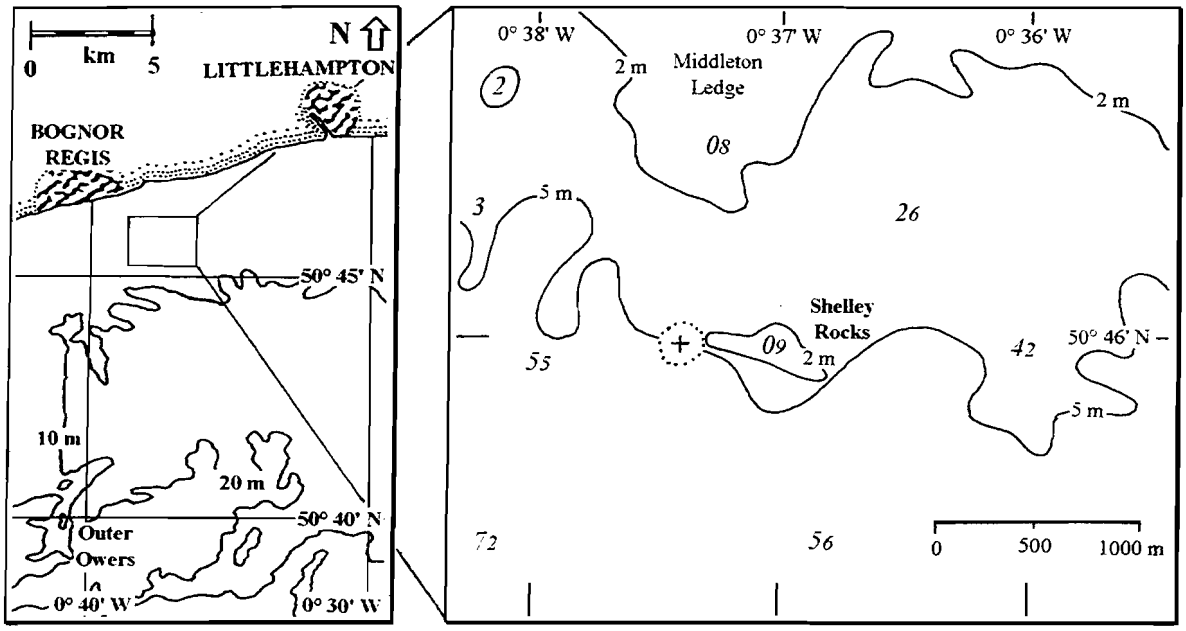
References:

Irving, R.A. 1994. *Report of the West Sussex Seasearch Project, 1992-1993: Chichester Harbour to Littlehampton.* Unpublished report. Coldwaltham, West Sussex.

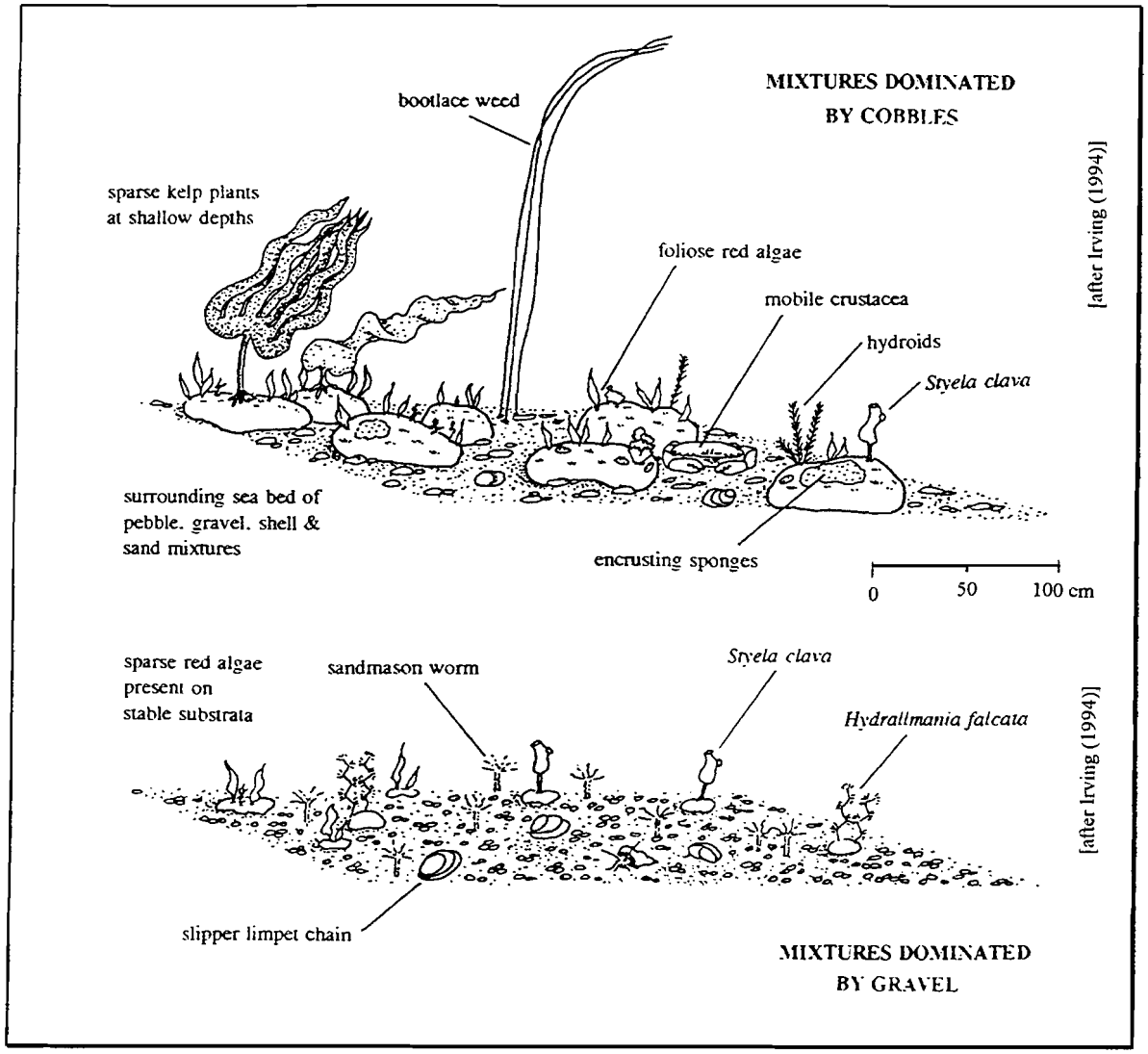
Wood, C. (ed.) 1984. *Sussex Sublittoral Survey: Selsey Bill to Beachy Head.* Marine Conservation Society, SE Branch.

Sussex Sublittoral Survey site no.: 11	Sussex *SEASEARCH* dive nos.: 93/21-25 & 44

Site location



Diagrammatic representation of site: SHELLEY ROCKS



Site: **H.M.S. Northcoates**		*Ref. No.* 7
Location: 14 km south of Bognor	*Other conservation designations?* No	
Lat./Long. position of centre of site: 50° 39.71' N 0° 35.40' W	*OS grid ref. of centre of site:* SZ 996 857	*Author:* Robert Irving
Sea bed type: Steel wreckage in deep water	*Depth range (below chart datum):* 20 - 26 m	*Date Identified:* November 1995

Summary

H.M.S. 'Northcoates'(known to many divers simply as the 'Armed Trawler') was a 277 ton trawler built in 1918 which, after 20 years as a fishing vessel, was commissioned by the Royal Navy for minesweeping duties during the Second World War. She sank in December 1944 due to "stress of weather" whilst under tow. Today she remains largely intact, sitting upright with just a slight list to starboard. Her stern is to the north and she is sanded up to the gunwhales. The surrounding sea bed is of silty gravel and coarse shell fragments. The marine biological interest lies in the fact that the communities present here are typical of many deep water wrecks found off the coast of West Sussex. The presence of Devonshire cup corals *Caryophyllia smithii* and jewel anemones *Corynactis viridis* is of special note.

Biological description

The vertical sides of the hull are dominated by a turf of bryozoan and hydroid species, particularly of the hydroid *Tubularia indivisa*. The tentacular heads of this species are a favourite prey item for several organisms including sea slugs, and by the end of the summer all that may remain of the hydroid are its twig-like stems protruding 10-12 cm from the wreck's surface. There are also a few patches of Devonshire cup corals *Caryophyllia smithii* and a small group of jewel anemones *Corynactis viridis* near the bow. Both of these species are more common in the clearer water of the western English Channel, so their presence here is close to the eastern edge of their known distribution. Other attached fauna include bryozoan crusts, crissid bryozoans, occasional white anemones *Actinothoë sphyrodeta*, small growths of the sponge *Dysidea fragilis*. Plumose anemones *Metridium senile* and colonies of the soft coral *Alcyonium digitatum* are present on the deck section, together with occasional large spider crabs *Maia squinado* and edible crabs *Cancer pagurus*. Silt covers much of the horizontal surfaces. Offshore wrecks often have large fishes associated with them and this one is no exception. Bib *Trisopterus luscus* are common, as are poor cod *Trisopterus minutus*. Other species less commonly seen are conger *Conger conger* and goldsinny *Ctenolabrus rupestris*.

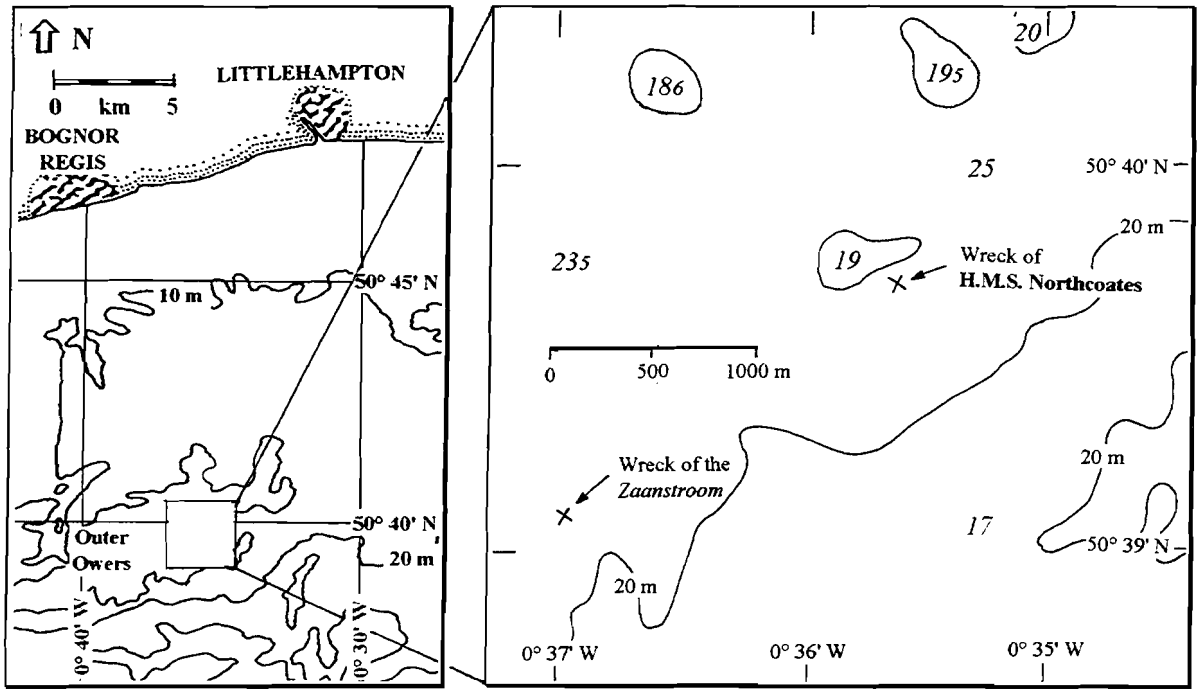
The surrounding sea bed is a mix of silty gravel (80%) and coarse shell gravel (20%). Present here are sandmason worms *Lanice conchilega*, mussels *Mytilus edulis*, burrowing anemones *Cerianthus lloydii* and the 'finger' bryozoan *Alcyonidium diaphanum*. An unusual record from 1994 was of a small colony of zoanthid anemones partially buried in the gravel, thought to be *Epizoanthus couchii*.

References:

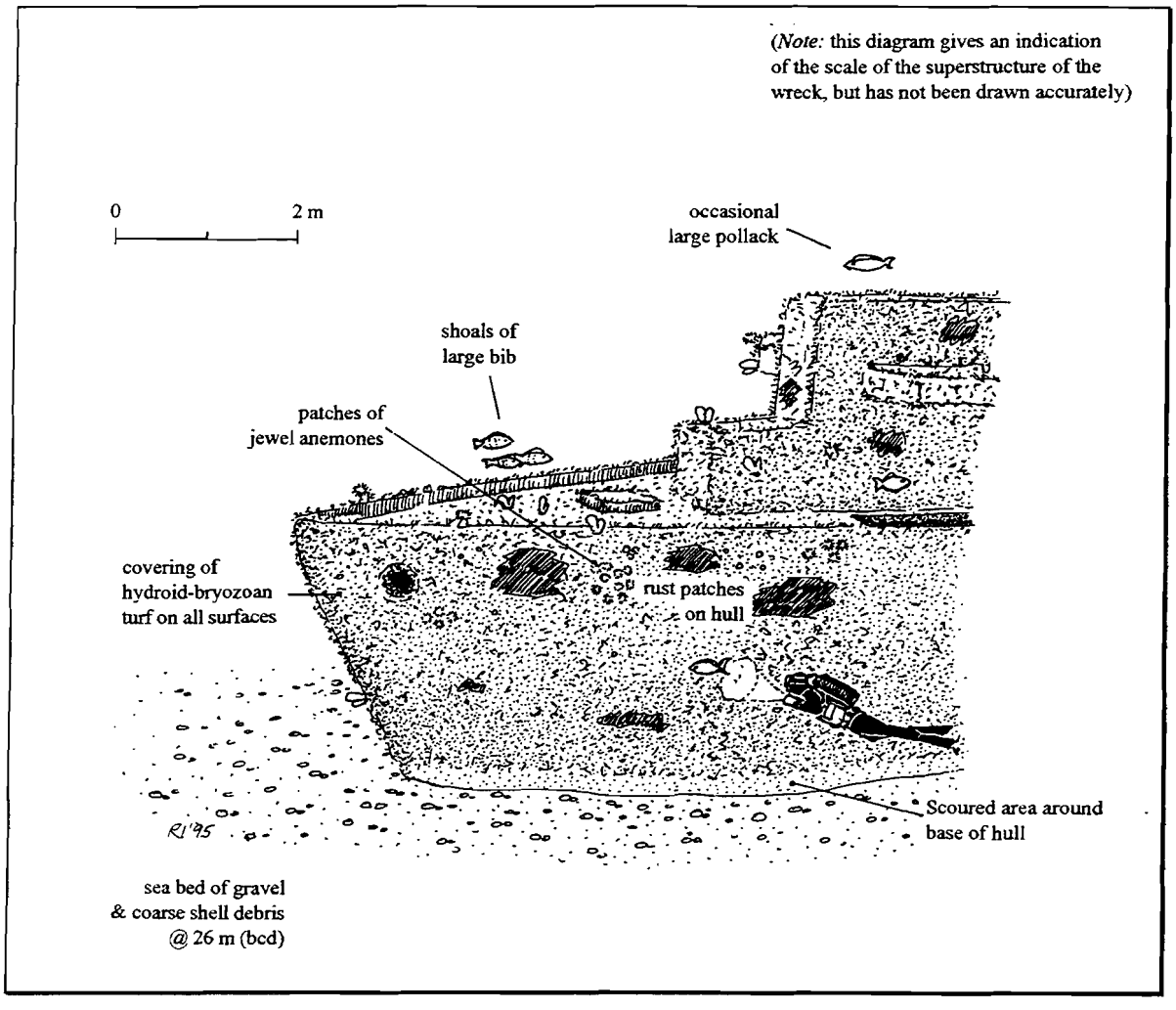
McDonald, K. 1985. *Dive Sussex - A Diver Guide*. Underwater World Publications, London.

Sussex *SEASEARCH* dive nos.: 94/121

Site location



Diagrammatic representation of site: H.M.S. NORTHCOATES



Site: **Worthing Lumps**		*Ref. No.* 8
Location: 8 km SSW of Worthing sea front	*Other conservation designations?* No	
Lat./Long. position of centre of site: 50° 43.96' N 0° 24.50' W	*OS grid ref. of centre of site:* TV 123 857	*Author:* Robert Irving
Sea bed type: Chalk cliff with small boulders, gravel and sand.	*Depth range (below chart datum):* 7 - 12 m	*Date Identified:* November 1995

Summary

The Worthing Lumps consists of two separate northerly-facing chalk cliff exposures, ranging in height from 2-3 m, separated by an area of pebble/gravel/sand approximately 200-300 m wide. The western section (> 350 m in length) and the eastern section (>190 m in length), are thought to be of the same stratum of chalk, and it has been suggested (though not proven) that these exposures are a continuation of the more easterly group of sites (South-West Rocks, Looe Gate and Ship Rock). On a national basis, sublittoral exposures of chalk are rare, though they are relatively common off the Sussex coast. This site probably represents the best exposures of sublittoral chalk cliffs in Sussex.

Biological description

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 may be due to greater separation from coastal influences and being exposed to stronger currents.

The cliff formation provides 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 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 sea bed 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.

References:

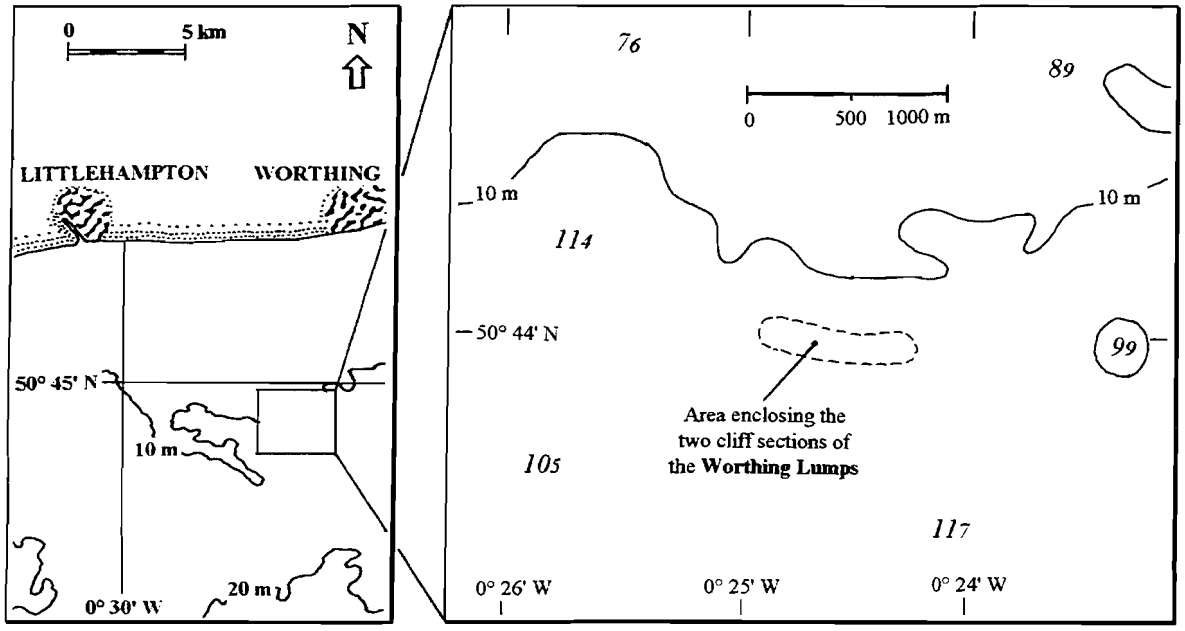
Irving, R.A. (in press). *Report of the Sussex Seasearch Project, 1994: Littlehampton to Brighton.* Unpublished report. Coldwaltham, West Sussex.

McDonald, K. 1985. *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

Wood, C. 1992. *Sublittoral Chalk Habitats in Southern England.* Report of the Marine Conservation Society, S.E. Group Chalk Cliffs project 1985-1991. Marine Conservation Society, Ross-on-Wye.

