Marine Nature Conservation Review

Marine biotope classification for Britain and Ireland

Volume 1. Littoral biotopes

Version 97.06

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Executive summary

A classification of benthic marine biotopes (seashore and seabed habitats and their associated communities) for Britain and Ireland has been developed by the ***Marine Nature Conservation Review (MNCR)*** as a contribution to ***BioMar***, a four-year project part-funded by the European Commission's ***Life*** programme.

The classification is intended as a tool to aid management and conservation of marine habitats, and to contribute to existing, but at present poorly developed, marine classifications for Europe. It has been developed by analysing empirical data sets, reviewing other classifications and the literature, and through collaboration with a wide range of marine scientists and conservation managers.

This report outlines the approaches adopted to development of the classification, a full listing of defined types and a description of types for the littoral (intertidal) zone together with those types from the shallow sublittoral (subtidal) zone which may be encountered on the extreme lower shore. A full set of descriptions for sublittoral types is given in a companion volume (Connor *et al.* 1997b).

The classification is presented in hierarchical format and through a series of habitat matrices. It comprises:

- A series of 28 high level units (*major habitats* and *habitat complexes*) of national and international application, which are linked to Habitats Directive Annex I types, SSSI selection units, UK Biodiversity Action Plan broad habitats, the European CORINE and Palaearctic classifications, and the Baltic HELCOM and French ZNIEFF classifications.
- Sixty medium level units (*biotope complexes*), particularly useful for regional studies, and for broad-scale and rapid surveys.
- 276 *biotopes* and *sub-biotopes*, defined from detailed field survey data, which provide the foundation for the whole classification.
- An intuitive letter coding system for each type and a national standard colour scheme for mapping linked to the higher complex types.
- Colour plates illustrating many of the biotopes.
- A complimentary classification of physiographic features (e.g. estuaries, lagoons), together with their correlations to Habitats Directive Annex I types and the European CORINE and Palaearctic physiographic classification types.

IMPORTANT

This classification supersedes the previous working version (96.07).

Users of this manual must ensure they refer to the current version (version 97.06).

The classification should not be considered static.

Your comments on any aspect of the classification are therefore encouraged.

Acknowledgements

The development and success of the classification has only been possible through the considerable input and tremendous enthusiasm of a wide variety of people. Expertise from scientific and conservation management perspectives, with international through to local standpoints, and with views on both general philosophies and practical considerations have been, essential to ensure the classification has developed as a robust, practical but scientific tool for marine nature conservation. We are very grateful to all those involved, for both the many positive comments which have encouraged us and the criticisms which helped sharpen the end product.

JNCC - Keith Hiscock has provided much encouragement, support and advice throughout the development of the classification, including through his contribution to the BioMar project and his initial development of a rocky shore classification.

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External - Many others, particularly through consultation on the initial proposals for the classification, through the BioMar European workshops in Cambridge and Dublin and through other meetings, have provided constructive criticism and much encouragement for the work being undertaken and advice in relation to European initiatives. In addition to the BioMar workshop participants, we would especially like to thank Helen Fazakerly (University College, Galway), Charlotte Johnston (Entec, Newcastle), Dorian Moss (Institute of Terrestrial Ecology, Monks Wood, Cambs.), Roger Proudfoot (Environment Agency, Newcastle), Ivor Rees (UCNW, Menai Bridge), Adrian Worley (Posford Duvivier, Peterborough) and Tim Worsfold (Unicomarine, Letchworth).

We are very grateful to Mike Elliott (University of Hull) and Jean-Claude Dauvin (ZNIEFF-MER, National Museum of Natural History, Paris) for their constructive comments on the final classification.

1 Introduction

1.1 Background

A classification of benthic marine biotopes (seashore and seabed habitats and their associated communities) for Britain and Ireland has been developed by the ***Marine Nature Conservation Review (MNCR)*** as a contribution to ***BioMar***, a project part-funded by the European Commission's ***Life*** programme. The classification is intended as a tool to aid management and conservation of marine habitats, and has been developed in association with seabed mapping, electronic data dissemination and other techniques as part of an integrated approach within the BioMar project (Costello *et al*. 1997). It will contribute significantly to existing, but at present poorly developed, marine classifications for Europe, especially those being refined through current initiatives promoted by the European Commission (EC) and the International convention for the protection of the marine environment of the north-east Atlantic (OSPAR).

The classification has been developed by analysing empirical data sets, reviewing the literature and other classifications, and through collaboration with a wide range of marine scientists and conservation managers. It is supported by field survey data collected throughout Britain and Ireland and by an extensive database. To ensure the classification is capable of expansion to offshore habitats and to other areas of the north-east Atlantic and has a widely-accepted structure, the MNCR has consulted widely with relevant institutes and marine habitat specialists throughout Europe.

This report provides general details on the approaches adopted to development of the classification, a full listing of defined types and a description of types for the littoral (intertidal) zone together with those types from the shallow sublittoral (subtidal) zone which may be encountered on the extreme lower shore. It does not include saltmarsh vegetation, for which the reader should refer to the National Vegetation Classification (Rodwell In prep.). A full set of descriptions for sublittoral types is given in Connor *et al*. (1997). Descriptions of all types are also available in electronic form in the ***BioMar biotope viewer*** (Picton & Costello 1997). The classification given here supersedes the previous working classification (version 96.7; Connor *et al*. 1996).

1.2 The terms biotope, habitat and community

A ***biotope*** is defined as the ***habitat*** (i.e. the environment's physical and chemical characteristics) together with its recurring associated ***community*** of species, operating together at a particular scale. The habitat is taken to encompass the substratum (rock, sediment or biotic reefs such as mussels) and the particular conditions of wave exposure, salinity, tidal streams and other factors which contribute to the overall nature of the location. The term community is used here to signify a similar association of species which regularly recurs in widely-separated geographical locations; the degree of similarity will vary, depending on the scale considered.

Whilst the term habitat, as used here, is its more accepted scientific meaning, the term is more widely used, for instance in the EC Habitats Directive, to also include the species or community living in the habitat; the common use of the term is, therefore, synonymous with the term biotope. The term biotope is now in common usage in Europe, for instance in the European CORINE biotope classification (Commission of the European Communities 1991), the Wadden Sea classification (von Nordheim, Norden Andersen & Thissen 1996) and the Helsinki Commission's Baltic Sea classification (Helsinki Commission 1997).

1.3 Applications of the classification

The classification has been developed to underpin management and conservation of marine ecosystems by providing a better basis for the evaluation of their scientific and nature conservation interest and for determining their management requirements. In doing this it will:

1. provide a common language for describing the biological character of the marine environment;

2. facilitate mapping of the distribution, frequency of occurrence and extent of biotopes at local, national and international levels;
3. provide a framework in which to place the results of ecological survey;
4. enable a more consistent assessment of site quality through the comparison of biotope composition, quality and rarity at different sites, thus supporting the designation of marine protected areas;
5. facilitate the identification of rare or vulnerable habitats which may require specific protection measures, e.g. under the EC Habitats Directive or the UK Biodiversity Action Plan;
6. by conserving representative examples of habitats, facilitate the conservation of biodiversity (the majority of marine species being small and sedentary or mobile but associated with the seabed);
7. help structure the future collection and interpretation of survey results (an important factor in helping to achieve standard approaches to environmental assessments and other types of ecological survey);
8. provide a basis for predicting the biological character of an area based on its physical environment (although the degree of confidence will vary according to particular habitats);
9. aid site monitoring through the placement of individual sites, and their temporal change in character or quality, within the framework of a wider national perspective;
10. facilitate the assessment of sensitivity of marine habitats and species to a range of impacts, uses and developments, enabling sensitivity maps to be developed;
11. improve the sustainable management of the marine environment through enhanced understanding of marine ecosystems and more objective scientifically-based decisions on use and development within the marine environment;
12. aid the management of rare species by placing them in the context of their associated biotopes;
13. contribute to international (European) classifications, through the methodology, structure and definition of types developed for Britain and Ireland.

1.4 Considerations underlying the classification's development

The following considerations were taken into account in establishing the classification:

- its intended application by a variety of users and at various scales (environmental managers, marine scientists and field surveyors working at local, national and international levels);
- the variety of intended applications (outlined above);
- the variation in the scale of physical and biological features (recognising that marine ecosystems operate at a wide variety of scales, e.g. whole estuaries, individual mussel beds);
- the different levels of detail in available data;
- the different skill levels of future users and their different methods of survey.

To achieve the points above it was considered essential to develop a hierarchical classification in which the broader higher units in the classification could be more finely divided to support more detailed use.

To underpin management and conservation of the marine environment, the classification needed to:

- be scientifically sound, adopting a logical structure in which the types are clearly defined, avoiding overlap in their definition and duplication of types in different parts of the system, and ensuring that ecologically-similar biotopes are placed near to each other and at an appropriate level (within a hierarchical classification);
- be practical in format and clear in its presentation;
- include sufficient detail to be of practical use for conservation managers and field surveyors but be sufficiently broad (through hierarchical structuring) to enable summary habitat information to be presented at national and international levels. The lower end of the system is comparable in detail to that of terrestrial classifications, such as the UK National Vegetation Classification (e.g. Rodwell 1995) and the lower end units of the European CORINE (Commission of the European Communities 1991) and Palaearctic classifications (Devilliers & Devilliers-Terschuren 1996);
- be sufficiently flexible to enable modification resulting from the addition of new information, but stable enough to support ongoing uses. Changes should be clearly documented to enable reference back to previous versions.

To this end the classification would be ecologically lead and based on actual field data from a wide range of sites.

1.5 Scope of the classification

The classification aims to provide comprehensive coverage, by including biotopes for artificial, polluted or barren areas as well as more natural biotopes, which encompass:

1. **Marine, estuarine and brackish-water (lagoon) habitats -** It also includes reference to saltmarsh habitats described in the National Vegetation Classification (NVC) (Rodwell In prep.; Doody, Johnston & Smith 1993) as these are regularly covered by the sea, and NVC types which occur in brackish lagoons (Rodwell 1995).
2. **Rock and sediment habitats.**
3. **Upper shore to coastal waters -** From the supralittoral or splash zone and strand-line on the shore out to the near-shore subtidal zone (out to about the 3 mile/5 km limit). However many of the subtidal biotopes described are also found much further offshore; an initial selection of deep-water types is also defined.
4. **Plant and animal communities, including epibiota and infauna -** Biotopes are defined using both their fauna and flora. Most benthic marine habitats include sedentary animals and small mobile animals which are an integral part of the community, whilst in many habitats, especially in deeper water, there are no macroflora to characterise the habitats. Sediment biotopes are defined both by their epibiota (surface-dwelling animals and plants) and their infauna (animals living in the sediment). For any given area of seabed only a single biotope is defined for it; thus the epibiota and infaunal components of sediment habitats are not treated as separate entities. Likewise the micro-habitat features, such as under-boulder and crevice biota of rocky habitats, are treated within the overall rocky habitat in which they occur.
5. **Britain and Ireland -** It covers habitats throughout Britain and Ireland and, through a widely-accepted broad framework, is readily expandable to include offshore continental shelf habitats and other areas in the north-east Atlantic, Mediterranean and Baltic Seas.

1.6 Classification strategy

It is possible to classify the marine environment in two principal ways:

1. by using physiographic features (such as estuaries and lagoons) which encompass an often disparate range of biotopes but which, in many cases, are at an appropriate scale for management and site designation;

2. on a <u>habitat</u> basis (e.g. sublittoral sediment, kelp forests, mussel beds) which in hierarchical form, even at the coarsest level of detail, have similarities in both habitat characteristics and their species composition.

Both approaches have their advantages, depending on the end use of the classification, and both have been employed, often inconsistently mixed together, by various existing classifications, e.g. Annex I types in the EC Habitats Directive, broad habitats in the UK Biodiversity Action Plan (Anon. 1995), and the CORINE and Palaearctic European classifications.

It was considered most important to develop a system that could be used at a variety of scales, from international through to local requirements. As there is considerable overlap in the biotope composition between different physiographic features (for instance seagrass beds occur on the open coast, in sealochs, in estuaries and in lagoons), it was not considered possible to use such physiographic features as the upper-end units in a fully hierarchical classification without inducing enormous duplication of the finer biotope units at the lower end of the system. It is, however, possible to have parallel physiographic- and habitat-based classifications which can be inter-related; such an approach is adopted here (see Section 7 regarding the inter-relationship of the two approaches).

1.7 Development of the classification

Development of the classification has been through the integration of a variety of aspects:

Literature review - At the outset (1991), a review of existing classifications was undertaken (Hiscock & Connor 1991), with a subsequent wide consultation on the proposed classification structure. With a view to future use in a European context the European CORINE (Commission of the European Communities 1991) and French ZNIEFF-MER (Dauvin *et al*. 1994) classifications were examined. In particular, this was to ensure compatible approaches were adopted, although it was recognised at the time that CORINE had significant short-comings in its structure. The review was particularly useful in helping to draw upon the best features of existing classifications, whilst avoiding their weaker aspects.

An extensive review of the literature describing marine habitats was also undertaken, to help formulate initial lists of biotopes which might form the basis of the classification. For this the scientific literature was of considerable help for sediment habitats (a traditional area for marine studies) but relatively poor for rocky habitats (which, in the subtidal, attracted attention only recently through use of Scuba diving techniques). These initial lists of biotopes were then refined on the basis of new dedicated field surveys, data analyses and further field trials.

Field surveys and other data acquisition - The MNCR has undertaken a programme of field surveys throughout Britain since 1987, collecting data suitable to develop the classification. In addition, data have been acquired from the published literature and through collaboration with a wide variety of academic, government and other organisations. Comparable data have been collected in Ireland since 1993 through the BioMar project. The data comprise information on the nature of each site (such as substratum, wave exposure and height or depth), the type of sampling undertaken, the site's location and the species present (together with an indication of their abundance) within discrete habitats at the site. In total, data for over 11, 000 sites (each comprising one or more habitat records) around Britain and Ireland have been collated and entered on the MNCR database. The programme, survey methods and database are fully described in Hiscock (1996). The database includes a module which holds definitions of each classification type, linked to a national dictionary of marine species and to the field survey data.

Data analysis - Data analyses, using clustering and ordination techniques such as TWINSPAN, DECORANA and PRIMER, have been employed to help define the biotopes. Prior to data analysis the data were screened to ensure they were of acceptable quality and compatible to the type of analysis employed. The analytical processes adopted are described in Mills (1994). To date over 15,500 habitat records (58% of current database records) have been analysed and assigned to the classification.

Dissemination of working versions of the classification - To stimulate use and comment on both the classification's general structure and the biotopes identified within it, there has been periodic release of interim working versions of the classification (versions 4.94, 11.94, 6.95 and 96.7: Connor 1994a, b;

Connor *et al*. 1995a, 1996). Consultation version 96.7 of the classification was distributed to over 170 institutes and individuals in fourteen countries. Feedback has been very important to help improve all aspects of the classification for end-users.

Trialling of the classification - The classification has been trialled in three key areas:

1. *Use by field surveyors*

   Field testing, particularly the intertidal biotopes, has been undertaken by a variety of groups, of differing skill levels and using various techniques (e.g. rapid shore surveys, detailed shore and diving surveys, remotely-operated video camera surveys) in the following areas: Busta Voe and Papa Stour, Shetland (Entec for Scottish Natural Heritage), Orkney (MNCR, JNCC), Plymouth Sound (English Nature and an SAC monitoring workshop), Cornwall (MNCR, JNCC), Fal and Helford Rivers, Cornwall (English Nature), Isles of Scilly (English Nature), Cardigan Bay (Countryside Council for Wales), Cardigan Bay and Anglesey (MNCR, JNCC), Solway Firth (University of Hull for Scottish Natural Heritage), Millport (SAC monitoring workshop), Loch Maddy, Outer Hebrides and Loch Duich (Entec for Scottish Natural Heritage), Barra, Outer Hebrides (MNCR, JNCC), St Kilda (SNH/MNCR) and Ireland (BioMar, Trinity College). The classification has proved to be robust and readily-usable by both specialist marine ecologists and non-specialist conservation managers. Modifications resulting from the field trials have been incorporated into each revision of the classification.

2. *Applicability for mapping*

   Data analysed to define biotopes have been used to provide biotope distribution maps for large areas of coast in south-east Scotland/north-east England (Brazier *et al*. In prep.a), the inlets in eastern England (Hill, Emblow & Northen 1996), Liverpool Bay and the Solway Firth (Covey In prep.a) and lagoons in Scotland. A national standard colour scheme has been developed to represent the higher level units in the classification and to promote consistency in the display of mapped biotope information (see Section 3.5). An example map is shown in Plate 2. This scheme has been successfully applied to mapping biotopes in six candidate Special Areas of Conservation (SACs) for English Nature (Posford Duvivier Environment 1996).

3. *Use in undertaking quality assessments of sites (for conservation management and site protection)*

   The classification has been used to undertake comparative site assessments to aid the identification of locations of high natural heritage importance (as outlined in Hiscock 1996). The assessments have been undertaken for large stretches of coast, marine inlets, estuaries and lagoons and to assist the interpretation of data to identify possible SACs for the EC Habitats Directive.

Consultation - Consultation with a wide variety of academic, government, international and other organisations and individuals has been undertaken to seek input into all aspects of the classification. The consultations have included:

- An initial consultation on the proposed development of a classification following publication of a literature review (Hiscock & Connor 1991).
- A BioMar workshop with CORINE representatives at the Institute of Terrestrial Ecology (ITE), Monks Wood, Cambridgeshire, UK in May 1993 to discuss possible links with the CORINE system (reported in Hiscock *ed*. 1995).
- A discussion session at the 28th European Marine Biology Symposium, Crete in September 1993, following a paper on the proposed classification (Connor *et al*. 1995b) (reported in Hiscock *ed*. 1995).

- Liaison with ZNIEFF-MER at the National Museum of Natural History, Paris in December 1993, and at subsequent BioMar workshops, regarding correlation with the French classification.
- Presentation of the classification to the International Council for the Exploration of the Seas (ICES) Benthic Ecology Working Group at Yserke, Netherlands in May 1994 with updates on progress at their workshops in Torshavn, Faroe Islands in May 1995, Aberdeen, UK in May 1996 and Gdynia, Poland in April 1997.
- The first MNCR/BioMar European workshop in Cambridge in November 1994 (Hiscock *ed*. 1995) at which a framework applicable to the north-east Atlantic was discussed.
- Liaison with the Helsinki Commission (HELCOM) EC Nature group concerning the development of a Baltic classification at their first habitat workshop at the Federal Agency for Nature Conservation, Isle of Vilm, Germany in December 1994, and subsequent liaison.
- A second MNCR/BioMar European workshop at Trinity College, Dublin in September 1995 (Connor *ed*. 1997) which built on the discussions of the first workshop to establish a framework for the classification.
- MNCR/BioMar workshops at the Centre for Environment, Fisheries and Aquaculture Science (CEFAS, formerly MAFF) in Conwy, Wales in November 1995, at JNCC, Peterborough, Cambs. in April 1996 and in Conwy in February 1997, particularly concentrating on development of the subtidal sections of the classification and further development of its general structure.
- A meeting with lagoon specialists (Dr M Sheader and Dr R Bamber) in January 1996 and subsequent liaison to discuss lagoon elements of the classification.
- Favourable external review of the MNCR BioMar classification in a JNCC-led project to review existing British and European (terrestrial, freshwater and marine) classification systems (Gibson 1996).
- Consultations with the Countryside Council for Wales, English Nature, Scottish Natural Heritage, BioMar partners and others, particularly relating to the use of the classification for mapping and the development of intermediate level units in the system, suitable for rapid or broad-scale survey.
- Presentation of the classification to representatives of the EC DGXI, the European Topic Centre on Nature Conservation, Paris (ETCNC) and OSPAR in Brussels in March 1996. The role of the MNCR BioMar classification was discussed in relation to the requirement for a North Sea classification under the North Sea Ministerial Declaration of June 1995 and OSPAR initiatives for a marine classification for north-east Atlantic waters (see Section 1.8).
- Presentation of the classification to the European Environment Agency (EEA)/ European Topic Centre for Nature Conservation (ETCNC) workshop on development of a new European classification (EUNIS) at ITE, Monks Wood in June 1996 (Institute of Terrestrial Ecology 1996). Further collaboration has followed with ITE in their development of the European EUNIS classification on behalf of the EEA/ETCNC.
- The MNCR BioMar classification was presented to an OSPAR habitats and species workshop in Texel, Netherlands in February 1997 as part of their consideration of the requirement for a marine habitat classification to cover the north-east Atlantic.

Publicity - The classification has been widely publicised to a variety of audiences at national and international conferences, through papers and workshops and through the JNCC/country agency *Marine Scene* newsletter. Presentations have been made to audiences in Belgium, Denmark, the Faroe Islands, France, Germany, Greece, Ireland, the Netherlands, Sweden and the UK.

1.8 The European perspective

European classifications - A European habitat classification system, CORINE (Commission of the European Communities 1991), was developed in the 1980's and used as a basis for deriving the Annex I habitats listed in the EC Habitats Directive, for which SACs are now being designated. For marine habitats, CORINE comprised mainly very broad and general marine habitats. Some restructuring of the marine elements at a European level was achieved in the re-named Palaearctic classification (Devilliers & Devilliers-Terschuren 1996).

With the establishment of the European Environment Agency, further consideration has been given to habitat classification requirements at a European level and, in particular, to the restructuring and rationalisation of the Palaearctic system (Moss & Davis 1997). Work is consequently underway, through the European Topic Centre on Nature Conservation to develop a new EUNIS (European Nature Information System) classification. This will be derived largely from the Palaearctic classification, and will link to an associated database on sites, habitats and species. For marine habitats, the MNCR BioMar classification, now widely known throughout Europe, is likely to contribute significantly to the proposed EUNIS classification; however, further work is required to integrate existing marine classifications, to ensure a satisfactory pan-European marine classification is developed.

North Sea Ministerial Declaration and OSPAR - The June 1995 North Sea Ministerial Declaration included (under *I. The protection of species and habitats in coastal and offshore areas*):

> "6. the Ministers INVITE the European Commission and the European Environment Agency to further develop and agree on a classification system for marine biotopes in the North Sea, compatible with the classification system used in the Habitats Directive, to be used as a basis for the identification of marine habitats and species that need special protection measures"

OSPAR, in consideration of this and other aspects in the North Sea Declaration, as well as requirements at a wider north-east Atlantic level to feed into their Quality Status Reports, considered the need for a marine classification at an OSPAR workshop on habitats and species (Texel, Netherlands in February 1997). The workshop strongly recommended that a north-east Atlantic classification be developed and, if approved further within OSPAR, that it should be developed in collaboration with the EEA to ensure full compatibility with the EUNIS classification (Oslo and Paris Conventions 1997).

Future requirements - To meet the needs of both OSPAR and the EEA for European marine habitat classifications, consideration needs to be given to amalgamation of existing classifications, e.g. those currently developed for the Baltic (HELCOM), Scandinavia (Nordic Council), the Wadden Sea (Common Wadden Sea Secretariat), Britain and Ireland (MNCR BioMar), France (ZNIEFF-MER), Mediterranean systems and others.

2 Structure of the classification

2.1 Habitat influence on marine communities

In the marine environment, there is a strong relationship between the physical and chemical nature of the habitat and the biological composition of the community. Most communities appear to occur within a recognisable suite of environmental parameters, although some occur within a more tightly-defined set of parameters (habitat), than do others. Community structure is additionally modified by biological factors such as recruitment, predation, grazing and inter-species competition. Species may modify habitats by their boring, accretion and bioturbation.

The habitat attributes which appear to influence community composition are given in Table 2.1; the following are considered to be the most important:

	Factor	***Gradient/range***
•	Substratum	Rock (including bedrock, boulders, mixed cobbles and pebbles; biological reefs e.g. mussels) to coarse gravels, sands, muds and mixed sediments.
•	Zonation (height or depth)	From the ***littoral*** zone (including the *supralittoral* or splash zone/strandline and the *eulittoral* or true intertidal zone), through to the shallow ***sublittoral*** zone dominated by kelps and seaweeds or with wave-disturbed sediment communities (***infralittoral***) to those in deeper water characterised by animals (***circalittoral***). In the stable conditions below about 60-80 m communities develop in the ***circalittoral offshore*** zone (see Figure 2.1).
•	Exposure to wave action	Very exposed coasts (e.g. Shetland and St Kilda) to extremely sheltered coasts (sealochs and lagoons).
•	Strength of tidal currents	Very strong currents of 8 to 10 knots (4 to 5 m per second) or more in tidal rapids to negligible currents in some sealochs.
•	Salinity	Fully marine on the open coast, through variable salinities in estuaries to stable brackish conditions in lagoons.

2.2 Biological characteristics of marine habitats

Shore and seabed habitats are represented primarily by seaweeds (on the shore and in shallow water) and by marine invertebrates from a wide range of different phyla. Lichens (in the splash zone), higher plants (especially in saltmarshes) and fish contribute to a lesser degree. In contrast to terrestrial habitats, it is commonplace for marine habitats to be characterised, i.e. dominated, by animals rather than plants and for the substratum to provide the main structure to the habitat (rather than plants such as in a forest).

Only a proportion of habitats have obvious 'dominant' species (e.g. kelp forests, mussel beds, maerl beds); many, particularly in deeper water, support a mosaic of species which may exhibit a degree of patchiness over the seashore or seabed and, in some cases, vary markedly with time. In these respects the species offer a much less robust mechanism for structuring a classification than does the habitat.

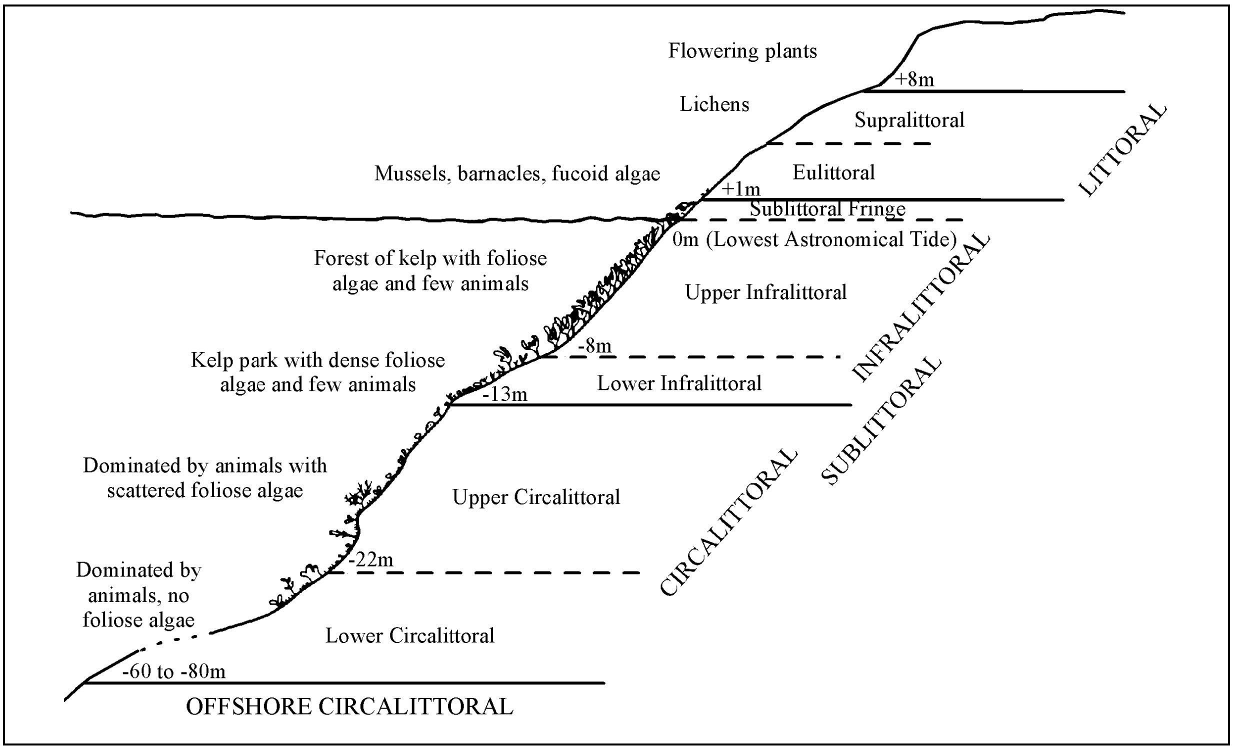

Figure 2.1 Profile of a rocky shore and seabed showing the biological zones (modified from Hiscock *ed*. 1996); heights and depths given are typical values for south-west Britain. In sediment habitats a similar vertical zonation for the main zones is found.