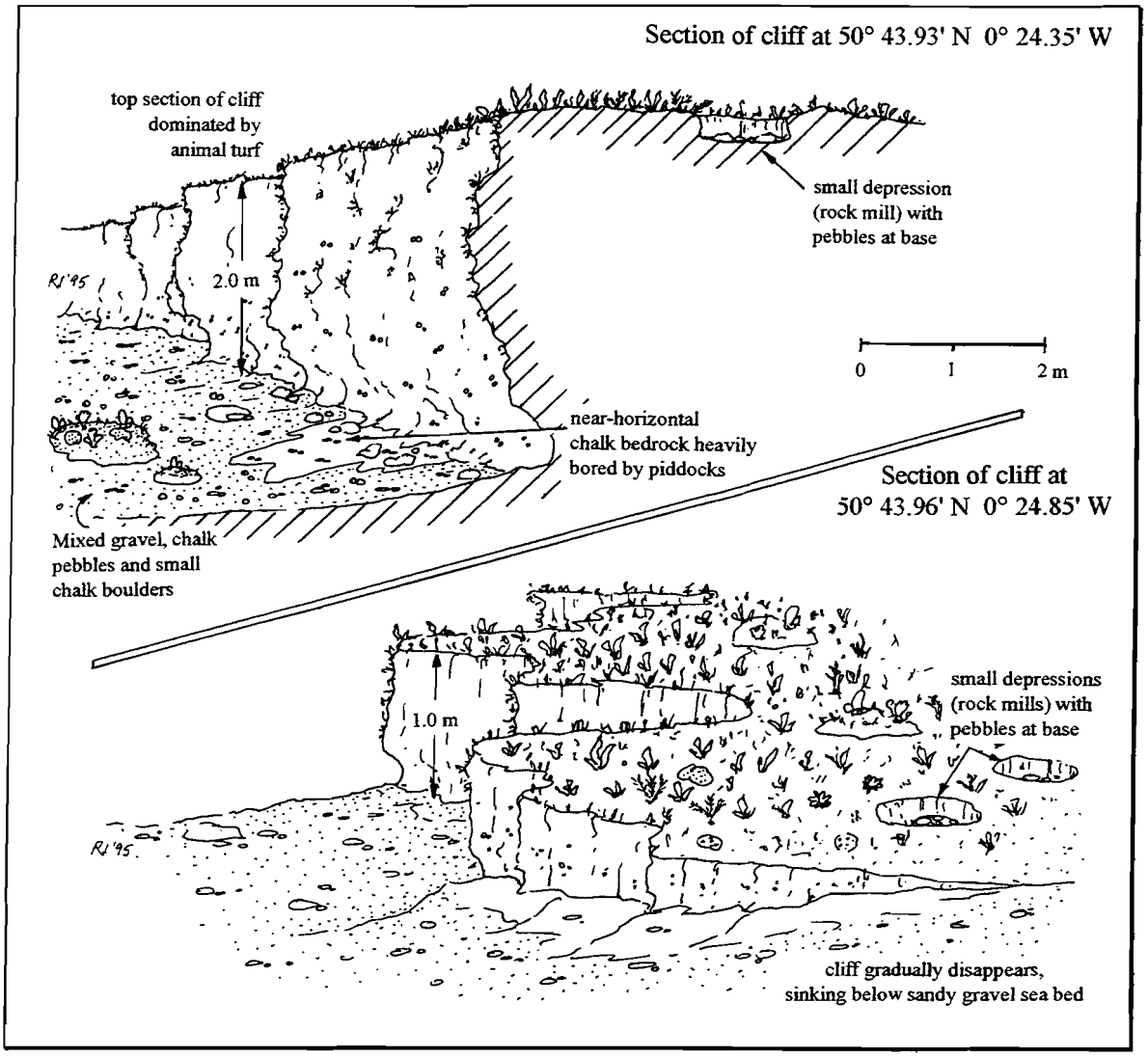
Sussex Sublittoral Survey site no.: 32	Sussex *SEASEARCH* dive nos.: 94/135-138 & 94/197-200
SEMCS Chalk Cliffs Project, site log nos.: 2,3,5,9,22,23,41,45,46, & 49	

Site location



Diagrammatic representation of site:

WORTHING LUMPS



Site: **South-West Rocks**		*Ref. No.* 9
Location: 4.5 km SW of Hove	*Other conservation designations?* No	
Lat./Long. position of centre of site: 50° 47.60' N 0° 12.50' W	*OS grid ref. of centre of site:* TQ 262 009	*Author:* Robert Irving
Sea bed type: Chalk cliff, sand and pebbles	*Depth range (below chart datum):* 8 - 11m	*Date Identified:* November 1995

Summary

South-West Rocks is a length of exposed vertical chalk cliff, 270 m long, northward-facing and running approximately 240°/60°. It is believed (though not proven) that this is the same chalk stratum which forms the Worthing Lumps (mSNCI 8), Looe Gate (10) and Ship Rock (11), following the 10 m depth contour. 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 sea bed 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.

Biological description

The area most densely covered by marine life is the upper part of the vertical face extending onto the upper horizontal surface. A dense animal turf dominates, with the hydroids being common, particularly the stalks of *Tubularia indivisa*. Foliose red algae occur on the upper horizontal surface though plants tend to be small and silt-covered. The green alga *Bryopsis plumosa* is also found occasionally. Other faunal components of the 'turf' include sponges, principally *Esperiopsis fucorum* and *Dysidea fragilis*, and bryozoans such as *Flustra foliacea* and *Bugula* spp. The soft coral *Alcyonium digitatum* may be common in some areas, though their occurrence is sporadic. The vertical chalk cliff face is peppered by many small holes made by boring piddock bivalves. In 1990, a small group of burrowing sea cucumbers, thought to be *Aslia lefeveri*, were found occupying abandoned vertical piddock holes (Wood 1992). This is believed to be the only record of burrowing sea cucumbers in the eastern part of the Channel, though they have not been recorded from this site since. The cowrie *Trivia arctica* may be common, feeding on colonial stalked sea squirts *Aplidium* sp. Crustaceans are not as common as one might expect, though certain fish species, such as bib *Trisopterus luscus*, poor cod *Trisopterus minutus*, ballan wrasse *Labrus bergylta* and goldsinny *Ctenolabrus rupestris*, are frequently seen.

The flora and fauna at this site appears to have changed considerably during the period from 1984/5 to 1994. Records made in 1984/5 listed 47 algal species, yet only 7 were recorded in 1990. The hydroid turf composition in 1990 included *Hydrallmania falcata* and *Obelia dichotoma* (neither recorded in 1984/5), but did not include *Eudendrium ramosum* nor *Sertularia cupressina* which were respectively abundant and common in 1986.

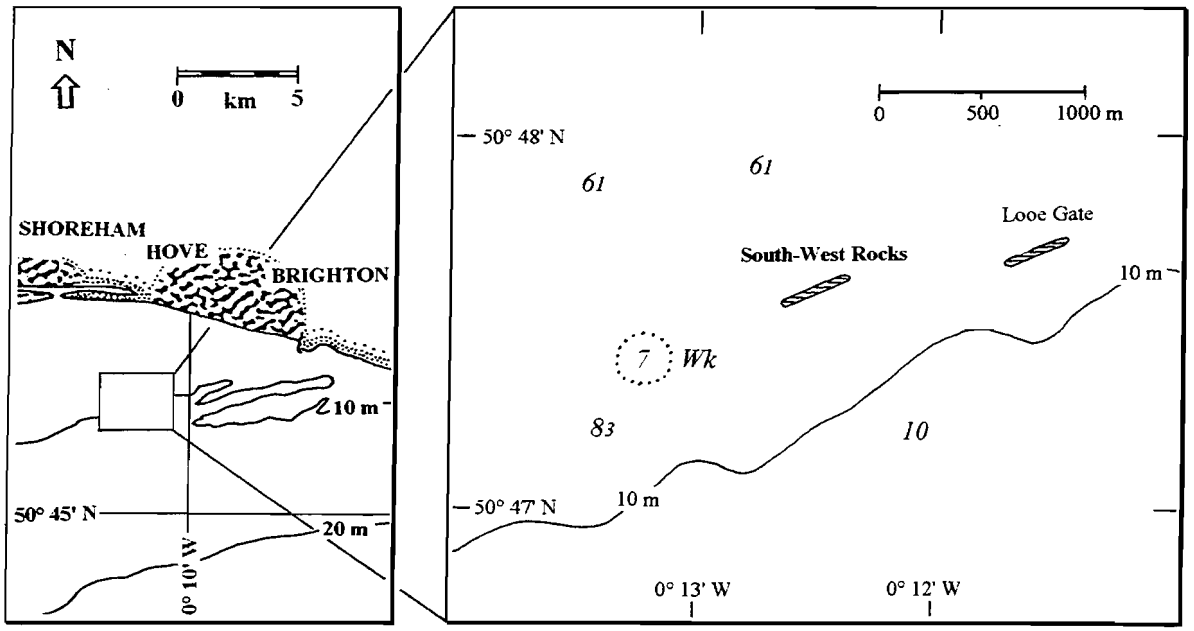
References:

Irving, R.A. (in press). *Report of the Sussex Seasearch Project, 1994: Littlehampton to Brighton.* Unpublished report. Coldwaltham, West Sussex.

Wood, C. 1992. *Sublittoral Chalk Habitats in southern England.* Report of the Marine Conservation Society, S.E. Group Chalk Cliffs project 1985-1991. Marine Conservation Society, Ross-on-Wye.

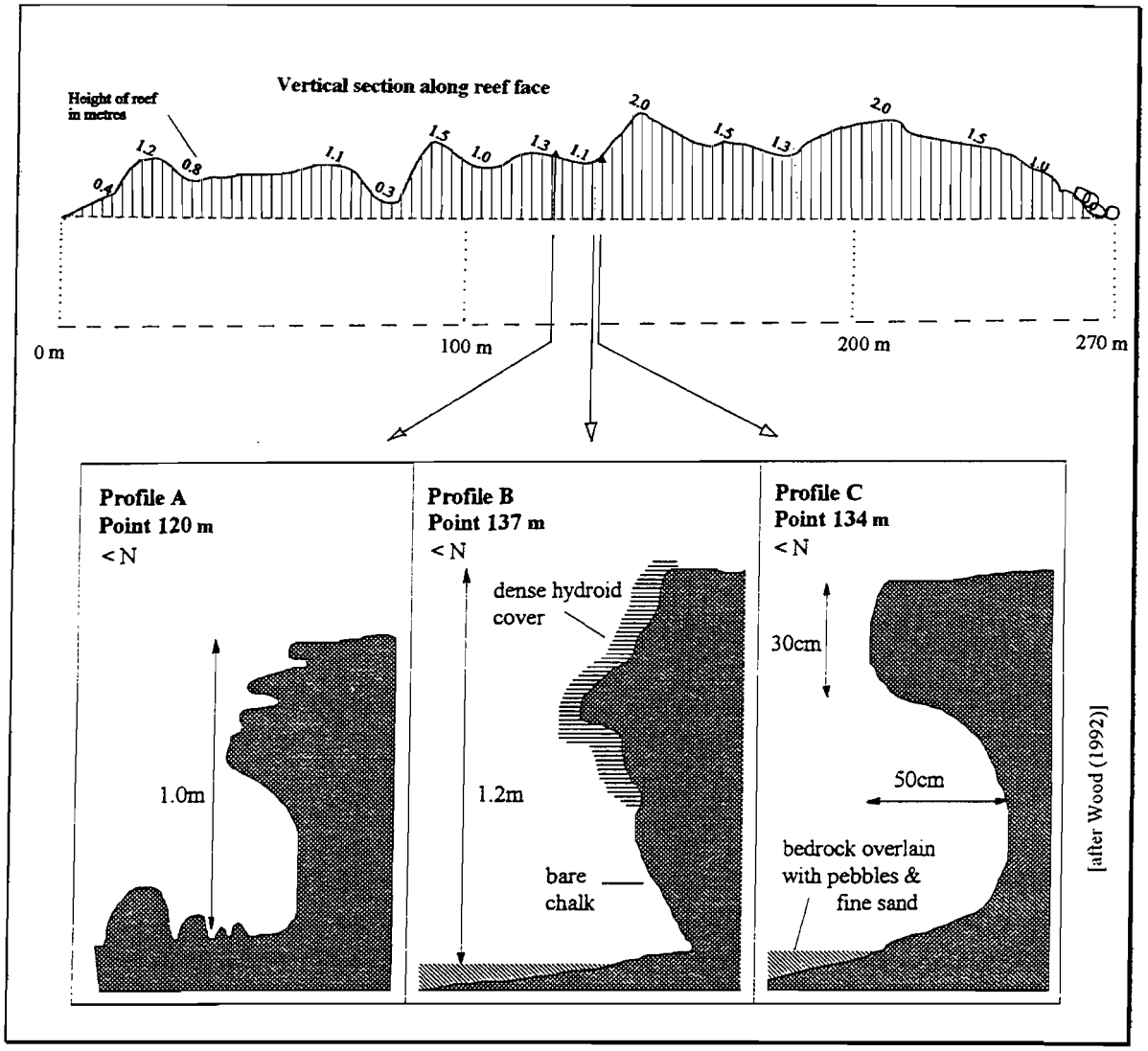
Sussex Sublittoral Survey site no.: 42	Sussex *SEASEARCH* dive nos.: 94/161-163,185-187
SEMCS Chalk Cliffs Project, site log nos.: 1,4,7,8 & 20	

Site location



Diagrammatic representation of site:

SOUTH-WEST ROCKS



Site: **Looe Gate**		*Ref. No.* 10
Location: 4 km SSW of Hove	*Other conservation designation?* No	
Lat./Long. position of centre of site: 50° 47.74' N 0° 11.59' W	*OS grid ref. of centre of site:* TQ 273 009	*Author:* Robert Irving
Sea bed type: Chalk cliff, silty sand mixed with shells	*Depth range (below chart datum):* 6 - 9 m	*Date Identified:* November 1995

Summary

The feature known as Looe Gate (reasons for name unknown, though a hole in the cliff has been reported at one point) is a low-lying chalk cliff, mostly 0.5 m in height but reaching a maximum height of 1.5 m in places. The length of exposed chalk is approximately 220 m. Its width can vary with shifting overlying sand, but may reach up to 5 m. The surrounding sea bed 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).

Biological description

The uppermost (shallowest) parts of the cliff support a sparse foliose red algal turf. Surveys in 1986 and 1994 revealed the attached fauna to be varied and densely packed, except on broken surfaces. Dominant elements of the cover were sponges and bryozoans. Eleven species of sponges were recorded in 1986, 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 *Alcyonium digitatum*. The tubicolous worm *Sabellaria spinulosa* is known to occur here, as is the 'feather duster' worm *Bispira volutacornis*. 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, sea squirts were particularly varied in 1986, with 12 species being 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.

The sea bed on the north (lower) side of the reef is of mixed sediment: chalk pebbles, gravel, sand, shell debris and occasional small chalk boulders. Occasional sparse red algae can be found attached to cobbles and small boulders. Otherwise, the fauna is typical of this type of sea bed, with the anemones *Urticina felina* and *Cerianthus lloydi*, the crabs *Necora puber* and *Cancer pagurus*, the hermit crab *Pagurus bernhardus*, the topshell *Calliostoma zizyphinum* and occasional chains of slipper limpets *Crepidula fornicata*.

References:

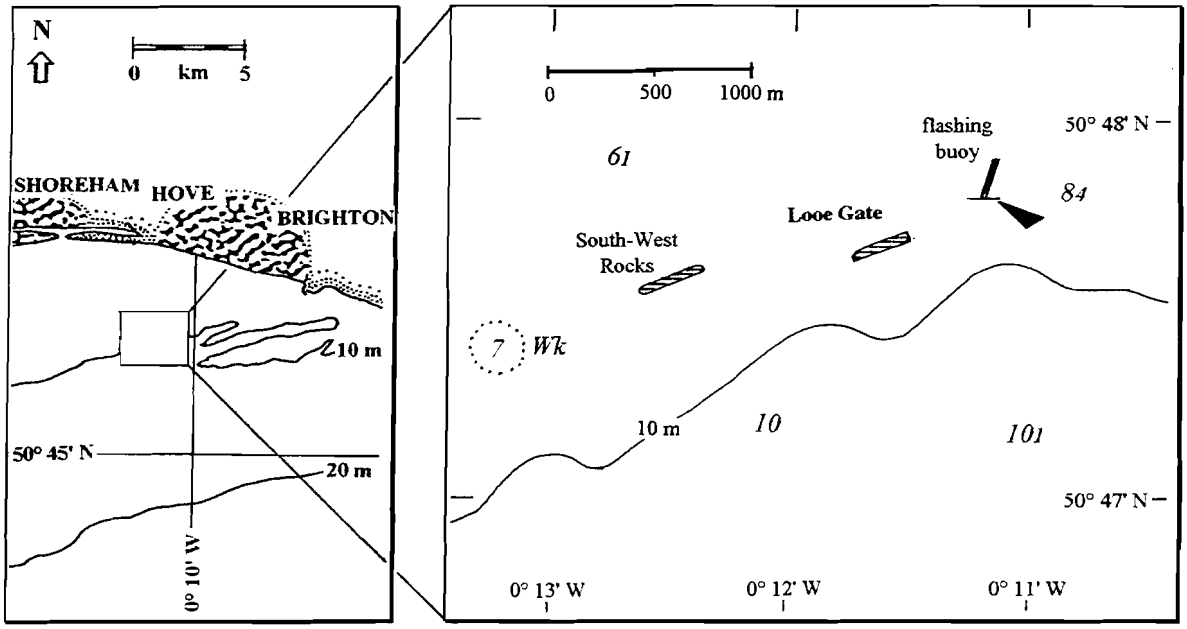
Irving, R.A. (in press) *Report of the Sussex Seasearch Project, 1994: Littlehampton to Brighton.* Unpublished report. Coldwaltham, West Sussex.

McDonald, K. 1985. *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

Wood, C. 1992. *Sublittoral Chalk Habitats in Southern England.* Report of the Marine Conservation Society SE Group Chalk Cliffs project, 1985-1991. Marine Conservation Society, Ross-on-Wye.

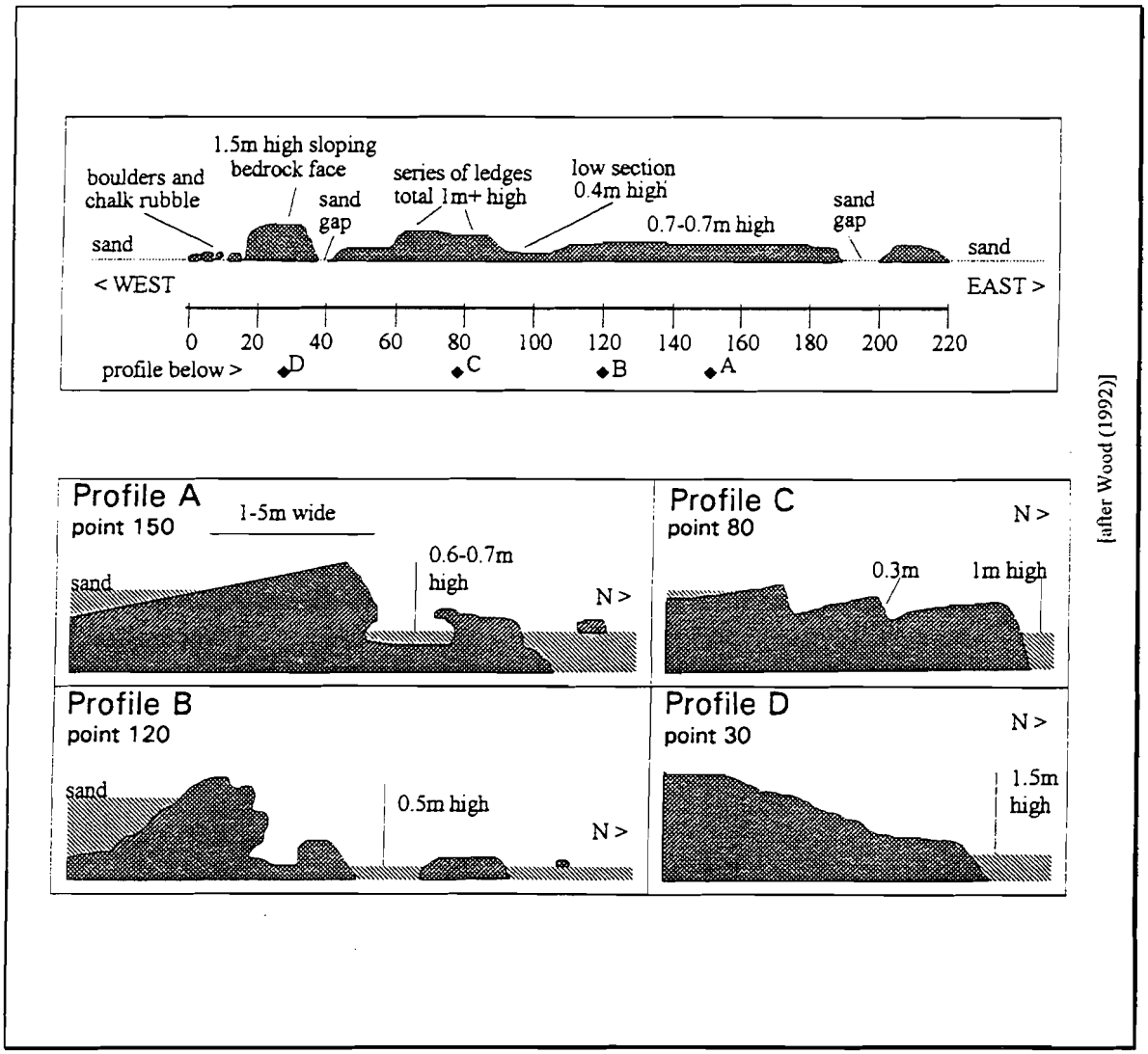
SEMCS Chalk Cliffs Project, site log nos.: 52 & 55	Sussex *SEASEARCH* dive nos.: 94/35&36, 46-48

Site location



Diagrammatic representation of site:

LOOE GATE



Site: **Seaford Head Gullies**		*Ref. No.* 11
Location: Between Seaford Head and Hope Point, just west of Cuckmere Haven	*Other conservation designation?* Within the Seven Sisters Voluntary Marine Conservation Area	
Lat./Long. position of centre of site: 50° 45.20' N 0° 07.50' E	*OS grid ref. of centre of site:* TV 500 972	*Author:* Robert Irving
Sea bed type: Shallow, near-shore chalk gullies and ridges	*Depth range (below chart datum):* 0 - 5 m	*Date Identified:* January 1996

Summary

At the edge of the wave-cut chalk platform between the Martello tower to the west of Seaford Head and Hope Point, lie a series of chalk gullies and ridges which run perpendicular to the line of the coast. Similar gullies are found at other sites along this stretch of coast (for instance, to the west of Newhaven and at Belle Tout), but are less well developed than the ones found at Seaford Head/Hope Point. The gullies extend from just above low water mark out to about 600 m offshore. Generally, the height of the ridges decreases with distance from the shore and increasing depth.