Table 2.1 Environmental factors which influence community structure

Factor	*Rocky habitats*	*Sediment habitats*
Substratum	Varies from bedrock, through boulders to stony shores, often mixed with sediment. The degree of stability of the rock is important, with algae and animals increasingly able to colonise smaller stones in more sheltered stable conditions.	Ranges from shingle (mobile cobbles and pebbles), through gravel and sand to very soft mud and muddy gravels. The type of sediment, mainly determined by the dynamics of water movement at the site, is highly important in structuring community composition, although salinity may become more critical in upper estuarine conditions.
Zonation: emersion / immersion on the shore (desiccation) / depth in the subtidal (illumination)	A major factor, related to the length of time the rock is exposed by the tide, which leads to very marked horizontal bands of zonation on most rocky coasts. Supralittoral and littoral fringe zones on the extreme upper shore are lichen dominated. The main eulittoral zone is characterised by barnacles, mussels or fucoid algae, the infralittoral by kelps and the circalittoral by animals.	Much less obvious than on rocky coasts, but with a zone of drying on the upper shore and a more water-logged/saturated zone on the lower shore. With increasingly finer sediments the saturated zone extends further up the shore. Very sheltered areas often support saltmarsh vegetation at extreme high water level. Shallow subtidal sediments reflect a high degree of wave disturbance and high temperature/salinity fluctuations with increasingly more stable conditions with depth.

Table 2.1 Continued

Exposure to wave action	Marked differences result due to different wave exposures. Exposed shores are usually animal (mussel and barnacle) dominated, whilst sheltered shores are fucoid algal dominated. Such differences can occur over only 10's of metres at certain sites, such as opposite sides of a headland. In the subtidal a similar pattern is exhibited, but is increasingly more masked by tidal current influence with depth.	Principally expressed by the resultant grade of sediment, with coarse sands on exposed coasts and fine muds on sheltered coasts.
Strength of tidal currents	Strong offshore currents affect many coasts and have a particularly strong influence on circalittoral communities, with lessening effects in shallow water and on the shore (where the influence of wave action predominates). However constricted sections of some inlets, particularly the narrows in sealochs, can have very strong currents which affect both the shallow subtidal and the lower shore zones, significantly increasing species richness.	Contributes, with wave action, to determining sediment grade and consequent community type. In estuaries and sealochs this can lead to coarser sediments than would normally be expected in sheltered areas. The lower shore of some inlets by the main channel can have tide-swept sands and gravels with distinctive communities.
Salinity	The majority of rocky shores are subject to full salinity, but within marine inlets are subject to increasing freshwater influence. Variable salinities lead to species-poor examples of open coast communities whilst the very limited areas of rock in permanently reduced salinities may support quite distinct communities. Localised freshwater influence often results in the growth of ephemeral green algae on the shore.	Variable and reduced salinity conditions are typical of sediment shores within inlets, especially estuaries, and play an important role, alongside sediment type, in determining community type and eventually becoming more important in the upper reaches of estuaries.
Temperature (biogeography)	National differences in water temperature give more species-rich communities in the south and west and poorer communities in the north and east.	
Topography	Topography has a marked influence on the variety of communities which may occur. Variations in topography (resulting from a particular rock type) which lead to vertical faces, overhangs, gullies, caves and rockpools all increase habitat and micro-habitat diversity over uniform areas of rock.	Variations in the slope of the beach can indicate differing degrees of saturation, whilst drainage channels may be subject to increased freshwater influence or currents. In the subtidal, variation in slope has little influence on community type, although the presence of dunes can effect small scale community structure.
Geology	The rock type is significant in two respects, affecting overall topography (see above) and the surface texture for colonisation. Soft limestones and chalks have a pitted surface which can affect species composition, whilst these types, plus peats and clays, are soft enough to be bored by piddocks and other species.	Not applicable.
Pollution	Severe pollution may reduce species richness (pollution effects are not well studied).	Pollution may reduce species richness, encourage higher densities of opportunist species, e.g. capitellid polychaetes or alter community structure.
Oxygenation	Not generally applicable, although severe deoxygenation can lead to reduction in species and the presence of bacterial growths.	More sheltered fine sediments tend to become anoxic below the surface, giving a distinct black layer. Severe deoxygenation significantly reduces species richness.
Wave surge	On exposed coasts gullies subject to wave surge have distinct animal-dominated communities. Wave surge on vertical rock tends to give communities typical of more exposed sites (e.g. *Alaria esculenta* occurring on moderately exposed vertical rock).	Influences sediment grade and may give highly mobile species-poor habitats.
Scour, turbidity and siltation	Sand scour and sediment in suspension can encourage growth of ephemeral algae and sometimes mussels (*Mytilus*) and tube-worms (*Sabellaria*). Siltation in sheltered areas often restricts the growth of algae.	A high degree of scour and turbidity may give species-poor communities.

Table 2.1 Continued

Shading	Shaded faces encourage the growth of species intolerant of desiccation on the shore.	Not applicable.
Organic carbon	Not applicable.	Significant in many sediment communities.
Anthropogenic disturbance	Disturbance of rock communities is not generally significant; activities, such as fisheries for crabs and lobsters, are likely to result in only limited changes in the balance of species composition within biotopes but more rarely may result in significant shifts in community composition.	Disturbance of sediment types is widespread, particularly through fisheries activities and aggregate extraction; such disturbance can have significant effects on community composition and may, in some cases, result in completely altered biotopes compared with fully naturally conditions.
Hydrographic regime (residual currents); water quality	The overall hydrographic regime and water quality characteristics of an area play an important role in determining community composition. Key aspects of these factors are discussed above; but also important is residual current flow which may affect larval distribution an water quality aspects such as nutrient levels as well as water temperature, salinity and turbidity.	

Table 2.2 Marine biological zones and the factors determining them

Zone	***Typical boundaries around Britain and Ireland***	***Immersion***	***Thermal stability***	***Light***	***Salinity***	***Wave action***
Adlittoral		Spray only	Highly variable	Photic	Saline influence	None
	+10 to +6 m					
Supralittoral		Spray and splash	Highly variable	Photic	Euryhaline	Highly variable
	+7 to +4 m MHWS					
Eulittoral		Regular immersion and emersion	Highly variable	Photic	Euryhaline	Highly variable
	+1 to 0 m MLWS					
Infralittoral		Immersed (intermittent spring tide emersion of sublittoral fringe)	Variable Eurythermal	Euphotic	Euryhaline	Variable
	-5 to -20 m					
Circalittoral		Immersed	Moderately variable - mesothermal	Mesophotic (sparse algae, algal crusts)	Stenohaline / mesohaline	Moderately variable
	-40 to -80 m					
Circalittoral offshore		Immersed	Stable - stenothermal	Aphotic	Stenohaline	Stable
	-200 m					
Bathyal		Immersed	Very stable Stenothermal	Aphotic	Stenohaline	Stable

2.3 A framework for the classification - the primary habitat matrix

The approach to using habitat parameters to aid the definition of biotopes was discussed in the BioMar European workshops (Hiscock *ed*. 1995; Brazier & Connor 1995; Connor *ed*. 1997) to help derive a framework for the classification which was both scientifically sound and had wide applicability in the north-east Atlantic (and elsewhere).

Whilst the classification has been developed for nature conservation purposes and hence needed to be biologically driven, the dynamic nature of certain populations of species, and sometimes whole communities, meant it was essential to identify the habitat within which the community (of potentially varying composition) occurs to ensure types defined would be robust over time. Full use is also made of the habitat attributes to provide a structure to the classification which is both logical and easy to use. In this way much more significant use of the habitat is made than for many terrestrial classifications, where vegetation alone is often the prime determinant of the classification's structure. The classification is presented in such a way as to allow access via either the habitat attributes through a series of ***habitat matrices*** or the biological community in a ***hierarchical classification*** of biotopes and higher types.

Each environmental gradient outlined in Section 2.1 can be considered to form an axis within a multi-dimensional matrix. Each community develops according to a suite of environmental conditions (and biological influences) which lie within such a multi-dimensional matrix, reflecting varying biological character according to its position along each particular gradient. Although the degree of importance of each habitat attribute varies for differing communities, the first two, namely substratum and the vertical gradient or zonation, appear to play a highly significant role in all communities. They are also the most easily and reliably recorded attributes in the field and are readily mapped. These factors combine to make the attributes of substratum and zonation the most appropriate for structuring the upper end of the classification.

The ***primary habitat matrix*** of substrata versus zonation (Table 2.3) illustrates the framework adopted for the classification which has been developed, through consultation in the BioMar European workshops, to reflect the most significant changes in biology at a scale appropriate to an internationally applicable classification. It represents the upper two levels in the hierarchical classification. Further matrices of exposure versus zonation and sediment type versus zonation or salinity have been developed to expand each part of the system (Figure 2.2; Tables 5.3-5.8).

The main divisions adopted in the primary habitat matrix are as follows:

	Rock ***Sediment***	A primary distinction is made between communities which develop on hard substrata (epibiota) and those which can develop in soft sediments (infauna). Sediments can support distinctive epibiota as well. The term rock is used in a broad sense to indicate hard substrata such as bedrock, boulders, stable cobbles, artificial substrata and biogenic substrata. Sediments also include pebbles and cobbles which are essentially mobile (shingle) and may have a small proportion of stones and shells on the surface which supports epibiota.
	Littoral ***Infralittoral*** ***Circalittoral*** ***Circalittoral offshore***	These represent the major divisions in a vertical gradient from the land (with its flowering plants) to the edge of the continental shelf (about 200 m). The main factors which control the zonation are immersion, thermal stability, light, salinity and wave action. They interact in a complex manner to produce a general zonation pattern, applicable to both rock and sediment habitats throughout Europe and beyond. Table 2.2 illustrates the inter-relationship of the factors for each zone.

	Exposed rock ***Moderately exposed rock*** ***Sheltered rock***	These are defined on an energy gradient, reflecting a combination of exposure to wave action or tidal streams or a combination of both, rather than treating wave exposure and tidal stream strength as separate entities. This energy gradient is paralleled in sediment habitats, where coarse clean sediments occur in high energy conditions and fine muds occur in low energy conditions. Although the effects of wave action and tidal streams can be significantly different, there are many instances where the increase in tidal stream strength in wave-sheltered habitats gives rise to communities similar to those found on more wave-exposed coasts but in reduced tidal currents. Also very strong tidal currents in the circalittoral appear to override the effect of wave action to a large extent, giving rise to a suite of associated communities of barnacles, cushion sponges and the hydroid *Tubularia indivisa* which are less obviously affected by wave action. These communities are in fact similar in character to those of surge gullies which are subject to extreme wave action. Another example where the increased currents in the infralittoral zone which change the *Laminaria saccharina* communities of very wave-sheltered sites to *L. hyperborea* communities similar to those on open coasts.
	Gravels & sands ***Muddy sands*** ***Muds*** ***Mixed sediments***	The particular sediment grade, derived from the hydrodynamic conditions of the site, strongly influences community structure. The four main divisions adopted here reflect major changes in species character, particularly related to the amount of silt or clay in the sediment.

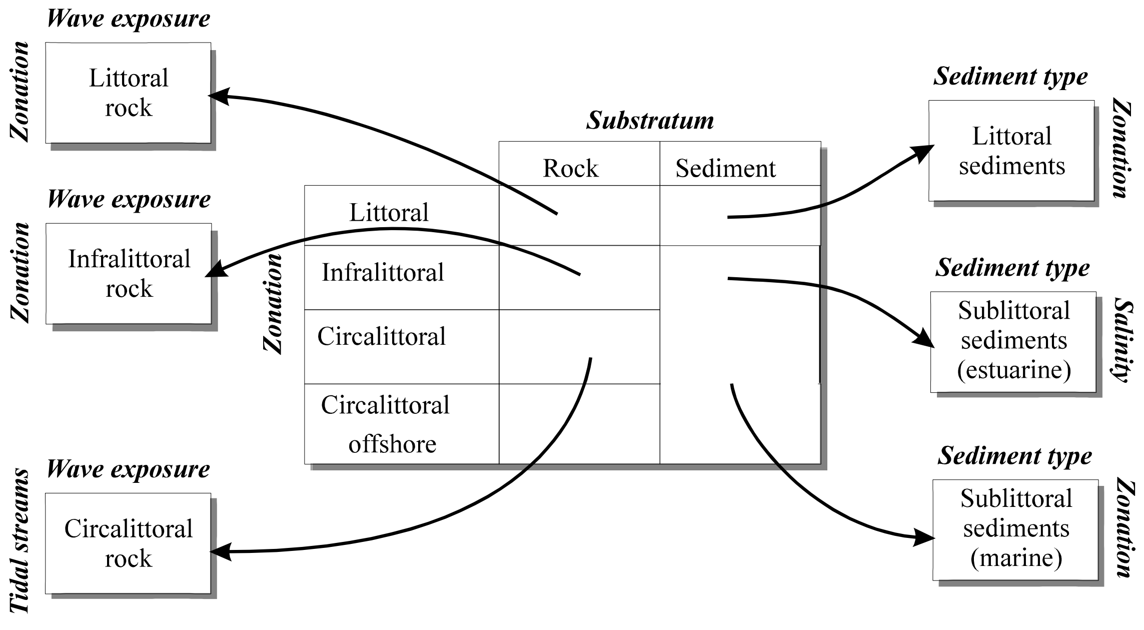

Figure 2.2 The inter-relationship of primary and secondary habitat matrices

Placement of the biological entities within such a habitat framework has a number of benefits:

- It helps to display the relationship of a biotope to other closely related types and to clarify the main habitat parameters which contribute to its structure. These relationships are less clear in conventional listings of types.

- It enables the identification of dissimilar communities within apparently similar physical environments. Here, although there may be subtle physical factors which drive such differences in biological composition, other factors such as seasonal change, chance recruitment, grazing pressures or pollution effects may account for the differences and allow such communities to be linked within the classification.
- It also provides a structure for undertaking new ecological survey, by enabling the full range of habitats in an area to be identified and sampled.

Particular parts of the coast provide data for the development of specific sections of the classification. For instance, sheltered rocky habitats predominate in the sealochs of western Scotland and it is here that the more subtle variations in community composition related to changes in salinity regime or tidal stream strength within sheltered habitats have been elucidated. Conversely the open North Sea coast of England is predominantly moderately exposed to wave action and here changes in community structure due to differences in shore topography have been identified.

Table 2.3 Framework for the MNCR BioMar biotope classification - the primary matrix (letters in [ ] are codes used in the coding system)

	SUBSTRATUM	ROCK [R] (epibiota)			SEDIMENT [S] (infauna + epibiota)			
	ZONE	**Exposed rock [E]** (high energy - wave exposed or very tide-swept)	**Moderately exposed rock [M]** (moderate energy - moderately wave-exposed or tide-swept)	**Sheltered rock [S]** (low energy - wave sheltered and weak tidal streams)	**Gravels & sands [GS]**	**Muddy sands [MS]** (10-30% silt/clay)	**Muds [MU]** (30-100% silt/clay)	**Mixed sediment [MX]** (gravel, sand and mud)
Littoral [L] (splash zone, strandline & intertidal)	(lichens; green algae; fucoid, barnacle & mussel communities; intertidal sediments)	Exposed littoral rock [ELR]	Moderately exposed littoral rock [MLR]	Sheltered littoral rock [SLR]	Littoral gravels & sands [LGS]	Littoral muddy sands [LMS]	Littoral muds [LMU]	Littoral mixed sediment [LMX]
Infralittoral [I] (shallow subtidal)	(kelp & other algal communities; wave-disturbed animal communities)	Exposed infralittoral rock [EIR]	Moderately exposed infralittoral rock [MIR]	Sheltered infralittoral rock [SIR]	Infralittoral gravels & sands [IGS]	Infralittoral muddy sands [IMS]	Infralittoral muds [IMU]	Infralittoral mixed sediment [IMX]
Circalittoral [C] (nearshore deeper subtidal)	(animal-dominated communities in semi-stable conditions)	Exposed circalittoral rock [ECR]	Moderately exposed circalittoral rock [MCR]	Sheltered circalittoral rock [SCR]	Circalittoral gravels & sands [CGS]	Circalittoral muddy sands [CMS]	Circalittoral muds [CMU]	Circalittoral mixed sediment [CMX]
Circalittoral offshore [CO] (offshore deep subtidal)	(animal communities in stable conditions)	Circalittoral offshore rock [COR]			Circalittoral offshore sediment [COS]			

2.4 The hierarchical approach

The classification adopts a hierarchical approach to the differentiation of types, related to their degree of biological distinction, to the ability to discriminate types by various methods of remote and *in situ* sampling, to the ease of recognition by workers with differing skill levels and to the end use of the classification for conservation management at various scales.

Five levels in the hierarchy have been developed:

1. **Major habitats -** These are extremely broad divisions of national and international application for which Habitats Directive Annex I habitats (e.g. reefs, mudflats and sandflats not covered by seawater at low tide) are the approximate equivalent. These are the units bounded by bold lines in Table 2.3.
2. **Habitat complexes -** These serve to provide very broad divisions of national and international application which reflect major differences in biological character. They are equivalent to the intertidal Sites of Special Scientific Interest (SSSI) selection units (for designation of shores in the UK) (Joint Nature Conservation Committee 1996) and can be used as national mapping units. These are the individual blocks in Table 2.3.
3. **Biotope complexes -** These are groups of biotopes with similar overall character, suitable for local mapping where biotopes consistently occur together and are relatively restricted in their extent. This is especially applicable to rocky shores and very nearshore subtidal rocky habitats, giving better units for management and for assessing sensitivity than the individual biotopes. They are relatively easy to identify, either by non-specialists or by coarser methods of survey (such as video or rapid shore surveys), thereby offering opportunities for data collection by a wide range of people and without recourse to specialist species identification skills.
4. **Biotopes -** These are typically distinguished by their different dominant species or suites of conspicuous species; most should be readily recognised by workers with a basic knowledge of marine species, although sampling may be necessary in some sediment types. The vast majority of available data are attributable to this level (or the sub-biotope level), which is equivalent to the communities defined in terrestrial classifications such as the UK National Vegetation Classification (e.g. Rodwell 1995) and the lower-end CORINE/Palaearctic units. Intertidal and subtidal sediment biotopes may cover very extensive areas of shore or seabed.
5. **Sub-biotopes -** These are typically defined on the basis of less obvious differences in species composition (e.g. less conspicuous species), minor geographical and temporal variations, more subtle variations in the habitat or disturbed and polluted variations of a natural biotope. They will often require greater expertise or survey effort to identify.

The levels in the hierarchy, together with their main roles, their definition, an example of each and the number of types at each level, are summarised in Table 2.4 below.

Where the biotopes cannot be grouped into higher units that offer an advantage over their habitat complex group (e.g. some sediment types) no biotope complex has been defined. Also to assist the interpretation of the classification by non-specialists, certain key biotopes (mainly those easy to recognise because they are characterised by single dominant species, e.g. *Sabellaria* honeycomb worm reefs) have been raised to the biotope complex level although they comprise only a single biotope. Whilst every effort has been made to ensure equivalence of types at each level of the hierarchy, the position of a unit in the hierarchy is a balance between the various definitions and roles outlined above and in Table 2.4 rather than a strict application of specified criteria.

Table 2.4 Outline structure of the classification hierarchy and number of types defined

Level	***1***	***2***	***3***	***4***	***5***
Term	***Major habitat***	***Habitat complex***	***Biotope complex***	***Biotope***	***Sub-biotope***
Example 1	Littoral rock	Sheltered littoral rock	Dense fucoids (stable rock)	*Ascophyllum nodosum* on very sheltered mid eulittoral rock	*Ascophyllum nodosum*, sponges and ascidians on tide-swept mid eulittoral rock
Code	LR	SLR	F	Asc	Asc.T
Example 2	Sublittoral sediments	Infralittoral gravels and sands	Maerl beds (open coast/clean sediments)	*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand	*Phymatolithon calcareum* maerl beds with red seaweeds in shallow infralittoral clean gravel or coarse sand
Code	SS	IGS	Mrl	Phy	Phy.R
Role	Approximate to Habitats Directive Annex I types	SSSI selection units National mapping units	Local mapping units (particularly for intertidal and subtidal rocky habitats) Rapid/broad scale survey	Sample data Important habitat/species variation MNCR conservation assessment units	Sample data Minor habitat/species variation Temporal variation Disturbed & polluted habitats
Typical survey techniques	Desk study of charts	Sublittoral acoustic	Phase 1 - Non-specialist recorders or subtidal video	Phase 2 - species identification (main species) *in situ* (or from samples)	Phase 2 - species identification *in situ* (or from samples)
Definition	Gross habitat features	Major differences in species/ community form Large habitat differences	Broad biology or habitat features	Dominant species/taxa linked to distinctive habitat characteristics Biogeographic variation	Sub-dominant species (or dominant species for disturbed/ polluted biotopes) Minor biogeographic variation
Number of types defined	7	21	60	196 (excludes 28 NVC types)	80

2.5 Distinguishing and defining biotopes

To ensure consistency across the classification in how biotopes are defined, a working definition as to what constitutes a biotope, enabling its distinction from closely-related types, was developed. The following criteria were applied:

1. The entity can be distinguished on the basis of a consistent difference in species composition based on:

   - different dominant species, some of which (e.g. mussels and kelps) maybe functionally important;
   - the co-occurrence of several species characteristic of the particular habitat conditions (even though some of these may occur more widely in other combinations); or
   - the presence of taxa unique to or primarily found in the community (highly preferential or faithful species), even if occurring in low density or infrequently.

   A combination of both the presence and abundance of the most 'obvious' species in a community is used. Sub-biotopes are often defined using less conspicuous species.

2. It occurs in a recognisably different habitat (but acknowledging that distinct communities may develop in the same habitat through change with time). Sub-biotopes are often defined on the basis of more subtle habitat differences. Some highly subtle differences may be critical in determining community structure (e.g. water circulation/exchange patterns in sealoch basins, oxygenation levels in the water column/sediment, sediment structure other than grain size composition). The separate divisions of habitat parameters currently used in MNCR recording (Appendix 2) need not necessarily be reflected in the end division of types (for instance less than five categories based on tidal stream strength have been used for all but the circalittoral zone, where use of five or more categories has been necessary).

3. It is a recognisable entity in the field, i.e. it is not an artefact of data analysis.

4. The assemblage of species recurs under similar habitat conditions in (at least several) widely-separate geographical locations. Associations of species confined to a small geographical area are considered unlikely to represent a recurrent community (unless the habitat is considered unique), but should rather be treated as a variation of a more widely occurring type.

5. As a working guide the biotope extends over an area at least 5 m x 5 m, but can also cover many square kilometres, such as for extensive offshore sediment plains. For minor habitats, such as rockpools and overhangs on the shore, this 'minimum size' can be split into several discrete patches at a site. Small features, such as crevices in rock or the biota on kelp stipes, are described as features of the main biotope rather than biotopes in their own right. Some entities, by virtue of their extent around the coast, have warranted description despite showing only minor differences in species composition; such types are often treated as sub-biotopes.

6. It is a single entity in the field, although there may be some spatial variation or patchiness from one square metre to the next. Therefore each area identified in the field should by capable of correlation with a single biotope as defined in classification (a 1:1 relationship of field units to classification units). The surface species characteristics of sediment habitats (their epibiota) are described in association with the sediment infauna as a single entity, rather than treated as separate communities (however the nature of available data has restricted the clear association of these two aspects in the classification as they are typically derived from differing survey techniques).

The following considerations are also taken into account in deciding whether to establish a biotope:

- There is a need to recognise that it is commonplace to have no distinct boundary between two different 'types', but a gradual transition, such that distinction of types is somewhat arbitrary at particular reference points or nodes along a continuum. For assessment of conservation value this factor is of utmost importance when considering typicality of a site to a particular type or its diversity where the record lies between a species-rich and a species-poor type.
- Where different associations are shown to occur within the same habitat, they may be spatial or temporal mosaics caused by factors such as grazing, disturbance or chance recruitment. These should be linked together in the classification as, for conservation purposes, it is important to manage or protect the habitat in which several communities may occur over time.
- To produce a practicable working classification it has been necessary at times to be general rather than specific in splitting different types, so that an excessively and unnecessarily complex classification is not developed (bearing in mind the end units that are necessary for practical conservation).
- Separation of communities can be related to conservation value - does the type add variety (of habitat or species) to a particular stretch of coast. This relates to natural habitats and excludes artificial, polluted or disturbed habitats which should not be considered of high conservation value although they may have distinct communities.

For each of the individual types defined, a description has been drawn up which sets out the typical habitat characteristics, describes the type, lists the characterising species and gives the known distribution, together with other relevant information. These descriptions are given in Section 6.

3 How to use the classification

3.1 Finding your way around

Layout of the report - Biotope descriptions within each of the major habitat types (e.g. infralittoral rock) are presented in different page colours to enable rapid access to each major section of the classification. Within each section the different habitat complexes are indicated in the headers, whilst the relevant biotope complex is given above each biotope title. To find a particular description, refer to either the habitat matrices, the biotope list or the code index.

Use of the matrices - The habitat matrices (Tables 5.3 - 5.8) indicate the range of biotopes which may occur within a given set of habitat characteristics, such as the 'mid shore (mid eulittoral) of moderately exposed rocky shores' or 'gravel habitats in moderate depths (circalittoral)', and hence need to be considered when matching data to the classification. In each part of the matrix the biotopes given are the most typical of those habitat conditions; where a suitable biotope match is not found the biotopes given in adjacent boxes of the matrix should additionally be considered. To locate a particular biotope description, cross-reference to the code index.

The biotope list - A full list of biotopes is given in Section 4.3, complete with an index to page numbers for descriptions presented in this volume (where no page number is indicated, the descriptions are given in the companion volume). Descriptions of the higher types (down to biotope complex level) are grouped together in Section 6.2 for ease of use by those only interested in the broader types. Descriptions of the biotopes and sub-biotopes are presented in the same order as listed in Section 4.3.

Index to codes - An index to the codes (without their habitat complex code prefixes) is given at the end of the report to enable rapid access to descriptions by those familiar with the codes.

3.2 Understanding the codes

A letter coding system has been adopted for the following reasons:

- It enables the construction of intuitive codes which can readily be related to their respective biotopes without recourse to the full biotope title.
- It enables changes to the order in which the biotopes are presented without the need to change a numerically sequenced code. This has been particularly useful in the early development phase of the classification, but has continued benefit as more minor revisions become necessary and leads to a more stable coding system.

Construction of codes follows a few simples rules, which achieve consistency throughout the classification whilst aiming to keep the resultant codes relatively short and intuitive. Familiarity with the rules for code construction and with the biotopes themselves, by those working regularly with the classification, results in rapid use of codes as a short-hand means of referring to the types defined.

Codes are defined for each level in the classification. They are assigned on the central MNCR classification database, which checks for uniqueness, and are based on the following rules:

1. Major habitat and habitat complex codes are as given in Table 3.1
2. Biotope complex, biotope and sub-biotope codes are based wherever possible upon the most characteristic taxa (which preferably also dominate spatially/numerically) (preferably no more than two per biotope complex, biotope or sub-biotope).
3. Codes for species names are derived using the first three letters of a genus or higher taxon name (e.g. Mas for ***Mas****tocarpus*, Chr for **Chr**ysophyceae). Where more than one species from a genus is used in the same section of the classification, the code is derived using the first letter of the genus and the first three letters of the specific name (e.g. Fspi for ***F****ucus* ***spi****ralis*). Other codes are as listed in Table 3.1.

4. Where the biological composition is too complex to derive a simple code, features of the habitat (e.g. **r**educed **s**alinity, **t**ide-swept) are used.

5. Within the code each new element of the code starts with a capital letter (e.g. AP for **a**mphipods and **p**olychaetes; ByAsS for **b**r**y**ozoans, **as**cidians and **s**ponges).

Although the biotope complex and biotope/sub-biotope codes are unique, to ease reference to them within the classification system they are typically used in combination with the habitat complex code. The codes are compiled using the habitat complex code, a full stop and then the biotope complex or biotope code. Where the biotope is further sub-divided the sub-biotope code is added after a second full stop. Thus:

IGS.Mrl = the **m**ae**rl** biotope complex in the **I**nfralittoral **g**ravels and **s**ands habitat complex

SLR.Asc = the ***Asc****ophyllum* biotope in the **S**heltered **L**ittoral **R**ock habitat complex

SLR.Asc.VS = the **v**ariable **s**alinity variant of the ***Asc****ophyllum* biotope in the **S**heltered **L**ittoral **R**ock habitat complex

NOTE: to avoid confusion, others using the classification should not erect similar codes for biotopes not currently described in the national classification. See Section 3.4.

Alternative codes - An alternative alpha-numeric coding system, presented in a format similar to the EUNIS code structure, is given in Appendix 3.

Table 3.1 Lexicon of codes, other than those for specific genera and species

Habitat complex code	***Meaning***
CGS	Circalittoral gravels and clean sands
CMS	Circalittoral muddy sands
CMU	Circalittoral muds
CMX	Circalittoral mixed sediments
COR	Circalittoral offshore rock
COS	Circalittoral offshore sediments
CR	Circalittoral rock
ECR	Exposed circalittoral rock
EIR	Exposed infralittoral rock
ELR	Exposed littoral rock
IGS	Infralittoral gravels and clean sands
IMS	Infralittoral muddy sands
IMU	Infralittoral muds
IMX	Infralittoral mixed sediments
IR	Infralittoral rock
LGS	Littoral gravels and clean sands
LMS	Littoral muddy sands
LMU	Littoral muds
LMX	Littoral mixed sediments
LR	Littoral rock
LS	Littoral sediments
MCR	Moderately exposed circalittoral rock
MIR	Moderately exposed infralittoral rock
MLR	Moderately exposed littoral rock
SCR	Sheltered circalittoral rock
SIR	Sheltered infralittoral rock
SLR	Sheltered littoral rock
SS	Sublittoral sediments

Table 3.1 Continued

Biotope complex/ biotope code	Meaning
A	Amphipods
Al	Algae
An	Anemones
Ang	Angiosperms
As	Ascidians
Axi	Axinellid sponges
B	Barnacles
Bar	Barren
Bwn	Brown seaweeds (Phaeophyceae)
Bo	Boulders
Br	Brachiopods
Bri	Brittlestars
Bv	Bivalves
By	Bryozoans
ByC	Bryozoan crusts
C	Crusts
Ca	Calcareous
CC	Coralline algal crusts
Chr	Chrysophyceae
Cr	Crustaceans
Cri	Crisiid bryozoans
Cup	Cup corals
CuS	Cushion sponges
Cv	Caves
D	Decapods
E	Exposed
Ec	Echinoderms
Eph	Ephemeral (seaweeds)
ErS	Erect sponges
Est	Estuarine
F	Fucoids
Fa	Fauna
Fi	Filamentous
Fo	Foliose
For	Foraminiferans
FS	Full salinity
Ft	Forest
G	Green seaweeds (Chlorophyceae)
Gz	Grazed
H	Hydroids
Ho	Holothurians
K	Kelps
L	Lichens
Lag	Lagoonal
LS	Low salinity
M	Mussels
Mar	Marine
MaS	Massive sponges
Meg	Megafauna (burrowing)
Mob	Mobile
Mrl	Maerl
MS	Muddy sand
Mu	Mud
Mx	Mixed sediment (gravel, sand & mud mixtures)
Ol	Oligochaetes
Ov	Overhangs
Oy	Oysters
P	Polychaetes
Pid	Piddocks
Pk	Park
R	Red seaweeds (Rhodophyceae)
Rkp	Rockpools
RS	Reduced salinity
S	Sponges
SC	Sponge crusts
Scr	Scour
Sed	Sediment
SfR	Soft rock
SG	Surge gully
Sgr	Seagrass
Sh	Shingle
SMu	Sandy mud
Snd & S	Sand
SoAs	Solitary ascidians
Sm	Saltmarsh
Sp	Seapens
Sw	Seaweed
Syn	Synaptid holothurians
T	Tide-swept
Tal	Talitrid amphipods
Tf	Turf
Tube	Tube/tube-building
Tw	Tubeworms
V	Vertical
VS	Variable salinity
YG	Yellow & grey lichens
X	Mixed substrata (boulders, stones & sediment mixtures)
XFa	Mixed fauna
XK	Mixed kelps

3.3 Matching data to the classification

When using the classification to match new data to the classified types, a variety of factors need to be considered:

- Whether you are in the field or have already gathered the data.
- Whether both habitat and species data (with abundance information) are available.
- The level of detail in the data (are full species lists available or only the main species? Is there granulometric data for sediment habitats? Was the data collected using techniques compatible with MNCR techniques - some old data were collected with a different philosophy to recording, such as recording from whole rocky shores as one habitat).
- Whether you have analytical packages to assist data interpretation or are matching individual records against the descriptions.

The varying levels of data, differing data sources and differing skill levels of users inevitably lead to a complex variety of options as to how best to identify the classification types in your data. Consideration is being given to the development of a matching programme to aid future use of the classification, but in the mean time the following general guidance is offered:

1. Always use both the habitat and the species data to match records. Use of species data alone (as in certain analytical packages or relying on a few obvious species alone) can be misleading. Make full use of the habitat matrices (Tables 5.2-5.8) to provide possible options of types to the considered.
2. Never rely solely on the results of a single analysis of species data; support the conclusions with other analytical techniques and with reference to the habitat data. More guidance on data analysis is given in Mills (1994).
3. Use the full hierarchical structure of the classification. Assign data to the lowest possible level in the classification; it can always be grouped up into broader types afterwards for presentation purposes (such as on maps) or other uses.
4. Do not adhere to a single level in the classification for data recording, interpretation and use. It is inappropriate to use only one level for many purposes. For instance, in mapping an area of coast, the intertidal rocky habitats may need to be mapped at the habitat complex level (because they occupy only a very narrow band on the shore) alongside the extensive subtidal sediment plains which can be mapped at biotope and sub-biotope level.

When assigning field records to a particular biotope, the MNCR has developed the following annotations to be used against the biotope code:

?	Unsure if record fits defined biotope
P	Only part of record refers to the identified biotope (i.e. record includes several biotopes) - this is used primarily when matching old data not collected to current MNCR phase 2 methodology
I	Incomplete record lacking full species list (such as collected in rapid surveys and video surveys; phase 1 methods)
?P	Combination of ? and P above

Records will not always fit clearly to the types defined as they are inevitably a generalisation of the character of the type from a variety of different locations. The closeness of fit can be defined as the degree of representivity of the record to the defined biotope as follows (from Connor & Hiscock 1996):

Very high	Habitat typical. Characteristic species present in average abundance. Significant number of preferential species present or fewer present but in high abundance.
High	Habitat typical. Characteristic species mostly present in average abundance. Preferential species present in moderate abundance.
Moderate	Habitat mostly typical. Characteristic species present but sometimes abundances different to normal. Few preferential species present.
Low	Habitat may show slight variation from the norm. Characteristic species present in slightly different abundances. Very few preferential species present.
Very low	Habitat may show large variation from the norm. Characteristic species present in markedly different abundance to normal. No preferential species present.

Use of these 'flags' against particular records in a data set is important in data handling to separate adequately correlated records from those for which some uncertainty remains.

3.4 Guidance on recording types not currently defined

Whilst every effort has been made to develop a comprehensive classification, it is likely that certain parts of the classification will need further consideration. This is most likely in the circalittoral rock and subtidal sediment sections. The present classification therefore remains open to further development, either to add additional types or to reconsider the status and definition of those currently described. Practical use of the classification, both in further field work and in its application for mapping, management and conservation assessment, are all likely to inform such development.

The classification aims to define biotopes at a level of detail which draws a sensible balance between real differences in habitat which lead to distinctive communities and the inevitable degree of variation from site to site and with time within these habitats. When due consideration has been given to the variation likely within any particular type, it may be considered that no type in the present classification adequately describes the feature. In these circumstances the following action is recommended:

1. If the features are encountered during field survey, make full and detailed records of the feature using standard MNCR recording techniques. Full guidance on field recording techniques is available in Connor & Hiscock (1996). Recording forms may be supplied by the MNCR.
2. Draft a full description of the feature, similar to the descriptions given here, ensuring the habitat classification details and the characterising species are given as well as a text description. If modification of an existing description is considered appropriate, simply annotate the relevant description.
3. Send the relevant data, as field records or from other data sources (this can be supplied in spreadsheet format), together with the new or annotated description to the MNCR. With such information the MNCR should be able to adequately consider the new feature and advise on how best to incorporate it into the classification (either as a new type or by modification of an existing definition if appropriate).
4. For those undertaking shore mapping surveys (Richards, Bunker & Foster-Smith 1996) such features can be assigned working codes to facilitate ongoing recording and data presentation, but these <u>must be clearly distinguished</u> from the MNCR national classification codes by prefixing with an appropriate local code (e.g. CAR.SLR.Fer for an entity found consistently in a survey of Cardigan Bay).

3.5 Mapping

The establishment of a single national classification system enables consistent interpretation of habitat/biotope data from different data sets and for different areas. One way of representing this consistency is through the standard representation of habitats/biotopes on maps. To this end a standard colour palette has been developed to represent each of the habitat complexes in the classification (Plate1). The scheme adopts dark colours for intertidal habitats, because they typically have to be represented as very narrow bands on maps, and progressively paler shades for shallow and deeper subtidal habitats, using the same general colour for each main type (e.g. blues for moderately exposed rock). Familiarisation with the colour scheme gives the reader an immediate indication of the distribution of the major habitat complexes (e.g. bright yellow indicates shallow sublittoral sands) in the area. For individual maps it is often desirable to depict further definition depending on the scale and the data available. This is achieved through the overlay of shading or symbols to represent biotope complexes or individual biotopes on the base colour for the habitat complex. This mapping technique has been tested for a wide range of coastal areas and covering a variety of habitat types and scales (e.g. Hill, Emblow & Northen 1996) and is illustrated in Plate 2. It may be desirable to further standardise the technique by developing standard overlay shading and symbols for biotope complexes and biotopes in addition to the standard colours for habitat complexes.

The colour scheme uses the Pantone Process colour palette which is widely used by commercial print companies. However, this colour palette may not be available with all mapping and drawing software packages and variations in colour reproduction are likely with different printers. In such circumstances the user should match the computer's colour palette to that given here to present the same end colour, albeit from a different palette. Table 3.2 should assist such colour matching.

Table 3.2 Red/green/blue colour balance for each of the Pantone colours (refer to Plate 1)

	ROCK			**SEDIMENT**			
	Exposed rock	**Moderately exposed rock**	**Sheltered rock**	**Gravels & sands**	**Muddy sands**	**Muds**	**Mixed sediment**
Littoral	R 100 G 0 B 0	R 0 G 40 B 100	R 0 G 80 B 0	R 100 G 50 B 0	R 45 G 45 B 5	R 40 G 0 B 0	R 40 G 25 B 50
Infralittoral	R 100 G 35 B 30	R 20 G 75 B 100	R 45 G 100 B 45	R 90 G 70 B 0	R 75 G 75 B 20	R 60 G 50 B 90	R 70 G 60 B 90
Circalittoral	R 100 G 70 B 75	R 75 G 100 B 100	R 75 G 100 B 80	R 100 G 100 B 45	R 90 G 90 B 50	R 88 G 69 B 69	R 85 G 80 B 90
Circalittoral offshore		R 72 G 77 B 97			R 100 G 85 B 65		
Conurbation:		R 60 G 60 B 60		**Land:**	R 80 G 80 B 80		

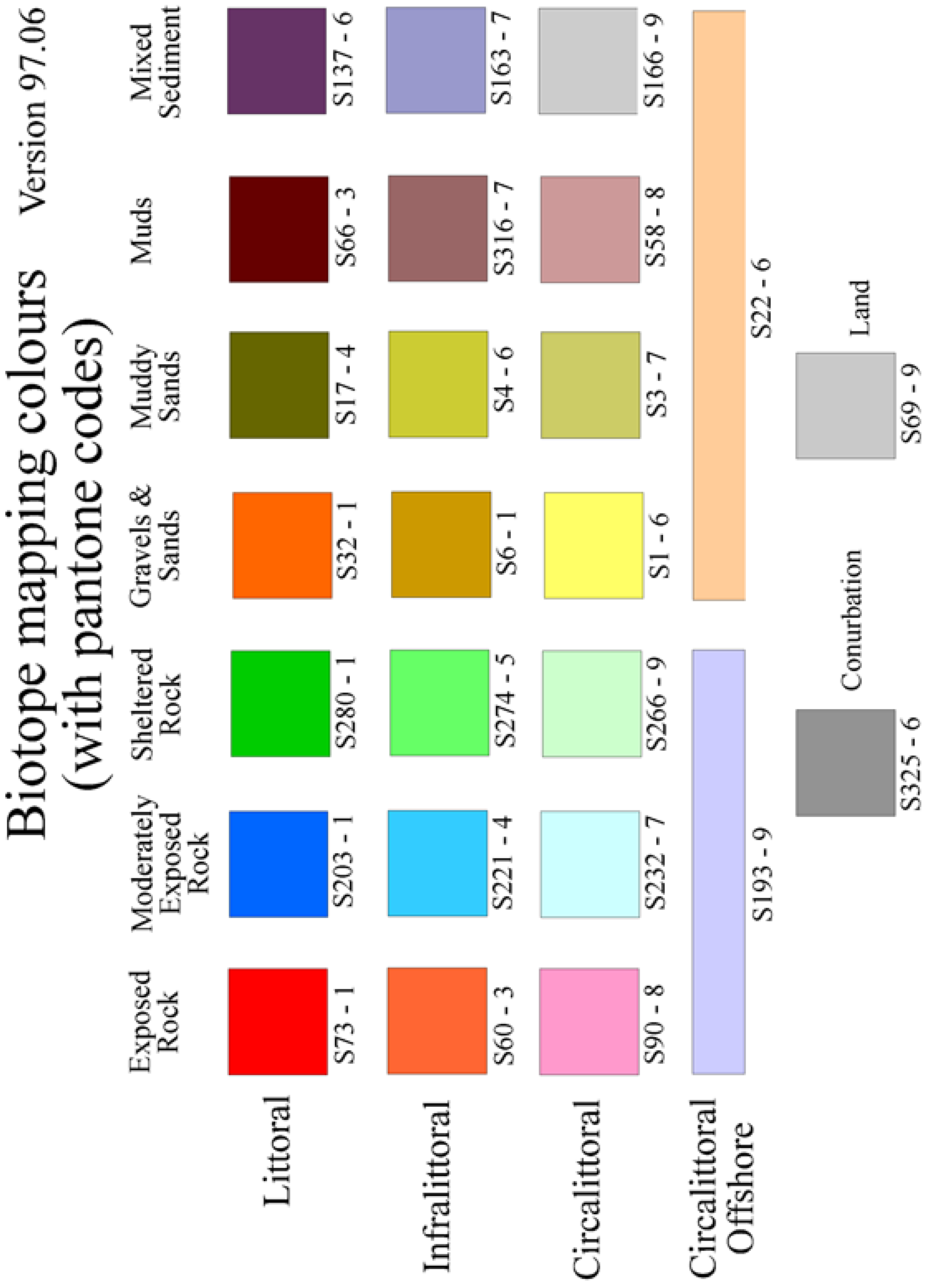

Plate 1 Colour chart for mapping habitat complex types

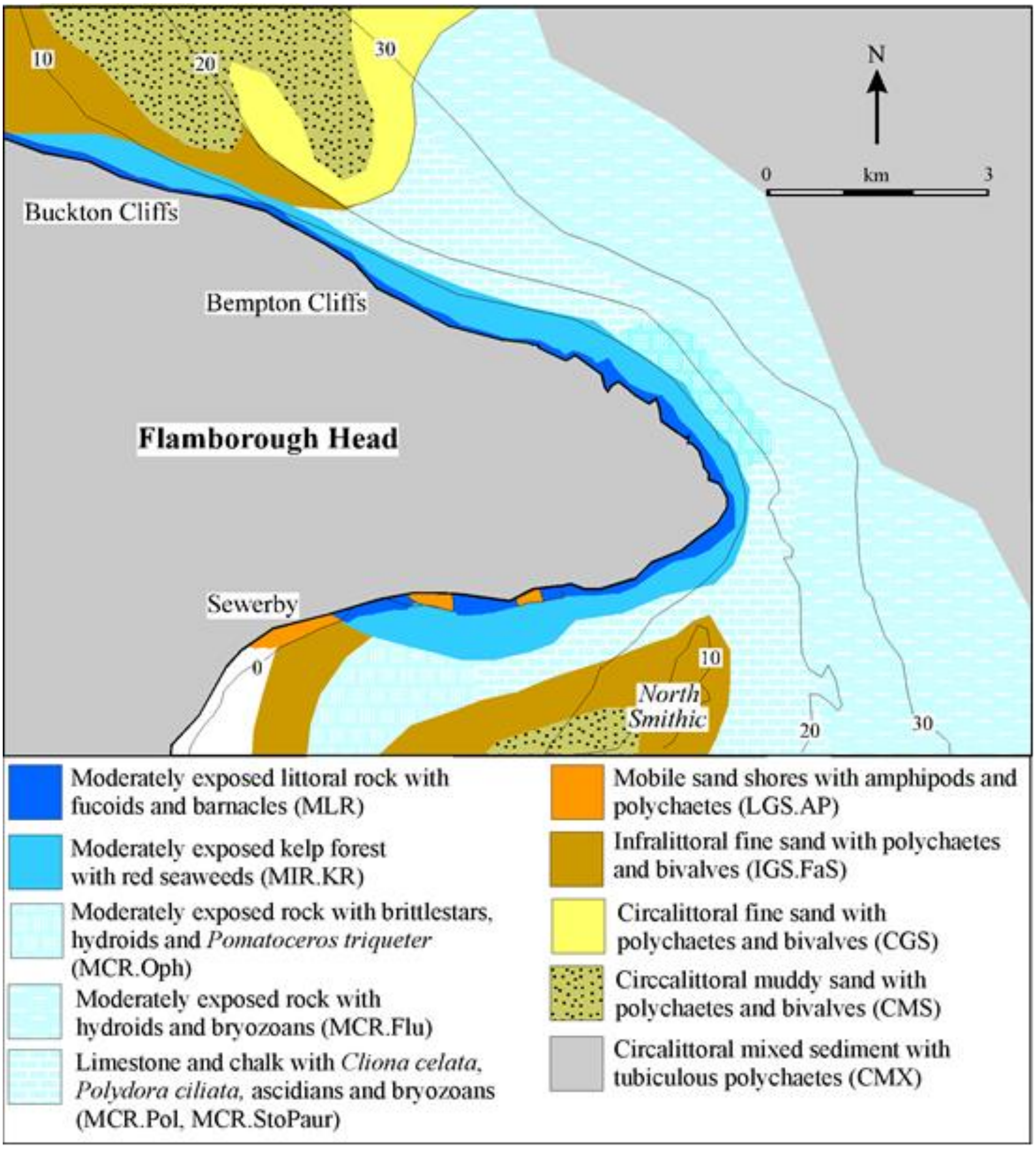

Plate 2 Example of a biotope distribution map using standard habitat complex colours and overlay shading to add further definition (from Brazier et al. In prep.; based on RoxAnn acoustic data, detailed in situ survey and remote grab sampling)

4 Biotope classification list

4.1 Layout of the hierarchical list

A hierarchical classification of the biotopes is given below, each of which is described in Section 6. The biotopes are presented in a logical order to help bring together those types which are most similar to each other in character. As defined biotopes often represent a node along a continuum of change it is important to refer to other closely-associated types, particularly through use of the matrices given in Section 5.

Within the major divisions of substrata (rock/mixed substrata, sediment) the types are given in each of the major zones (littoral, infralittoral, circalittoral and circalittoral offshore), representing major changes in biological character from the coastal terrestrial habitats dominated by higher plants through to deep water (circalittoral) animal-dominated communities. In each main zone types are generally listed in order according to wave and tidal exposure (exposed to sheltered), sub-zones (higher to lower), and for sediments their sediment grade (coarse to fine). Minor types, e.g. for rockpools, overhangs and caves, are placed at the end of the appropriate section. Some biotopes do not lie readily in this preferred sequence and consequently a pragmatic decision has been made to place particular biotopes in the most useful sequence to help users of the system. Species nomenclature follows Howson & Picton (1997).

4.2 The MNCR BioMar biotope classification - main types

A list of the main types down to biotope complex level is given below.

LITTORAL ROCK (and other hard substrata)

Lichens or algal crusts

EXPOSED LITTORAL ROCK (mussel/barnacle shores)

Mytilus (mussels) and barnacles
Robust fucoids and red seaweeds

MODERATELY EXPOSED LITTORAL ROCK (barnacle/fucoid shores)

Barnacles and fucoids
Red seaweeds (moderately exposed shores)
Ephemeral green or red seaweeds (freshwater or sand-influenced)
Mytilus (mussels) and fucoids (moderately exposed shores)
Littoral *Sabellaria* (honeycomb worm) reefs

SHELTERED LITTORAL ROCK (fucoid shores)

Dense fucoids (stable rock)
Fucoids, barnacles or ephemeral seaweeds (mixed substrata)
Mytilus (mussel) beds (mixed substrata)

Rockpools
Overhangs and caves

LITTORAL SEDIMENTS

LITTORAL GRAVELS AND SANDS

Shingle (pebble) and gravel shores
Sand shores
Estuarine coarse sediment shores

LITTORAL MUDDY SANDS

Muddy sand shores
Littoral *Zostera* (seagrass) beds

LITTORAL MUDS

Saltmarsh
Sandy mud shores
Soft mud shores

LITTORAL MIXED SEDIMENTS

INFRALITTORAL ROCK (and other hard substrata)

EXPOSED INFRALITTORAL ROCK

Kelp with cushion fauna, foliose red seaweeds or coralline crusts (wave-exposed rock
Robust faunal cushions and crusts (surge gullies & caves)

MODERATELY EXPOSED INFRALITTORAL ROCK

Kelp with red seaweeds (moderately exposed rock)
Grazed kelp with algal crusts
Sand or gravel-affected or disturbed kelp and seaweed communities

SHELTERED INFRALITTORAL ROCK

Silted kelp (stable rock)
Estuarine faunal communities (shallow rock/mixed substrata)
Submerged fucoids, green and red seaweeds (lagoonal rock)

Fauna and seaweeds (shallow vertical rock)

CIRCALITTORAL ROCK (and other hard substrata)

EXPOSED CIRCALITTORAL ROCK

Faunal crusts or short turfs (wave-exposed rock)
Alcyonium-dominated communities (tide-swept/vertical)
Barnacle, cushion sponge and *Tubularia* communities (very tide-swept/wave-sheltered)

MODERATELY EXPOSED CIRCALITTORAL ROCK

Mixed faunal turfs (moderately exposed rock)
Bryozoan/hydroid turfs (sand-influenced)
Circalittoral *Sabellaria* reefs
Mussel beds (open coast circalittoral rock/mixed substrata)
Brittlestar beds
Grazed fauna (moderately exposed or sheltered rock)
Ascidian communities (silt-influenced)
Soft rock communities

SHELTERED CIRCALITTORAL ROCK

Brachiopod and solitary ascidian communities (sheltered rock)
Sheltered *Modiolus* (horse-mussel) beds

Faunal turfs (deep vertical rock)
Caves and overhangs (deep)

CIRCALITTORAL OFFSHORE ROCK (and other hard substrata)

Lophelia reefs

SUBLITTORAL SEDIMENTS

INFRALITTORAL GRAVELS AND SANDS

Maerl beds (open coast/clean sediments)
Shallow gravel faunal communities
Shallow sand faunal communities
Estuarine sublittoral gravels and sands

CIRCALITTORAL GRAVELS AND SANDS

INFRALITTORAL MUDDY SANDS

Seagrass beds (shallow sublittoral/lower shore)
Shallow muddy sand faunal communities

CIRCALITTORAL MUDDY SANDS

INFRALITTORAL MUDS

Angiosperm communities (lagoons)
Shallow marine mud communities
Estuarine sublittoral muds

CIRCALITTORAL MUDS

INFRALITTORAL MIXED SEDIMENTS

Laminaria saccharina (sugar kelp) and filamentous seaweeds (mixed sediment)
Maerl beds (muddy mixed sediments)
Oyster beds
Shallow mixed sediment faunal communities
Estuarine sublittoral mixed sediments

CIRCALITTORAL MIXED SEDIMENTS

CIRCALITTORAL OFFSHORE SEDIMENTS

4.3 The MNCR BioMar biotope classification - full list of types

Higher code	Biotope code	Biotope	Pg.
LR		**LITTORAL ROCK (and other hard substrata)**	74
LR.L		**Lichens or algal crusts**	75
LR.L	YG	Yellow and grey lichens on supralittoral rock	110
LR.L	Pra	*Prasiola stipitata* on nitrate-enriched supralittoral or littoral fringe rock	111
LR.L	Ver	*Verrucaria maura* on littoral fringe rock	112
LR.L	Ver.Por	*Verrucaria maura* and *Porphyra umbilicalis* on very exposed littoral fringe rock	113
LR.L	Ver.B	*Verrucaria maura* and sparse barnacles on exposed littoral fringe rock	115
LR.L	Ver.Ver	*Verrucaria maura* on moderately exposed to very sheltered upper littoral fringe rock	117
LR.L	Chr	Chrysophyceae on vertical upper littoral fringe soft rock	119
LR.L	Bli	*Blidingia* spp. on vertical littoral fringe soft rock	120
LR.L	UloUro	*Ulothrix flacca* and *Urospora* spp. on freshwater-influenced vertical littoral fringe soft rock	121
ELR		**EXPOSED LITTORAL ROCK (mussel/barnacle shores)**	76
ELR.MB		***Mytilus* (mussels) and barnacles**	77
ELR.MB	MytB	*Mytilus edulis* and barnacles on very exposed eulittoral rock	122
ELR.MB	BPat	Barnacles and *Patella* spp. on exposed or moderately exposed, or vertical sheltered, eulittoral rock	124
ELR.MB	BPat.Cht	*Chthamalus* spp. on exposed upper eulittoral rock	126
ELR.MB	BPat.Lic	Barnacles and *Lichina pygmaea* on steep exposed upper eulittoral rock	128
ELR.MB	BPat.Cat	*Catenella caespitosa* on overhanging, or shaded vertical, upper eulittoral rock	130
ELR.MB	BPat.Fvesl	Barnacles, *Patella* spp. and *Fucus vesiculosus* f. *linearis* on exposed eulittoral rock	131
ELR.MB	BPat.Sem	*Semibalanus balanoides* on exposed or moderately exposed, or vertical sheltered, eulittoral rock	133
ELR.FR		**Robust fucoids or red seaweeds**	78
ELR.FR	Fdis	*Fucus distichus* subsp. *anceps* and *Fucus spiralis* f. *nana* on extremely exposed upper eulittoral rock	134
ELR.FR	Coff	*Corallina officinalis* on very exposed lower eulittoral rock	135

Higher code	Biotope code	Biotope	Pg.
LMU.Sm	NVC SM26	*Inulu crithmoides* on saltmarshes	
LMU.Sm	NVC SM27	*Sagina maritima* ephemeral salt marsh in sand	
LMU.Sm		**Saltmarsh (mid-upper)**	
LMU.Sm	NVC SM18	*Juncus maritimus*	
LMU.Sm	NVC SM15	*Juncus maritimus* with *Triglochin maritima*	
LMU.Sm	NVC SM20	*Eleocharis uniglumis*	
LMU.Sm	NVC SM19	*Blysmus rufus*	
LMU.Sm	NVC SM17	*Artemisia maritima* with *Festuca rubra*, or open canopy of *A. maritima* and *Halimione*	
LMU.Sm	NVC SM16	*Festuca rubra*	
LMU.Sm	NVC SM16	Sub-communities of *Festuca rubra* with *Agrostis stolonifera*, *Juncus gerardi*, *Puccinellia maritima*, *Glaux maritima*, *Triglochin maritima*, *Armeria maritima* and *Plantago maritima*	
LMU.Sm		**Saltmarsh (low-mid)**	
LMU.Sm	NVC SM14	*Halimione portulacoides*	
LMU.Sm	NVC SM13	*Puccinellia maritima*	
LMU.Sm	NVC SM13	Sub-communities of *Puccinellia maritima* saltmarsh with *Limonium vulgare* and *Armeria maritima*; *Puccinellia maritima* with *Glaux maritima* co-dominant in species-poor vegetation; *Puccinellia maritima* with *Plantago maritima* and/or *Armeria maritima*	
LMU.Sm	NVC SM10	Annual *Salicornia*, *Suaeda maritima* and *Puccinella maritima*	
LMU.Sm		**Saltmarsh (pioneer)**	
LMU.Sm	NVC SM12	Rayed *Aster tripolium*	
LMU.Sm	NVC SM11	*Aster tripolium* var. *discoides*	
LMU.Sm	NVC SM7	*Arthrocnemum perenne*, sometimes with *Halimione*, *Puccinella* and *Suaeda*	
LMU.Sm	NVC SM9	*Suaeda maritima*	
LMU.Sm	NVC SM8	*Salicornia* spp.	238
LMU.Sm	NVC SM6	*Spartina anglica*	
LMU.Sm	NVC SM5	*Spartina alterniflora* with *Spartina anglica*, *Puccinellia maritima* and *Aster tripolium*	
LMU.Sm	NVC SM4	*Spartina maritima*	