Biological description

In the shallowest areas (0.5 m below chart datum) closest to the edge of the wave-cut platform, the chalk ridges lining the gullies are about 1.5 m high with a 'thick' kelp cover (reported from Hope Gap), mostly of *Laminaria saccharina* but with some *L. digitata* too. (The presence of *L. saccharina* is unusual in such an exposed location: one might expect to find *L. hyperborea* here, but this species is absent). The kelp does not extend below 2.5 m (bcd); beyond this, upward-facing surfaces are dominated by smaller brown and red seaweeds such as *Taonia atomaria*, *Calliblepharis ciliata* and *Ceramium rubrum*. Algal cover becomes sparse below 5 m (bcd) and is absent below 7 m (bcd).

On all vertical or steeply sloping chalk bedrock surfaces below the dense algal zone, animal communities are dominant. 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 to the ridges have a covering of animal turf, made up largely of bryozoans (*Bugula* spp.) and hydroids, with various tubicolous worms including *Sabellaria spinulosa*, *Pomatoceros triqueter* and *Filograna implexa*/ *Salmacina dysteri*. The tubes of these worms may well help to prevent erosion of the soft rock. The lower sides of the ridges are affected by the movement of sand and pebbles from the gully floor, and are often bare. There is, however, a narrow (10-20 cm wide) 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*. The gully floors are of chalk overlain by silty muddy sand with occasional cobbles and pebbles. Mobile species include various crustacea such as lobster *Homarus gammarus*, edible crabs *Cancer pagurus* and velvet swimming crabs *Necora puber*. Common fishes associated with the reefs include the tompot blenny *Parablennius gattorugine*, long-spined sea scorpion *Taurulus bubalis* and the leopard spotted goby *Thorogobius ephippiatus* (near the eastern limit of its distribution).

References:

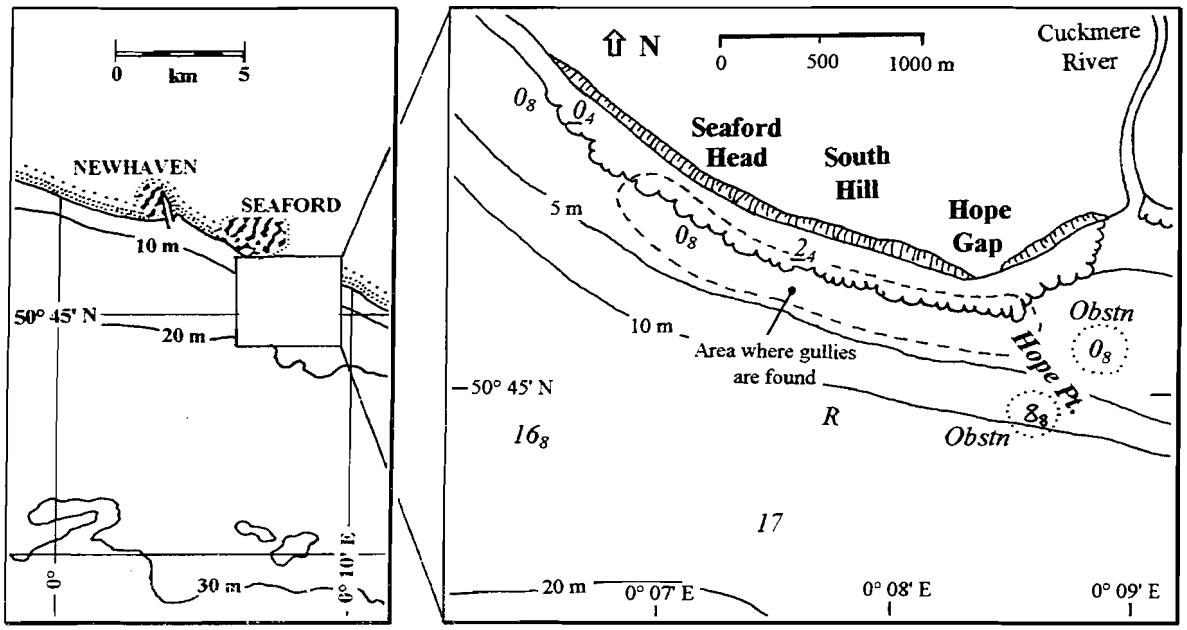
Wood, C. (ed.) 1984. *Sussex Sublittoral Survey: Selsey Bill to Beachy Head.* Marine Conservation Society, SE Branch.

Wood, C. & Jones, E. 1986. *Seven Sisters Marine Surveys.* Marine Conservation Society, SE Branch.

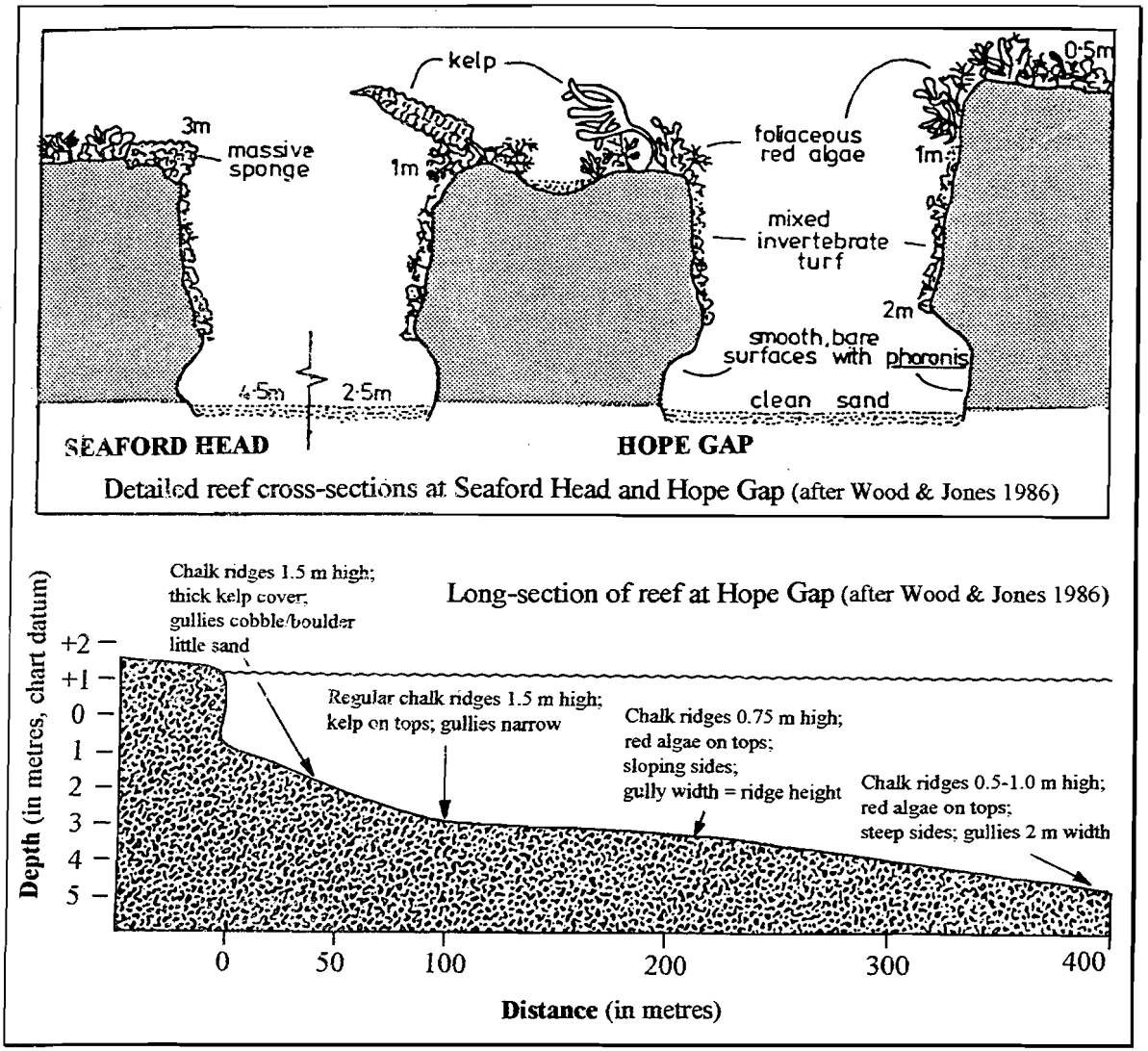
Irving, R.A. (in prep.) Report of the Sussex *SEASEARCH* project, 1995: Brighton to Beachy Head. Unpublished report, Colwaltham, West Sussex

Sussex Sublittoral Survey site no.: 56	Sussex *SEASEARCH* dive nos.: 95/34, 35, 36, 40, 41, 78, 80, 81, 106, 107

Site location



Diagrammatic representation of site: SEAFORD HEAD GULLIES



Site: **Royal Sovereign Shoals**		*Ref. No.* 12
Location: 12 km east of Beachy Head (the Royal Sovereign buoy marks the southern extent of the reef).	*Other conservation designation?* No	
Lat./Long. position of centre of site: 50° 44.50' N 0° 26.00' E	*OS grid ref. of centre of site:* TV 720 960	*Author:* Robert Irving
Sea bed type: Extensive offshore sandstone reef (& part chalk reef)	*Depth range (below chart datum):* 3.5 - 15 m	*Date Identified:* January 1996

Summary

The Royal Sovereign Shoals lie between 10-13 km ENE of Beachy Head, and 8-10 km off Langney Point, NE of Eastbourne. The reef covers an area of about 1 km^2 and is marked by a buoy (the Royal Sovereign) at its southern end. Though most of the Shoals are of sandstone (probably Upper Greensand), outcrops of chalk occur in the north-west part. Other sandstone reef exposures occur to the west of this site, including Long Shoal, Horse of Willingdon and Elphick Tree. The reef rises from a surrounding sea bed of gravel, muddy sand and sand, and the area is subject to strong tidal currents which reach 2.6 knots at spring tides. The Shoals display a wide range of habitat types within a relatively small area and provide a good example of an offshore sandstone reef.

Biological description

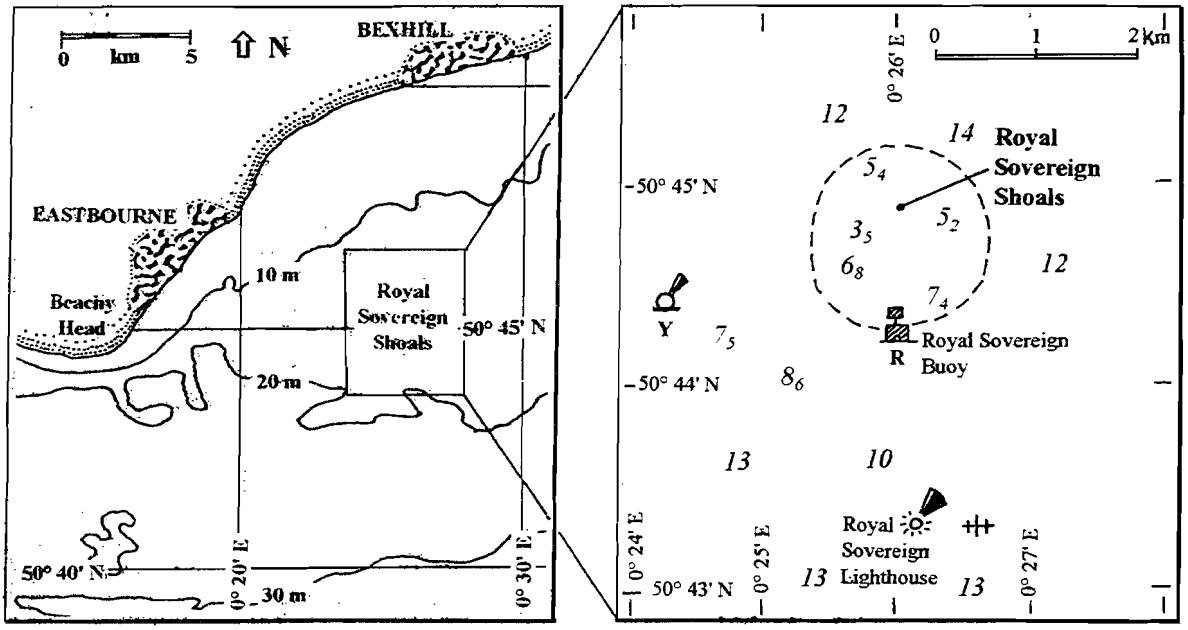
At the shallowest parts of the reef, sandstone bedrock slabs and flat-topped boulders are present. Kelp is absent and upward-facing rock surfaces have a covering of small foliose red algae with many small, silt amphipod tubes. Commonly seen animals include a variety of sponges, the white anemone *Actinothoë sphyrodeta*, sea squirts such as *Clavelina lepadiformis* and *Botryllus schlosseri*, the hydroid *Nemertesia antenina*, the erect bryozoans *Alcyonidium diaphanum* and *Flustra foliacea* and the starfish *Asterias rubens*. At depths of 7-14 m, rectangular slabs of sandstone bedrock may be encountered, with lengths of 2-3 m and vertical sides typicaly 40-50 cm high. 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, an interesting find as this has not been recorded from Sussex chalk reefs and may be the most easterly record for this species. 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*.

References:

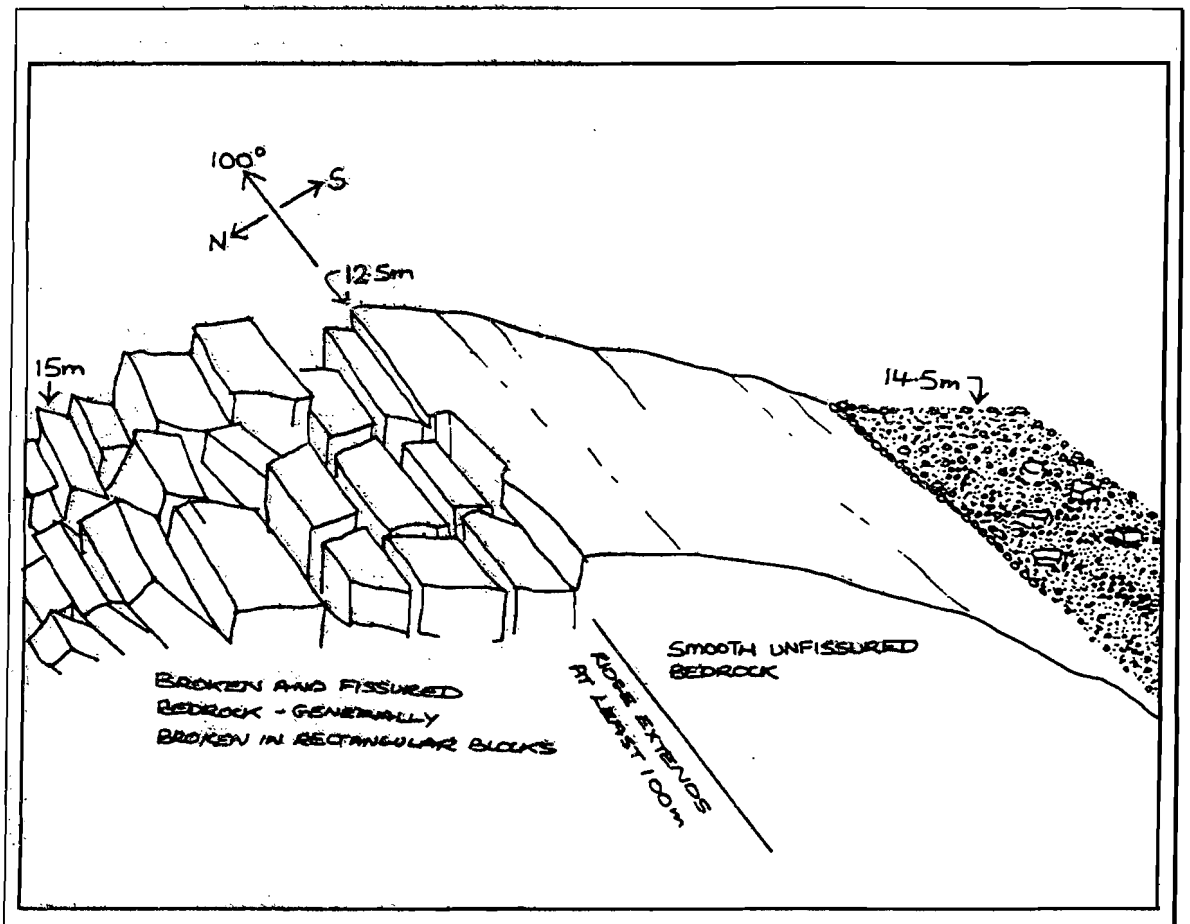
Wood, C. 1990. *Seasearch survey of sandstone reefs off Eastbourne, East Sussex.* A report to the Nature Conservancy Council from Marine Biological Consultants Ltd., Ross-on-Wye.

Sandstone reefs survey site nos.: 5A, 5B & 5C. Sussex *SEASEARCH* dive nos.: -

Site location



Diagrammatic representation of site: ROYAL SOVEREIGN SHOALS



Sketch of raised reef structure at Royal Sovereign Shoals (south-east) (after Wood 1990)

Site: **The Hounds**		*Ref. No.* 13
Location: Bracklesham Bay. 3 km NW of Selsey Bill.		
Lat./Long. position of centre of site: 50° 44.16' N 0° 50.52' W	*OS grid ref. of centre of site:* SZ 817 936	*Author:* Robert Irving
Sea bed type: Limestone outcrops of bedrock and boulders, with some horizontal clay exposures and mixed substrata.	*Depth range (below chart datum):* 0 – 8 m	*Date Identified:* June 2001

Summary

The Hounds reef lies close inshore at the south-eastern edge of Bracklesham Bay. The shallowest parts of the reef are exposed at low water springs. It would appear as though the reef is formed of limestone cap-rock, either intact in the form of bedrock or as broken flat slabs. Underlying this limestone stratum, which is only 15-20 cm deep, is a softer clay layer which has been eroded in places, forming holes and caves beneath the limestone. In amongst the rocky outcrops are small open areas with a mix of small boulders, cobbles and pebbles overlying horizontal clay. The primary interest of the site lies within a radius of 250 m from the centre of the site.

Biological description

Upward-facing surfaces of the bedrock outcrops are sparsely colonised by an assortment of algal species including *Laminaria* kelp plants (rare-occasional) and the red foliose algae *Calliblepharis ciliata* and *Halurus flusculosus* (both frequent). These surfaces, however, are often heavily silted, local erosion of the clay leading to a frequently high loading of fine material in the water column, especially after rough weather. Where algae are less dominant, various sessile faunal species may be found including occasional white anemones *Actinothoe sphyrodeta*, dead man's fingers *Alcyonium digitatum* and small patches of the grey colonial ascidian *Diplosoma listerianum*. Encrusting sponges include the 'shredded carrot' sponge *Esperiopsis fucorum*, the 'goose bump' sponge *Dysidia fragilis*, *Hymeniacedon perleve* and *Halichondria bowerbanki*. More upright species include the hydroid *Hydrallmania falcata* and hornwrack *Flustra foliacea*.

Exposures of clay/mudstone are often scoured clean of attached life (by other mobile sediments), though they are frequently riddled with piddock holes (probably both *Pholas dactylus* and *Hiatella arctica* being present). Patches of sand are largely bare of surface dwelling species (epifauna), with the exception of occasional sandmason worms *Lanice conchilega* and netted dogwhelks *Hinia reticulata*.

Surrounding seabed areas of mixed sediments (mostly of pebbles, gravel, sand and slipper limpet shells) have few attached species associated with them, with the exception of live slipper limpet chains *Crepidula fornicata* and occasional oysters *Ostrea edulis*. Mobile species include various crustaceans (particularly crabs, hermit crabs and prawns), small gobies and dragonets *Callionymus lyra*.

Justification

Sublittoral rocky reefs account for probably less than 3% of the total area of seabed off Sussex (within the 12 nm limit of territorial waters). Exposed sublittoral limestone strata are rarely encountered off Sussex, most of the reefs being formed of sandstone or chalk. Other occurrences of limestone cap-rock are found at the Outer Owers (to the SE of Selsey Bill – mSNCI ref. no. 15) and on scattered, isolated 'mushroom-like' formations in Bracklesham Bay.