Higher code	Biotope code	Biotope	Pg.
LMU.Sm		**Saltmarsh (low)**	
LMU.Sm	NVC SM3	*Eleocharis parvula*	
LMU.SMu		**Sandy mud shores**	105
LMU.SMu	HedMac	*Hediste diversicolor* and *Macoma balthica* in sandy mud shores	239
LMU.SMu	HedMac.Are	*Hediste diversicolor, Macoma balthica* and *Arenicola marina* in muddy sand or sandy mud shores	240
LMU.SMu	HedMac.Pyg	*Hediste diversicolor, Macoma balthica* and *Pygospio elegans* in sandy mud shores	241
LMU.SMu	HedMac.Mare	*Hediste diversicolor, Macoma balthica* and *Mya arenaria* in sandy mud shores	242
LMU.Mu		**Soft mud shores**	106
LMU.Mu	HedScr	*Hediste diversicolor* and *Scrobicularia plana* in reduced salinity mud shores	244
LMU.Mu	HedStr	*Hediste diversicolor* and *Streblospio shrubsolii* in sandy mud or soft mud shores	246
LMU.Mu	HedOl	*Hediste diversicolor* and oligochaetes in low salinity mud shores	248
LMX		**LITTORAL MIXED SEDIMENTS**	107
LMX	MytFab	*Mytilus edulis* and *Fabricia sabella* in poorly-sorted muddy sand or muddy gravel shores	250
LMX	Mare	*Mya arenaria* and polychaetes in muddy gravel shores	251
IR		**INFRALITTORAL ROCK (and other hard substrata)**	
EIR		**EXPOSED INFRALITTORAL ROCK**	
EIR.KFaR		**Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)**	
EIR.KFaR	Ala	*Alaria esculenta* on sublittoral fringe bedrock	254
EIR.KFaR	Ala.Myt	*Alaria esculenta, Mytilus edulis* and coralline crusts on very exposed sublittoral fringe bedrock	255
EIR.KFaR	Ala.Ldig	*Alaria esculenta* and *Laminaria digitata* on exposed sublittoral fringe bedrock	257
EIR.KFaR	AlaAnSC	*Alaria esculenta* forest with dense anemones and sponge crusts on extremely exposed infralittoral bedrock	
EIR.KFaR	LhypFa	*Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock	

Higher code	Biotope code	Biotope	Pg.
EIR.KFaR	LhypPar	Sparse *Laminaria hyperborea* and dense *Paracentrotus lividus* on exposed infralittoral limestone	
EIR.KFaR	LhypR	*Laminaria hyperborea* with dense foliose red seaweeds on exposed infralittoral rock	
EIR.KFaR	LhypR.Ft	*Laminaria hyperborea* forest with dense foliose red seaweeds on exposed upper infralittoral rock	
EIR.KFaR	LhypR.Pk	*Laminaria hyperborea* park with dense foliose red seaweeds on exposed lower infralittoral rock	
EIR.KFaR	LhypR.Loch	Mixed *Laminaria hyperborea* and *Laminaria ochroleuca* forest on exposed infralittoral rock	
EIR.KFaR	LsacSac	*Laminaria saccharina* and/or *Saccorhiza polyschides* on exposed infralittoral rock	
EIR.KFaR	FoR	Foliose red seaweeds on exposed or moderately exposed lower infralittoral rock	
EIR.KFaR	FoR.Dic	Foliose red seaweeds with dense *Dictyota dichotoma* and/or *Dictyopteris membranacea* on exposed lower infralittoral rock	
EIR.SG		**Robust faunal cushions and crusts (surge gullies & caves)**	
EIR.SG	FoSwCC	Foliose seaweeds and coralline crusts in surge gully entrances	
EIR.SG	SCAn	Sponge crusts and anemones on wave-surged vertical infralittoral rock	
EIR.SG	SCAn.Tub	Sponge crusts, anemones and *Tubularia indivisa* in shallow infralittoral surge gullies	
EIR.SG	SCAs	Sponge crusts and colonial ascidians on wave-surged vertical infralittoral rock	
EIR.SG	SCAs.DenCla	*Dendrodoa grossularia* and *Clathrina coriacea* on wave-surged vertical infralittoral rock	
EIR.SG	SCAs.ByH	Sponge crusts, colonial (polyclinid) ascidians and a bryozoan/hydroid turf on wave-surged vertical or overhanging infralittoral rock	
EIR.SG	SC	Sponge crusts on extremely wave-surged infralittoral cave or gully walls	
EIR.SG	CC	*Balanus crenatus* and/or *Pomatoceros triqueter* with spirorbid worms and coralline crusts on severely scoured infralittoral rock (No description at this level)	
EIR.SG	CC.BalPom	*Balanus crenatus* and/or *Pomatoceros triqueter* with spirorbid worms and coralline crusts on severely scoured vertical infralittoral rock	
EIR.SG	CC.Mob	Coralline crusts and crustaceans on mobile boulders or cobbles in surge gullies	

Higher code	Biotope code	Biotope	Pg.
MIR		**MODERATELY EXPOSED INFRALITTORAL ROCK**	
MIR.KR		**Kelp with red seaweeds (moderately exposed rock)**	
MIR.KR	Ldig	*Laminaria digitata* on moderately exposed or tide-swept sublittoral fringe rock	259
MIR.KR	Ldig.Ldig	*Laminaria digitata* on moderately exposed sublittoral fringe rock	260
MIR.KR	Ldig.Ldig.Bo	*Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders	262
MIR.KR	Ldig.T	*Laminaria digitata*, ascidians and bryozoans on tide-swept sublittoral fringe rock	264
MIR.KR	Ldig.Pid	*Laminaria digitata* and piddocks on sublittoral fringe soft rock	265
MIR.KR	Lhyp	*Laminaria hyperborea* and foliose red seaweeds on moderately exposed infralittoral rock	
MIR.KR	Lhyp.Ft	*Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock	
MIR.KR	Lhyp.Pk	*Laminaria hyperborea* park and foliose red seaweeds on moderately exposed lower infralittoral rock	
MIR.KR	Lhyp.TFt	*Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock	
MIR.KR	Lhyp.TPk	*Laminaria hyperborea* park with hydroids, bryozoans and sponges on tide-swept lower infralittoral rock	
MIR.KR	Lhyp.Loch	Mixed *Laminaria hyperborea* and *Laminaria ochroleuca* forest on moderately exposed or sheltered infralittoral rock	
MIR.GzK		**Grazed kelp with algal crusts**	
MIR.GzK	LhypGz	Grazed *Laminaria hyperborea* with coralline crusts on infralittoral rock	
MIR.GzK	LhypGz.Ft	Grazed *Laminaria hyperborea* forest with coralline crusts on upper infralittoral rock	
MIR.GzK	LhypGz.Pk	Grazed *Laminaria hyperborea* park with coralline crusts on lower infralittoral rock	
MIR.SedK		**Sand or gravel-affected or disturbed kelp and seaweed communities**	
MIR.SedK	Sac	*Saccorhiza polyschides* and other opportunistic kelps on disturbed upper infralittoral rock	267
MIR.SedK	LsacChoR	*Laminaria saccharina*, *Chorda filum* and dense red seaweeds on shallow unstable infralittoral boulders and cobbles	
MIR.SedK	XKScrR	Mixed kelps with scour-tolerant and opportunistic foliose red seaweeds on scoured or sand-covered infralittoral rock	
MIR.SedK	SabKR	*Sabellaria spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock	
MIR.SedK	EphR	Ephemeral red seaweeds and kelps on tide-swept mobile infralittoral cobbles	

Higher code	Biotope code	Biotope	Pg.
MIR.SedK	HalXK	*Halidrys siliquosa* and mixed kelps on tide-swept infralittoral rock with coarse sediment	
MIR.SedK	PolAhn	*Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock	
SIR		**SHELTERED INFRALITTORAL ROCK**	
SIR.K		**Silted kelp (stable rock)**	
SIR.K	LhypLsac	Mixed *Laminaria hyperborea* and *Laminaria saccharina* on sheltered infralittoral rock	
SIR.K	LhypLsac.Ft	Mixed *Laminaria hyperborea* and *Laminaria saccharina* forest on sheltered upper infralittoral rock	
SIR.K	LhypLsac.Pk	Mixed *Laminaria hyperborea* and *Laminaria saccharina* park on sheltered lower infralittoral rock	
SIR.K	Lsac	*Laminaria saccharina* on very sheltered infralittoral rock	269
SIR.K	Lsac.Ldig	*Laminaria saccharina* and *Laminaria digitata* on sheltered sublittoral fringe rock	270
SIR.K	Lsac.Ft	*Laminaria saccharina* forest on very sheltered upper infralittoral rock	272
SIR.K	Lsac.Pk	*Laminaria saccharina* park on very sheltered lower infralittoral rock	
SIR.K	Lsac.T	*Laminaria saccharina*, foliose red seaweeds, sponges & ascidians on tide-swept infralittoral rock	
SIR.K	Lsac.Cod	Sparse *Laminaria saccharina* with *Codium* spp. and sparse red seaweeds on heavily silted very sheltered infralittoral rock	
SIR.K	EchBriCC	*Echinus*, brittlestars and coralline crusts on grazed lower infralittoral rock	
SIR.K	LsacRS	*Laminaria saccharina* on reduced or low salinity infralittoral rock	
SIR.K	LsacRS.FiR	Sparse *Laminaria saccharina* with dense filamentous red seaweeds, sponges and *Balanus crenatus* on tide-swept variable salinity infralittoral rock	
SIR.K	LsacRS.Psa	*Laminaria saccharina* and *Psammechinus miliaris* on reduced salinity grazed infralittoral rock	
SIR.K	LsacRS.Phy	*Laminaria saccharina* with *Phyllophora* spp. and filamentous green seaweeds on reduced or low salinity infralittoral rock	
SIR.EstFa		**Estuarine faunal communities (shallow rock/mixed substrata)**	
SIR.EstFa	MytT	*Mytilus edulis* beds on reduced salinity tide-swept infralittoral rock	
SIR.EstFa	CorEle	*Cordylophora caspia* and *Electra crustulenta* on reduced salinity infralittoral rock	
SIR.EstFa	HarCon	*Hartlaubella gelatinosa* and *Conopeum reticulum* on low salinity infralittoral mixed substrata	

Higher code	Biotope code	Biotope	Pg.
SIR.Lag		**Submerged fucoids, green and red seaweeds (lagoonal rock)**	
SIR.Lag	FChoG	Mixed fucoids, *Chorda filum* and green seaweeds on reduced salinity infralittoral rock	
SIR.Lag	AscSAs	*Ascophyllum nodosum* with epiphytic sponges and ascidians on variable salinity infralittoral rock	
SIR.Lag	PolFur	*Polyides rotundus* and/or *Furcellaria lumbricalis* on reduced salinity infralittoral rock	
SIR.Lag	FcerEnt	*Fucus ceranoides* and *Enteromorpha* spp. on low salinity infralittoral rock	
		Infralittoral rock (other)	
IR.FaSwV		**Fauna and seaweeds (shallow vertical rock)**	
IR.FaSwV	CorMetAlc	*Corynactis viridis*, *Metridium senile* and *Alcyonium digitatum* on exposed or moderately exposed vertical infralittoral rock	
IR.FaSwV	AlcByH	*Alcyonium digitatum* and a bryozoan, hydroid and ascidian turf on moderately exposed vertical infralittoral rock	
IR.FaSwV	AlcByH.Hia	*Hiatella arctica*, bryozoans and ascidians on vertical infralittoral soft rock	
CR		**CIRCALITTORAL ROCK (and other hard substrata)**	
ECR		**EXPOSED CIRCALITTORAL ROCK**	
ECR.EFa		**Faunal crusts or short turfs (wave-exposed rock)**	
ECR.EFa	CCParCar	Coralline crusts, *Parasmittina trispinosa*, *Caryophyllia smithii*, *Haliclona viscosa*, polyclinids and sparse *Corynactis viridis* on very exposed circalittoral rock	
ECR.EFa	CorCri	*Corynactis viridis* and a crisiid/*Bugula*/*Cellaria* turf on steep or vertical exposed circalittoral rock	
ECR.EFa	PomByC	*Pomatoceros triqueter*, *Balanus crenatus* and bryozoan crusts on mobile circalittoral cobbles and pebbles	
ECR.Alc		***Alcyonium*-dominated communities (tide-swept/vertical)**	
ECR.Alc	AlcTub	*Alcyonium digitatum* with dense *Tubularia indivisa* and anemones on strongly tide-swept circalittoral rock	
ECR.Alc	AlcMaS	*Alcyonium digitatum* with massive sponges (*Cliona celata* and *Pachymatisma johnstonia*) and *Nemertesia antennina* on moderately tide-swept exposed circalittoral rock	

Higher code	Biotope code	Biotope	Pg.
ECR.Alc	AlcSec	*Alcyonium digitatum* with *Securiflustra securifrons* on weakly tide-swept or scoured moderately exposed circalittoral rock	
ECR.Alc	AlcC	*Alcyonium digitatum*, *Pomatoceros triqueter*, algal and bryozoan crusts on vertical exposed circalittoral rock	
ECR.BS		**Barnacle, cushion sponge and *Tubularia* communities (very tide-swept/wave-sheltered)**	
ECR.BS	BalTub	*Balanus crenatus* and *Tubularia indivisa* on extremely tide-swept circalittoral rock	
ECR.BS	TubS	*Tubularia indivisa*, sponges and other hydroids on tide-swept circalittoral bedrock	
ECR.BS	BalHpan	*Balanus crenatus*, *Halichondria panicea* and *Alcyonidium diaphanum* on extremely tide-swept sheltered circalittoral rock	
ECR.BS	CuSH	Cushion sponges, hydroids and ascidians on very tide-swept sheltered circalittoral rock	
ECR.BS	HbowEud	*Halichondria bowerbanki*, *Eudendrium arbusculum* and *Eucratea loricata* on reduced salinity tide-swept circalittoral mixed substrata	
MCR		**MODERATELY EXPOSED CIRCALITTORAL ROCK**	
MCR.XFa		**Mixed faunal turfs (moderately exposed rock)**	
MCR.XFa	PhaAxi	*Phakellia ventilabrum* and axinellid sponges on deep exposed circalittoral rock	
MCR.XFa	ErSEun	Erect sponges, *Eunicella verrucosa* and *Pentapora foliacea* on slightly tide-swept moderately exposed circalittoral rock	
MCR.XFa	ErSPbolSH	Cushion sponges (*Polymastia boletiformis*, *Tethya*), stalked sponges, *Nemertesia* spp. and *Pentapora foliacea* on moderately exposed circalittoral rock	
MCR.XFa	ErSSwi	Erect sponges and *Swiftia pallida* on slightly tide-swept moderately exposed circalittoral rock	
MCR.ByH		**Bryozoan/hydroid turfs (sand-influenced)**	
MCR.ByH	SNemAdia	Sparse sponges, *Nemertesia* spp., *Alcyonidium diaphanum* and *Bowerbankia* spp. on circalittoral mixed substrata	
MCR.ByH	Flu	*Flustra foliacea* and other hydroid/bryozoan turf species on slightly scoured circalittoral rock or mixed substrata	
MCR.ByH	Flu.Flu	*Flustra foliacea* on slightly scoured silty circalittoral rock or mixed substrata	
MCR.ByH	Flu.HByS	*Flustra foliacea* with hydroids, bryozoans and sponges on slightly tide-swept circalittoral mixed substrata	
MCR.ByH	Flu.SerHyd	*Sertularia argentea*, *S. cupressina* and *Hydrallmania falcata* on tide-swept circalittoral cobbles and pebbles	

Higher code	Biotope code	Biotope	Pg.
MCR.ByH	Flu.Hocu	*Haliclona oculata* and *Flustra foliacea* with a rich faunal turf on tide-swept sheltered circalittoral boulders or cobbles	
MCR.ByH	Urt	*Urticina felina* on sand-affected circalittoral rock	
MCR.ByH	Urt.Urt	*Urticina felina* on sand-scoured circalittoral rock	
MCR.ByH	Urt.Cio	*Urticina felina* and *Ciocalypta penicillus* on sand-covered circalittoral rock	
MCR.CSab		**Circalittoral *Sabellaria* reefs**	
MCR.CSab	Sspi	*Sabellaria spinulosa* crusts on silty turbid circalittoral rock	
MCR.M		**Mussel beds (open coast circalittoral rock/mixed substrata)**	
MCR.M	MytHAs	*Mytilus edulis* beds with hydroids and ascidians on tide-swept moderately exposed circalittoral rock	
MCR.M	Mus	*Musculus discors* beds on moderately exposed circalittoral rock	
MCR.M	ModT	*Modiolus modiolus* beds with hydroids and red seaweeds on tide-swept circalittoral mixed substrata	
MCR.Bri		**Brittlestar beds**	
MCR.Bri	Oph	*Ophiothrix fragilis* and/or *Ophiocomina nigra* beds on slightly tide-swept circalittoral rock or mixed substrata	
MCR.Bri	Oph.Oacu	*Ophiopholis aculeata* beds on slightly tide-swept circalittoral rock or mixed substrata	
MCR.GzFa		**Grazed fauna (moderately exposed or sheltered rock)**	
MCR.GzFa	FaAlC	Faunal and algal crusts, *Echinus esculentus*, sparse *Alcyonium digitatum* and grazing-tolerant fauna on moderately exposed circalittoral rock	
MCR.GzFa	FaAlC.Abi	Faunal and algal crusts, *Echinus esculentus*, sparse *Alcyonium digitatum*, *Abietinaria abietina* and other grazing-tolerant fauna on moderately exposed circalittoral rock	
MCR.As		**Ascidian communities (silt-influenced)**	
MCR.As	StoPaur	*Stolonica socialis* and/or *Polyclinum aurantium* with *Flustra foliacea* on slightly sand-scoured tide-swept moderately exposed circalittoral rock	
MCR.As	MolPol	*Molgula manhattensis* and *Polycarpa* spp. with erect sponges on tide-swept moderately exposed circalittoral rock	
MCR.As	MolPol.Sab	Dense ascidians, bryozoans and hydroids on a crust of *Sabellaria spinulosa* on tide-swept circalittoral rock	
MCR.SfR		**Soft rock communities**	
MCR.SfR	Pid	Piddocks with a sparse associated fauna in upward-facing circalittoral very soft chalk or clay	

Higher code	Biotope code	Biotope	Pg.
MCR.SfR	Pol	*Polydora* sp. tubes on upward-facing circalittoral soft rock	
SCR		**SHELTERED CIRCALITTORAL ROCK**	
SCR.BrAs		**Brachiopod and solitary ascidian communities (sheltered rock)**	
SCR.BrAs	AntAsH	*Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock	
SCR.BrAs	SubSoAs	*Suberites* spp. and other sponges with solitary ascidians on very sheltered circalittoral rock	
SCR.BrAs	AmenCio	Solitary ascidians, including *Ascidia mentula* and *Ciona intestinalis*, on very sheltered circalittoral rock	
SCR.BrAs	AmenCio.Met	Large *Metridium senile* and solitary ascidians on grazed very sheltered circalittoral rock	
SCR.BrAs	Aasp	*Ascidiella aspersa* on sheltered circalittoral rocks on muddy sediment	
SCR.BrAs	NeoPro	*Neocrania anomala* and *Protanthea simplex* on very sheltered circalittoral rock	
SCR.BrAs	NeoPro.CaTw	Brachiopods, calcareous tubeworms (*Placostegus tridentatus*, *Hydroides*) and sponges on variable salinity circalittoral rock	
SCR.BrAs	NeoPro.Den	*Neocrania anomala*, *Dendrodoa grossularia* and *Sarcodictyon roseum* on reduced or low salinity circalittoral rock	
SCR.Mod		**Sheltered *Modiolus* (horse-mussel) beds**	
SCR.Mod	ModCvar	*Modiolus modiolus* beds with *Chlamys varia*, sponges, hydroids and bryozoans on slightly tide-swept very sheltered circalittoral mixed substrata	
SCR.Mod	ModHAs	*Modiolus modiolus* beds with fine hydroids and large solitary ascidians on very sheltered circalittoral mixed substrata	
		Circalittoral rock (other)	
CR.FaV		**Faunal turfs (deep vertical rock)**	
CR.FaV	Ant	*Antedon bifida* and a bryozoan/hydroid turf on steep or vertical circalittoral rock	
CR.FaV	Bug	*Bugula* spp. and other bryozoans on vertical moderately exposed circalittoral rock	
CR.Cv		**Caves and overhangs (deep)**	
CR.Cv	SCup	Sponges, cup corals and *Parerythropodium coralloides* on shaded or overhanging circalittoral rock	
COR		**CIRCALITTORAL OFFSHORE ROCK (and other hard substrata)**	

Higher code	Biotope code	Biotope	Pg.
		Only one type currently defined. Classification requires expansion here.	
COR.Lop		***Lophelia* reefs**	
SS		**SUBLITTORAL SEDIMENTS**	
IGS		**INFRALITTORAL GRAVELS AND SANDS**	
IGS.Mrl		**Maerl beds (open coast/clean sediments)**	
IGS.Mrl	Phy	*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand	
IGS.Mrl	Phy.R	*Phymatolithon calcareum* maerl beds with red seaweeds in shallow infralittoral clean gravel or coarse sand	
IGS.Mrl	Phy.HEc	*Phymatolithon calcareum* maerl beds with hydroids and echinoderms in deeper infralittoral clean gravel or coarse sand	
IGS.Mrl	Lgla	*Lithothamnion glaciale* maerl beds in tide-swept variable salinity infralittoral gravel	
IGS.FaG		**Shallow gravel faunal communities**	
IGS.FaG	HalEdw	*Halcampa chrysanthellum* and *Edwardsia timida* on sublittoral clean stone gravel	
IGS.FaG	Sell	*Spisula elliptica* and venerid bivalves in infralittoral clean sand or shell gravel	
IGS.FaS		**Shallow sand faunal communities**	
IGS.FaS	Mob	Sparse fauna in marine infralittoral mobile clean sand	
IGS.FaS	NcirBat	*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand	
IGS.FaS	ScupHyd	*Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral cobbles or pebbles in coarse sand	
IGS.FaS	Lcon	Dense *Lanice conchilega* and other polychaetes in tide-swept infralittoral sand	
IGS.FaS	FabMag	*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves in infralittoral compacted fine sand	
IGS.EstGS		**Estuarine sublittoral gravels and sands**	
IGS.EstGS	MobRS	Sparse fauna in reduced salinity infralittoral mobile sand	
IGS.EstGS	Ncir	*Nephtys cirrosa* and fluctuating salinity-tolerant fauna in reduced salinity infralittoral mobile sand	
IGS.EstGS	NeoGam	*Neomysis integer* and *Gammarus* spp. in low salinity infralittoral mobile sand	
CGS		**CIRCALITTORAL GRAVELS AND SANDS**	
CGS	Ven	Venerid bivalves in circalittoral coarse sand or gravel	

Higher code	Biotope code	Biotope	Pg.
CGS	Ven.Neo	*Neopentadactyla mixta* and venerid bivalves in circalittoral shell gravel or coarse sand	
CGS	Ven.Bra	Venerid bivalves and *Branchiostoma lanceolatum* in circalittoral coarse sand with shell gravel	
IMS		**INFRALITTORAL MUDDY SANDS**	
IMS.Sgr		**Seagrass beds (sublittoral/lower shore)**	
IMS.Sgr	Zmar	*Zostera marina*/*angustifolia* beds in lower shore or infralittoral clean or muddy sand	276
IMS.Sgr	Rup	*Ruppia maritima* in reduced salinity infralittoral muddy sand	278
IMS.FaMS		**Shallow muddy sand faunal communities**	
IMS.FaMS	EcorEns	*Echinocardium cordatum* and *Ensis* sp. in lower shore or shallow sublittoral muddy fine sand	279
IMS.FaMS	SpiSpi	*Spio filicornis* and *Spiophanes bombyx* infralittoral clean or muddy sand	
IMS.FaMS	MacAbr	*Macoma balthica* and *Abra alba* in infralittoral muddy sand or mud	
IMS.FaMS	Cap	*Capitella capitata* in enriched sublittoral muddy sediments	
CMS		**CIRCALITTORAL MUDDY SANDS**	
CMS	AbrNucCor	*Abra alba*, *Nucula nitida* and *Corbula gibba* in circalittoral muddy sand or slightly mixed sediment	
CMS	AfilEcor	*Amphiura filiformis* and *Echinocardium cordatum* in circalittoral clean or slightly muddy sand	
CMS	VirOph	*Virgularia mirabilis* and *Ophiura* spp. on circalittoral sandy or shelly mud	
CMS	VirOph.HAs	*Virgularia mirabilis* and *Ophiura* spp. with hydroids and ascidians on circalittoral sandy or shelly mud with shells or stones	
CMS	Ser	*Serpula vermicularis* reefs on very sheltered circalittoral muddy sand	
IMU		**INFRALITTORAL MUDS**	
IMU.Ang		**Angiosperm communities (lagoons)**	
IMU.Ang	NVC A12	*Potamogeton pectinatus* community	
IMU.Ang	NVC S4	*Phragmites australis* swamp and reed beds	
IMU.MarMu		**Shallow marine mud communities**	
IMU.MarMu	TubeAP	Semi-permanent tube-building amphipods and polychaetes in sublittoral mud or muddy sand	

Higher code	Biotope code	Biotope	Pg.
IMU.MarMu	AreSyn	*Arenicola marina* and synaptid holothurians in extremely shallow soft mud	
IMU.MarMu	PhiVir	*Philine aperta* and *Virgularia mirabilis* in soft stable infralittoral mud	
IMU.MarMu	Ocn	*Ocnus planci* aggregations on sheltered sublittoral muddy sediment	
IMU.EstMu		**Estuarine sublittoral muds**	
IMU.EstMu	PolVS	*Polydora ciliata* in variable salinity infralittoral firm mud or clay	
IMU.EstMu	AphTub	*Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud	
IMU.EstMu	NhomTub	*Nephtys hombergii* and *Tubificoides* spp. in variable salinity infralittoral soft mud	
IMU.EstMu	MobMud	Infralittoral fluid mobile mud	
IMU.EstMu	CapTub	*Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment	
IMU.EstMu	Tub	*Tubificoides* spp. in reduced salinity infralittoral muddy sediment	
IMU.EstMu	LimTtub	*Limnodrilus hoffmeisteri*, *Tubifex tubifex* and *Gammarus* spp. in low salinity infralittoral muddy sediment	
CMU		**CIRCALITTORAL MUDS**	
CMU	BriAchi	*Brissopsis lyrifera* and *Amphiura chiajei* in circalittoral mud	
CMU	SpMeg	Seapens and burrowing megafauna in circalittoral soft mud	
CMU	SpMeg.Fun	Seapens, including *Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral soft mud	
CMU	Beg	*Beggiatoa* spp. on anoxic sublittoral mud	

Higher code	Biotope code	Biotope	Pg.
CMX	ModHo	Sparse *Modiolus modiolus*, dense *Cerianthus lloydii* and burrowing holothurians on sheltered circalittoral stones and mixed sediment	
COS		**CIRCALITTORAL OFFSHORE SEDIMENTS** Only three types currently defined. The classification requires expansion here.	
COS	AmpPar	*Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy very fine sand near margins of deep stratified seas	
COS	ForThy	Foramaniferans and *Thyasira* sp. in deep circalittoral soft mud	
COS	Sty	*Styela gelatinosa* and other solitary ascidians on sheltered deep circalittoral muddy sediment	

5 Habitat matrices

The following habitat matrices show the distribution of biotopes within the primary habitat features of zonation and wave exposure (rocky types) or zonation and sediment type (sediment types). Within the general framework (repeated here for convenience to the other matrices - Table 5.1), the biotope complexes are shown (Table 5.2). The main sections of the classification are shown in more detail with their respective biotopes and sub-biotopes (Tables 5.3-5.8) - Figure 2.2 illustrates the inter-relationship of these matrices.

The matrices should provide a rapid indication of the range of biotopes that could occur under a particular set of habitat conditions, for instance in the mid shore zone of moderately exposed rock. They can also be used to indicate which closely related biotopes should be considered before determining to which type a record should be assigned. This is most important as most defined biotopes represent a stage along a continuum of change for a particular environmental variable, such as wave exposure, sediment grade or salinity.

The most widespread biotopes are given centred in bold larger typeface in each part of the matrix whilst more uncommon biotopes are given in ordinary smaller typeface to the bottom left-hand side. In some cases sub-biotopes are not shown, because of restricted space, but are indicated by an * after the biotope code. Double lines around the boxes in Tables 5.2-5.8 delineate the habitat complexes from each other.

Table 5.1 Framework for the MNCR BioMar biotope classification

	SUBSTRATUM	ROCK [R] (epibiota)			SEDIMENT [S] (infauna + epibiota)			
	ZONE	**Exposed rock [E]** (high energy - wave exposed or very tide-swept)	**Moderately exposed rock [M]** (moderate energy - moderately wave-exposed or tide-swept)	**Sheltered rock [S]** (low energy - wave sheltered and weak tidal streams)	**Gravels & sands [GS]**	**Muddy sands [MS]** (10-30% silt/clay)	**Muds [MU]** (30-100% silt/clay)	**Mixed sediment [MX]** (gravel, sand and mud)
Littoral [L] (splash zone, strandline & intertidal)	(lichens; green algae; fucoid, barnacle & mussel communities; intertidal sediments)	Exposed littoral rock [ELR]	Moderately exposed littoral rock [MLR]	Sheltered littoral rock [SLR]	Littoral gravels & sands [LGS]	Littoral muddy sands [LMS]	Littoral muds [LMU]	Littoral mixed sediment [LMX]
Infralittoral [I] (shallow subtidal)	(kelp & other algal communities; wave-disturbed animal communities)	Exposed infralittoral rock [EIR]	Moderately exposed infralittoral rock [MIR]	Sheltered infralittoral rock [SIR]	Infralittoral gravels & sands [IGS]	Infralittoral muddy sands [IMS]	Infralittoral muds [IMU]	Infralittoral mixed sediment [IMX]
Circalittoral [C] (nearshore deeper subtidal)	(animal-dominated communities in semi-stable conditions)	Exposed circalittoral rock [ECR]	Moderately exposed circalittoral rock [MCR]	Sheltered circalittoral rock [SCR]	Circalittoral gravels & sands [CGS]	Circalittoral muddy sands [CMS]	Circalittoral muds [CMU]	Circalittoral mixed sediment [CMX]
Circalittoral offshore [CO] (offshore deep subtidal)	(animal communities in stable conditions)	Circalittoral offshore rock [COR]			Circalittoral offshore sediment [COS]			

Table 5.2 Main types (biotope complexes) in the MNCR BioMar biotope classification

	Exposed rock	Moderately exposed rock	Sheltered rock	Gravels & sands	Muddy sands	Muds	Mixed sediment
		Lichens or algal crusts				Saltmarsh	
Littoral (intertidal)	*Mytilus* (mussels) & barnacles Robust fucoids or red seaweeds	Barnacles & fucoids Red seaweeds (mod. exposed shores) Ephemeral green or red seaweeds (freshwater or sand-influenced) *Mytilus* (mussels) & fucoids *Sabellaria* (honeycomb worm) reefs	Dense fucoids (stable rock) Fucoids, barnacles or ephemeral seaweeds (mixed substrata) *Mytilus* (mussel) beds (mixed substrata)	Shingle (pebble) & gravel shores Sand shores Estuarine coarse sediment shores	Muddy sand shores Littoral *Zostera* (seagrass) beds	Sandy mud shores Soft mud shores	Mixed sediment shores
	Rockpools	Overhangs & caves					
Infralittoral (shallow subtidal)	Kelp with cushion fauna, foliose red seaweeds or coralline crusts (wave-exposed rock) Robust faunal cushions & crusts (surge gullies & caves)	Kelp with red seaweeds (moderately exposed rock) Grazed kelp with algal crusts Sand or gravel-affected or disturbed kelp & seaweed communities	Silted kelp (stable rock) Estuarine faunal communities (shallow rock/mixed substrata) Submerged fucoids, green & red seaweeds (lagoonal rock)	Maerl beds (clean) Shallow gravel fauna Shallow sand fauna Estuarine gravels & sands	Seagrass beds (sublittoral/lower shore) Shallow muddy sand fauna	Angiosperm communities (lagoons) Shallow marine mud fauna Estuarine sublittoral muds	*Laminaria saccharina* (sugar kelp) & filamentous seaweeds Maerl beds (muddy) Oyster beds Shallow mixed sediment faunal communities Estuarine sublittoral mixed sediments
		Fauna & seaweeds (shallow vertical rock)					
Circalittoral (deeper subtidal)	Faunal crusts or short turfs (wave-exposed rock) *Alcyonium*-dominated communities (tide-swept/vertical) Barnacle, cushion sponge & *Tubularia* communities (very tide-swept/wave-sheltered)	Mixed faunal turfs Bryozoan/hydroid turfs (sand-influenced) Circalittoral *Sabellaria* reefs Mussel beds (open coast) Brittlestar beds Grazed fauna Ascidian communities (silt-influenced) Soft rock communities	Brachiopod & solitary ascidian communities Sheltered *Modiolus* (horse-mussel) beds	Circalittoral gravels & sands	Circalittoral muddy sands	Circalittoral muds	Circalittoral mixed sediments
	Faunal turfs	(deep vertical rock) Caves &	overhangs (deep)				
Circalittoral offshore		*Lophelia* reefs			Circalittoral	offshore	sediments

Table 5.3 Littoral rock habitat matrix

	VERY EXPOSED	EXPOSED	MODERATELY EXPOSED	SHELTERED	VERY SHELTERED
SUPRA-LITTORAL	Pools - *Enteromorpha* & *Cladophora* (G) Nitrate enrichment - *Prasiola stipitata* (Pra)		**Yellow & grey lichens (YG)**		
UPPER LITTORAL FRINGE	***Verrucaria* with *Porphyra umbilicalis* (Ver.Por)** ***Verrucaria* with sparse barnacles (Ver.B)**		***Verrucaria maura* (Ver.Ver)** Pools - *Enteromorpha* & *Cladophora* (G) Freshwater runoff / unstable - *Enteromorpha* (Ent) Nitrate enrichment - *Prasiola stipitata* (Pra) Vertical soft rock - Chrysophyceae (Chr) Soft rock caves - *Rhodothamniella floridula* (RhoCv)	***Verrucaria maura* (Ver.Ver)** Pools - *Enteromorpha* & *Cladophora* (G) Freshwater runoff / unstable - *Enteromorpha* (Ent)	
LOWER LITTORAL FRINGE	Pools - Coralline crusts & *Corallina officinalis* (Cor) Nitrate enrichment - *Prasiola stipitata* (Pra)		***Pelvetia canaliculata* & barnacles (PelB)** Vertical - *Verrucaria maura* & sparse barnacles (Ver.B) Pools - Coralline crusts & *Corallina officinalis* (Cor) Freshwater runoff / unstable - *Enteromorpha* (Ent) Vertical rock - *Blidingia* (Bli) or *Ulothrix flacca* & *Urospora* (UloUro)	***Pelvetia canaliculata* (Pel)** Vertical - *Verrucaria maura* (Ver.Ver) Freshwater runoff / unstable - *Enteromorpha* (Ent)	
UPPER EULITTORAL	***Mytilus edulis* & barnacles (MytB)** **Barnacles & *Patella* (BPat.Cht)** Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Extreme exposure - *Fucus distichus* & *Fucus spiralis* f. *nana* (Fdis)	**Barnacles & *Patella* (BPat.Cht & BPat.Sem)** Vertical / steep - Barnacles & *Lichina pygmaea* (BPat.Lic) Overhang / shaded - *Catenella caespitosa* (BPat.Cat) Shallow pools - Coralline crusts & *Corallina officinalis* (Cor)	***Fucus spiralis* (Fspi)** Vertical - Barnacles & *Patella* (BPat.Cht & BPat.Sem) Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Freshwater runoff / unstable - *Enteromorpha* (Ent)	***Fucus spiralis* (Fspi)** Vertical - Barnacles & *Patella* (BPat.Cht & BPat.Sem) Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Mixed - Barnacles & *L. littorea* (BLlit)	***Fucus spiralis* (Fspi)** Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Mixed - Barnacles & *L. littorea* (BLlit) Mixed freshwater - Ephemerals (EphX) Low salinity - *Fucus ceranoides* (Fcer & FcerX)
MID EULITTORAL	***Mytilus edulis* & barnacles (MytB)** Vertical - *Mastocarpus* (Mas); *Palmaria* (Pal) Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Deep pools - Fucoids & kelps (FK.*)	**Barnacles & *Patella* (BPat.Cht & BPat.Sem)** **Barnacles & *F. vesiculosus* f. *linearis* (BPat.Fvesl)** Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Deep pools - Fucoids & kelps (FK.*)	**Barnacles & *Patella* (BPat.Sem)** ***Fucus vesiculosus* & barnacle mosaics (FvesB)** ***Fucus vesiculosus* (Fves)** Shallow pools - Coralline crusts & *Corallina officinalis* (Cor*) Deep pools - Fucoids & kelps (FK.*) Sand influence - *Mytilus edulis* beds (MytFves & MytPid) Sand-abrasion - *Sabellaria alveolata* reefs (Salv) Sand-scour - *Porphyra* & *Enteromorpha* (EntPor) Chalk - *Osmundea* & *Gelidium* (Osm); Peat - Piddocks (RPid)	***Fucus vesiculosus* (Fves)** ***Ascophyllum nodosum* (Asc.Asc)** Vertical - Barnacles & *Patella* (BPat.Sem) Mixed - *F. vesiculosus* (FvesX) Mixed - Barnacles & *L. littorea* (BLlit) Shallow pools - Coralline crusts & *Corallina officinalis* (Cor*) Deep pools - Fucoids & kelps (FK.*)	***Ascophyllum nodosum* (Asc.*)** Mixed var. salinity. - *F. vesiculosus* (FvesX) Mixed full salinity. - *Ascophyllum* (AscX) Extreme shelter - *A. nodosum mackaii* (AscX.mac) Mixed - Barnacles & *L. littorea* (BLlit) Mixed freshwater - Ephemerals (EphX) Mixed - *Mytilus* (MytX) Low salinity - *Fucus ceranoides* (Fcer & FcerX)
LOWER EULITTORAL	***Mytilus edulis* & barnacles (MytB)** ***Corallina* (Coff)** Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Deep pools - Fucoids & kelps (FK.*) Surge gullies - Sponges & anemones (SCAn)	***Himanthalia elongata* (Him)** ***Corallina* (Coff)** **Red seaweeds (R.*)** Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Deep pools - Fucoids & kelps (FK.*) Overhangs - Sponges & red seaweeds (SR)	***Himanthalia elongata* (Him)** **Red seaweeds (R.*)** ***Fucus serratus* & red seaweeds (Fser.R)** ***Fucus serratus* (Fser.Fser)** Boulders - *F. serratus* & under-boulder fauna (Fser.Fser.Bo) Overhangs - Sponges & red seaweeds (SR) & Sponges, bryozoans & ascidians (SByAs) Shallow pools - Coralline crusts & *Corallina officinalis* (Cor) Deep pools - Fucoids & kelps (FK.*) Sand influence - *Mytilus edulis* beds (MytFR & MytPid) Sand-scour - *Rhodothamniella floridula* (Rho) Soft rock - *Fucus serratus* & piddocks (Fser.Pid)	***Fucus serratus* (Fser.Fser)** Boulders - *F. serratus* & under-boulder fauna (Fser.Fser.Bo) Overhangs - Sponges & red seaweeds (SR) & Sponges, bryozoans & ascidians (SByAs) Shallow pools - Coralline crusts & *Corallina officinalis* (Cor*) Deep pools - Fucoids & kelps (FK.*) Mixed - *Mytilus* (MytX)	***Fucus serratus* (Fser.Fser)** Overhangs - Sponges & red seaweeds (SR) & Sponges, bryozoans & ascidians (SByAs) Tide-swept - *F. serratus*, sponges & ascidians (Fser.T) Variable salinity - *F. serratus* & large *Mytilus edulis* (Fser.VS) Mixed - *F. serratus* (FserX.*) Mixed - *Mytilus* (MytX)

For sublittoral fringe (extreme lower shore) refer to the Infralittoral rock matrix. An * after the code indicates sub-biotopes are described.

Table 5.4 Littoral sediment habitat matrix

	GRAVELS & SANDS		MUDDY SANDS	MUDS		MIXED SEDIMENTS
	Pebble (shingle) & gravels	Clean sands	(10-30% silt/clay)	Sandy muds (30-80% silt/clay)	Soft muds (>80% silt/clay)	(gravel / sand / mud)
EXTREME UPPER SHORE	Strand-line - Talitrid amphipods (Tal)			Saltmarsh		
UPPER SHORE		**Highly mobile sand - (BarSnd)** **Well-drained coarse-medium sand - Amphipods & *Eurydice* (AEur)**	***Bathyporeia* & *Corophium* spp. (BatCor)** Upper-mid shore - *Zostera noltii* (Znol)	**Muddy sand/sandy mud - *Hediste, Macoma* & *Arenicola* (HedMac.Are)**	**Variable/reduced salinity - *Hediste* & *Scrobicularia* (HedScr)**	
MID SHORE	**Barren shingle/gravel - (BarSh)** Mid shore well-sorted gravel/very coarse sand - *Pectenogammarus* (Pec)	**Medium/fine sand - Amphipods & polychaetes (AP.P)**	**Slightly muddy fine sand - Polychaetes & *Cerastoderma edule* (PCer)** **Muddy sand - *Macoma* & *Arenicola* (MacAre)** Upper-mid shore - *Zostera noltii* (Znol)	**Variable salinity slightly sandy mud - *Hediste, Macoma* & *Pygospio* (HedMac.Pyg)**	**Variable/reduced salinity - *Hediste* & *Streblospio* (HedStr)**	**Reduced salinity - *Mya arenaria* (Mare)**
LOWER SHORE	Reduced/low salinity - Oligochaetes (Ol)	**Lower shore medium/fine sand - Amphipods *Pontocrates* spp. & *Bathyporeia* spp. (AP.Pon)** Lower shore tidal-scour - *Lanice* (Lan)	**Muddy sand/sandy mud - *Hediste, Macoma* & *Arenicola* (HedMac.Are)** Reduced salinity - *Macoma, Arenicola* & *Mya arenaria* (MacAre.Mare)	**Reduced salinity - *Hediste, Macoma* & *Mya arenaria* (HedMac.Mare)**	**Low salinity - *Hediste* & oligochaetes (HedOl)**	Full salinity - *Mytilus* & *Fabricia* (MytFab)
EXTREME LOWER SHORE		**Mobile sand - (Mob)** **Clean sand - *Nephtys cirrosa* & *Bathyporeia* spp. (NcirBat)**	***Echinocardium* & *Ensis* (EcorEns)** ***Zostera marina / angustifolia* (Zmar)**			Full salinity - *Venerupis senegalensis* & *Mya truncata* (VsenMtru)

Table 5.5 Infralittoral rock habitat matrix

	VERY EXPOSED - EXPOSED	MODERATELY EXPOSED	SHELTERED - VERY SHELTERED
INFRA-LITTORAL (SUB-LITTORAL) FRINGE	**Very exposed - *Alaria esculenta* & *Mytilus edulis* (Ala.Myt)** **Exposed - *Alaria esculenta* & *Laminaria digitata* (Ala.Ldig)** Surge gullies/caves - Sponge crusts & anemones (SCAn.*) or Sponge crusts & colonial ascidians (SCAs.*) Scoured gully/cave walls - Coralline crusts with *Balanus crenatus/Pomatoceros* & spirorbids (CC.BalPom)	***Laminaria digitata* (Ldig.Ldig)** Boulders - *L. digitata* & under-boulder fauna (Ldig.Ldig.Bo) Soft rock (including chalk) - *L. digitata* & piddocks (Ldig.Pid) Disturbed / sand scour - *Saccorhiza polyschides* (Sac) Vertical - *A. esculenta* & *L. digitata* (Ala.Ldig) Surge gullies/caves - Sponge crusts & anemones (SCAn.*) or Sponge crusts & colonial ascidians (SCAs.*)	***Laminaria saccharina* & *L. digitata* (Lsac.Ldig)** ***Laminaria saccharina* (Lsac.Ft)** Tide-swept - *L. digitata*, ascidians & bryozoans (Ldig.T)
INFRA-LITTORAL **(kelp forest & kelp park)**	***Laminaria hyperborea* forest with a faunal cushion & foliose red seaweeds (LhypFa)** ***Laminaria hyperborea* forest & park with foliose red seaweeds (LhypR.Ft & LhypR.Pk)** Vertical - *Corynactis*, *Metridium* & *Alcyonium*(CorMetAlc) Extreme exposure - *Alaria esculenta* forest with anemones & sponges (AlaAnSC) Grazed limestone - Sparse *L. hyperborea* with *Paracentrotus lividus* (LhypPar) SW coasts (exposed) - mixed *L. hyperborea* & *L. ochroleuca* (LhypR.Loch) Disturbed rock - *L. saccharina* &/or *Saccorhiza polyschides* (LsacSac) Below kelp - Dense red seaweeds (FoR); with *Dictyota dichotoma* & *Dictyopteris membranacea* turf (FoR.Dic) Surge gully/cave entrances - Foliose seaweeds (FoSwCC) Surge gullies/caves - Sponge crusts & anemones (SCAn.*); Sponge crusts & colonial ascidians (SCAs.*); Sponge crusts (SC) Scoured gully/cave walls - Coralline crusts with *Balanus crenatus/Pomatoceros* & spirorbids (CC.BalPom) Gully/cave bottoms with mobile rocks - Coralline & bryozoan crusts with crustaceans (CC.Mob)	***Laminaria hyperborea* forest & park with red foliose red seaweeds (Lhyp.Ft & Lhyp.Pk)** **Grazed - *L. hyperborea* forest & park with coralline crusts (LhypGz.Ft & LhypGz.Pk)** Vertical - *Alcyonium digitatum*, bryozoan, hydroid & ascidian turf (AlcByH) Vertical soft rock - *Hiatella*, bryozoans & ascidians (AlcByH.Hia) Tide-swept - *L. hyperborea* forest & park with foliose red seaweeds & diverse fauna (Lhyp.TFt & Lhyp.TPk) Mod. exposed/sheltered (SW coasts) - Mixed *L. hyperborea* & *L. ochroleuca* (Lhyp.Loch) Disturbed / sand scour - *Saccorhiza polyschides* (Sac) Shallow, unstable boulders & cobbles - *L. saccharina* & *Chorda filum* & dense red seaweeds (LsacChoR) Scoured tidal rapids - Mixed kelps & scour-tolerant seaweeds (XKScrR) Sand-influenced - *Sabellaria spinulosa*, kelp & red seaweeds (SabKR) Tide-swept mobile cobbles - ephemeral red seaweeds (EphR) Tide-swept with coarse sediments - *Halidrys siliquosa* & mixed kelp (HalXK) Sand-covered rock - *Polyides, Ahnfeltia* & *Chondrus* (PolAhn)	***Laminaria hyperborea* & *L. saccharina* forest & park (LhypLsac.Ft & LhypLsac.Pk)** ***Laminaria saccharina* forest & park (Lsac.Ft & Lsac.Pk)** Tide-swept (shallow/unstable) - *L. saccharina*, foliose red seaweeds, sponges & ascidians (Lsac.T & LsacRS.FiR) Heavily silted (extreme shelter) - Sparse *L. saccharina* with *Codium* spp. & red seaweeds (Lsac.Cod) Heavily grazed - *Echinus*, brittlestars & coralline crusts (EchBriCC) Variable salinity, grazed - *L. saccharina* & *Psammechinus miliaris* (LsacRS.Psa) Reduced /low salinity - *L. saccharina*, *Phyllophora* spp. & filamentous green seaweeds (LsacRS.Phy) Reduced salinity fauna - *Mytilus edulis* (MytT); *Cordylophora* & *Electra crustulenta* (CorEle); *Hartlaubella* & *Conopeum* (HarCon) Reduced salinity (lagoons) - Mixed fucoids, *Chorda filum* & green seaweeds (FChoG) Variable/reduced salinity (lagoons) - *Ascophyllum nodosum* with sponges & ascidians (AscSAs) Reduced salinity (lagoons) - *Polyides* &/or *Furcellaria* (PolFur) Low salinity (lagoons) - *Fucus ceranoides* & *Enteromorpha* spp. (FcerEnt)

Table 5.6 Circalittoral rock habitat matrix

	VERY EXPOSED	EXPOSED	MODERATELY EXPOSED	SHELTERED	VERY SHELTERED
VERY STRONG **(>6 kn.)**	**Habitat not found**		***Balanus crenatus* & *Tubularia indivisa* (BalTub)**	***Balanus crenatus, Halichondria panicea* & *Alcyonidium diaphanum* (BalHpan)**	
STRONG **(3-6 kn.)**		***Tubularia*, sponges & other hydroids (TubS)** **Dense *Alcyonium, Tubularia* & anemones (AlcTub)**		**Cushion sponges, hydroids & ascidians (CuSH)** Mixed reduced salinity - *H. bowerbanki* & *Eudendrium* (HbowEud)	
MODER-ATELY STRONG **(1-3 kn.)**	***Corynactis* & crisiid/ *Bugula/Cellaria* turf (CorCri)**	***Corynactis* & crisiid/ *Bugula/Cellaria* turf (CorCri)** ***Alcyonium, Cliona, Pachymatisma* & *Nemertesia* (AlcMaS)** ***Alcyonium, Pomatoceros*, algal & bryozoan crusts (AlcC)**	**Erect sponges & *Eunicella/Swiftia* (ErSEun, ErSPbolSH, ErSSwi)** ***Flustra* & hydroid/bryozoan turf (Flu*)** **Sponges, *Nemertesia* spp. & *Alcyonidium diaphanum* (SNemAdia)** **Slight tides/mixed - *Ophiothrix/Ophiocomina* beds (Oph*)** ***Stolonica* & *Polyclinum* (StoPaur)** Vertical - *Alcyonium, Pomatoceros*, algal & bryozoan crusts (AlcC) Soft rock - Piddocks (Pid); *Polydora* (Pol) Vertical rock - *Bugula* spp. (Bug); *Antedon bifida* & bryozoan/hydroid turf (Ant) Sand influence - *Sabellaria spinulosa* (Sspi) Sand abraded/covered - *Urticina* / *Ciocalypta* (Urt.Urt & Urt.Cio) Mixed - *Musculus* beds (Mus); *Modiolus* beds (ModT); *Mytilus* beds (MytHAs)		**Mixed - *Modiolus* beds with *Chlamys varia*, sponges, hydroids & bryozoans (ModCvar)**
WEAK **(<1 kn.)**	**Coralline crusts, *Parasmittina* & *Caryophyllia* (CCParCar)**	**Coralline crusts, *Parasmittina* & *Caryophyllia* (CCParCar)** ***Alcyonium* & *Securiflustra* (AlcSec)**	**Faunal & algal crusts, *Echinus* & sparse *Alcyonium* (FaAlC*)** ***Alcyonium* & *Securiflustra* (AlcSec)** **Slight tides/mixed - *Ophiothrix/Ophiocomina* beds (Oph*)**	***Antedon*, solitary ascidians & fine hydroids (AntAsH)** Mixed - *Modiolus* with fine hydroids & solitary ascidians (ModHAs)	***Suberites*, other sponges & solitary ascidians (SubSoAs)** Mixed - *Modiolus* with fine hydroids & solitary ascidians (ModHAs)
VERY WEAK **(Negligible)**	Deep - *Phakellia* & axinellid sponges (PhaAxi) Mobile/mixed - *Pomatoceros, Balanus crenatus* & bryozoan crusts (PomByC)	***Alcyonium, Pomatoceros*, algal & bryozoan crusts (AlcC)** Mobile/mixed - *Pomatoceros, Balanus crenatus* & bryozoan crusts (PomByC)	Vertical - *Alcyonium, Pomatoceros*, algal & bryozoan crusts (AlcC) Vertical - *Bugula* spp. (Bug); *Antedon bifida* & bryozoan/hydroid turf (Ant) Caves - Sponges, cup corals & *Parerythropodium* (SCup) Soft rock - Piddocks (Pid); *Polydora* (Pol) Silty - *Molgula manhattensis* & *Polycarpa* spp. (MolPol); with *Sabellaria* (MolPol.Sab)	**Solitary ascidians, inc. *Ciona, Ascidia mentula* (AmenCio)** Mixed - *Ascidiella aspersa* (Aasp)	***Metridium* & solitary ascidians (AmenCio.Met)** ***Neocrania* & *Protanthea* (NeoPro)** Variable salinity - Brachiopods, calcareous tubeworms & sponges (NeoPro.CaTw) Reduced salinity - *Neocrania, Dendrodoa* & *Sarcodictyon* (NeoPro.Den)

Table 5.7 Sublittoral sediment habitat matrix (see Table 5.8 for estuarine types)

	GRAVELS & COARSE SANDS	**MEDIUM-FINE SANDS**	**MUDDY SANDS**	**MUDS**	**MIXED SEDIMENT (Gravel / sand / mud)**
(with seaweeds or higher plants)	**Clean gravels & coarse sands - *Phymatolithon calcareum* maerl beds (Phy*)** Tide-swept variable salinity gravels - *Lithothamnion glaciale* maerl beds (Lgla)	**Marine - *Zostera marina* (Zmar)**	**Marine - *Zostera marina* (Zmar)** Reduced salinity - *Ruppia maritima* (Rup)	Lagoons - *Potamogeton pectinatus* (NVC A12) Lagoon fringes - *Phragmites australis* reed beds (NVC S4)	**Sediments with stones/shells - *Laminaria saccharina* & filamentous seaweeds (LsacX)** **Muddy sediments - *Trailliella* & other loose-lying seaweed communities (Tra, Pcri, FiG)** **Muddy gravels - Maerl beds (Lcor, Lfas, Lden)** Muddy fine sand & shell - *Ostrea* beds (Ost)
INFRA-LITTORAL **(animal dominated)**	**Clean sand/shell gravel - *Spisula elliptica* & venerid bivalves (Sell)** Clean stone gravel - *Halcampa chrysanthellum* & *Edwardsia timida* (HalEdw)	**Clean mobile sand - Sparse infauna (Mob)** **Shallow clean sand - *Nephtys cirrosa* & *Bathyporeia* spp. (NcirBat)** **Shallow fine sand - *Fabulina* & *Magelona* (FabMag)** Tide-swept sand & stones - *Sertularia cupressina* & *Hydrallmania* (ScupHyd) Tide-swept sand - Dense *Lanice conchilega* (Lcon)	**Fine/muddy sand - *Echinocardium* & *Ensis* (EcorEns); *Spio* & *Spiophanes* (SpiSpi)** **Muddy sand/sandy mud - *Macoma* & *Abra* (MacAbr)** Enriched - *Capitella capitata* (Cap)	**Tube-building amphipods & polychaetes (TubeAP)** ***Philine* & *Virgularia* (PhiVir)** Extremely shallow marine - *Arenicola* & synaptid holothurians (AreSyn) Marine muddy sediment - *Ocnus* aggregations (Ocn)	**Lower shore/shallow muddy gravel - *Venerupis senegalensis* & *Mya truncata* (VsenMtru)** **Muddy gravels - Burrowing anemones (An)** Tide-swept - *Limaria* beds (Lim)
CIRCA-LITTORAL	**Shell gravel - *Neopentadactyla mixta* & venerid bivalves (Ven.Neo)** **Coarse sand with shell gravel - Venerid bivalves & *Branchiostoma* (Ven.Bra)**	**Clean medium/fine sand - *Amphiura filiformis* & *Echinocardium cordatum* (AfilEcor)**	***Amphiura filiformis* & *Echinocardium cordatum* (AfilEcor); *Abra alba, Nucula nitida & Corbula gibba* (AbrNucCor)** **Muddy/shelly sand - *Virgularia* & *Ophiura* spp. (VirOph*)** Very sheltered marine - *Serpula* reefs (Ser)	**Stable mud - Sea pens & burrowing megafauna (SpMeg*)** ***Brissopsis* & *Amphiura chiajei* (BriAchi)** Anoxic mud - *Beggiatoa* spp. (Beg)	***Sabellaria spinulosa* & *Polydora* (SspiMx)** **Open coast mixed sediments - *Modiolus modiolus* beds (ModMx)** **Sheltered stony sediments - *Modiolus* , *Cerianthus* & holothurians (ModHo)**
CIRCA-LITTORAL OFFSHORE			**Cohesive muddy fine sand - *Ampharete falcata* & *Parvicardium ovale* (AmpPar)**	**Foraminifera & *Thyasira* spp. (ForThy)**	***Styela gelatinosa* & other ascidians (Sty)**

Table 5.8 Estuarine sublittoral sediment habitat matrix

	GRAVELS & SANDS	MUDDY SANDS	MUDS	MIXED SEDIMENT
LOW (Oligohaline)	***Neomysis integer* & *Gammarus* spp. (NeoGam)**	**No information**	***Limnodrilus hoffmeisteri, Tubifex tubifex* & *Gammarus spp.* (LimTtub)**	
REDUCED (Mesohaline)	**Mobile sand (MobRS)** ***Nephtys cirrosa* (Ncir)**	**No information**	***Tubificoides* spp. (Tub)** ***Capitella capitata* & *Tubificoides* spp. (CapTub)** **Fluid mobile muds - (MobMud)**	
VARIABLE (Polyhaline)	See Table 5.7	See Table 5.7	**Fluid mobile muds - (MobMud)** **Soft mud / sandy mud - *Nephtys hombergii* & *Tubificoides* spp. (NhomTub)** **Cohesive mud - *Aphelochaeta marioni* & *Tubificoides* spp. (AphTub)** Firm clay - *Polydora ciliata* (PolVS)	***Crepidula fornicata* & *Aphelochaeta marioni* (CreAph)** ***Mytilus edulis* beds (MytV)** ***Polydora ciliata, Mya truncata* & solitary ascidians (PolMtru)**

Salinity regime based on McLusky (1993).