References:

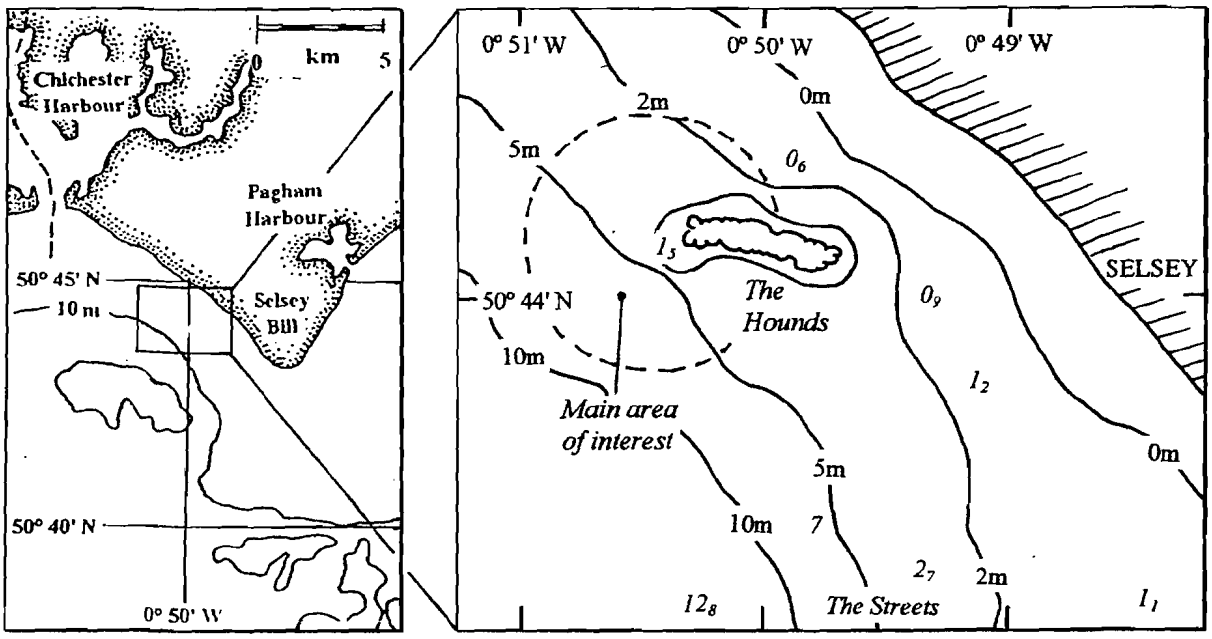
Irving, R.A. 1998. Sussex Marine Life – an identification guide for divers. Lewes, East Sussex County Council.

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

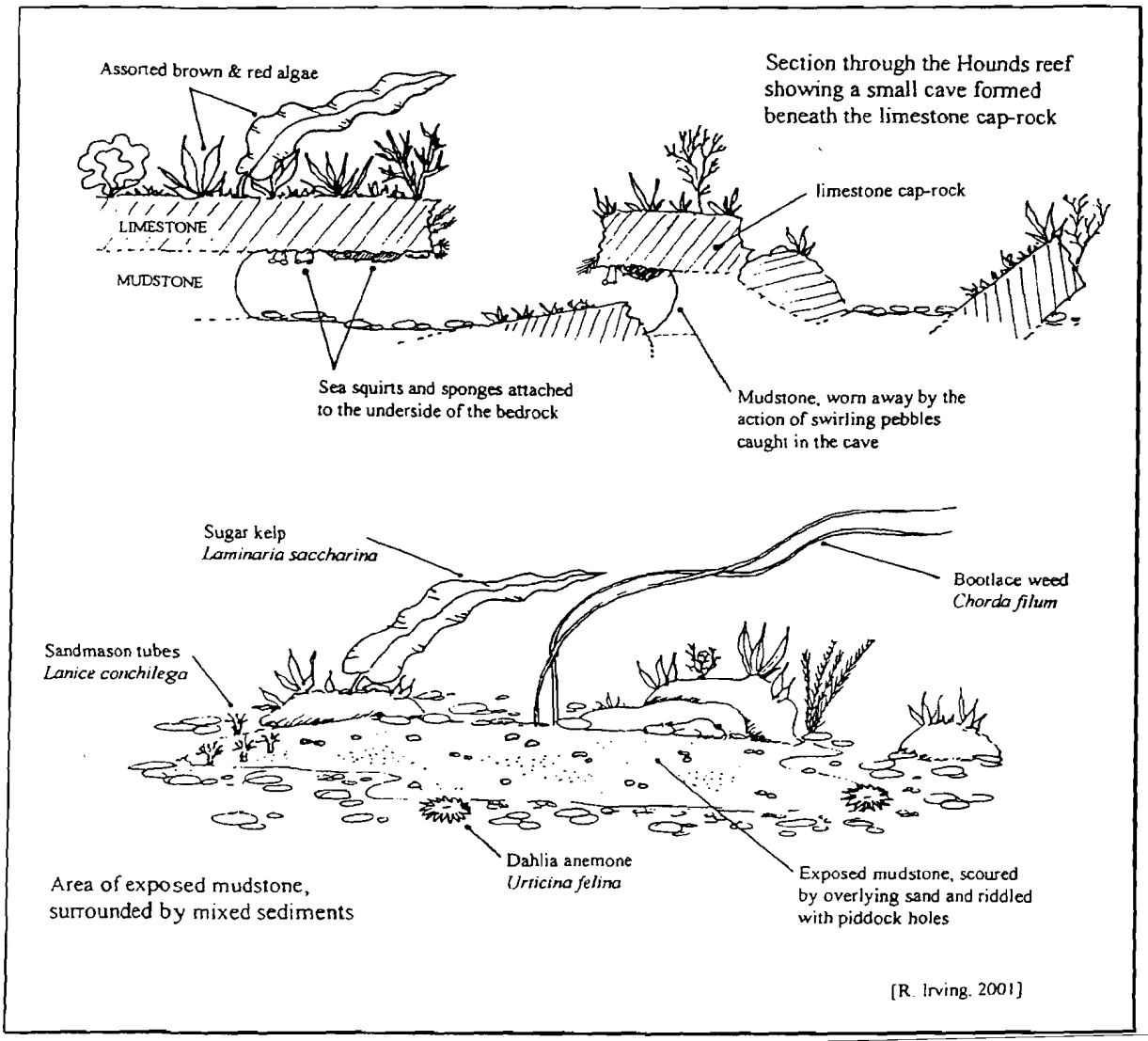
McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

Dive nos.: Sussex *SEASEARCH*: 711/32, 33, 35, 713/159 & 717/22

Site location



Diagrammatic representation of site: THE HOUNDS



Site: **Whirlpool Hole**		*Ref. No.* 14
Location: Just east of the Boulder Buoy, 3 km south of Selsey Bill.		
Lat./Long. position of centre of site: 50° 41.40' N 0° 48.85' W	*OS grid ref. of centre of site:* SZ 837 885	*Author:* Robert Irving
Sea bed type: Steeply sloping seabed of gravel, with a few large boulders at the base.	*Depth range (below chart datum):* 10 – 20 m	*Date Identified:* June 2001

Summary

Whirlpool Hole is an uncharted seabed feature which lies approximately 3 km south of Selsey Bill. Whilst no specific topographical survey has been carried out as part of the Sussex *SEASEARCH* Project, its overall shape appears to be funnel or cone-like. Interest in the feature is largely geomorphological. The diameter of the opening of the hole is in the region of 100-150 m, at the depth of the surrounding seabed (~ 10 m BCD). Its base is 10-15 m across at a depth of about 20 m BCD. The sides of the hole are at a slope of about 45° and are lined with gravel and pebbles and occasional cobbles. There are a few large limestone(?) boulders (~ 1 m in diameter) which have collected at the base of the hole. It is presumed that the hole has come to be in its present form by strong tidal action preventing it becoming filled with surrounding sediments.

Biological description

The sides of the hole are lined with silty gravel and pebbles with occasional flat cobbles. Attached life is largely confined to the larger flat cobbles (being less mobile than the gravel and pebbles), with the exception of tubeworms *Pomatoceros triqueter* and occasional white anemones *Actinothoe sphyrodeta*. The cobbles are covered with various sea squirts (including *Molgula* sp., *Didemnum maculosum* and *Botrylloides leachi*) and occasional bryozoans (*Cellepora pumicosa* and *Flustra foliacea* in particular).

The large rounded boulders at the base of the slope (20 m BCD) are festooned with encrusting sponges, sea squirts and bryozoans, their tops adorned with dense clusters of hornwrack *Flustra foliacea*. The communities here are quite different (and certainly more diverse) than those on the surrounding pebbles and gravel.

Interestingly, McDonald (1985) describes Whirlpool Hole as being very similar to the Mixon Hole, with a sheer cliff of the same geological formation as the Mixon (i.e. a limestone cap over stiff blue clay, with a rubble strewn slope with boulders at the bottom). The descriptions from the two Sussex *SEASEARCH* dives undertaken at the site did not mention any likeness to the Mixon Hole, but it may be that that particular side of the hole to which McDonald was referring, was not surveyed. Clearly the strong tidal currents, which are a definite feature of this area, have had, and continue to have, a considerable influence on the existence of this hole.

Justification

Whirpool Hole appears to be a unique geomorphological *natural* feature off the Sussex coast, the only other physical feature of any similarity being the Mixon Hole (mSNCI ref. no. 2).

References:

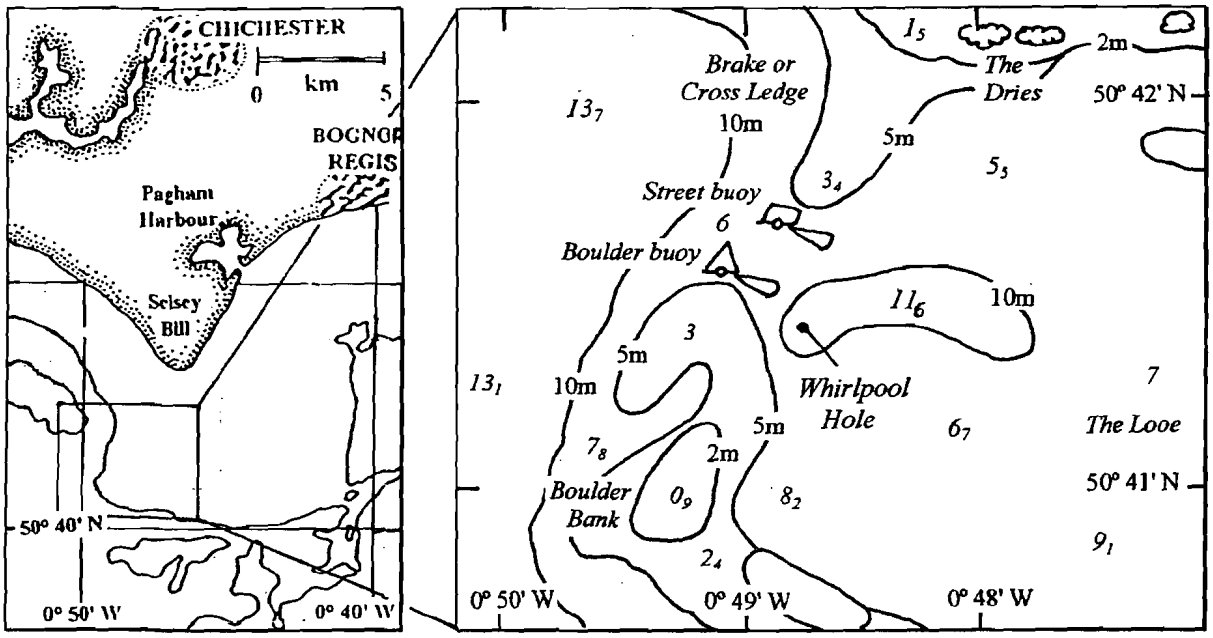
Irving, R.A. 1998. Sussex Marine Life – an identification guide for divers. Lewes, East Sussex County Council.

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

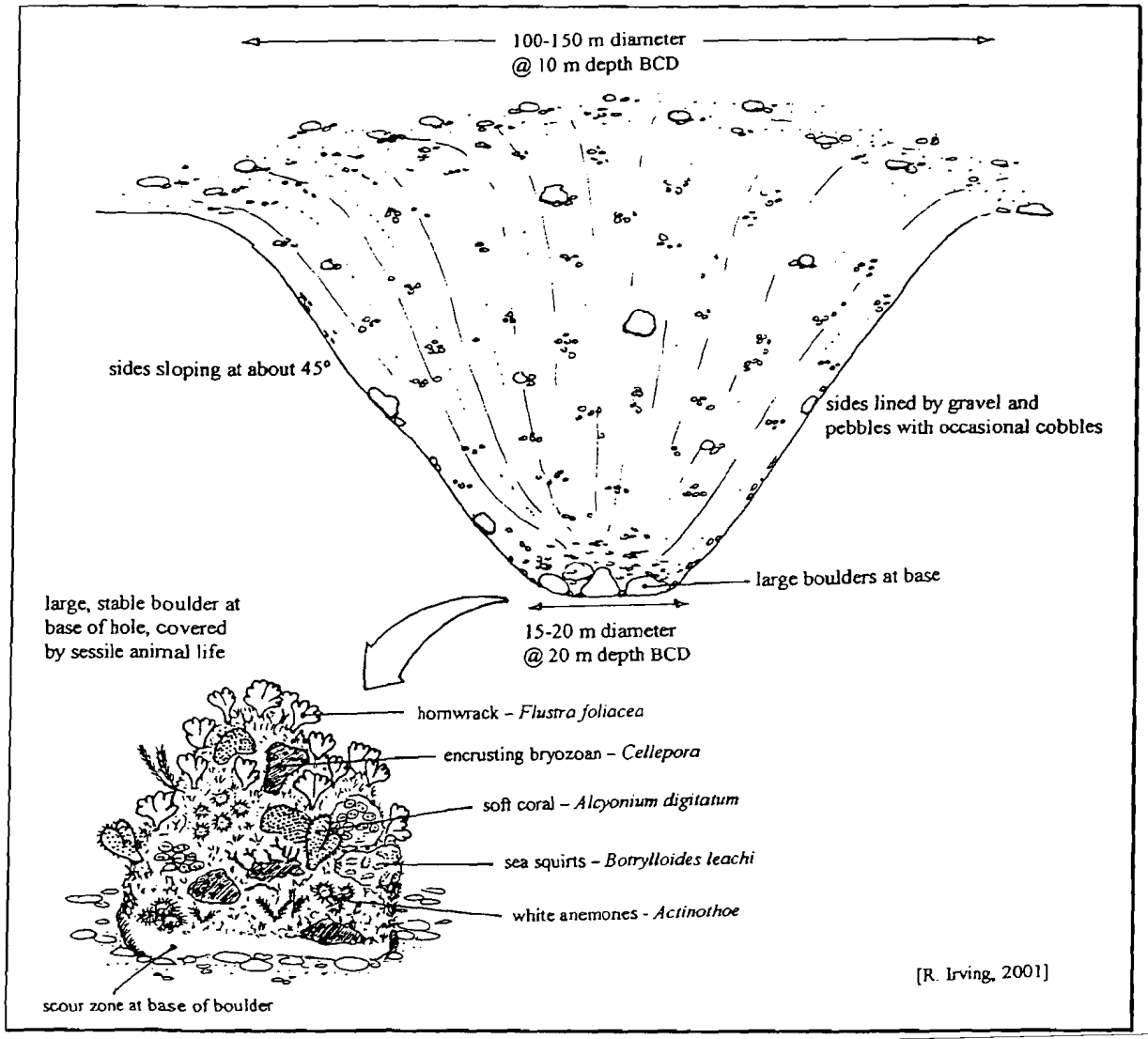
McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

Dive nos.: Sussex *SEASEARCH:* 716/50 & 58

Site location



Diagrammatic representation of site: WHIRLPOOL HOLE



Site: **Outer Owers**		*Ref. No.* 15
Location: 8-10 km SE of Selsey Bill (includes the Elbow and the Shoal of the Lead)		
Lat./Long. position of centre of site: 50° 39.50' N 0° 41.00' W	*OS grid ref. of centre of site:*	*Author:* Robert Irving
Sea bed type: Shallow (to deep) mixed substrata with limestone bedrock, boulders & mudstone on a tide-swept gravel slope.	*Depth range (below chart datum):* 5 – 40+ m	*Date Identified:* June 2001

Summary

The Outer Owers consists of an extensive area of mostly shallow ground lying 8-10 km to the south-east of Selsey Bill, and includes the following features marked on charts: West Head, East Bank, and the Elbow. Within this triangle lie East Borough Head and the Shoal of the Lead. The area consists of a number of rock exposures (of both bedrock and boulders), interspersed by areas of mixed sediments. The area is affected by strong tidal currents, especially close to the Outer Owers buoy (at the southern edge of the area) and the Shoal of the Lead (on the east). Here the seabed drops away very rapidly, forming a steep slope of broken limestone cap-rock, mudstone and gravel, from 0 m to 67 m BCD.

Biological description

The top of the reef known as the Shoal of the Lead consists of a horizontal exposure of limestone similar to that found at the Hounds, to the west of Selsey Bill. The main limestone 'sheet' is about 2 m thick, overlain by more broken slabs of limestone of lesser thickness, typically 30-50 cm thick. The limestone layers are sandwiched between layers of hard clay or mudstone. As the mudstone is eroded by the strong water movements which affect the site (and possibly by fishing gear?), the limestone slabs are left exposed. Eventually these break off and slide down the steep gravel and sand slope as large, flat boulder slabs.

Once stable, the upper surfaces of the slabs gradually become colonised by a low-growing hydroid-bryozoan turf, with occasional anemones, such as *Actinothoe sphyrodeta*, erect hydroids and encrusting sponges. In shallow depths, algae are the dominant cover organisms. The deepest depth at which foliose red algae have been found here is 15.7 m BCD (an unidentified species), and the deepest for brown algae is 10.1 m BCD (*Dictyota dichotoma*). Some sediment is present on the surface of the boulders, presumably swept down from above. The mudstone cobbles are riddled by piddock holes (*SEASEARCH* record 716/23). To the north-east of the aforementioned site, an extensive area of broken slipper limpet and oyster shells has been recorded (*SEASEARCH* record 716/26). The seabed here at 27 m BCD was described as resembling 'ploughed furrows', possibly caused by towed fishing gear but also the result of strong currents. Little marine life was associated with this habitat, with just hermit crabs, sand mason worms and spider crabs being recorded. A similar area of seabed at 28 m BCD, dominated by shell fragments but with little marine life, has been recorded to the SE of here (*SEASEARCH* record 716/30).

Justification

Exposed sublittoral limestone strata are rarely encountered off Sussex, most of the reefs being formed of sandstone or chalk. Other occurrences of limestone cap-rock are found at the Hounds reef (to the W of Selsey Bill – mSNCI Ref. No. 13) and on scattered, isolated 'mushroom-like' formations in Bracklesham Bay. Within the Outer Owers mSNCI area is the deepest area of seabed within 10 km of the Sussex coast (at 67 m BCD), and the steep cliff-like slope forms a unique physiographic feature.

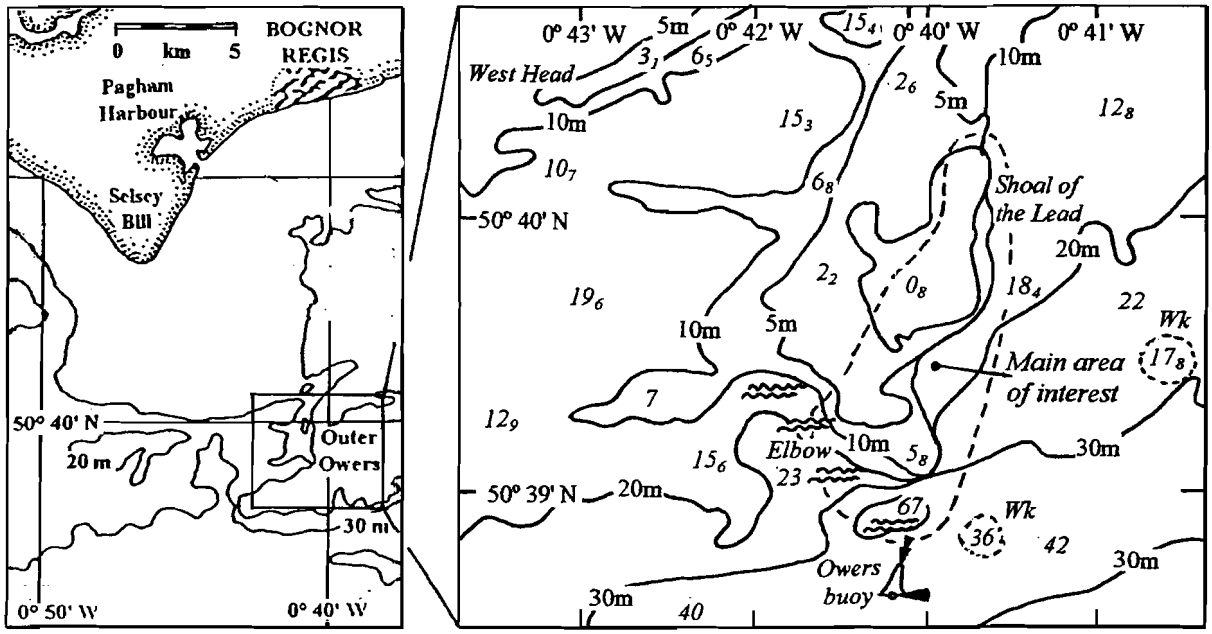
References:

Irving, R.A. 1998. Sussex Marine Life – an identification guide for divers. Lewes, East Sussex County Council.