6 Biotope descriptions

6.1 Layout of the descriptions

Descriptions for each biotope are laid out as follows:

NOTE: Not all sections of the standard description are available for every biotope in this version. It is intended to add further information as it becomes available.

Biotope complex code and title	The relevant biotope complex code and title are given for all biotopes and sub-biotopes.
Biotope code	A unique letter code based on the habitat complex and the biotope and, where appropriate, the sub biotope (see Section 3.2).
Biotope title	The title gives the key features of the community and the habitat, with emphasis on the features which help to distinguish the biotope from closely related types. The habitat part of the title usually includes the zone, substratum and another key habitat parameter. To avoid becoming overly clumsy the titles do not cover all habitat characteristics (see ***Habitat classification***) or characteristic species (see ***Biotope description*** and ***Characterising species***) and common names are not given (but are given in the text). For instance on mid eulittoral rock Fves's title is given as sheltered whilst Asc.Asc is very sheltered, although Fves can extend onto moderately exposed shores and Asc.Asc onto sheltered shores. **NOTE: It is very important to refer to the full description and to the habitat matrices to determine the full nature of the biotope and not to rely on the title alone.**
Habitat classification	The habitat parameters under which the community typically occurs are shown, using terminology as defined in Connor & Hiscock (1996) and given in Appendix 2. In some cases the biotope may occur outside the range given, but care should be taken to ensure that another biotope has not been described to cover the example being considered. All heights and depths are corrected to chart datum.
Previous code	Codes used in versions 6.95 and 96.7 (Connor *et al*. 1995a, 1996) are given where different to the current code, or where biotopes have been combined or split.
Biotope description	An account of the general nature of the biotope's habitat and community characteristics, its variability including any known temporal changes, its micro-habitat features (e.g. crevices, under-boulders, kelp stipes) and its relationship to other biotopes (i.e. along gradients of substratum, zonation, wave exposure, tidal streams, salinity, etc.).
Similar biotopes	Attention is drawn to similar biotopes which should be considered before firmly identifying a field record.

Characterising species	A list of those species considered to best characterise the biotope together with associated information on their frequency of occurrence, degree of faithfulness and the typical abundance at which they occur. **% Frequency of occurrence -** The species listed include those which are *constants* (i.e. they occur in >60% of the records for the type) plus those which occur in less than 60% of the records but which are *highly faithful* or *moderately faithful*. The symbols represent percentage occurrence in the samples as follows: ●●●●● Occurs in 81-100% of the records for the type ●●●● Occurs in 61-80% of the records for the type ●●● Occurs in 41-60% of the records for the type ●● Occurs in 21-40% of the records for the type ● Occurs in 1-20% of the records for the type **Degree of faithfulness -** This is indicated by the following guidelines, based on the relevant *major habitat* and the appropriate level in the classification (i.e. *Ascophyllum nodosum* may be considered moderately faithful at the biotope level, but highly faithful at the biotope complex level): ●●● *Highly faithful* - species restricted to this or very closely related types ●● *Moderately faithful* - species found in this and other related types in the relevant *major habitat* ● *Poorly faithful* - species found very widely in the relevant *major habitat* **Typical abundances -**These are given according to the MNCR abundance scales in Connor & Hiscock (1996) (Appendix 1) which are the scales used for all MNCR and BioMar field recording for *in situ* surveys. Sediment infaunal sampling usually yields counts of individuals per sample; these have been converted to the MNCR abundance scale for compatibility of data presentation here. The abundance given is a mean abundance derived from the records assigned to the biotope.
Distribution	The current known distribution of the biotope, from the literature and MNCR data analysis, according to the MNCR British and BioMar Irish coastal sectors (Figures 6.1 and 6.2). The distribution includes reference codes with the following regional classification prefixes: R1 for Shetland R2-4 for Orkney, north and east Scotland R5 for south-east Scotland/north-east England R6 for inlets in eastern England SWI for inlets in south-west Britain R10 for Wales R11 for Liverpool Bay and the Solway Firth ir (suffix) for Ireland (BioMar data)

Frequency of occurrence	An indication of the likely frequency of occurrence in Britain of the biotope is given on a scale related to the number of 10x10 km squares in which the biotope is likely to be present; these criteria are analogous to those used to define nationally rare and scarce marine species (Sanderson 1996). Rare 1-8 Scarce 9-55 Uncommon 56-150 Common 151-500 Very common 500+ Similar ratings for Ireland remain to be established. **NOTE: These cut-off points and the frequency ratings are preliminary and are only intended as a guide until the criteria can be firmly established and adequate data are available for the whole of Britain.**
Features of conservation interest	An indication of which features, such as the presence of particular characterising species (perhaps in particularly high abundance), the species richness or extent of the biotope, the variety of micro-habitat features or its naturalness, should be particularly considered in identifying sites of high nature conservation importance for this biotope. NOTE: this information has still to be established for the majority of biotopes.
Potentially damaging activities	An indication of which activities might affect the nature of the biotope and the degree of effect (very high, high, moderate, low, very low). NOTE: This information has still to be established for the majority of biotopes.
Photographs	Photographs to illustrate the main features of the biotopes are given in the plates. Many biotopes can be expected to change in their species composition and overall appearance; the photographs may therefore not adequately reflect all conditions found in the field.
Species nomenclature	All species names are given according to Howson & Picton *eds*. 1997, including the following changes from Howson (1987) of commonly referenced species: *Esperiopsis* (was *Amphilectus*) *fucorum*, *Axinella dissimilis* (was *polypoides*), *Suberites ficus* (was *domuncula*), *Iophon hyndmanni* (was *ingalli*), *Polyplumaria* (was *Schizotricha*) *frutescens*, *Galathowenia* (was *Myriochele*) *oculata*, *Aphelochaeta* (was *Tharyx*) *marioni*, *Heterochaeta costata* (was *Tubifex costatus*), *Semibalanus* (was *Balanus*) *balanoides*, *Melarhaphe* (was *Littorina*) *neritoides*, *Lasaea adansoni* (was *rubra*), *Leptopentacta* (was *Trachythyone*) *elongata*, *Thyonidium drummondi* (was *commune*), *Rhodothamniella* (was *Audouinella*) *floridula*, *Polycarpa scuba* (was *rustica*), *Osmundea* (was *Laurencia*) spp., *Ceramium nodulosum* (was *rubrum*), *Halurus flosculosus* (was *Griffithsia flosculosa*), *Polysiphonia fucoides* (was *nigrescens*).

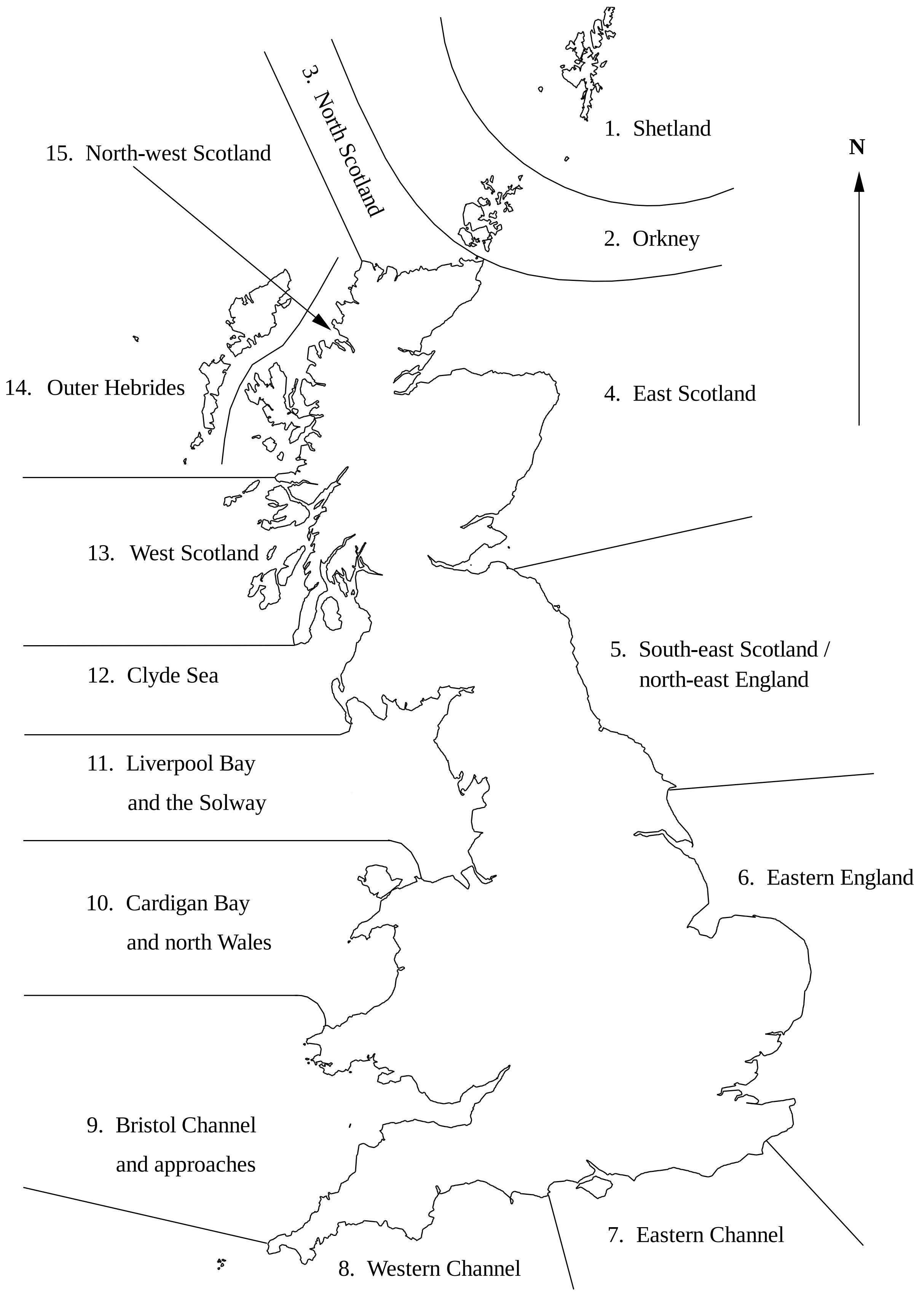

Figure 6.1 MNCR British coastal sectors

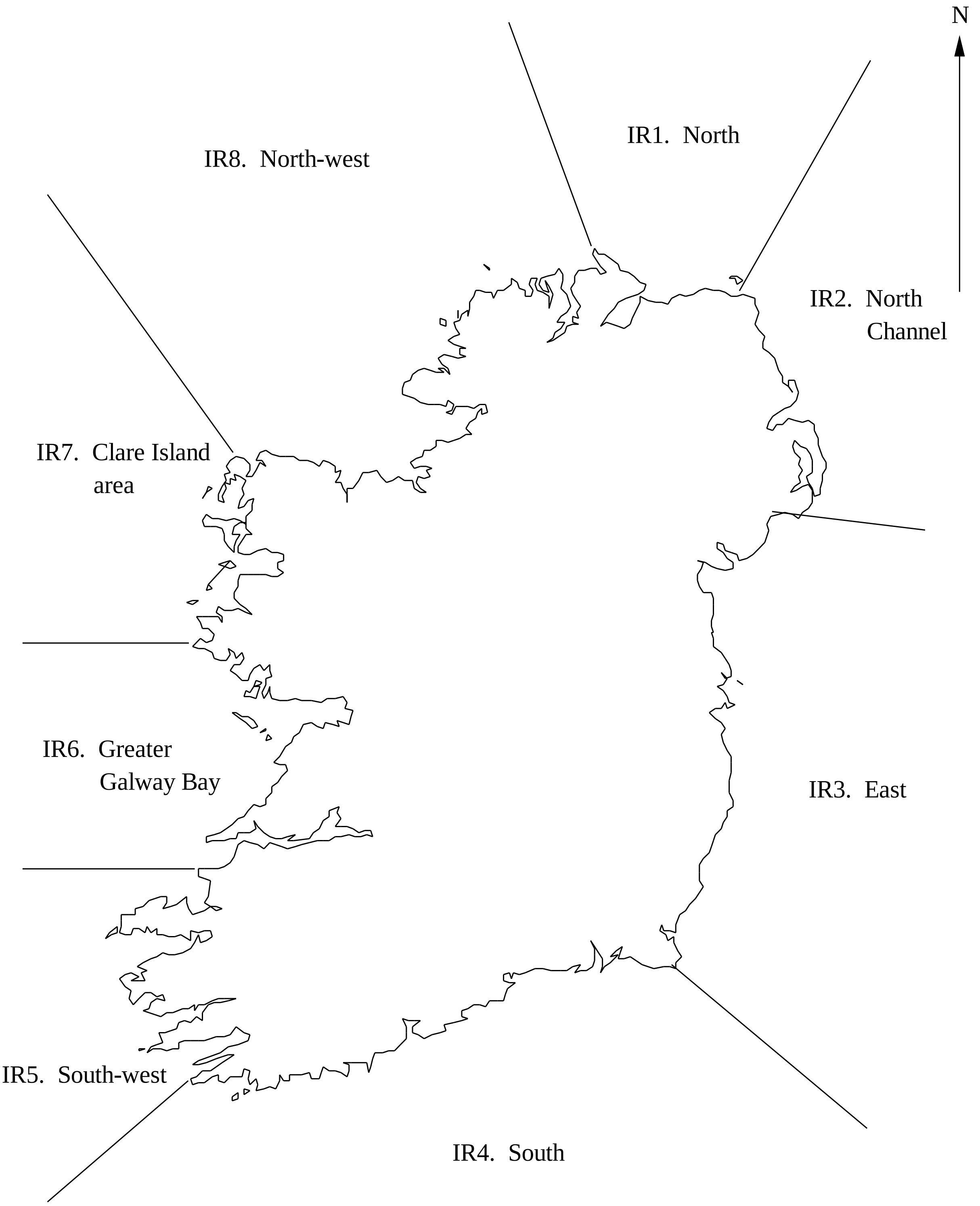

Figure 6.2 BioMar Irish coastal sectors

6.2 Main types (littoral)

LR Littoral rock (and other hard substrata)

Habitat classification

Salinity:	Full, Variable, Reduced / low		
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Bedrock; boulders; cobbles and pebbles		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

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

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

LR.L Lichens or algal crusts

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Bedrock; boulders; cobbles		
Zone:	Supralittoral, Littoral fringe		
Height band:	Upper shore		

Biotope description

Lichens occur on all rocky shores (bedrock, boulders and cobbles) where there is sufficient seawater spray to maintain a viable population. Yellow and grey lichens dominate the supralittoral rock (LR.YG) with the distinctive black band of *Verrucaria maura* occurring below in the littoral fringe (LR.Ver). On very exposed shores the lichen zone may extend 10s of metres up the shore, whereas on very sheltered shores the same zone can be extremely compressed or absent. Algal crusts can sometimes be found in this splash zone, where localised conditions allow growth in what would otherwise be inhospitable conditions for algae. Such an example is the green alga *Prasiola stipitata* which occurs in areas of nitrate enrichment from nearby roosting seabirds (LR.Pra). Chalk cliffs also support algal crust communities.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Melarhaphe neritoides	•	••	Frequent
Pelvetia canaliculata	•	••	Occasional
Caloplaca marina	••	•••	Frequent
Caloplaca thallincola	•	•••	Occasional
Lecanora atra	•	•••	Frequent
Ramalina	•	•••	Occasional
Verrucaria maura	••••	••	Common
Xanthoria parietina	••	•••	Frequent
Grey lichens	••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

ELR Exposed littoral rock (mussel/barnacle shores)

Habitat classification

Salinity:	Full		
Wave exposure:	Extremely exposed, Very exposed, Exposed		
Tidal streams:			
Substratum:	Bedrock; large boulders		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Extremely exposed to exposed bedrock and boulder shores. Mussels and barnacles dominate these shores, occasionally with robust fucoids in extremely exposed conditions or turfs of red seaweed.

Frequency of occurrence

In Britain:	Very common

ELR.MB *Mytilus* (mussels) and barnacles

Habitat classification

Salinity:	Full		
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; large boulders		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Communities dominated by barnacles and limpets *Patella* spp. cover extensive areas of the upper and mid shore on very exposed to moderately exposed rocky shores (ELR.BPat). There is much regional variation affecting the zonation of barnacles in the UK, but generally it follows as such: in the north-west where both *Chthamalus* spp. and *Semibalanus balanoides* occur, *Chthamalus montagui* will form a distinct band above the *Semibalanus*; in the south-west *Chthamalus* can be the dominant barnacle throughout the eulittoral zone; and on the east coast where there are no *Chthamalus* spp., *Semibalanus* is able to extend to the upper shore, in the absence of any competition. Where the black lichen *Lichina pygmaea* or the red seaweed *Catenella caespitosa* form extensive patches in the barnacle zone these can be recorded as sub-biotopes (ELR.BPat.Lic or ELR.BPat.Cat). On very exposed shores the mid to lower shore below is typically characterised by patches of mussels *Mytilus edulis* interspersed with barnacles (ELR.MytB). On less exposed shores the non-vesiculate form *linearis* of *Fucus vesiculosus* can occur in small clumps covering up to 50% of the upper to mid eulittoral zone (ELR.BPat.Fvesl).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chthamalus montagui	•	•••	Common
Chthamalus stellatus	•	•••	Frequent
Semibalanus balanoides	•••••	•	Common
Patella vulgata	••••	•	Common
Melarhaphe neritoides	•	••	Common
Littorina neglecta	•••	•	Common
Mytilus edulis	••••	•	Frequent
Verrucaria maura	•	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

ELR.FR Robust fucoids or red seaweeds

Habitat classification

Salinity:	Full		
Wave exposure:	Extremely exposed, Very exposed, Exposed		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

This biotope complex encompasses those seaweeds that are able to tolerate the extreme conditions of exposed rocky shores, primarily the physical stresses caused by wave action. The strong holdfast and short tufty structure of *Fucus distichus* and *Fucus spiralis* f. *nana* allow these fucoids to survive on extremely exposed shores in the north and north-west (ELR.Fdis). Other seaweeds able to tolerate the wave-wash are the red seaweed *Corallina officinalis* which can form a dense turf on the mid to lower shore (ELR.Coff), and the brown seaweed *Himanthalia elongata*, also occurring on the lower shore and extending on to moderately exposed shores (ELR.Him). The red seaweed *Mastocarpus stellatus* is also common to both exposed and moderately exposed shores where it may form a dense turf particularly on vertical or overhanging rock faces (MLR.Mas).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Grantia compressa	•	••	Occasional
Chthamalus stellatus	•	••	Occasional
Semibalanus balanoides	••••	•	Common
Patella ulyssiponensis	••	••	Common
Patella vulgata	••••	•	Common
Calliostoma zizyphinum	•	••	Occasional
Melarhaphe neritoides	•	••	Frequent
Umbonula littoralis	•	••	Occasional
Mastocarpus stellatus	•••••	•	Frequent
Lomentaria articulata	•••	••	Occasional
Plumaria plumosa	•	••	Occasional
Cryptopleura ramosa	•	••	Occasional
Membranoptera alata	•	••	Occasional
Osmundea pinnatifida	••••	•	Frequent
Leathesia difformis	••	••	Occasional
Himanthalia elongata	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	
R4	E Scotland		MNCR data	
R5	SE Scotland/ NE England		MNCR data	
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R10	Wales		MNCR data	
R14	Outer Hebrides		MNCR data	

R15	NW Scotland		MNCR data	

Frequency of occurrence

In Britain:	Uncommon

MLR Moderately exposed littoral rock (barnacle/fucoid shores)

Habitat classification

Salinity:	Full		
Wave exposure:	Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; boulders; cobbles		
Zone:	Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Moderately exposed rocky shores (bedrock, boulders and cobbles) characterised by mosaics of barnacles and fucoids on the mid and upper shore; with fucoids and red seaweed mosaics or dense red seaweed turfs on the lower shore. Where freshwater or sand-scour effects the shore ephemeral green or red seaweeds can dominate. Other shores support communities of mussels and fucoids in the mid to lower shore. Where there is a plentiful supply suspended sand in the water *Sabellaria* reefs can develop.

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

MLR.BF Barnacles and fucoids (moderately exposed shores)

Habitat classification

Salinity:	Full		
Wave exposure:	Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

On moderately exposed rocky shores the extent of fucoid cover is typically less than that found on sheltered shores (SLR.F). The fucoids form a mosaic with barnacles on bedrock and boulders, rather than the blanket cover associated with sheltered shores, except for on the lower shore where there may be dense *Fucus serratus* (MLR.Fser). Beneath the band of lichens at the top of the shore (LR.YG and LR.Ver) the channel wrack *Pelvetia canaliculata* typically occurs overgrowing the black lichen *Verrucaria* spp. with sparse barnacles (MLR.PelB). Below, barnacles and limpets *Patella* may cover extensive areas of rock (ELR.BPat), particularly on steep or vertical rock. In the absence of ELR.BPat, the spiral wrack *Fucus spiralis* may occur (SLR.Fspi). On the mid shore the bladder wrack *Fucus vesiculosus* generally forms a mosaic with barnacles (MLR.FvesB). Finally, the serrated wrack *Fucus serratus*, dominates the lower shore (MLR.Fser); a number of sub-biotopes have been described: lower shore bedrock and boulders may be characterised by mosaics of *F. serratus* and turf-forming red algae (MLR.Fser.R); where the density of *F. serratus* is greater (typically common - superabundant) and the abundance of red algae less MLR.Fser.Fser should be recorded. The presence of boulders and cobbles on the shore can increase the micro-habitat diversity which often results in a greater species richness. Although the upper surface of the boulders may bear very similar communities to MLR.Fser.Fser there is often an increase in fauna (crabs, tube-worms, sponges and bryozoans) and MLR.Fser.Fser.Bo should be recorded.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chthamalus montagui	•	•••	Frequent
Semibalanus balanoides	••••	•	Frequent
Patella vulgata	••••	•	Frequent
Gibbula umbilicalis	•	••	Occasional
Melarhaphe neritoides	•	••	Frequent
Flustrellidra hispida	•	••	Occasional
Lomentaria articulata	••	••	Occasional
Membranoptera alata	•	••	Occasional
Leathesia difformis	•	••	Occasional
Ascophyllum nodosum	•	••	Occasional
Fucus serratus	••••	•	Abundant
Pelvetia canaliculata	•	••	Frequent
Verrucaria maura	•	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	UK - all coasts			

Frequency of occurrence

In Britain:	Very common

MLR.R Red seaweeds (moderately exposed shores)

Habitat classification / Previous code

Salinity:	Full	LRK.RED	6.95
Wave exposure:	Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; large boulders		
Zone:	Eulittoral - mid, Eulittoral - lower		
Height band:	Mid shore, Lower shore		

Biotope description

Moderately exposed mid or lower eulittoral bedrock or stable boulders can be characterised by a dense turf of red seaweeds, usually without significant quantities of fucoids. The red seaweed turf is most frequently characterised by a mixture of species, including *Mastocarpus stellatus*, *Chondrus crispus*, *Osmundea* (*Laurencia*) *pinnatifida*, *Corallina officinalis* and *Palmaria palmata* (MLR.XR). On some shores, certain red seaweeds may form a dense band dominated by a single species (MLR.Pal, MLR.Mas or MLR.Osm).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Patella ulyssiponensis	•	••	Occasional
Patella vulgata	••••	•	Frequent
Mastocarpus stellatus	••••	•	Common
Lomentaria articulata	••	••	Occasional
Plumaria plumosa	•	••	Occasional
Leathesia difformis	•	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland			
R5	SE Scotland/ NE England			
R6	E England			
R7	Eastern English Channel			
R8	Western English Channel			
R9	Bristol Channel and approaches			
R10	Cardigan Bay and North Wales			
R12	Clyde Sea			
R14	Outer Hebrides			
R15	NW Scotland			
Other	Sealochs		MNCR data	
Other	Inlets in SW Britain	Moore In prep	SWI.6	=
IR7	Clare Island area		R_ir	=

Frequency of occurrence

In Britain:	Uncommon

MLR.Eph Ephemeral green or red seaweeds (freshwater or sand-influenced)

Habitat classification

Salinity:	Full		
Wave exposure:	Moderately exposed, Sheltered		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Littoral fringe - lower, Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Ephemeral algae often colonise disturbed littoral rock. On moderately exposed shores this can occur as *Enteromorpha* spp. on freshwater-influenced or unstable upper shore rock (MLR.Ent), *Porphyra purpurea* and/or *Enteromorpha* spp. on sand-scoured mid to lower eulittoral rock (MLR.EntPor) and dense mats of *Rhodothamniella floridula* on lower shore rock surrounded by sand (MLR.Rho).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Enteromorpha	••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Common

MLR.MF *Mytilus* (mussels) and fucoids (moderately exposed shores)

Habitat classification / Previous code

Salinity:	Full	MLR.Myt	96.7
Wave exposure:	Moderately exposed		
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock; large boulders		
Zone:	Eulittoral - mid, Eulittoral - lower		

Biotope description

Mid and lower eulittoral moderately exposed bedrock, often with nearby sediment, may be densely covered by large mussels *Mytilus edulis*. In the mid eulittoral, the mussels may form a band or large patches with scattered bladder wrack *Fucus vesiculosus* (MLR.MytFves). In the lower eulittoral a range of red seaweeds occur amongst the mussels (in higher abundance than the mid eulittoral) (MLR.MytFR). Ephemeral green algae such as *Enteromorpha* spp. and *Ulva lactuca* commonly occur on the shells of the mussels. Barnacles are common on both the mussel valves and on patches of bare rock, where the limpet *Patella vulgata* is also found, often at high abundance. The dog whelk *Nucella lapillus* and a range of littorinids also occur within the mussel bed. A dense *Mytilus* community may also be found on more sheltered coasts on mixed substrata (SLR.MX).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Common
Nucella lapillus	••••	•	Occasional
Mytilus edulis	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland			
R5	SE Scotland/ NE England			
R6	E England			
R8	Western English Channel			
R9	Bristol Channel and approaches			
R10	North Wales			
R11	Liverpool Bay			
R12	Clyde Sea			
R14	Outer Hebrides			
R15	NW Scotland			

Frequency of occurrence

In Britain:	Scarce

MLR.Sab Littoral *Sabellaria* (honeycomb worm) reefs

Habitat classification

Salinity:	Full		
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Boulders; cobbles; pebbles; sand; bedrock		
Zone:	Eulittoral - mid, Eulittoral - lower		
Height band:	Mid shore, Lower shore		

Biotope description

The sedentary polychaete worm *Sabellaria alveolata* builds tubes from sand and shell. On moderately exposed shores, where there is a plentiful supply of sediment, *Sabellaria* can form honeycomb reefs on boulders and low-lying bedrock on the mid to lower shore. These *Sabellaria* reefs are quite distinct from the mosaic of seaweeds and barnacles or red seaweeds (MLR.BF; MLR.R) generally associated with moderately exposed rocky shores. Although these reefs may be susceptible to storm damage in the winter, they can regenerate remarkably quickly in a season.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Sabellaria alveolata	•••••	•••	Common
Semibalanus balanoides	••••	•	Frequent
Balanus crenatus	•••	••	Occasional
Patella vulgata	••••	•	Rare
Littorina littorea	••••	•	Frequent
Nucella lapillus	••••	•	Common
Polysiphonia fucoides	••	••	Occasional
Fucus serratus	••••	•	Occasional
Ulva	••••	•	Occasional
Bryopsis plumosa	•	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R9	Bristol Channel and approaches		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	
R11	Irish Sea		MNCR data	

Frequency of occurrence

In Britain:	Rare

SLR Sheltered littoral rock (fucoid shores)

Habitat classification

Salinity:	Full, Variable, Reduced / low		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Bedrock; boulders; cobbles; pebbles; mixed substrata on sand and mud		
Zone:	Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Sheltered rocky shores, of bedrock or stable boulders and cobbles, are typically characterised by a dense cover of fucoid algae which form distinct zones (channelled wrack *Pelvetia canaliculata* on the upper shore through to the serrated wrack *Fucus serratus* on the lower shore). Where salinity is reduced (such as at the head of a sealoch or where streams run across the shore) *Fucus ceranoides* may occur. Fucoids also occur on less stable, mixed substrata (cobbles and pebbles on sediment) although in less abundance and with fewer associated epifaunal species; beds of mussels *Mytilus edulis* are also common. In summer months, dense blankets of ephemeral green and red seaweeds can dominate these mixed shores.