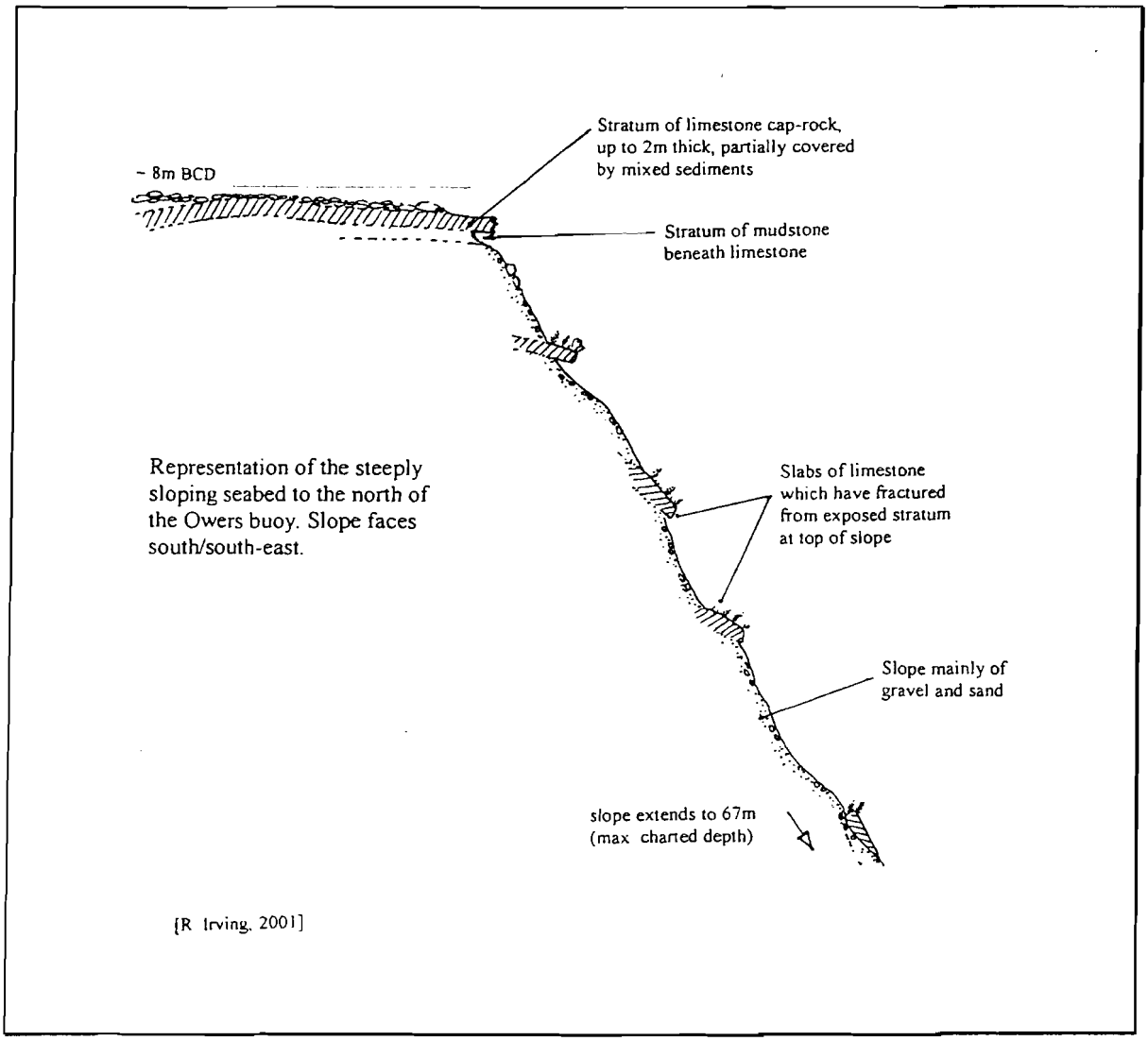
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

Site location



Diagrammatic representation of site: OUTER OWERS



Site: **Kingmere Rocks**		*Ref. No.* 16
Location: 10 km SSE of Littlehampton.		
Lat./Long. position of centre of site: 50° 43.53' N 0° 27.62' W	*OS grid ref. of centre of site:* TV 086 929	*Author:* Robert Irving
Sea bed type: Sandstone & mudstone reefs, mostly of boulders, cobbles and mixed ground	*Depth range (below chart datum):* 6 – 14 m	*Date Identified:* June 2001

Summary

Kingmere Rocks encompasses a large area (in the region of 0.5 sq. nautical miles) of uneven seabed, consisting of outcrops of sandstone rising 2-3 m above the surrounding seabed, with boulders and mixed sediment areas in between. The boulders are frequently in the form of large rectangular slabs, 1-2 m in width/length and 20-50 cm thick (see also the Waldrons reef, mSNCI ref. 5). Although the depth of the seabed ranges from 6-14 m BCD, there is very little obvious slope to the seabed. In places, horizontal exposures of mudstone are present amongst the mixed sediment areas.

Biological description

The upward-facing surfaces of sandstone bedrock and boulders are 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 are dominated by a dense animal turf, particularly the bryozoans *Bugula* spp. and *Flustra foliacea*. Extensive patches of encrusting coralline algae are present on the sides of the boulders, together with various sponges (*Esperiopsis fucorum*, *Dysidia fragilis*, *Tethya aurantium*, *Suberites ficus* and *Polymastia mammilaris*), dead man's fingers *Alcyonium digitatum*, sea squirts (especially *Clavelina lepadiformis*, *Aplidium punctum* and *Morchellium argus*), and occasional starfish *Asterias rubens*. The mud tubes of fan worms (particularly *Bispira volutacornis*) protrude from the cracks between boulders, and edible crabs *Cancer pagurus* are frequently encountered sheltering under overhangs. A narrow band at the base of bedrock outcrops and boulders is scoured clean of encrusting marine life by periodic movement of surrounding sediment. Fish associated with the reef areas include bib *Trisopterus luscus*, tompot blenny *Parablennius gattorugine* and ballan wrasse *Labrus bergylta*, though the most frequently recorded wrasse species from here has been the goldsinny *Ctenolabrus rupestris*.

Areas between the reef have a seabed of mixed sediments, consisting of cobbles, pebbles, gravel, shells and sand. Occasionally, there are chalk cobbles and pebbles in amongst the flints. Most of the fauna here is mobile, reflecting the unstable nature of the sediments, such as hermit crabs, netted dogwhelks *Hinia reticulata* and gobies. However, there may also be the occasional dahlia anemone *Urticina felina* and the odd cobble or pebble with encrustations of keelworms *Pomatoceros triqueter*.

Justification

Sublittoral rocky reefs account for probably less than 3% of the total area of seabed off Sussex (within the 12 nm limit of territorial waters). Kingmere Rocks is an example of a sandstone reef area with a rich and diverse fauna and flora associated with it.

References:

Irving, R.A. 1998. Sussex Marine Life – an identification guide for divers. Lewes, East Sussex County Council.

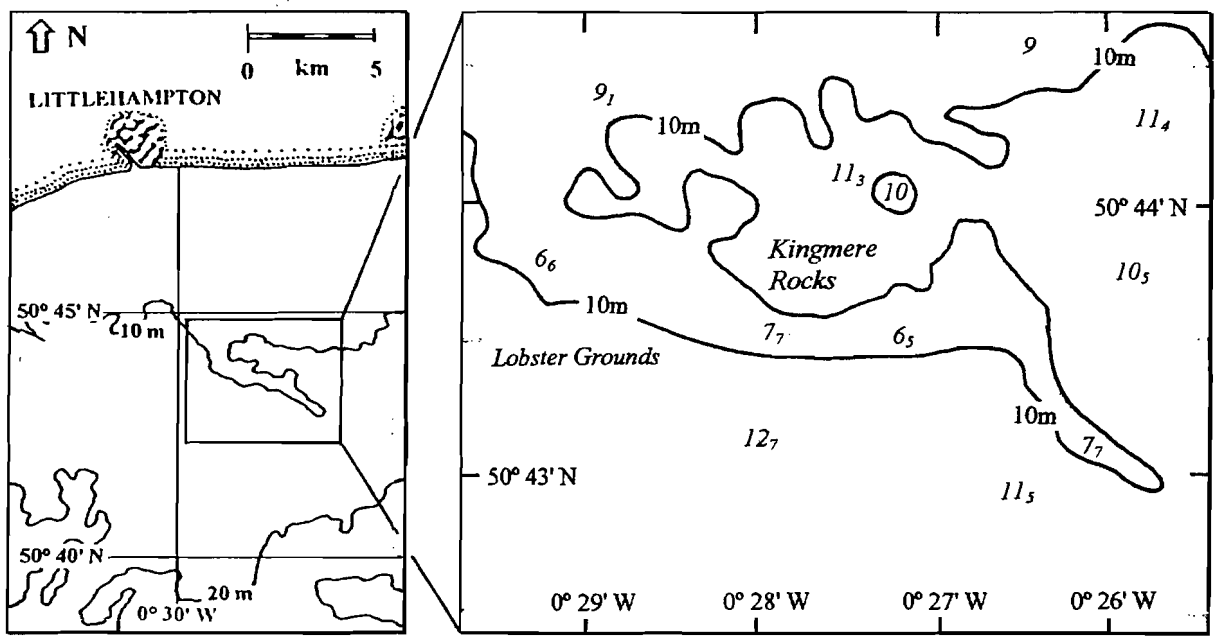
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

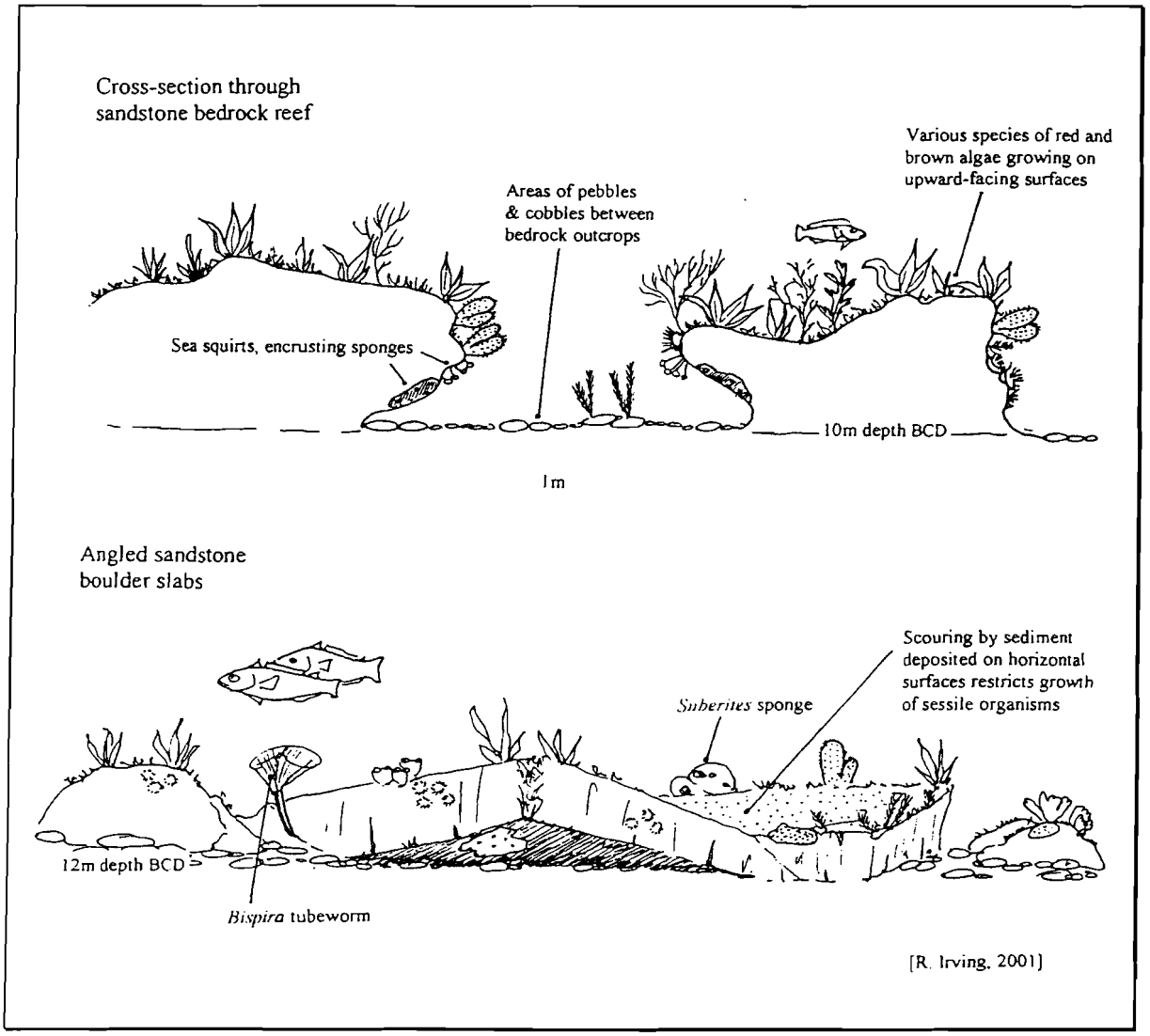
Wood, C. (ed.) 1984. *Sussex Sublittoral Survey: Selsey Bill to Beachy Head.* Marine Conservation Society, SE Branch.

Dive nos.: Sussex Sublittoral Survey: 83/43. Sussex *SEASEARCH*: 711/36, 712/102, 713/17, 21, 22, 25, 146 & 147.

Site location



Diagrammatic representation of site: KINGMERE ROCKS



Site: **Ship Rock**		*Ref. No.* 17
Location: 2 km SSW of the West Pier, Hove.		
Lat./Long. position of centre of site: 50° 47.95' N 0° 09.90' W	*OS grid ref. of centre of site:* TQ 293 016	*Author:* Robert Irving
Sea bed type: Low-lying chalk reef/cliff	*Depth range (below chart datum):* 9 – 11 m	*Date Identified:* June 2001

Summary

Ship Rock is a sublittoral exposure of low-lying chalk cliff (or ledge) approximately 2 km SSW of the West Pier, Hove. The cliff lies at a depth of 9-11 m BCD and is reported to be just over 100 m long. The maximum height of the cliff is 1.0 m (along two short sections), though it has an average height of nearer 0.5 m. It is assumed this is the same site known by some divers as Kingswest Ledge. Indeed, this may be a more appropriate name for the whole linear feature. It is reported that sections of the cliff appear to have collapsed, possibly the result of fishing gear being towed over them.

Biological description

As with the other sections of sublittoral chalk cliffs present off Sussex, the line of the cliff forming Ship Rock runs approximately WSW/ENE. The cliff face itself faces the shore (i.e. northwards), the top of the cliff being on the seaward (though shallower) side.

The cliff is roughly stepped for much of its length, with many fissures, crevices and holes. Many of the exposed sheltered surfaces are heavily silted. The cliff's horizontal top has sparse foliose red algae growing on it, with occasional clumps of hydroids on the current-swept edge. The vertical chalk faces have a general covering of hydroid-bryozoan turf and are frequently riddled by piddock holes (most likely to be *Pholas dactylus*). Other fauna, such as colonial ascidians (e.g. *Aplidium punctum*), sponges and erect bryozoans cover the chalk surface. Occasional clusters of *Bispira volutacornis* tubeworms are present in places. The base of the cliff has been eroded in places to form small caves, often occupied by crustacea, especially prawns and edible crabs *Cancer pagurus*. Other mobile fauna present include occasional velvet swimming crabs *Necora puber*, goldsinny *Ctenolabrus rupestris*, ballan wrasse *Labrus bergylta*, tompot blennies *Parablennius gattorugine*, and leopard-spotted gobies *Thorogobius ephippiatus*. Triggerfish *Balistes carolinensis* have also been recorded from this vicinity and seen sheltering within the small caves. At the foot of the cliff, horizontal exposed chalk bedrock is present, with scattered chalk boulders, cobbles and mixed sediments.

Justification

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). These exposures are therefore of regional, if not national, importance, more as an unusual feature rather than on account of the marine communities they possess. Other sublittoral chalk cliff exposures off Sussex include the Worthing Lumps (mSNCI ref. 8), South-West Rocks (mSNCI ref. 9) and Looe Gate (mSNCI ref. 10).

References:

Irving, R.A. 1998. Sussex Marine Life – an identification guide for divers. Lewes, East Sussex County Council.

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

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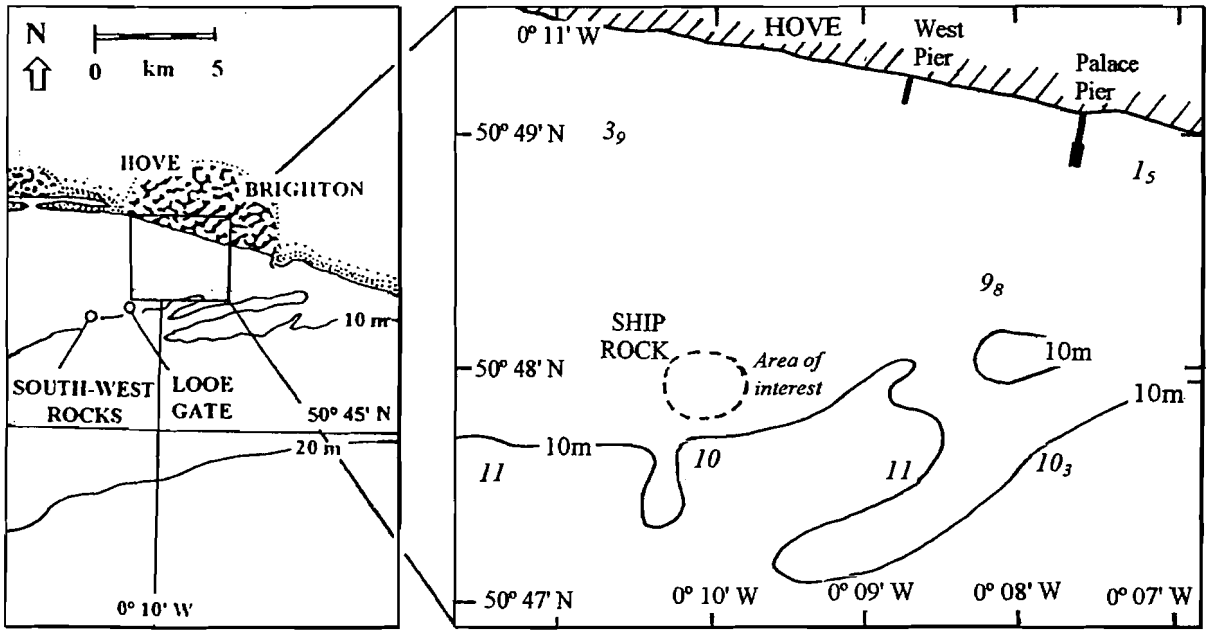
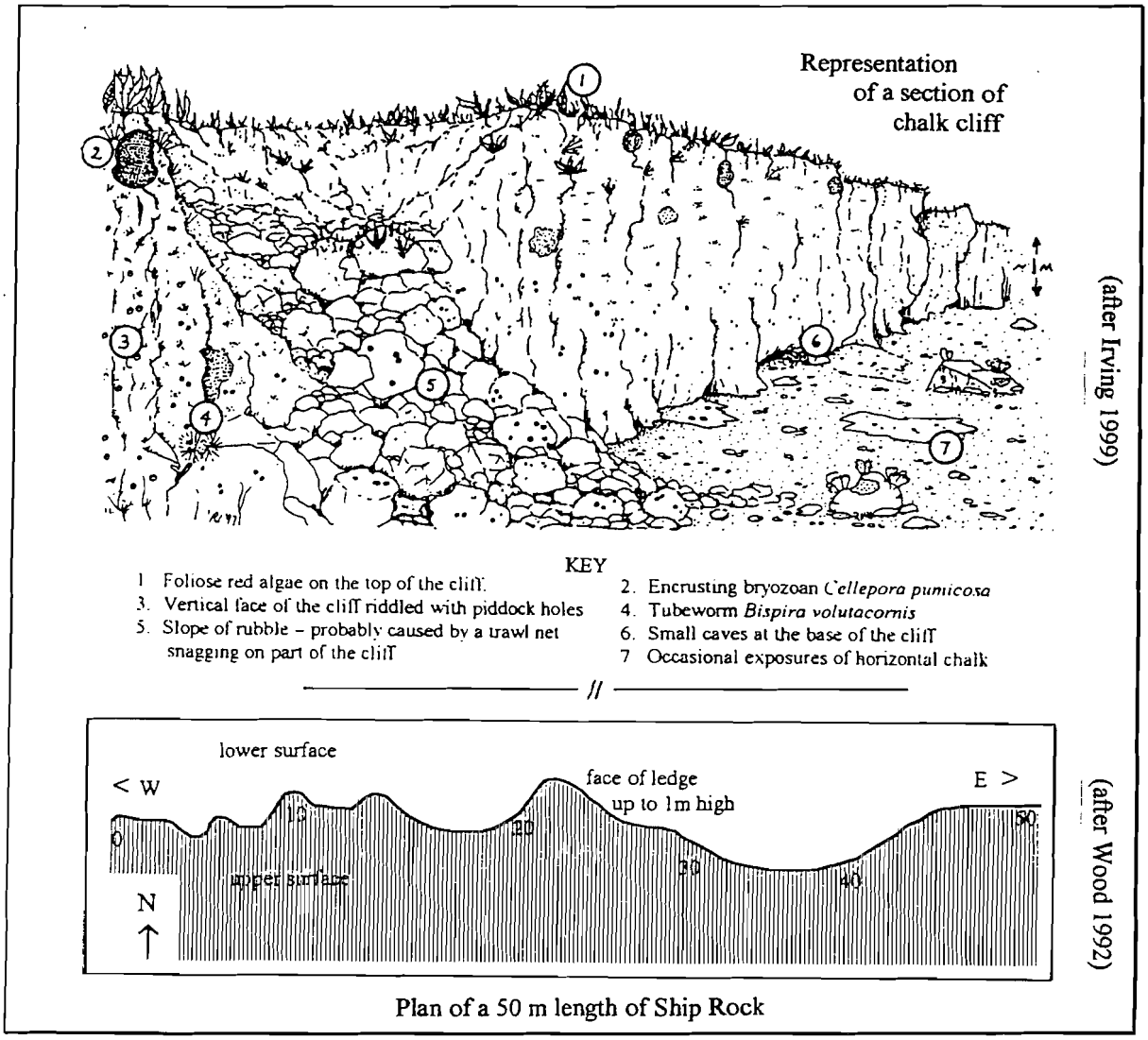
Wood, C. 1992. *Sublittoral Chalk Habitats in southern England.* Report of the Marine Conservation Society, SE Group Chalk Cliffs project 1985-1991. Marine Conservation Society, Ross-on-Wye.

Dive nos.: Sussex Sublittoral Survey: (83/30). Sussex *SEASEARCH*: 713/49-51, 168-170, 185-187 & 202

Site location



Diagrammatic representation of site: SHIP ROCK



Plan of a 50 m length of Ship Rock

Site: **Brighton Marina**		*Ref. No.* 18
Location: About 2 km E of the Palace Pier, Brighton.		
Lat./Long. position of centre of site: 50° 48.50' N 0° 06.20' W	*OS grid ref. of centre of site:*	*Author:* Robert Irving
Sea bed type: Mud seabed, but most interest in the communities associated with the floating pontoons of wood, polystyrene & concrete.	*Depth range (below chart datum):* 0 – + 3 m	*Date Identified:* June 2001

Summary

Brighton Marina was built between 1971 and 1999, though the Outer Harbour was operational by 1980. The construction of the Marina obliterated Black Rock Ledge, an Upper Cretaceous chalk exposure of considerable geological and marine biological interest. It is apt that such a development has now acquired a marine biological interest all of its own, quite different from that which it possessed before. The main interest now lies in the marine community which has colonised the floating pontoons in the Outer Harbour, though the Inner Harbour has the potential of developing similarly interesting, though quite different, communities adapted to brackish water conditions.

Biological description

Two main types of structure exist in the Outer Marina: those that are floating (i.e. the concourses and the pontoons) and those that are non-floating (i.e. the pilings and the harbour walls). The floating structures provide the prime marine biological interest of the site, as these rise and fall with each successive tide, their undersides never being exposed to the air. This fact, coupled with the extreme shelter which the Marina's east and west breakwaters provide, has allowed for a diverse and prolific community to have developed just below the surface, featuring many species which are usually encountered in water depths of 10 m or more (i.e. well below low water mark). Of particular note are the sponges (e.g. *Suberites ficus*, *Halichondria bowerbanki*), anemones (e.g. *Metridium senile*, *Sagartia* sp.), and ascidians (e.g. *Ciona intestinalis*, *Ascidia mentula* and *Ascidiella aspersa*). Many individuals grow surprisingly large, reflecting the sheltered conditions and slightly elevated water temperatures. The non-floating structures (i.e. the pilings and the harbour walls) are subject to the full range of tidal movement and therefore support completely different communities, more characteristic of vertical zonation in the littoral zone.

A third habitat type is the Outer Marina's seabed. As a result of the extreme shelter afforded the Outer Harbour, the seabed here mostly consists of settled silt on top of soft mud, both of which are very easily disturbed. In amongst the mud protrude a number of man-made objects: mostly various items of rubbish such as drink cans and the inevitable shopping trolley. Harbour crabs *Liocarcinus depurator* are often seen on the bottom, together with juvenile flatfish. The enclosed water of the Marina is often a degree or two warmer than the open water outside, and this, together with the shelter on offer, makes it conducive to many species of fish and other open water species. The jellyfish *Rhizostoma plumo*, *Aurelia aurita* and *Chrysaora hysoscella* have been recorded from here, together with species of mullet, eels, wrasse, bass, black goby, fifteen-spine stickleback and greater pipefish.

Justification

The subtidal communities which have colonised the floating pontoons in the Outer Harbour are unusual and rarely encountered elsewhere along the Sussex coast. The site permits these communities (normally accessible for study by diving biologists only) to be studied from the safety and comfort of dry land!

References:

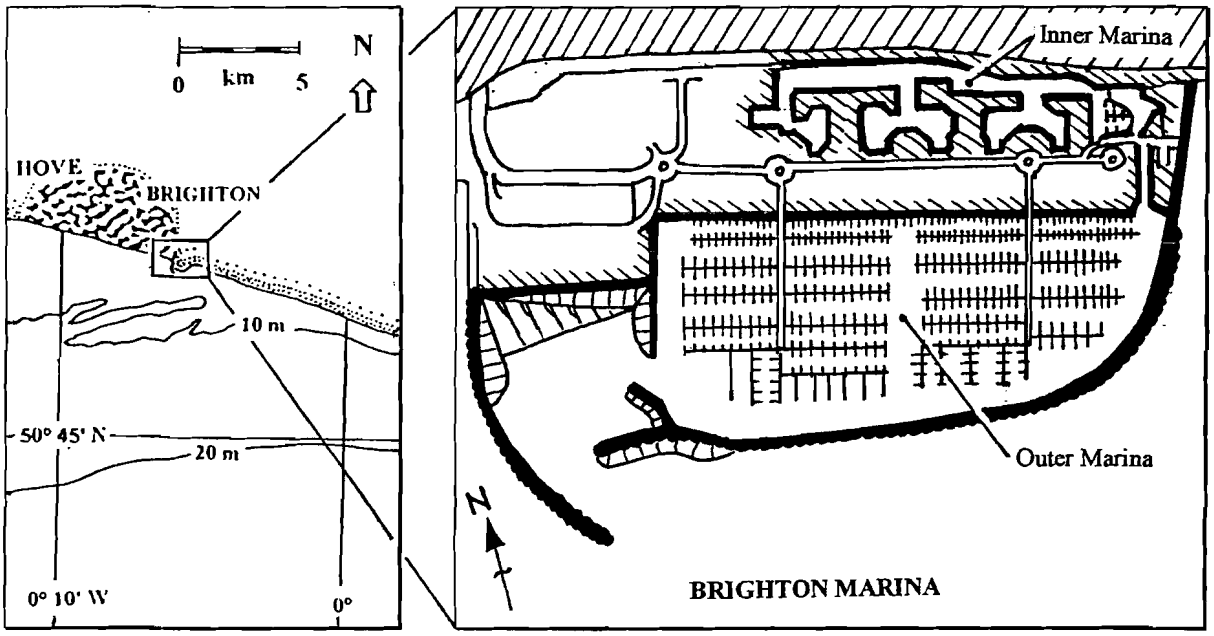
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

Natural Science Services. 1991. Report on the preliminary marine biological survey of Brighton Marina, carried out in association with the Marine Conservation Society, May-October 1990.

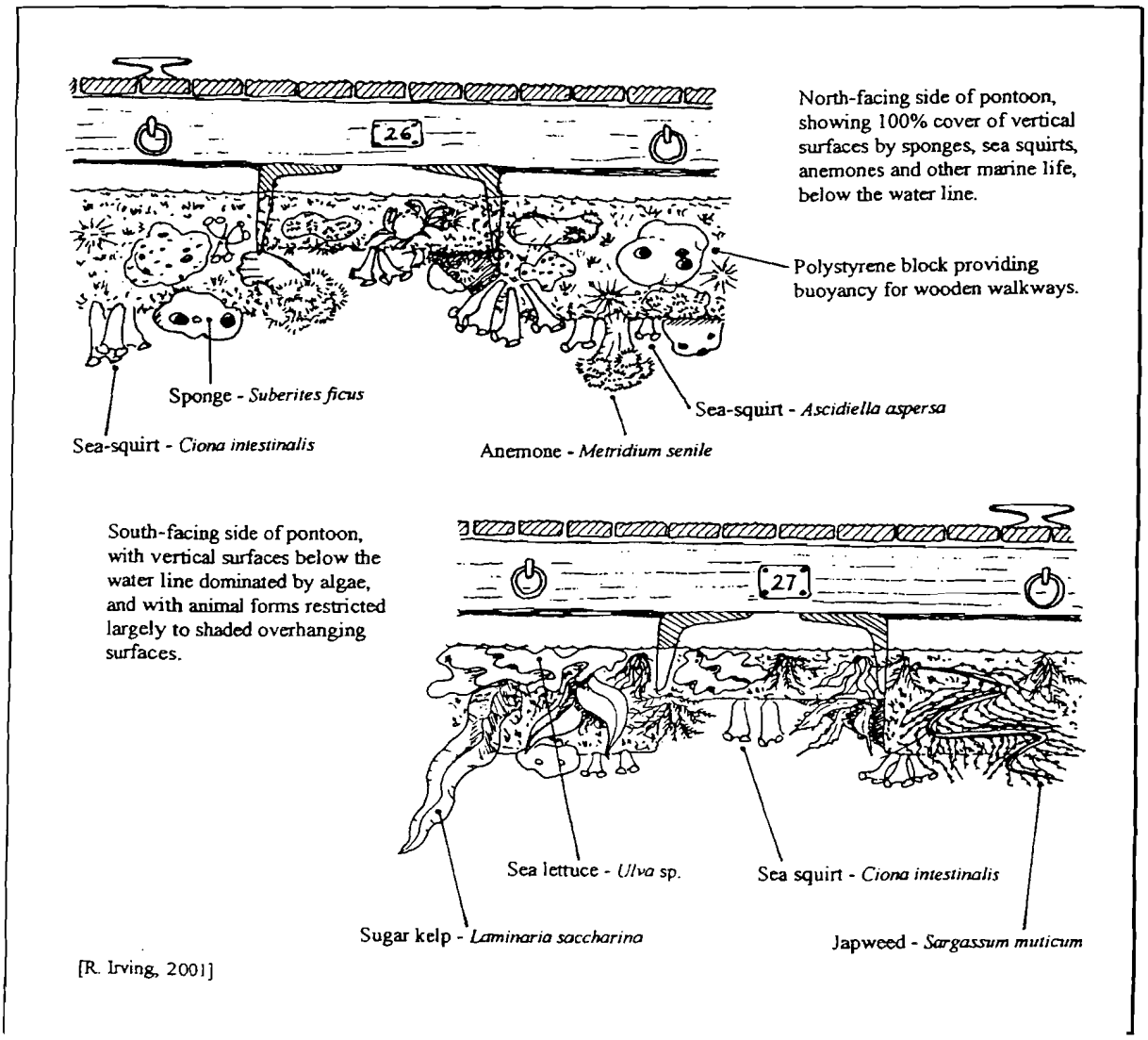
Dive nos.: (SEMCS Brighton Marina Survey, 1990/91) Sussex *SEASEARCH*: 714/1

Site location



Diagrammatic representation of site: BRIGHTON MARINA

Note that this site adjoins the Brighton - Newhaven mSNCI site



[R. Irving, 2001]

Site: **Marina Reef**		*Ref. No.* 19
Location: 1 km SSW of the entrance to Brighton Marina		
Lat./Long. position of centre of site: 50° 47.64' N 0° 06.66' W	*OS grid ref. of centre of site:* TQ 331 011	*Author:* Robert Irving
Sea bed type: Reef of chalk and grey clay with chalk slabs and boulders	*Depth range (below chart datum):* 9 – 13 m	*Date Identified:* June 2001

Summary

Marina Reef (also known as 'Measor's Rocks') lies approximately 1 km SSW of the entrance to Brighton Marina at a depth of 9-13 m BCD. It consists of an exposure of chalk bedrock lying above a stratum of grey clay.

Biological description

Marina Reef is said to be up to 500 m long (though this has yet to be confirmed), forming a gradual curve in plan view. Its form varies considerably along its length, the width of the raised bedrock forming the reef ranging from about 15-50 m. It rises to a maximum of 3 m above the surrounding seabed. Essentially the reef consists of an angled narrow stratum of chalk (only about 30 cm thick) with a softer grey layer 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 following erosion of the clay base. In places the chalk bedrock has been dissected into blocks, with numerous small gullies in between, which in places form steps and ledges.

Sparse foliose red algae are present on the shallowest parts of the reef, with the upper vertical faces being dominated by a hydroid-bryozoan turf. Other larger hydroids, such as *Nemertesia antennina* and *Hydrallmania falcata*, are also present on the vertical and steeply sloping faces, along with dead man's fingers *Alcyonium digitatum*, fan worms *Bispira volutacornis*, white anemones *Actinothoe sphyrodeta* and various small ascidians. The horseshoe worm *Phoronis hippocrepia* is commonly found on upward –facing surfaces, which often have a heavy covering of silt on them. Holes at the base of the reef are likely to harbour various crustaceans, especially edible crabs *Cancer pagurus*, lobster *Homarus gammarus* and velvet swimming crabs *Necora puber*. The sponges *Polymastia mamillaris* and *Ciocalypta penicillus*, not often recorded elsewhere in Sussex waters, have also been noted from here. Piddocks holes are present where both the chalk and the clay are exposed. Fish associated with the reef include bib *Trisopterus luscus*, goldsinny *Ctenolabrus rupestris* and tompot blennies *Parablennius gattorugine*.

Between the bedrock outcrops, and also on their fringes, are patches of sand overlying the soft clay with occasional pebbles. Empty slipper limpet shells are frequently present here, with the hydroid *Sertularia argentea* being attached to occasional pebbles. Other regularly seen marine life in this habitat includes hermit crabs and occasional flatfish.

Justification

Sublittoral chalk exposures are unusual within the British Isles, with most being found in the South East. Marina Reef is a good example of a sublittoral chalk reef. Whilst not being particularly spectacular in its form or in the marine communities it possesses, the reef nonetheless forms an oasis of life surrounded by vast expanses of relatively barren sand.

References:

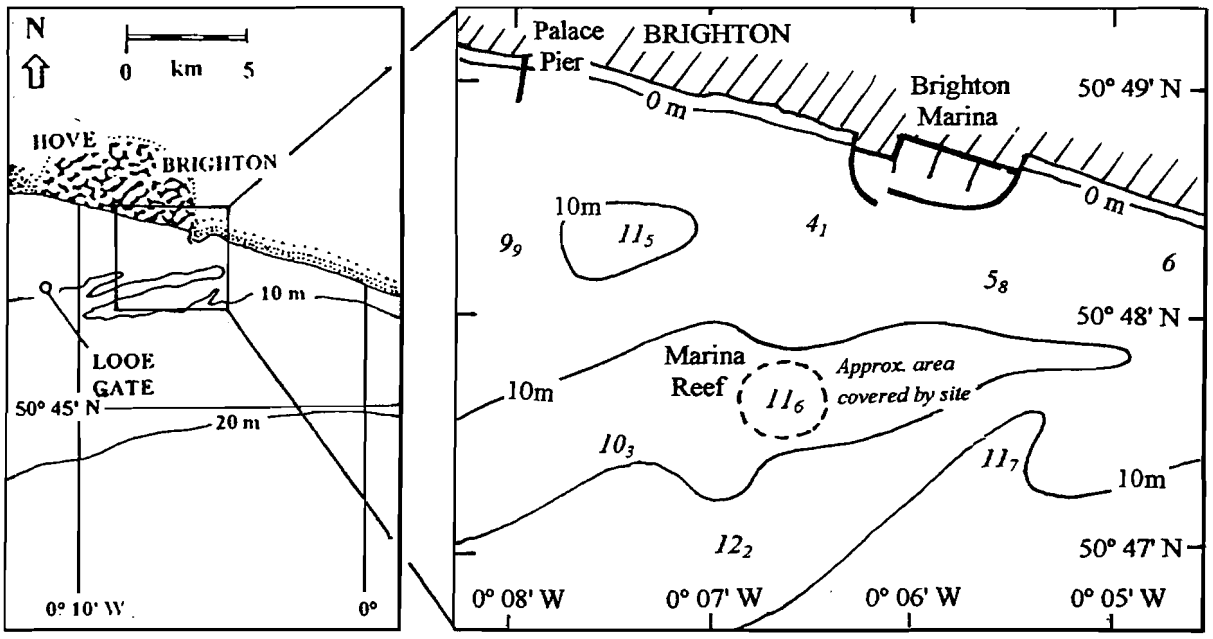
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

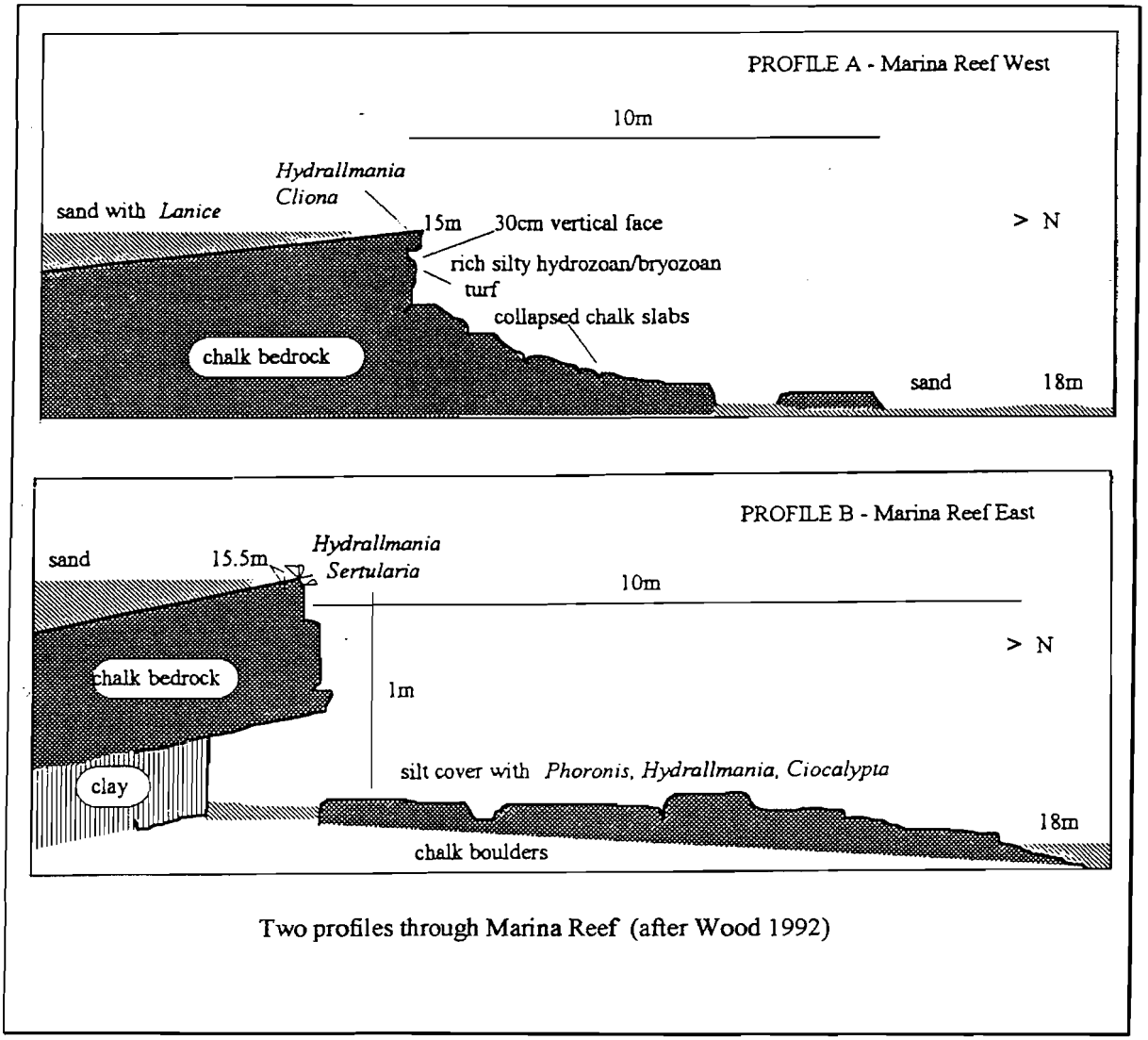
Wood, C. 1992. *Sublittoral Chalk Habitats in southern England.* Report of the Marine Conservation Society, SE Group Chalk Cliffs project 1985-1991. Marine Conservation Society, Ross-on-Wye.

Dive nos.: Sussex Sublittoral Survey: Sussex *SEASEARCH*: 713/53-55, 58, 715/1, 8, 717/1, 2, 4 & 5

Site location



Diagrammatic representation of site: MARINA REEF



Two profiles through Marina Reef (after Wood 1992)

Site: ***City of Waterford* wreck**		*Ref. No.* 20
Location: 15 km S of Brighton Marina.		
Lat./Long. position of centre of site: 50° 40.57' N 0° 06.69' W	*OS grid ref. of centre of site:* TV 334 880	*Author:* Robert Irving
Sea bed type: Metal plates & superstructure lying proud of surrounding seabed of sand and gravel	*Depth range (below chart datum):* 23 – 29 m	*Date Identified:* June 2001

Summary

The *City of Waterford* was a 1,258 ton British steamer built in 1921 in the Clyde (and originally named *Skerries II*), which sank in 1949 after a collision with a Greek steamer in thick fog. She now sits upright on the seabed with a slight list to port, the shallowest part of her superstructure being at 23 m BCD with the seabed at 29 m BCD. She makes a popular deep water wreck dive for many of the local diving clubs.

Biological description

Much of the superstructure of the wreck is covered by marine life. Fauna recorded from the wreck includes various crustaceans (for example lobster *Homarus vulgaris*, edible crab *Cancer pagurus*, spider crab *Maja squinado* and swimming crabs), patches of mussels *Mytilus edulis*, clumps of the hydroid *Nemertesia antennina* and occasional sea anemones and dead man's fingers *Alcyonium digitatum*. Arguably, the main biological interest on the wreck is the presence of variously coloured patches of jewel anemones *Corynactis viridis* on vertical metal plates. These patches have been described as being 0.5-1.0 m^2 in size, with green, pink/purple and orange colour morphs being conspicuous. Jewel anemones are commonly found along the western seaboard of the British Isles, though are rare this far east along the English Channel. Indeed, this is the furthest east they have been recorded.