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

SLR.F Dense fucoids (stable rock)

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Bedrock; stable boulders; cobbles		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Sheltered rocky shores are generally dominated by dense blankets of fucoid seaweed. Typically, the channel wrack *Pelvetia canaliculata* (SLR.Pel) occurs on the upper shore, with the spiral wrack *Fucus spiralis* (SLR.Fspi) below. The middle shore is dominated by vast areas of the knotted wrack *Ascophyllum nodosum* or the bladder wrack *Fucus vesiculosus* (SLR.Asc, SLR.Fves) or a mixture of both. The serrated wrack *Fucus serratus* covers lower shore bedrock and boulders (SLR.Fserr). Where there is an increased tidal flow over the shore an increase in epiphytic biota results (SLR.Asc.T and SLR.Fserr.T). This contrasts to shores subject to variable salinity, such as occur in the Scottish sealochs, where there is a general decline in species diversity. Under these conditions there is usually an increase in green algae such as *Cladophora* spp. (SLR.Asc.VS and SLR.Fserr.VS).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Amphipoda indet.	••	••	Frequent
Polysiphonia lanosa	•	••	Frequent
Ascophyllum nodosum	•••	••	Common
Pelvetia canaliculata	••	••	Frequent
Verrucaria maura	••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

SLR.FX Fucoids, barnacles or ephemeral seaweeds (mixed substrata)

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Mixed pebbles, cobbles and boulders on sediment		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Sheltered to very sheltered mixed substrata (pebbles and cobbles overlying muddy sand and gravel) shores can support fucoid communities. The bladder wrack *Fucus vesiculosus* and the knotted wrack *Ascophyllum nodosum* both occur on the mid shore (SLR.FvesX, SLR.AscX). On extremely sheltered shores in Scottish sealochs, the unattached form of *A. nodosum* ecad *mackaii* can form extensive beds (SLR.AscX.mac). The serrated wrack *Fucus serratus* occurs on the lower shore (SLR.FserX). These mixed substrata communities differ from those on bedrock in having a less dense canopy of fucoids and a reduced richness of epifaunal species. Banks of cobbles and pebbles that are too unstable to support fucoids are usually colonised by barnacles and dense aggregations of the gastropod *Littorina littorea* (SLR.BLlit). In summer months, dense blankets of ephemeral green and red seaweed can dominate these shores (SLR.EphX), while in upper estuarine conditions and by streams *Fucus ceranoides* occurs (SLR.FcerX).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	●●●	●	Frequent
Amphipoda indet.	●●	●●	Frequent
Littorina littorea	●●●●	●	Frequent
Polysiphonia lanosa	●	●●	Occasional
Ascophyllum nodosum	●●	●●	Frequent
Fucus ceranoides	●●	●●●	Frequent
Fucus vesiculosus	●●●	●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Common

SLR.MX *Mytilus* (mussel) beds (mixed substrata)

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Mixed boulders, cobbles and pebbles on muddy sediments		
Zone:	Eulittoral - mid, Eulittoral - lower		
Height band:	Mid shore, Lower shore		

Biotope description

On moderately exposed to sheltered shores the mussel *Mytilus edulis* can form dense aggregations on mixed substrata, creating stable biogenic reefs.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Amphipoda indet.	•	••	Occasional
Littorina littorea	•••••	•	Common
Mytilus edulis	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland			
R4	E Scotland			
R5	SE Scotland/ NE England			
R6	E England			
R7	Eastern English Channel			
R8	Western English Channel			
R9	Bristol Channel and approaches			
R10	Cardigan Bay and N Wales			
R11	Liverpool Bay and The Solway			
R12	Clyde Sea			
R13	W Scotland			
R15	NW Scotland			

Frequency of occurrence

In Britain:	Common

LR.Rkp Rockpools

Habitat classification

		Previous code	
Salinity:	Full, Variable	RKP	96.7
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

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

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Amphipoda indet.	•	••	Occasional
Patella ulyssiponensis	•	••	Common
Gibbula umbilicalis	••	••	Occasional
Amphipholis squamata	•	••	Occasional
Lipophrys pholis	•	•••	Occasional
Corallina officinalis	••••	•	Common
Polyides rotundus	•	••	Occasional
Lomentaria articulata	•	••	Occasional
Cryptopleura ramosa	•	••	Occasional
Membranoptera alata	•	••	Occasional
Polysiphonia fucoides	•	••	Occasional
Leathesia difformis	•	••	Occasional
Dictyota dichotoma	•	••	Occasional
Scytosiphon lomentaria	•	••	Occasional
Himanthalia elongata	••	•••	Occasional
Halidrys siliquosa	••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Common

LR.Ov Overhangs and caves

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Littoral fringe, Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Where overhangs occur on rocky shores there is a reduction in desiccation which allows certain species to proliferate, in particular, crusts of bryozoans, sponges, ascidians, barnacles (*Balanus perforatus*) and spirorbid tubeworms (LR.SByAs). Shade-tolerant red seaweeds can also develop in such conditions (LR.SR). Although similar communities are known to occur in littoral caves, there is currently insufficient data to define cave biotopes in detail. However, some provisional biotopes have been described, based on caves studied on the Berwickshire and Northumberland coast (Environmental Resource Technology In prep.): (1) Upper shore caves sheltered from wave action with brown algae near the entrance and shade-tolerant red algae and the green alga *Cladophora* spp. penetrating further into the cave. (2) Exposed to moderately exposed caves subject to direct wave action. The moist spray allows lichen and seaweeds to grow on the walls (*Verrucaria mucosa* and *Hildenbrandia* sp.) with barnacles in crevices. (3) Cave walls with low diversity and low density of faunal species (*Ligia oceanica*, *Actinia* sp., *Verruca stroemia and spirorbids) (4) Barren, scoured bedrock and boulders on cave floor. (5) Upper shore caves with scoured floor and base of walls, dominated by encrusting coralline algae (6) Mid to upper shore caves dominated by encrusted coralline algae, with limpets,* Verrucaria *and the red alga* Rhodothamniella *sp., subject to some wave surge.*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Grantia compressa	••	••	Frequent
Halichondria panicea	••••	•	Frequent
Myxilla incrustans	•	•••	Occasional
Balanus crenatus	••	••	Frequent
Calliostoma zizyphinum	•	••	Rare
Umbonula littoralis	••	••	Occasional
Morchellium argus	•	•••	Occasional
Dendrodoa grossularia	•	••	Frequent
Botryllus schlosseri	•	••	Occasional
Botrylloides leachi	•	••	Occasional
Lomentaria articulata	•••	••	Frequent
Plumaria plumosa	••	••	Frequent
Cryptopleura ramosa	•	••	Occasional
Membranoptera alata	•	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	Berwickshire/ Northumberland	Environment and Resource Technology In prep		

Frequency of occurrence

In Britain:	Scarce

LS Littoral sediments

Habitat classification

Salinity:	Full, Variable, Reduced / low		
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Shingle; gravel; sand; mud; mixed sediment		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Littoral sediment includes habitats of shingle (mobile cobbles and pebbles), gravel, sand and mud or any combination of these which occur in the intertidal zone (the area between high and low tides), including the strand-line at the very top of the shore. Littoral sediment is defined further using descriptions of particle sizes - gravel (16-4 mm), coarse sand (4-1 mm), medium sand (1-0.25 mm), fine sand (0.25-0.063 mm) and mud (less than 0.063 mm) and various admixtures of these grades - muddy sand, sandy mud and mixed sediment (gravel, sand and mud together). Littoral sediments support communities tolerant to some degree of drainage at low tide and often subject to variation in air temperature and reduced salinity in estuarine situations. Communities of burrowing amphipods, polychaetes, bivalves and oligochaetes make up the majority of the biota. Occasionally algae (e.g. *Enteromorpha* spp.) may grow on the sediment surface, whilst seagrass *Zostera* spp. and angiosperm saltmarsh communities also occur.

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK-all coasts			
Other	Ireland-all coasts			

Frequency of occurrence

In Britain:	Very common

LGS Littoral gravels and sands

Habitat classification

Salinity:	Full, Variable, Reduced / low		
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Shingle; gravel; sand		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Clean gravel and/or sand in the littoral zone (the area between high and low tides) with a particle diameter range from 16 mm to 0.063 mm; shingle shores comprising mobile cobbles, pebbles and coarse gravel are also included. The shore and substratum type can range from steep mobile shores that are typically of coarse material (gravel and coarse sand), through less steep shores of coarse, medium or fine sand to level sandflats of fine sand that remain water-saturated throughout the tidal cycle. Mud (particle diameter less than 0.063 mm) does not exceed 10%, and is usually totally absent.

Distribution

Sector	***Area***	***Source***	***Section/page***	***Equivalence***
Other	UK-all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

LGS.Sh Shingle (pebble) and gravel shores

Habitat classification

Salinity:	Full		
Wave exposure:	Very exposed, Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Shingle; gravel		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Shores of shingle (mobile cobbles and pebbles) or coarse gravel, typically deposited as a result of onshore wave action and long-shore drift. The particle size tends to increase along the shore in the direction of the long-shore drift. As the sediment is very coarse and often quite mobile, it typically supports little marine life, other than opportunist amphipods and oligochaete worms. Summer growths of ephemeral green algae (*Enteromorpha* spp.) may develop.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pectenogammarus planicrurus	•	•••	Frequent
Eurydice pulchra	•	••	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Orfordness, Sheerness			
R7	Dungeness			
R8	Chesil Beach			

Frequency of occurrence

In Britain:	Uncommon

LGS.S Sand shores

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Exposed, Moderately exposed, Sheltered		
Tidal streams:			
Substratum:	Sand		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Shores comprising predominantly of clean sands (coarse, medium or fine-grained) and typically with little gravel or mud present. Shells and stones may occasionally be present on the surface. The sand may be duned or rippled as a result of wave action or tidal currents. They exhibit varying degrees of drying at low tide depending on the steepness of the shore, the sediment grade and the height on the shore. The more mobile sand shores are relatively impoverished (LGS.BarSnd, LGS.AEur), with more species-rich communities of amphipods, polychaetes and, on the lower shore, bivalves developing with increasing stability in finer sand habitats (LGS.AP). A strandline of talitrid amphipods (LGS.Tal) typically develops at the top of the shore where decaying seaweed accumulates.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa	••	•••	Common
Paraonis fulgens	•	•••	Abundant
Scolelepis squamata	••	•••	Common
Lanice conchilega	•	••	Abundant
Pontocrates altamarinus	•	•••	Common
Pontocrates arenarius	••	•••	Common
Bathyporeia pelagica	••	•••	Common
Bathyporeia pilosa	•	••	Common
Bathyporeia sarsi	•	••	Common
Haustorius arenarius	•	•••	Common
Eurydice pulchra	••	••	Common
Angulus tenuis	•	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK-all coasts			
Other	Ireland-all coasts			

Frequency of occurrence

In Britain:	Very common

LGS.Est Estuarine coarse sediment shores

Habitat classification

Salinity:	Variable, Reduced / low		
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:	Very strong, Strong, Moderately strong		
Substratum:	Shingle; gravel; coarse sand		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Shores of coarse sediments (shingle, gravels and coarse sand) in the upper reaches of estuaries and other inlets (e.g. sealochs) which are subject to variable and reduced salinity conditions. The out-flow of riverine freshwater at the heads of the inlets results in the washing out of fine particulate matter, leaving coarse sediments. These are typically species-poor and characterised by oligochaete worms (LGS.Ol).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Oligochaeta indet.	●●●	●	Common
Heterochaeta costata	●	●●	Abundant
Tubificoides benedii	●	●●	Present/Not known
Enchytraeidae	●●	●●	Abundant

Frequency of occurrence

In Britain:	Uncommon

LMS Littoral muddy sands

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Muddy sand		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Shores of muddy sand, typically consisting of particles less than 4 mm in diameter, where the mud fraction (less than 0.063 mm diameter particles) makes up between 10% and 30% of the sediment. Typically, the sand fraction is medium (particle diameter 0.25-1 mm) or fine (particle diameter 0.063-0.25 mm) sand. Muddy sand usually forms gently sloping flats that remain water-saturated throughout the tidal cycle. They support communities predominantly of polychaetes and bivalves, including the lugworm *Arenicola marina*, the cockle *Cerastoderma edule* and the Baltic tellin *Macoma balthica*, but may also have seagrass *Zostera noltii* beds (LMS.Znol).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina			
Cerastoderma edule			
Macoma balthica			
Zostera noltii			

Frequency of occurrence

In Britain:	Common

LMS.MS Muddy sand shores

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Muddy sand		
Zone:	Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Shores of muddy sand, typically consisting of particles less than 4 mm in diameter, where the mud fraction (less than 0.063 mm diameter particles) makes up between 10% and 30% of the sediment. Typically, the sand fraction is medium (particle diameter 0.25-1 mm) or fine (particle diameter 0.063-0.25 mm) sand. Muddy sand usually forms gently sloping flats that remain water-saturated throughout the tidal cycle. They support communities predominantly of polychaetes and bivalves, including the lugworm *Arenicola marina*, the cockle *Cerastoderma edule* and the Baltic tellin *Macoma balthica*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Anaitides mucosa	•	•••	Present/Not known
Nephtys hombergii	••	••	Occasional
Aricidea minuta	•	••	Common
Spio filicornis	•	••	Present/Not known
Arenicola marina	•••	•	Common
Bathyporeia pilosa	••	••	Common
Bathyporeia sarsi	•	••	Common
Corophium arenarium	••	••	Common
Crangon crangon	•	••	Present/Not known
Cerastoderma edule	•••	••	Common
Macoma balthica	•••	••	Common

Frequency of occurrence

In Britain:	Common

LMS.Zos Littoral *Zostera* (seagrass) beds

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Muddy fine sand or sandy mud		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore		

Biotope description

Beds of the seagrass *Zostera noltii*, typically on the upper and mid shore of muddy sand or sandy mud shores. Beds of *Zostera marina*, which typically occur on the extreme lower shore and in the shallow subtidal, are classified under IMS.Sgr.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Heteromastus filiformis	•	••	Frequent
Mediomastus fragilis	•	••	Common
Arenicola marina	••••	•	Common
Galathowenia oculata	•	•••	Frequent
Ampharete grubei	•	••	Present/Not known
Fabricia sabella	•	••	Frequent
Heterochaeta costata	••	••	Frequent
Tubificoides benedii	••	••	Abundant
Tubificoides pseudogaster	•	••	Common
Enchytraeidae	••	••	Frequent
Crangon crangon	•	••	Present/Not known
Cerastoderma edule	••••	••	Abundant
Macoma balthica	•••	••	Occasional
Scrobicularia plana	••	••	Common
Abra tenuis	•	••	Common
Mya arenaria	•	••	Occasional
Zostera noltii	•••••	•••	Common

Frequency of occurrence

In Britain:	Scarce

LMU Littoral muds

Habitat classification

Salinity:	Full, Variable, Reduced / low		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Sandy mud, mud		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Shores of fine particulate sediment with a particle size less than 0.063 mm in diameter that typically forms extensive mudflats. Dry compacted mud can form steep and even vertical structures, particularly at the top of the shore adjacent to saltmarshes. Also included in this higher division are sandy muds which have between 20% and 70% sand, the remainder being made up of mud with a particle size less than 0.063 mm. Small amounts of gravel or pebbles may be found within mud, having little effect upon the structure of the associated communities. Littoral muds support communities characterised by polychaetes, certain bivalves and oligochaetes. The ragworm *Hediste* (*Nereis*) *diversicolor*, the Baltic tellin *Macoma balthica* and the furrow shell *Scrobicularia plana* are conspicuous members of muddy shore communities.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Polychaeta indet.			
Pelecypoda indet.			

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK-all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Common

LMU.Sm Saltmarsh

Habitat classification

Salinity:	Variable, Reduced / low		
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Sandy or muddy sediment		
Zone:	Supralittoral, Littoral fringe		
Height band:	Strandline		

Biotope description

Angiosperm-dominated stands of vegetation, occurring on the extreme upper shore of sheltered coasts and periodically covered by high tides. The vegetation develops on a variety of sandy and muddy sediment types and may have admixtures of coarser material. The character of the saltmarsh communities is affected by height up the shore, resulting in a zonation pattern related to the degree or frequency of immersion in seawater. Saltmarsh vegetation is generally well studied; its classification is fully covered by the UK National Vegetation classification, where 26 types are defined (Rodwell in prep.). The species listed below relate primarily to pioneer saltmarsh habitats, rather than fully established saltmarshes.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Manayunkia aestuarina	••	••	Frequent
Heterochaeta costata	•	••	Abundant
Enchytraeidae	•••	••	Common
Pelvetia canaliculata	•••	••	Common
Angiospermae indet.	•••••	•••	Super abundant
Salicornia	•••••	•••	Abundant

Frequency of occurrence

In Britain:	Common

LMU.SMu Sandy mud shores

Habitat classification

Salinity:	Full, Variable, Reduced / low		
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Sandy mud		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Soft sediment shores, comprising predominantly sandy mud between 30 and 80% silt/clay fraction. The presence of at least 30% silt/clay gives rise to typically muddy communities in which the lugworm *Hediste diversicolor* and oligochaete worms are common. As the sediment has a reasonable proportion of sandy material in it the shores are relatively firm under-foot.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor	••••	•	Abundant
Nephtys hombergii	•	••	Frequent
Pygospio elegans	•••	•	Common
Streblospio shrubsolii	•	••	Common
Aphelochaeta marioni	•	•••	Abundant
Manayunkia aestuarina	•	••	Common
Heterochaeta costata	•	••	Common
Tubificoides benedii	••	••	Common
Tubificoides pseudogaster	•	••	Common
Corophium arenarium	•	••	Abundant
Crangon crangon	•	••	Present/Not known
Cerastoderma edule	••	••	Present/Not known
Macoma balthica	••••	••	Common
Abra tenuis	•	••	Common
Mya arenaria	•	••	Super abundant

Frequency of occurrence

In Britain:	Common

LMU.Mu Soft mud shores

Habitat classification

Salinity:	Variable, Reduced / low		
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Mud		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Shores of soft mud, typically with over 80% silt/clay fraction, giving very or extremely soft sediment shores. These are typically restricted to the upper reaches of estuaries and subject to variable, reduced or low salinity conditions. Although not very species-rich, with increasingly lower salinity conditions the mud supports even more impoverished communities, characterised by oligochaete worms.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor	••••	•	Abundant
Nephtys hombergii	•	••	Common
Streblospio shrubsolii	••	••	Common
Manayunkia aestuarina	•	••	Common
Heterochaeta costata	•	••	Abundant
Tubificoides benedii	••	••	Common
Tubificoides pseudogaster	•	••	Common
Enchytraeidae	•	••	Common
Cyathura carinata	•	•••	Common
Cerastoderma edule	•	••	Occasional
Macoma balthica	••	••	Frequent
Scrobicularia plana	••	••	Super abundant

Frequency of occurrence

In Britain:	Common

LMX Littoral mixed sediments

Habitat classification

Salinity:	Full, Variable, Reduced / low		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Pebble, gravel, sand and mud		
Zone:	Supralittoral, Littoral fringe, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		
Other features:	Poorly sorted		

Biotope description

Shores of mixed sediment, comprising predominantly sediment material less than 64 mm in diameter. Often, cobbles and pebbles may also be present which may support epibiota such as fucoids and green seaweeds. By definition, mixed sediments are poorly sorted, consisting of an admixture of pebbles, gravel, sand and mud grades. Few communities are currently defined here; shores with moderate quantities of seaweeds attached to surface stones may be classified under SLR.FX.

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	UK-all coasts			

Frequency of occurrence

In Britain:	Uncommon

6.3 Littoral (intertidal) rock biotopes

L *Lichens or algal crusts*

LR.YG Yellow and grey lichens on supralittoral rock

Habitat classification

		Previous code	
Salinity:	Full, Variable	SUR.YG	96.7
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Bedrock; stable boulders		
Zone:	Supralittoral		

Biotope description

Rock in the supralittoral is typically characterised by a maritime community of yellow and grey lichens, such as *Xanthoria parietina* and *Caloplaca marina*. This band of lichens is usually found immediately above a zone of *Verrucaria maura* (Ver), a black lichen which is also present in this zone, though typically less than common. Damp pits and crevices are occasionally occupied by littorinid molluscs and acarid mites. In sheltered areas the transition from this biotope to *Verrucaria maura* (Ver.Ver) is often indistinct and a mixed zone of YG and Ver.Ver may occur. With increasing wave exposure both zones become wider and more distinct. In estuaries this biotope is often restricted to artificial substrata such as sea defences.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halacaridae	•	•••	Occasional
Ligia oceanica	•	•••	Occasional
Littorina saxatilis	•	•	Occasional
Armeria maritima	•	•••	Occasional
Caloplaca marina	•••	•••	Frequent
Lecanora atra	••	•••	Frequent
Ochrolechia parella	••	•••	Occasional
Ramalina	•••	•••	Frequent
Verrucaria maura	••••	••	Frequent
Xanthoria parietina	••••	•••	Frequent
Grey lichens	•••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.1	=
R6	Ore/Alde/Butley estuary	Hill & Emblow In prep	R6.1	=
R11	Irish Sea	Covey In prep.b	R11.1	=
Other	Sealochs	Howson, Connor & Holt 1994	SL1	=
Other	Inlets in SW Britain	Moore In prep	SWI.1	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.1	=
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Very common

L *Lichens or algal crusts*

LR.Pra *Prasiola stipitata* on nitrate-enriched supralittoral or littoral fringe rock

Habitat classification

Salinity:	Full		
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Supralittoral, Littoral fringe		
Height band:	Upper shore		
Other features:	Nitrate enrichment		

Previous code

LRK.PRA 6.95

Biotope description

Supralittoral and littoral fringe bedrock that receives nitrate enrichment from nearby roosting sea birds is frequently characterised by a band or patches of the ephemeral tufty green alga *Prasiola stipitata*, which grows over the black lichen *Verrucaria maura* in the littoral fringe or yellow and grey lichens in the supralittoral zone. The *Prasiola* reaches its maximum abundance during the winter months. It generally dies out during the summer in southern Britain but in northern areas some *Prasiola* may be present all year round.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Littorina saxatilis	•••	•	Frequent
Enteromorpha	••	•	Common
Prasiola stipitata	•••••	•••	Common
Verrucaria maura	••••	••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.2	In part
R6	Eastern England		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	
R13	W Scotland		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR4	
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=

Frequency of occurrence

In Britain: Uncommon

L *Lichens or algal crusts*

LR.Ver *Verrucaria maura* on littoral fringe rock

Habitat classification

		Previous code	
Salinity:	Full, Variable	LRK.VER	6.95
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Bedrock; stable boulders and cobbles		
Zone:	Littoral fringe		

Biotope description

Bedrock or stable boulders and cobbles in the sublittoral fringe is typically covered by a band of the black lichen *Verrucaria maura*. It occurs below the yellow and grey lichen zone (YG) and above communities of barnacles and fucoid algae. This biotope occurs in a wide range of wave exposures. Several variants are defined. On exposed shores *Verrucaria* spp. may occur with sparse barnacles (*Chthamalus* spp. or *Semibalanus balanoides*) (Ver.B). Where the ephemeral red alga *Porphyra umbilicalis* occurs this should be recorded as Ver.Por. More sheltered shores tend to lack these species (Ver.Ver).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Littorina saxatilis	•••	•	Frequent
Verrucaria maura	•••••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R11	Irish Sea	Covey In prep.b	R11.2	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.2	=
Other	UK - all coasts		MNCR data	
Other	Ireland - all coasts		Ver_ir	=

Frequency of occurrence

In Britain: Common

L *Lichens or algal crusts*

LR.Ver.Por *Verrucaria maura* and *Porphyra umbilicalis* on very exposed littoral fringe rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.VER.POR	6.95
Wave exposure:	Very exposed, Exposed		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Littoral fringe		

Biotope description

The littoral fringe of very exposed to exposed rocky shores may be dominated by tufts or sheets of the red alga *Porphyra umbilicalis* and microscopic blue-green algae (Myxophyceae) (the latter particularly in the north), which overlie the black lichen *Verrucaria maura*. During warm weather the *Porphyra* is often bleached light brown and sticks to the rock as it dries out. The abundance of *Porphyra umbilicalis* shows considerable seasonal and geographical variation. It may be absent in the south during the summer (reverting to Ver.B) on all but the most exposed shores. In the cooler north the *Porphyra* zone persists throughout the year, where during the late winter and spring it may also contain *Porphyra linearis*. *Porphyra* spp. may also occur on exposed shores in the upper eulittoral, generally growing on mussels (MytB) or barnacles (BPat).

Similar biotopes

LR.Ver.B	On southern shores *Porphyra* may die back in the summer and revert to Ver.B

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••	•	Rare
Patella vulgata	••	•	Occasional
Porphyra linearis	••	•••	Common
Porphyra umbilicalis	••••	••	Frequent
Enteromorpha	•••	•	Occasional
Cladophora rupestris	••	•	Frequent
Lichina pygmaea	••	••	Frequent
Verrucaria maura	••••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.2	=
R6	Eastern England		MNCR data	
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	
IR3	E Ireland (St John's Point to Carnsore Point)		Ver.Por_ir	=

Frequency of occurrence

In Britain: Common

L *Lichens or algal crusts*

LR.Ver.B *Verrucaria maura* and sparse barnacles on exposed littoral fringe rock

Habitat classification

Salinity:	Full	
Wave exposure:	Very exposed, Exposed, Moderately exposed	
Tidal streams:		
Substratum:	Bedrock; stable boulders	
Zone:	Littoral fringe	

Previous code

LRK.VER.B 6.95

Biotope description

Exposed rock in the littoral fringe with a sparse covering of barnacles over the black lichen *Verrucaria maura*. On south-west and western shores the barnacle is usually *Chthamalus montagui* which may extend over the whole of the zone. On north and east coast shores the barnacle is usually *Semibalanus balanoides*, and is usually restricted to the lower littoral fringe, with a band of *V. maura* only in the upper littoral fringe. Littorinid molluscs are usually present; *Pelvetia canaliculata* may be present, becoming increasingly more common with greater shelter (see PelB). Ver.B occurs on vertical faces of more sheltered shores with *Pelvetia* (PelB). Ver.B is usually found above *Mytilus edulis* and barnacles (MytB) or the Barnacle and *Patella* zone (BPat, BPat.Cht or BPat.Sem), both of which have much denser coverings of barnacles.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chthamalus montagui	•••	••	Occasional
Semibalanus balanoides	•••	•	Occasional
Patella vulgata	•••	•	Occasional
Melarhaphe neritoides	•••	••	Frequent
Littorina saxatilis	••••	•	Common
Mytilus edulis	••	•	Rare
Pelvetia canaliculata	••	••	Rare
Lichina pygmaea	••	••	Occasional
Verrucaria maura	•••••	••	Common
Verrucaria mucosa	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.8	=
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	
R11	Liverpool Bay and The Solway		MNCR data	
R13	W Scotland		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	
Other	Inlets in SW Britain	Moore In prep	SWI.3	=
Other	Sealochs	Howson, Connor & Holt 1994	SL2	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Ver.B_ir	
IR5	SW Ireland (Mizen Head to Kerry Head)		Ver.B_ir	

IR6	Greater Galway (Kerry Head to Slynne Head)Bay	Ver.B_ir
IR8	NW Ireland (Erris Head to Malin Head)	Ver.B_ir

Frequency of occurrence

In Britain: Common

L *Lichens or algal crusts*

LR.Ver.Ver *Verrucaria maura* on very exposed to very sheltered upper littoral fringe rock

Habitat classification

		Previous code	
Salinity:	Full, Variable	LRK.VER.VER	6.95
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Bedrock; stable boulders		
Zone:	Littoral fringe - upper		

Biotope description

Upper littoral fringe bedrock and stable boulders on very exposed to very sheltered shores are typically characterised by the black lichen *Verrucaria maura* and littorinid molluscs. *Littorina saxatilis* is most common, although *Littorina neritoides* may be found on more exposed shores. This black lichen zone is normally found below the yellow and grey lichen zone (YG), with yellow and grey lichens typically less than common in this biotope. In very sheltered areas there is not always a clear transition from one zone to the next and a mixed zone of YG and Ver.Ver is common. With increasing wave exposure the two lichen zones become wider and more distinct.