The fish life on and around the wreck is prolific, the wreck providing shelter and food for a wide variety of species. In particular, large numbers of big individuals have been noted (this despite it being a popular site for anglers too). The following fishes have been recorded from the site: conger eel *Conger conger* (common); bass *Dicentrarchus labrax* (numerous at times); pollack *Pollachius pollachius* (common and usually very large individuals); cod *Gadus morhua* (common, though not so much in recent years); bib *Trisopterus luscus* (abundant); brill *Scophthalmus rhombus* (rare though difficult to spot); plaice *Pleuronectes platessa* (common); lemon sole *Microstomus kitt* (occasional); Dover sole *Solea solea* (common); and black sea bream *Spondyliosoma cantharus* (possibly common at certain times of year).

The surrounding seabed, at 29 m BCD, is of sand and gravel.

Justification

Many shipwrecks litter the seabed off the Sussex coast in varying states of decay. The *City of Waterford* is a particularly good example of a 'modern' shipwreck which lies in deep water in a largely intact state. The marine life associated with the wreck is 'typical' for this part of the country. The main biological interest is that this is thought to be the furthest east the jewel anemone *Corynactis viridis* is found in the English Channel.

References:

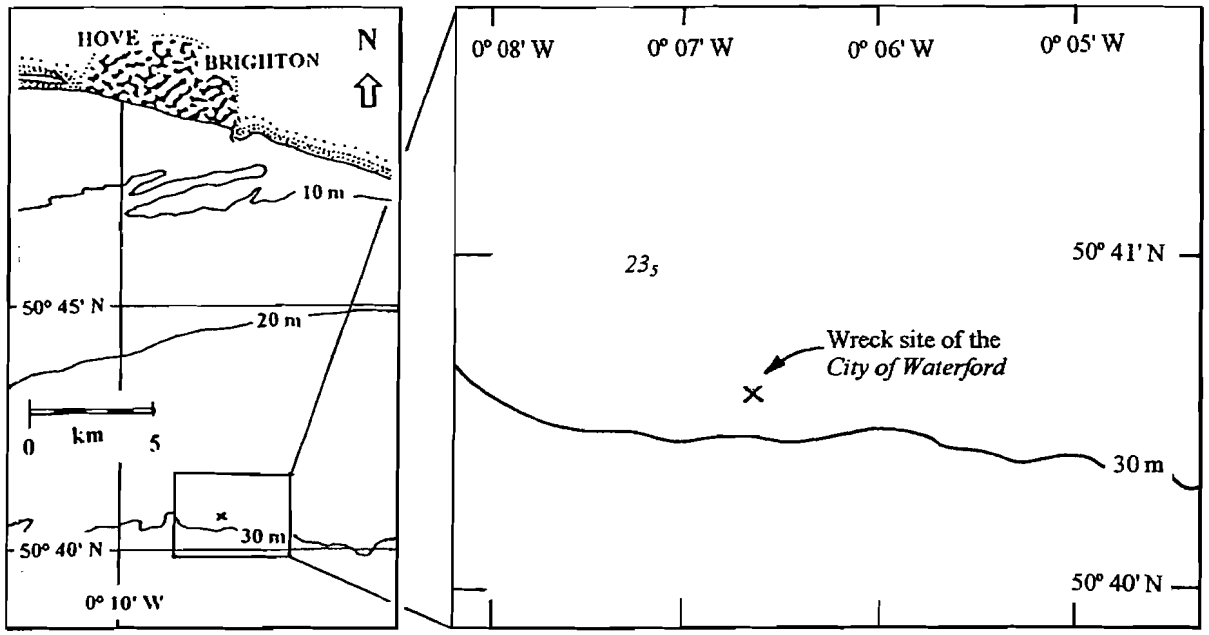
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

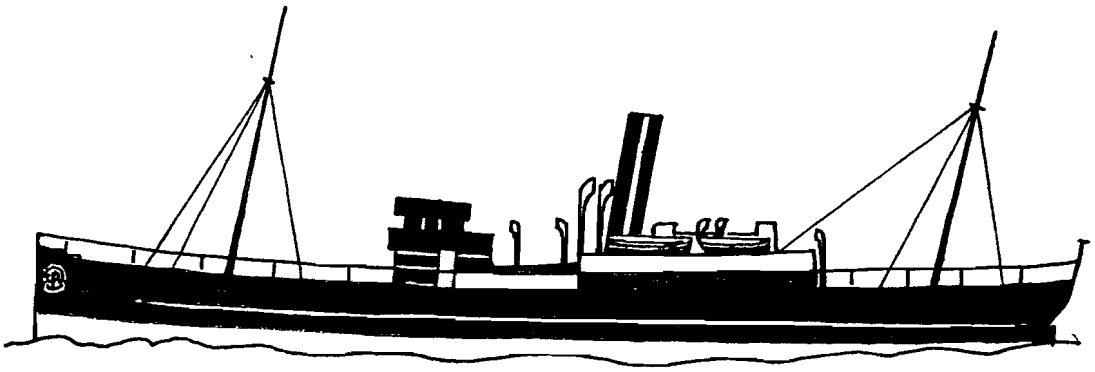
Salsbury, J. 1984. *Sussex Shipwrecks – a personal view.* West Press Publishing, Shoreham.

Dive nos.: Sussex *SEASEARCH*: 714/71 & 716/12

Site location



Diagrammatic representation of site: *CITY OF WATERFORD*



The *City of Waterford* – a drawing taken from a photograph featured in *Sussex Shipwrecks* by John Salsbury, 1984.

Site: **Subtidal wave-cut chalk platform (Brighton –Newhaven)**		*Ref. No.* 21
Location: East of Brighton Marina to Newhaven breakwater (11 km in length).		
Lat./Long. position of centre of site: 50° 47.57' N 0° 01.27' W	*OS grid ref. of centre of site:* TQ 394 011	*Author:* Robert Irving
Sea bed type: Dissected chalk platform with ridges and gullies – site extends from mid-shore to approx. 750 m seaward.	*Depth range (below chart datum):* + 1 – 6 m	*Date Identified:* June 2001

Summary

The foreshore between Brighton Marina and the Newhaven breakwater (approximately 11 km in length) comprises a wave-cut chalk platform which extends beyond low water mark into the shallow sublittoral. On the lower shore and beyond, the platform has been eroded into a number of low-lying ridges and gullies which extend for approximately 3-500 m out to sea. The ridges become less distinct as one moves further away from the shore, until the chalk bedrock eventually becomes covered by sand.

Biological description

Beyond low water mark, the chalk bedrock has been eroded into a series of flat-floored gullies with prominent ridges in between, aligned perpendicular to the shore. The height of the ridges is greatest closest to the shore (1.2 m being the maximum recorded), reducing to just 20-30 cm further out. Similarly, the gullies may be 1.2 m wide closest to the shore, but reduce to 20-30 cm further out. The sides of the gullies are usually concave, but on occasion are vertical or undercut. The gully floors have a light covering of sand or fine silt, with occasional chalk and flint cobbles too. The ridges between the gullies tend to be flat-topped with up to 90% cover of foliose red algae on upward-facing surfaces, as well as some encrusting calcareous growths. Most surfaces have silt deposited on them. The surface of the chalk bedrock is pitted by holes – mostly caused by piddocks, but with smaller ones resulting from the actions of boring worms such as spionids and horseshoe worms *Phoronis hippocrepia*. The ridges and gully sides are often covered with tightly-packed mussels *Mytilus edulis* (often with accompanying common starfish *Asterias rubens*), and also barnacles. Sponges recorded from here include the goose-bump sponge *Dysidea fragilis* and *Halichondria bowerbanki*, together with silt-tolerant ascidians *Molgula* spp., the antenna hydroid *Nemertesia antennina* and occasional anemones (including small plumose *Metridium senile* and dahlia anemones *Urticina felina*). Mobile species include spiny spider crabs *Maja squinado*, velvet swimming crab *Necora puber*, and hermit crabs. Fishes include many small bib *Trisopterus luscus*, ballan wrasse *Labrus bergylta* and small gobies *Pomatoschistus* spp.

Little life is apparent on the patches of sand encroaching the seaward end of the gullies. Infauna includes occasional sandmason worms *Lanice conchilega*, lugworms *Arenicola marina*, and heart urchins *Echinocardium cordatum*. Apparent on the surface may be netted dogwhelks *Hinia reticulata*, common whelks *Buccinum undatum*, hermit crabs, flatfish, and even juvenile rays.

Justification

Sublittoral chalk exposures are unusual within the British Isles, with the vast majority being found in the South East. The wave-cut platform between Brighton and Newhaven displays the characteristic features of gully and ridge topography, with their associated biological communities.

References:

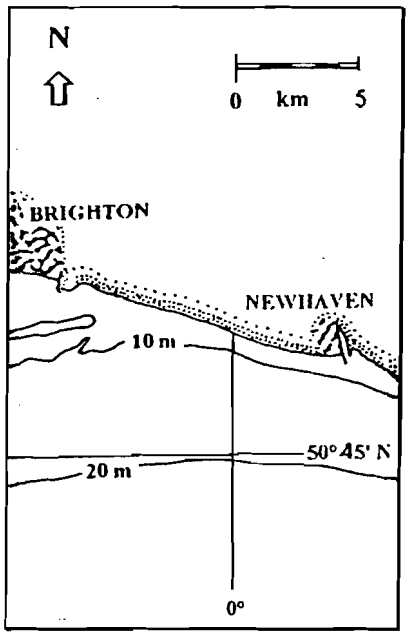
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

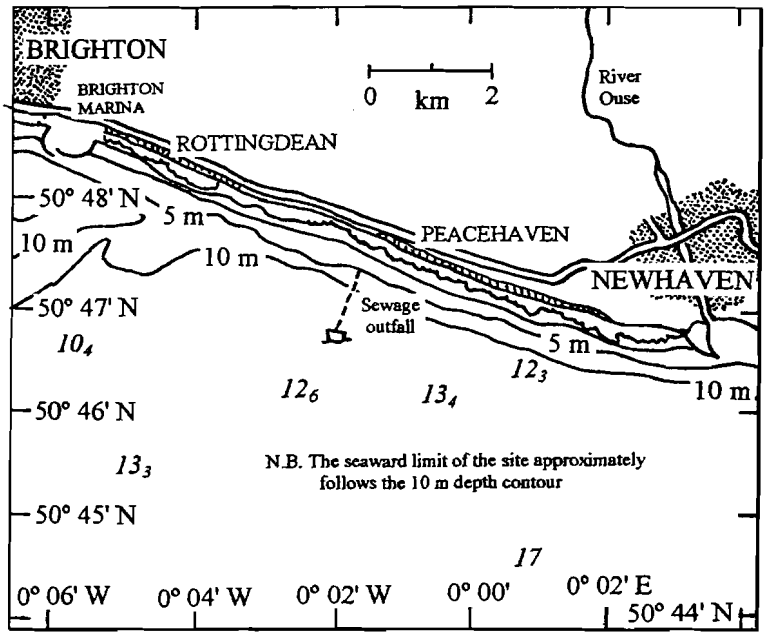
Wood, C. (ed.) 1984. *Sussex Sublittoral Survey: Selsey Bill to Beachy Head.* Marine Conservation Society, SE Branch.

Wood, C. 1992. *Sublittoral Chalk Habitats in southern England.* Report of the Marine Conservation Society, SE Group Chalk Cliffs project 1985-1991. Marine Conservation Society, Ross-on-Wye.

Dive nos.: Sussex Sublittoral Survey: 82/13, 83/31 & 33. Sussex *SEASEARCH*: 714/2-5, 7, 10, 11, 19-21, 48-50, 715/37, 38, 716/13, 16, 18, 19

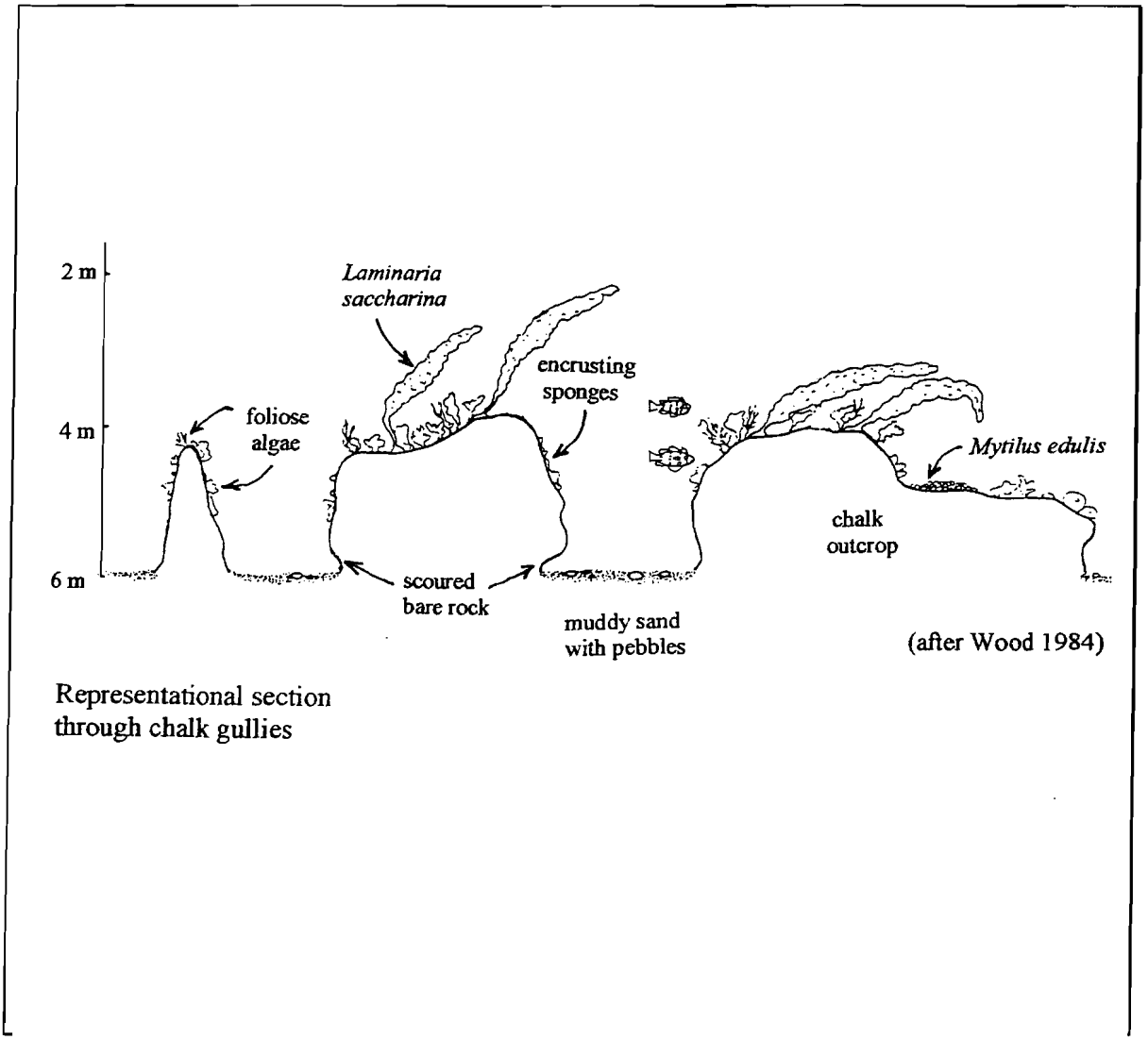
Site location





Diagrammatic representation of site: BRIGHTON TO NEWHAVEN

Note that this site adjoins the Brighton Marina mSNCI site



Representational section through chalk gullies

Site: **The Horse of Willingdon reef**		*Ref. No.* 24
Location: 8 km E of Eastbourne		
Lat./Long. position of centre of site: 50° 44.87' N 0° 22.31' E	*OS grid ref. of centre of site:* TV 673 969	*Author:* Robert Irving
Sea bed type: Sandstone bedrock and boulder slabs.	*Depth range (below chart datum):* 5 – 14 m	*Date Identified:* June 2001

Summary

The Horse of Willingdon reef is one of a number of subtidal sandstone reefs which lie scattered between The Pound at Eastbourne and the Royal Sovereign Shoals, some 12 km offshore. They include Elphick Tree, Long Shoal and the Royal Sovereign Shoals themselves, and a little further to the south, Southern Head close to the Royal Sovereign light tower. These constitute the easternmost sandstone reefs in the Channel, with an associated rich and diverse flora and fauna.

Biological description

The Horse of Willingdon reef (origin of name uncertain) lies approximately 6 km east of Eastbourne. It is about 1 km in length (running NW/SE) and rises from a surrounding seabed of 14 m to 5 m depth BCD. The reef consists of sandstone bedrock and boulders, with patches of cobbles, pebbles and mixed sediment in between. The bedrock is clearly liable to fracturing (a phenomenon reported from other subtidal sandstone reefs off Sussex), described by a recorder as "irregular vertical fissuring giving an effect like crazy paving". Elsewhere the bedrock may form horizontal ledges with overhangs, or have irregular gullies up to 1 m deep in between large angular blocks.

The upward-facing surfaces of the shallowest parts of the reef have sparse foliose red algae present, with sponges dominating the sloping and vertical surfaces (in places providing over 75% cover). The purse sponges *Grantia compressa* and *Scypha ciliata*, and the elephant's ear sponge *Pachymatisma johnstoni* have been recorded from here, though they have not been recorded from the subtidal chalk reefs off Sussex. In some areas, surfaces are completely covered by mussels *Mytilus edulis* (both juveniles and adults), the shells of the larger ones being colonised by encrusting bryozoans. There are often large numbers of common starfish *Asterias rubens* also present. Silting is evident on ledges and horizontal surfaces. Other commonly encountered species include dead man's fingers *Alcyonium digitatum*, white anemones *Actinothoe sphyrodeta*, hydroids including *Nemertesia antennina*, barnacles and hornwrack *Flustra foliacea*. Tucked away in holes are edible crabs *Cancer pagurus* and velvet swimming crabs *Necora puber*. There are often shoals of small bib *Trisopterus luscus* present, as well as solitary goldsinny *Ctenolabrus rupestris*. On areas of mixed sediment are found short chains of slipper limpets *Crepidula fornicata*, dahlia anemones *Urticina felina*, gobies, dragonets *Callionymus lyra*, tompot blennies *Parablennius gattorugine* and occasional leopard-spotted gobies *Thorogobius ephippiatus*.

Justification

There are relatively few offshore rocky reefs in the eastern English Channel, with most being outcrops of chalk rather than of harder sandstone. The high nature conservation interest in these sandstone reefs is reflected in the fact that several are now marine SNCIs: the Royal Sovereign Shoals (ref. no. 12), Kingmere Rocks off Littlehampton (ref. no. 16) and The Waldrons off Bognor (ref. no. 5).

References:

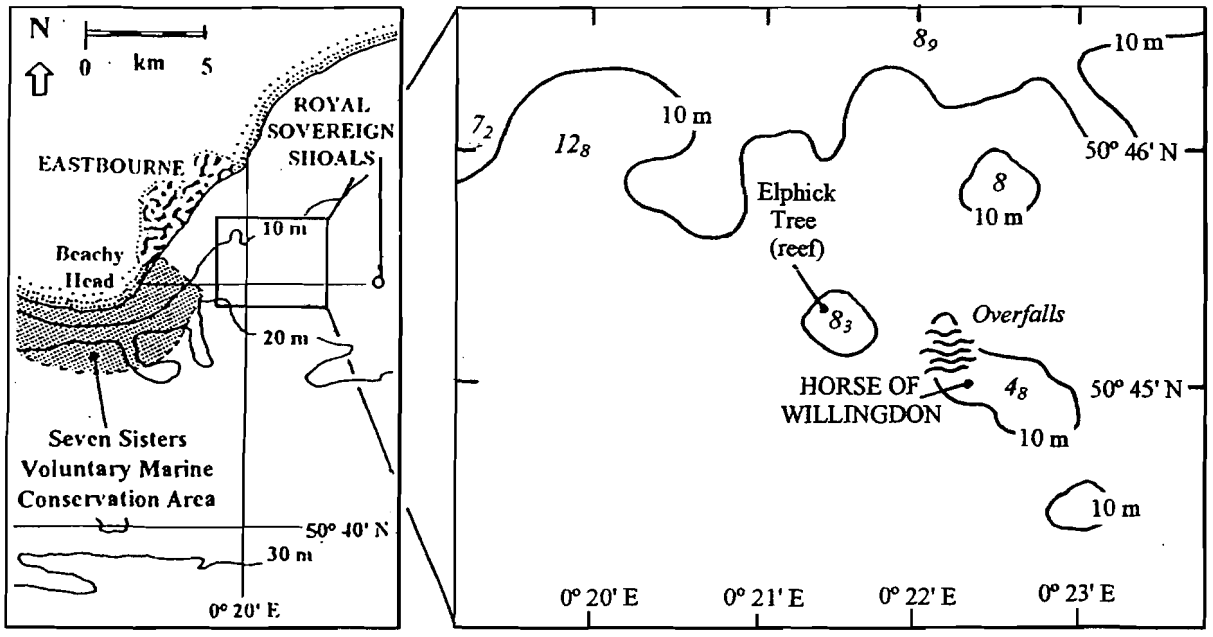
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

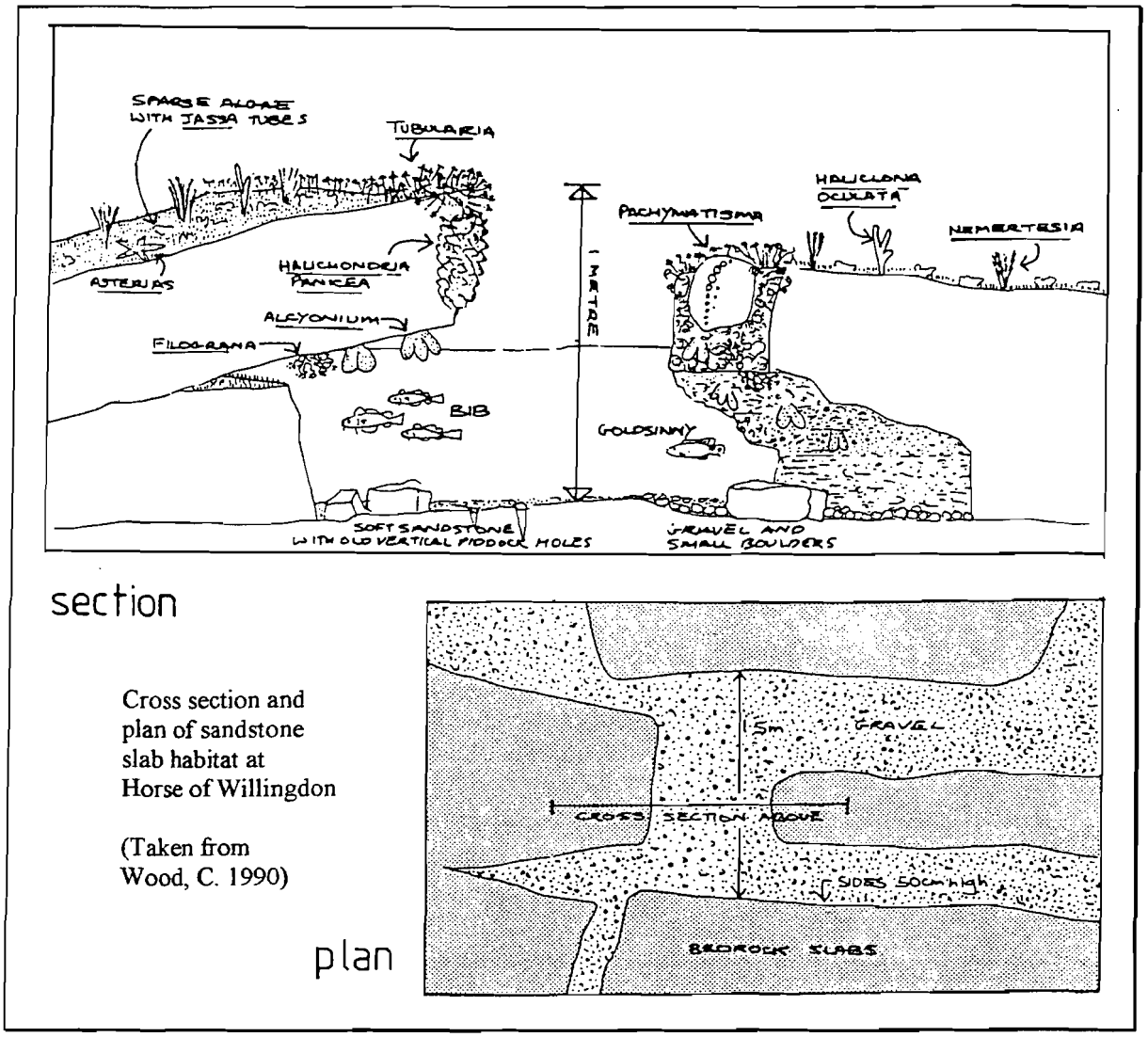
Wood, C. 1990. *Seasearch Survey of Sandstone Reefs off Eastbourne, East Sussex.* A report to the Nature Conservancy Council from Marine Biological Consultants Ltd., Ross-on-Wye.

Dive nos.: Seasearch Sandstone Reefs Survey: (Site No. 4). Sussex *SEASEARCH*: 715/12-15, 52, 53, 55 & 59-62

Site location



Diagrammatic representation of site: THE HORSE OF WILLINGDON REEF



Site: **Subtidal wave-cut chalk platform (Hope Point – Beachy Head)**		*Ref. No.* 22
Location: Adjacent to the Seven Sisters chalk cliffs (8 km)		
Lat./Long. position of centre of site: 50° 44.64' N 0° 10.23' E	*OS grid ref. of centre of site:* TV 531 961	*Author:* Robert Irving
Sea bed type: Dissected chalk platform with ridges and gullies – site extends from mid-shore to approx. 750 m seaward.	*Depth range (below chart datum):* + 1 – 8 m	*Date Identified:* June 2001

Summary

The intertidal wave-cut platform at the foot of the impressive Seven Sisters chalk cliffs extends beyond low water mark some 500 m offshore. The chalk bedrock here has been eroded to form a series of gullies and ridges which run perpendicular to the shore. The gullies are some of the best examples of their type in Sussex, if not the South East. Indeed, the subtidal gullies at Seaford Head (just to the west of this site) are considered to be the best developed in the area and were identified as an mSNCI in 1996 (ref. no. 11).

Biological description

Closest to low water mark, the chalk ridges bounding the gullies are about 1.5 m high with dense growths of stunted kelps *Laminaria saccharina* and *L. digitata* on their tops. The kelps do not extend below 2.5 m BCD. Below 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 BCD 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. There is often, 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 here). At the seaward extent of the gullies, between 300 –450 m from low water mark, the ridges are barely 30 cm high. Beyond about 500 m from the low water mark the seabed flattens out and sand predominates.

Justification

Sublittoral chalk exposures are unusual within the British Isles, with the vast majority being found in the South East. The wave-cut platform between Hope Point and Beachy Head displays excellent examples of gully and ridge topography, with their associated biological communities. The site lies within the Seven Sisters Voluntary Marine Conservation Area, and constitutes one of its main features of interest.

References:

Irving, R.A. 1998. Sussex Marine Life – an identification guide for divers. Lewes, East Sussex County Council.

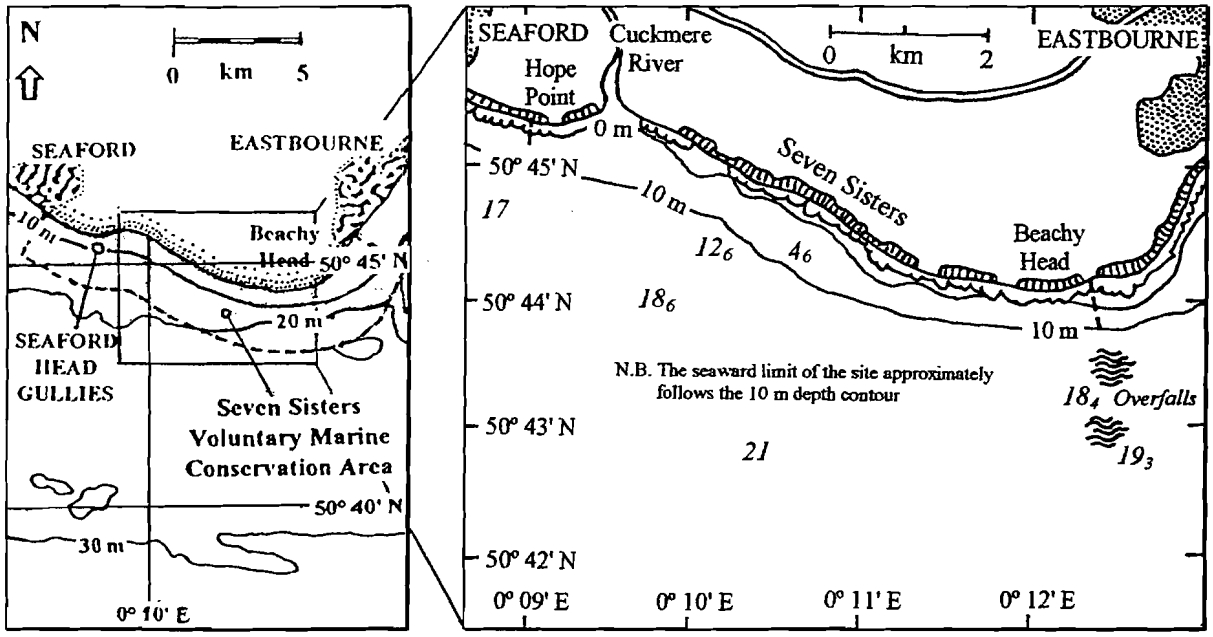
Irving, R.A. 1999. *Report of the Sussex Seasearch Project, 1992-1998.* Published by the Sussex *SEASEARCH* Project. English Nature, Lewes and Brighton & Hove Council, Brighton.

Wood, C. 1992. *Sublittoral Chalk Habitats in southern England.* Report of the Marine Conservation Society, SE Group Chalk Cliffs project 1985-1991. Marine Conservation Society, Ross-on-Wye.

Wood, C. & Jones, E. 1986. *Seven Sisters Marine Surveys.* Report to the Nature Conservancy Council by the Marine Conservation Society (SE Group). Ross-on-Wye.

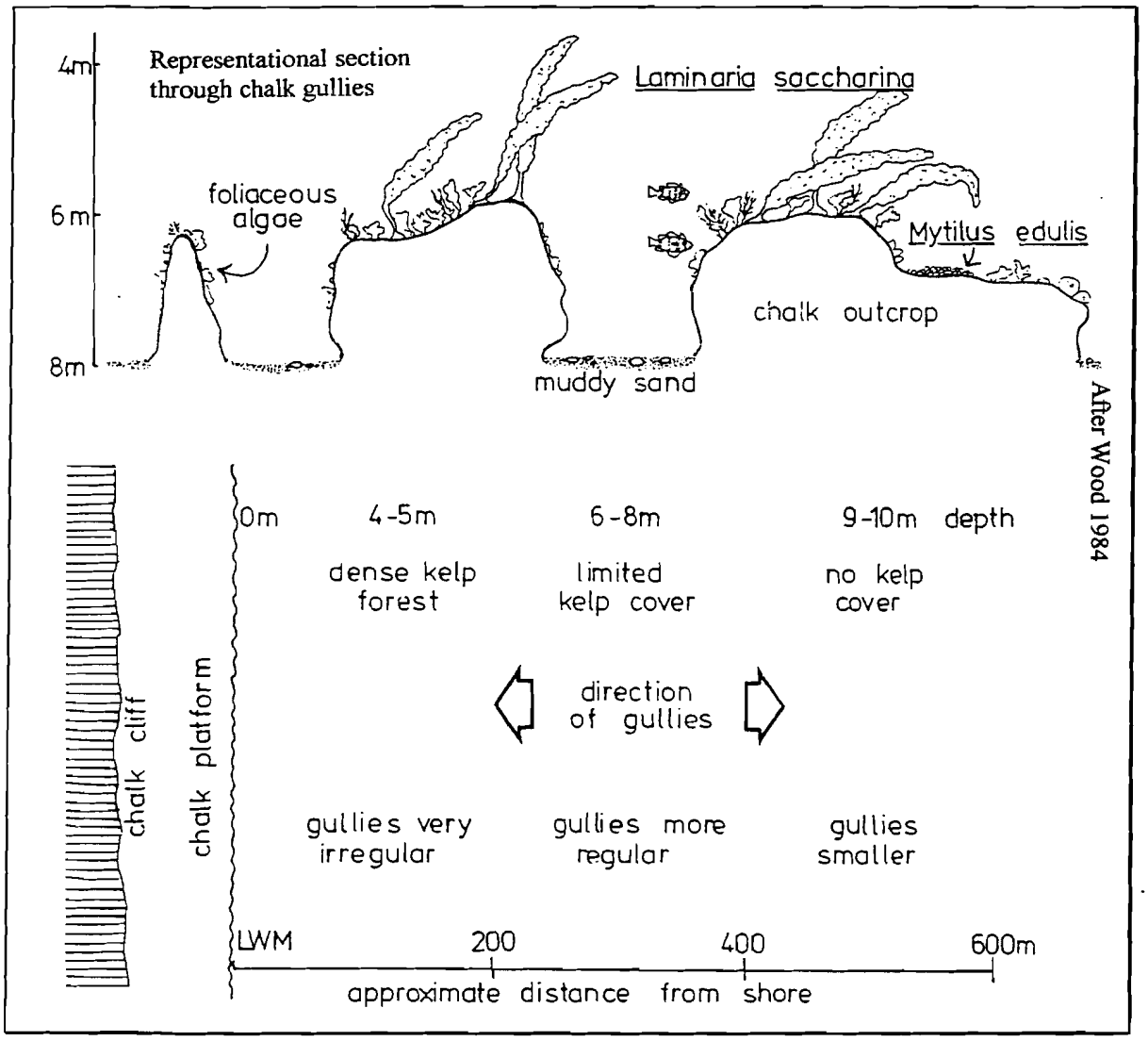
Dive nos.: Seven Sisters Marine Survey: 3-8. Sussex *SEASEARCH*: 714/28-30, 37-39, 42, 43, 103, 113, 115, 116, 118, 715/33

Site location



Diagrammatic representation of site: HOPE POINT TO BEACHY HEAD

Note that this site adjoins both Seaford Head Gullies mSNCI and Beachy Head mSNCI



Site: **Beachy Head**		*Ref. No.* 23
Location: Between 0 and 1 km S & SE of the lighthouse		
Lat./Long. position of centre of site: 50° 43.83' N 0° 14.89' E	*OS grid ref. of centre of site:* TV 586 947	*Author:* Robert Irving
Sea bed type: Chalk bedrock, mixed sediments, mussel beds and angular greensand boulders (off Head Ledge)	*Depth range (below chart datum):* 7 – 25 m	*Date Identified:* June 2001

Summary

The seabed geology in the vicinity of Beachy Head is very varied, with chalk, gault clay and greensand all being present. The topography too is unusual, the 20 m depth contour coming to within 800 m of the shore in places, and the area is affected by strong currents. The Upper Greensand promontory of Head Ledge which extends out from the headland at Beachy Head, is a relatively hard sedimentary rock when compared to chalk, giving rise to different epifaunal communities being associated with it.

Biological description

Head Ledge extends in a south-westerly direction beyond low water mark for almost 200 m, as a shallow ridge just below the surface. Strong tidal currents flow across the ridge creating turbulent water and overfalls. To the west of the ledge (as far as the lighthouse and then beyond that) is an area of sand. Besides greensand bedrock, Head Ledge comprises a jumble of angular greensand boulders which extend to a depth of at least 12 m BCD. The boulders may be up to 1 m in any dimension and there are many holes between them for small crustacea and fish to hide within. In shallow water their tops are dominated by red foliose algae, but in deeper water, both the tops and the sides are dominated by low-growing mats of the ascidian *Molgula manhattensis* and large numbers of both small mussels *Mytilus edulis* and barnacles. The horizontal and sloping surfaces of the boulders are often heavily silted. Further to the east, similar angular greensand boulders have been recorded embedded in muddy, clay-like sand (gault clay?) at 12 m BCD. Again the dominant cover on these boulders was of *Molgula manhattensis* and *Mytilus edulis*. A little to the west, extensive mussel beds have also been recorded in depths of 7-22 m BCD, often with predatory starfish *Asterias rubens* being present too.

In deeper water (21-25 m BCD) to the SW of the headland, the gently sloping seabed is of small pebbles and cobbles of flint and chalk overlying piddock-bored chalk bedrock. Chalk is also present in shallower water too (7 m BCD), a little further to the east, where it appears mixed in with gault clay (it is sometimes difficult to distinguish these two 'soft' rock types). Where there are fissures or gaps in the chalk bedrock, or where there are pockets sheltered from the current, silt accumulates to form soft mud, 10 cm or more deep. Other organisms recorded from here include encrusting sponges, bushy hydroids and bryozoans, and the anemones *Actinothoe sphyrodeta* and *Urticina felina*.

It is interesting to note that some 2-300 m off Beachy Head, *SEASEARCH* dive 715/28 (a drift dive) 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.

Justification

The varied geology and topography, strong tidal streams and depth of water close to the shore, all contribute to an unusual mix of environmental conditions within the vicinity of Beachy Head, which leads to the area being of particular marine biological interest.

References:

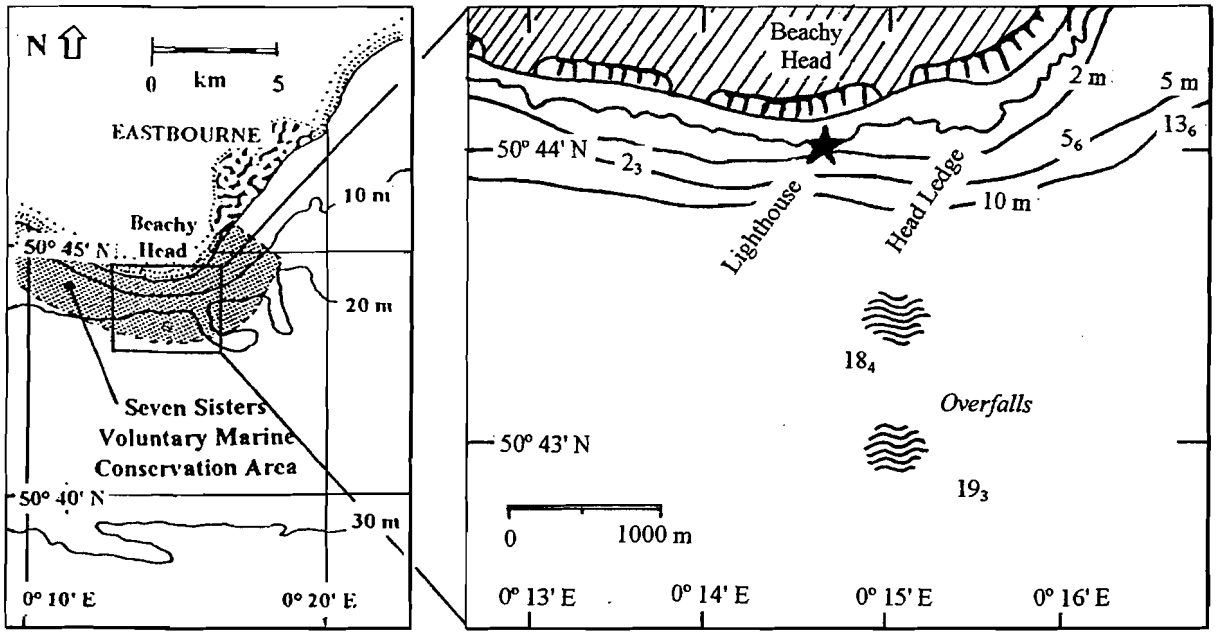
Irving, R.A. 1998. Sussex Marine Life – an identification guide for divers. Lewes, East Sussex County Council.

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

McDonald, K. 1985 *Dive Sussex - A Diver Guide.* Underwater World Publications, London.

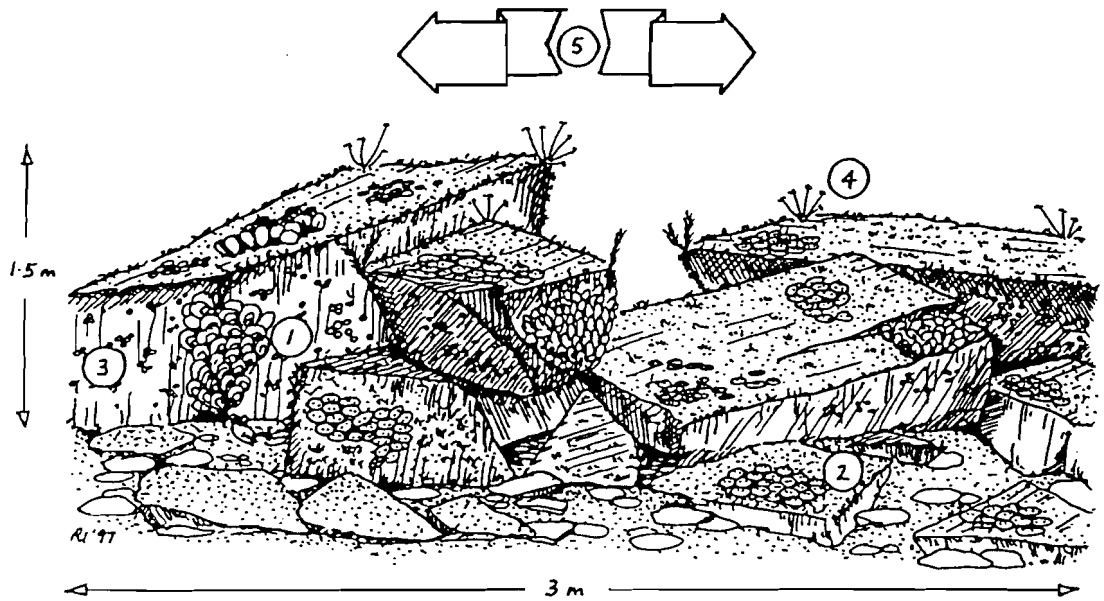
Dive nos.: Sussex Sublittoral Survey: Sussex *SEASEARCH*: 714/14, 715/25-28

Site location



Note that this site adjoins the Hope Point – Beachy Head mSNCI site

Diagrammatic representation of site: 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

Representation of Greensand boulders present at –20 m depth off Head Ledge, Beachy Head.

(after Irving 1999)