Similar biotopes

LR.Ver.B

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Ligia oceanica	•	•••	Occasional
Littorina saxatilis	••	•	Frequent
Littorina saxatilis var. *rudis*	•	••	Frequent
Lichina pygmaea	•	••	Frequent
Verrucaria maura	•••••	••	Abundant
Verrucaria mucosa	•	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.2	=
R6	SE Inlets	Hill & Emblow In prep	R6.2	=
Other	UK - all coasts		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep		
Other	Inlets in SW Britain	Moore In prep	SWI.2	=
Other	Sealochs	Howson, Connor & Holt 1994	SL3	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep.	Lag.2	=
Other	UK - all coasts		MNCR data	
IR3	E Ireland (St John's Point to Carnsore Point)		Ver.Ver_ir	
IR4	S Ireland (Carnsore Point to Mizen Head)		Ver.Ver_ir	
IR5	SW Ireland (Mizen Head to Kerry Head)		Ver.Ver_ir	
IR6	Greater Galway Bay		Ver.Ver_ir	
IR7	Clare Island area		Ver.Ver_ir	

IR8	NW Ireland (Erris Head to Malin Head)	Ver.Ver_ir

Frequency of occurrence

In Britain: Very common

L *Lichens or algal crusts*

LR.Chr Chrysophyceae on vertical upper littoral fringe soft rock

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Littoral fringe - upper
Other features:	Vertical; soft rock

Previous code

LRK.CHR	6.95

Biotope description

"Chrysophyceae" communities form orange, brownish or blackish gelatinous bands at high tide and supralittoral levels on open cliff faces and in caves and tunnels of soft rock. Open cliff-faces and entrances to chalk caves and tunnels at lower supralittoral levels bear a dark brown band comprising an assemblage dominated by *Apistonema carterae*. During summer this gelatinous growth dries and often peels off. The filamentous green alga *Epicladia perforans* is often associated with *Apistonema*, forming a green layer beneath the upper layer of *Apistonema*. *Entodesmsis maritima* and *Thallochrysis litoralis* are commonly associated with *Apistonema*. Associated with this splash zone algal community is an assemblage of animals of terrestrial origin, with red mites, insects and centipedes commonly found. These species descend into the community as the tide falls and retreat as the tide rises. The most common truly marine species is the small winkle *Littorina neritoides*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Entodesmsis maritima		•••	Present/Not known
Thallochrysis litoralis		•••	Present/Not known
Apistonema carterae		•••	Present/Not known
Semibalanus balanoides		•	Present/Not known
Ligia oceanica		•••	Present/Not known
Anurida maritima		•	Present/Not known
Patella depressa		••	Present/Not known
Littorina saxatilis		•	Present/Not known
Ulothrix flacca		•••	Occasional
Entocladia perforans		•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.3	=
R6	Eastern England		MNCR data	
R7	Eastern English Channel		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR1	=

Frequency of occurrence

In Britain: Rare

L *Lichens or algal crusts*

LR.Bli *Blidingia* spp. on vertical littoral fringe soft rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Littoral fringe
Other features:	Soft rock; vertical chalk

Previous code

LRK.BLID 6.95

Biotope description

Vertical soft rock in the littoral fringe may be characterised by a green band of *Blidingia minima*. It is usually found below the *Verrucaria* zone (Ver.Ver) and above a band of the similar looking green alga *Enteromorpha* spp. (Eph). Other filamentous green algae, including *Ulothrix* spp. and *Urospora* spp., are found amongst the *Blidingia*. During low tide terrestrial mites, insects and centipedes migrate into this zone.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Porphyra	•••	••	Present/Not known
Ulothrix flacca	•••	•••	Present/Not known
Enteromorpha prolifera	•••	••	Present/Not known
Blidingia marginata	•••	•••	Occasional
Blidingia minima	•••••	•••	Frequent
Urospora wormskioldii	•••	•••	Present/Not known
Vaucheria	•••••	•••	Super abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.5	=
R6	Eastern England		MNCR data	
R7	Eastern English Channel		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR6	=

Frequency of occurrence

In Britain: Rare

L *Lichens or algal crusts*

LR.UloUro *Ulothrix flacca* and *Urospora* spp. on freshwater-influenced vertical littoral fringe soft rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.UU	6.95
Wave exposure:	Moderately exposed		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Littoral fringe		
Other features:	Vertical soft rock, Freshwater influence		

Biotope description

An assemblage of algae occurring at High Water Spring Tide level on steep and vertical soft rock is visually recognised as closely adherent, often shiny, mats of filamentous growth. It comprises *Ulothrix flacca*, *Urospora penicilliformis*, *Urospora wormskioldii* and *Bangia atropurpurea*. In late winter *B. atropurpurea* may be predominant and the community appears as shiny blackish mats of filamentous growth. The community is more consistently present in areas of freshwater seepage. Associated species include *Blidingia minima* and *Enteromorpha prolifera*. On chalk coasts this community overlaps with and merges into the *Enteromorpha* community (Eph). Although this biotope is believed to occur on soft rock other than chalk, this description has been derived from chalk coast sites.

Similar biotopes

LR.Bli

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Present/Not known
Patella vulgata	••••	•	Present/Not known
Bangia atropurpurea	••	•••	Present/Not known
Ulothrix flacca	••••	•••	Present/Not known
Enteromorpha prolifera	••••	••	Present/Not known
Urospora penicilliformis	••	•••	Present/Not known
Urospora wormskioldii	••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.6	=
R6	Eastern England		MNCR data	
R7	Eastern English Channel		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR5	=

Frequency of occurrence

In Britain: Rare

MB Mytilus *(mussels) and barnacles*

ELR.MytB *Mytilus edulis* and barnacles on very exposed eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.MB	6.95
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Eulittoral		
Other features:	Also occurs on vertical and steep bedrock on moderately exposed shores		

Biotope description

The eulittoral zone, particularly mid and lower shore zones, of very exposed rocky shores are typically characterised by patches of small mussels *Mytilus edulis* interspersed with patches of barnacles *Semibalanus balanoides*. Amongst the mussels small red algae including *Ceramium shuttleworthianum*, *Corallina officinalis*, *Mastocarpus stellatus* and *Aglaothamnion* spp. can be found. Two red algae in particular, *Porphyra umbilicalis* and *Palmaria palmata*, are commonly found on the *Mytilus* itself and can form luxuriant growths. The abundance of the red algae generally increases down the shore and in the lower eulittoral they may form a distinct zone in which mussels or barnacles are scarce (R, Him or Coff. Where *Mytilus* occurs on steep rock, red algae are scarce, and restricted to the lower levels. The dog whelk *Nucella lapillus* and a few littorinid molluscs occur where cracks and crevices provide a refuge in the rock. Fucoids are generally absent, although some *Fucus vesiculosus* f. *linearis* may occur where the shore slopes more gently. MytB is generally found above a zone of either mixed turf-forming red algae (R), *Himanthalia elongata* (Him) or above the sublittoral fringe kelp *Alaria esculenta* (Ala). Above MytB there may be a *Porphyra* zone (Ver.Por), a *Verrucaria maura* and sparse barnacle zone (Ver.B) or a denser barnacle and limpet zone (BPat), often with *Porphyra*. In addition, patches of *Lichina pygmaea* with barnacles (BPat.Lic) may also occur above this biotope, particularly on southern shores. This biotope also occurs on steep moderately exposed shores which experience increased wave crash.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••••	•	Common
Patella vulgata	••••	•	Common
Littorina neglecta	••	••	Common
Nucella lapillus	•••	•	Frequent
Mytilus edulis	•••••	•	Common
Porphyra umbilicalis	•••	••	Frequent
Palmaria palmata	••	•	Occasional
Corallina officinalis	•••	•	Occasional
Mastocarpus stellatus	••	•	Occasional
Aglaothamnion sepositum	•	•••	Occasional
Ceramium shuttleworthianum	••	•••	Occasional
Fucus vesiculosus	•	•	Occasional
Enteromorpha	••	•	Occasional
Cladophora rupestris	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	

R2	Orkney		MNCR data	
R5	SE Scotland/ NE England		MNCR data	
R8	Isles of Scilly		MNCR data	
R9	N Cornwall		MNCR data	
R10	Pembrokeshire		MNCR data	
R11	Irish Sea	Covey In prep.b	R11.6	=
R13	W Scotland		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
IR3	E Ireland (St John's Point to Carnsore Point)		MytB_ir	
IR4	S Ireland (Carnsore Point to Mizen Head)		MytB_ir	
IR5	SW Ireland (Mizen Head to Kerry Head)		MytB_ir	
IR6	Greater Galway Bay		MytB_ir	
IR7	Clare Island area		MytB_ir	
IR8	NW Ireland (Erris Head to Malin Head)		MytB_ir	

Frequency of occurrence

In Britain: Common

MB Mytilus *(mussels) and barnacles*

ELR.BPat Barnacles and *Patella* spp. on exposed or moderately exposed, or vertical sheltered, eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; large boulders
Zone:	Eulittoral - upper, Eulittoral - mid
Height band:	Mid shore
Other features:	Also on sheltered vertical bedrock

Previous code

LRK.BP	6.95

Biotope description

Exposed or moderately exposed upper and mid eulittoral bedrock and boulders are characterised by dense barnacles *Semibalanus balanoides* and the limpet *Patella vulgata*. In the south-west *Chthamalus* spp. can be the dominant barnacle. *Patella ulyssiponensis* predominates in the south-west, but in the north is restricted to very exposed conditions. The barnacles may be covered by *Porphyra* on the upper shore of exposed sites. Patches of *Lichina pygmaea* may be prominent, especially in the south, where this may form a distinct *Lichina* zone (BPat.Lic). Cracks and crevices in the rock provide a refuge for small mussels *Mytilus edulis*, winkles *Littorina saxatilis* and the dog whelk *Nucella lapillus*. Damp crevices are also frequently occupied by red algae, particularly *Osmundea pinnatifida*, *Mastocarpus stellatus* and encrusting coralline algae. With decreasing wave exposure *Fucus vesiculosus* is able to survive, gradually replacing the Barnacles and *Patella* biotope (see FvesB). On such moderately exposed shores BPat may occur on steep and vertical faces, while fucoids dominate the flatter areas. It should not be confused with more exposed shores characterised by *Fucus vesiculosus f. linearis* and *Chthamalus* spp. (BPat.Fvesl). In areas of soft rock (e.g. shales), the barnacles may be scarce or absent and the rock dominated by *Patella*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	••	•	Occasional
Semibalanus balanoides	••••	•	Common
Patella vulgata	••••	•	Common
Littorina neglecta	•••	••	Common
Littorina saxatilis	••	•	Frequent
Nucella lapillus	•••	•	Frequent
Mytilus edulis	••••	•	Occasional
Corallinaceae	••	•	Occasional
Corallina officinalis	••	•	Occasional
Fucus vesiculosus	••	•	Occasional
Enteromorpha	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	
R5	SE Scotland/ NE England	Brazier *et al*. In prep.b	R5.8	=
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.13	In part
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	

R11	Irish Sea	Covey In prep.b	R11.3	=
R12	Clyde Sea			
R13	W Scotland			
R14	Outer Hebrides		MNCR data	
R15	NW Scotland			
Other	Sealochs	Howson, Connor & Holt 1994	SL6	=
Other	Sealochs	Howson, Connor & Holt 1994	SL4	In part
Other	Sealochs	Howson, Connor & Holt 1994	SL9	In part
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.5	=
Other	Inlets in SW Britain	Moore In prep	SWI.4	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR10	In part
IR3	E Ireland (St John's Point to Carnsore Point)		BPat_ir	
IR6	Greater Galway Bay		BPat_ir	
IR8	NW Ireland (Erris Head to Malin Head)		BPat_ir	

Frequency of occurrence

In Britain: Very common

MB Mytilus *(mussels) and barnacles*

ELR.BPat.Cht *Chthamalus* spp. on exposed upper eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	
Substratum:	Bedrock; large boulders
Zone:	Eulittoral - upper, Eulittoral - mid
Height band:	Upper shore, Mid shore
Other features:	Also on sheltered vertical bedrock

Biotope description

Exposed to moderately exposed upper and mid eulittoral bedrock and boulders are characterised by dense barnacles, *Chthamalus* spp. and the limpet *Patella vulgata*. On the west coast *Chthamalus* spp. dominate the upper to mid eulittoral, often forming a distinct white band above a darker *Semibalanus balanoides* zone (BPat.Sem). This is because *Chthamalus montagui* is better adapted to resist desiccation and, therefore, extends further up the shore. There is much regional variation in the distribution and zonation of *Chthamalus* spp. In more northern latitudes, such as north-west Scotland, the abundance of *Chthamalus* is greater on more wave exposed shores. In the south-west *Chthamalus* spp. can be the dominant barnacle throughout the eulittoral zone. Patches of *Lichina pygmaea* may be prominent within the *Chthamalus* zone, especially in the south. Where this forms a distinct *Lichina* zone it should be recorded as BPat.Lic. Cracks and crevices in the rock provide a refuge for small mussels *Mytilus edulis*, winkles *Littorina saxatilis* and the dog whelk *Nucella lapillus*. Damp crevices are also frequently occupied by red algae, particularly *Osmundea pinnatifida* and encrusting coralline algae. With decreasing wave exposure *Fucus vesiculosus* is able to survive and this alga gradually replaces the barnacles and *Patella* biotope (see FvesB). On such moderately exposed shores BPat.Cht may occur on steep and vertical faces, while fucoids dominate the flatter areas. It should not be confused with more exposed shores characterised by *Fucus vesiculosus f. linearis* and *Chthamalus* spp. (BPat.Fvesl). In areas of soft rock (e.g. shales), the barnacles may be scarce or absent and the rock dominated by *Patella*. *Chthamalus* spp. are uncommonly abundant in the upper eulittoral zone in very sheltered sealochs in Argyll, West Scotland.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chthamalus montagui	••••	••	Abundant
Chthamalus stellatus	•••	••	Common
Semibalanus balanoides	••	•	Occasional
Patella vulgata	•••	•	Common
Melarhaphe neritoides	••	••	Frequent
Littorina neglecta	••	••	Common
Littorina saxatilis	•••	•	Occasional
Nucella lapillus	••	•	Occasional
Mytilus edulis	••••	•	Frequent
Osmundea pinnatifida	••	•	Occasional
Fucus vesiculosus	••	•	Occasional
Lichina pygmaea	••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	

R10	Cardigan Bay and north Wales	MNCR data
R11	Liverpool Bay and The Solway	MNCR data
R12	Clyde Sea	MNCR data
R13	West Scotland	MNCR data

Frequency of occurrence

In Britain: Common

MB Mytilus *(mussels) and barnacles*

ELR.BPat.Lic Barnacles and *Lichina pygmaea* on steep exposed upper eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	
Substratum:	Bedrock
Zone:	Littoral fringe - lower, Eulittoral - upper
Other features:	Steep sunny rock

Previous code

ELR.BPat.Lpyg	96.7
LRK.LPYG	6.95

Biotope description

Areas of steep and vertical rock in the upper eulittoral on exposed shores are often characterised by the lichen *Lichina pygmaea*. In some areas, a high abundance of this lichen results in a distinct *Lichina* zone, particularly in the south. On *Chthamalus*-dominated shores (south and west coasts) this band of *Lichina* lies within the barnacle zone, whereas on *Semibalanus* shores (north and east coasts) this biotope lies astride the upper limit of the barnacles. The band of *Lichina*, therefore, generally lies between the *Verrucaria* zone (Ver) above and the barnacle-*Patella* zone (BPat.Sem) below. Within the *Lichina* zone, the barnacles *Chthamalus montagui* and *Chthamalus stellatus* are common, although long-established patches of *Lichina* ultimately exclude barnacles. The rigid branching thallus of *Lichina* provides an ideal habitat for the molluscs *Lasaea rubra* and *Littorina neritoides*. Other upper shore biotopes (Ver.B, Ver.Por) may contain occasional patches of *Lichina pygmaea*, particularly on steep sunny faces, though not forming a distinct zone. *L. pygmaea* also occurs on less steeply sloping shores, provided they are in a sunny aspect.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	•••	•	Occasional
Chthamalus montagui	••••	••	Common
Chthamalus stellatus	•••••	••	Frequent
Semibalanus balanoides	••	•	Common
Patella vulgata	••••	•	Common
Melarhaphe neritoides	•••	••	Occasional
Littorina neglecta	•••••	••	Common
Littorina saxatilis	•••••	•	Frequent
Mytilus edulis	•••	•	Occasional
Lasaea adansoni	••	•••	Occasional
Porphyra umbilicalis	••	••	Frequent
Corallina officinalis	•••	•	Occasional
Catenella caespitosa	••	•••	Occasional
Pelvetia canaliculata	••	••	Rare
Enteromorpha	•••	•	Rare
Lichina pygmaea	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.8	=
R8	Cornwall		MNCR data	

Frequency of occurrence

In Britain: Uncommon

MB Mytilus *(mussels) and barnacles*

ELR.BPat.Cat *Catenella caespitosa* on overhanging, or shaded vertical, upper eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.CAT	6.95
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Littoral fringe - lower, Eulittoral - upper		
Height band:	Upper shore, Mid shore		
Other features:	Shaded verticals and overhangs		

Biotope description

Overhanging or shaded vertical littoral fringe and upper eulittoral bedrock may be characterised by the red alga *Catenella caespitosa*, together with littorinid molluscs, the anemone *Actinia equina*, ephemeral green algae *Enteromorpha* spp. and shade-tolerant red algae (e.g. *Lomentaria articulata*). Often at the same level on these shores, south-facing vertical rock is characterised by similar-looking patches of the lichen *Lichina pygmaea* (BPat.Lic). Where the turf of *Catenella* is well established, barnacles are rare or absent from the biotope. In the south-west, the red alga *Bostrychia scorpioides* is commonly found with *Catenella* and may co-dominate. *B. scorpioides* is also known to occur on the north and east coast of Scotland and the Outer Hebrides.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	●●	●	Frequent
Semibalanus balanoides	●●●	●	Occasional
Anurida maritima	●●	●	Occasional
Littorina littorea	●●	●	Frequent
Littorina neglecta	●	●●	Frequent
Littorina saxatilis	●●●	●	Rare
Mytilus edulis	●●●	●	Rare
Rhodothamniella floridula	●●	●●	Frequent
Hildenbrandia	●●	●●	Common
Catenella caespitosa	●●●●●	●●●	Common
Lomentaria articulata	●●	●	Occasional
Bostrychia scorpioides	●	●●●	Frequent
Enteromorpha	●●●●	●	Common
Verrucaria maura	●●	●●	Frequent
Verrucaria mucosa	●●	●●	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/ NE England		MNCR data	
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	
R11	Liverpool Bay and The Solway		MNCR data	

Frequency of occurrence

In Britain: Uncommon

ELR.BPat.Fvesl Barnacles, *Patella* spp. and *Fucus vesiculosus* f. *linearis* on exposed eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	
Substratum:	Bedrock
Zone:	Eulittoral - upper, Eulittoral - mid
Height band:	Mid shore

Biotope description

Very exposed and exposed upper and mid eulittoral bedrock characterised by dense barnacles, predominantly *Chthamalus* spp. (regionally abundant in the south and west) and the non- vesiculate form *linearis* of *Fucus vesiculosus*. This fucoid forms tufts on the bedrock (frequent or above) and may occupy up to 50% of the rock on some shores. With decreasing wave exposure the normal vesiculate form of *Fucus vesiculosus* is able to survive and this alga gradually replaces the Barnacle and *Patella* biotope (see FvesB). BPat.Fvesl is characterised by typically exposed-shore species such as the small littorinid *Littorina neritoides*, which frequently occurs in empty barnacle tests and a variety of sparse red algae, particularly *Porphyra umbilicalis*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	••••	•	Frequent
Chthamalus montagui	••	••	Frequent
Chthamalus stellatus	••••	••	Common
Semibalanus balanoides	••	•	Common
Patella ulyssiponensis	••	••	Common
Patella vulgata	•••	•	Abundant
Melarhaphe neritoides	••	••	Frequent
Littorina neglecta	••••	••	Frequent
Littorina nigrolineata	••	••	Frequent
Nucella lapillus	••••	•	Frequent
Mytilus edulis	••••	•	Occasional
Porphyra umbilicalis	•••	••	Frequent
Corallina officinalis	••••	•	Occasional
Fucus vesiculosus	•••••	•	Common
Enteromorpha	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	=
R5	SE Scotland/ NE England		MNCR data	=
R8	Western English Channel		MNCR data	=
R9	Bristol Channel and approaches		MNCR data	=
R10	Cardigan Bay and North Wales		MNCR data	=
R13	W Scotland		MNCR data	=
R14	Outer Hebrides		MNCR data	=
R15	NW Scotland		MNCR data	=
IR4	S Ireland (Carnsore Point to Mizen Head)		BPat.Fvesl_ir	

IR8	NW Ireland (Erris Head to Malin Head)	BPat.Fvesl_ir

Frequency of occurrence

In Britain: Scarce

MB Mytilus *(mussels) and barnacles*

ELR.BPat.Sem *Semibalanus balanoides* on exposed or moderately exposed, or vertical sheltered, eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	
Substratum:	Bedrock; large boulders
Zone:	Eulittoral - upper, Eulittoral - mid
Height band:	Upper shore, Mid shore
Other features:	Also on sheltered vertical bedrock

Biotope description

Exposed to moderately exposed eulittoral bedrock and boulders characterised by dense barnacles *Semibalanus balanoides* and the limpet *Patella vulgata*. In the north-west, where *Chthamalus* spp. also occur, *Semibalanus balanoides* may form a grey band below the distinct white band of *Chthamalus* spp. (BPat.Cht) in which patches of *Lichina pygmaea* may be prominent On some shores, particularly in the south, the *Lichina* may form a distinct zone (see BPat.Lic). On the east coast, where there is no *Chthamalus* spp. *Lichina*, if present, tends to form a band astride the upper limit of the barnacles (i.e. partly in BPat and partly in Ver.B). Cracks and crevices in the rock provide a refuge for small mussels *Mytilus edulis*, winkles *Littorina neglecta* and the dog whelk *Nucella lapillus*. Damp crevices are also frequently occupied by red algae, particularly *Osmundea pinnatifida*, *Mastocarpus stellatus* and encrusting coralline algae. With decreasing wave exposure *Fucus vesiculosus* is able to survive, gradually replacing the barnacles and *Patella* biotope (see FvesB). BPat.Sem may also occur on steep and vertical faces on sheltered shores, while fucoids dominate the flatter areas.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••••	•	Common
Patella vulgata	••••	•	Common
Littorina neglecta	•••	••	Common
Nucella lapillus	•••	•	Frequent
Mytilus edulis	••••	•	Occasional
Corallinaceae	••	•	Occasional
Mastocarpus stellatus	••	•	Occasional
Osmundea pinnatifida	••	•	Occasional
Fucus vesiculosus	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL9	=
IR4	S Ireland (Carnsore Point to Mizen Head)		BPat.Lpyg_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		BPat.Lpyg_ir	=
Other	UK - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Very common

FR *Robust fucoids or red seaweeds*

ELR.Fdis *Fucus distichus* and *Fucus spiralis* f. *nana* on extremely exposed upper shore rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.FDIS	6.95
Wave exposure:	Extremely exposed		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Littoral fringe - lower, Eulittoral - upper		

Biotope description

Extremely exposed gently or steeply sloping upper shore bedrock may support a mixture of *Fucus distichus* and *Fucus spiralis* f. *nana*, the latter often at the top of the zone. This biotope is rare and restricted to the far north and west coasts. This mixed band is generally found between the *Verrucaria maura* and *Porphyra* zone (Ver.Por) above, and the *Mytilus edulis* and barnacle zone below (MytB). Although it may occur above a red algal zone (Mas), as recorded on Barra or above a *Porphyra* and sparse barnacle zone (Ver.Por) as on St Kilda.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chthamalus montagui	●●●	●●	Occasional
Semibalanus balanoides	●●●●●	●	Occasional
Patella vulgata	●●●●●	●	Occasional
Melarhaphe neritoides	●●●	●●	Frequent
Littorina neglecta	●●●●●	●●	Frequent
Mytilus edulis	●●●●●	●	Occasional
Porphyra	●●●●●	●●	Occasional
Hildenbrandia rubra	●●●	●●	Common
Fucus distichus	●●●●●	●●●	Frequent
Fucus spiralis	●●●	●●●	Frequent
Verrucaria maura	●●●	●●	Abundant
Verrucaria mucosa	●●●	●●	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	
R14	Barra and St Kilda, Outer Hebrides		MNCR data	

Frequency of occurrence

In Britain: Rare

FR *Robust fucoids or red seaweeds*

ELR.Coff *Corallina officinalis* on very exposed lower eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.RED.COR	6.95
Wave exposure:	Very exposed, Exposed, Moderately exposed		
Tidal streams:	Moderately strong, Weak, Very weak		
Substratum:	Bedrock		
Zone:	Eulittoral - lower		
Height band:	Mid shore, Lower shore		

Biotope description

Very exposed lower eulittoral rock on some shores supports a band of dense *Corallina officinalis* with low abundances of other turf-forming red algae such as *Lomentaria* spp., *Mastocarpus stellatus*, *Ceramium* spp. and *Osmundea* (=*Laurencia*) *pinnatifida*, the red encrusting alga *Callithamnion* spp. and the brown alga *Scytosiphon lomentaria*. The coralline turf also creates a micro-habitat for small animals such as spirorbid worms. The brown alga *Bifurcaria bifurcata* and the barnacle *Balanus perforatus* may occur in the extreme south-west. This community usually forms a distinct band just above the kelp zone (Ala, Ala.Ldig or Ldig).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••	•	Occasional
Patella ulyssiponensis	••	••	Common
Patella vulgata	•••	•	Occasional
Littorina neglecta	••	••	Frequent
Nucella lapillus	••••	•	Rare
Mytilus edulis	••••	•	Frequent
Corallinaceae	•••	•	Common
Corallina officinalis	••	•	Abundant
Mastocarpus stellatus	•••••	•	Occasional
Chondrus crispus	••	•	Occasional
Lomentaria articulata	••	•	Frequent
Lomentaria clavellosa	••	•	Occasional
Callithamnion	••	•	Frequent
Ceramium	•••	•	Occasional
Osmundea pinnatifida	•••	•	Common
Scytosiphon lomentaria	•	•	Common
Alaria esculenta	•••	•••	Rare
Himanthalia elongata	••	•••	Occasional
Cladophora	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R8	S Cornwall		MNCR data	
R8	Isles of Scilly		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	
R14	Barra			
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR25	=

Frequency of occurrence

In Britain: Scarce

FR *Robust fucoids or red seaweeds*

ELR.Him *Himanthalia elongata* and red seaweeds on exposed lower eulittoral rock

Habitat classification

Salinity:	Full		
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Eulittoral - lower		

Previous code

LRK.HIM 6.95

Biotope description

Exposed to moderately exposed lower eulittoral bedrock may be characterised by buttons and straps of the thong weed *Himanthalia elongata* (at least frequent) with a dense turf of red algae beneath. The predominant red algae are usually *Mastocarpus stellatus*, *Laurencia pinnatifida*, *Corallina officinalis* and *Palmaria palmata* which tend to grow over a crust of pink coralline algae. Any patches between the algal turf may be colonised by barnacles *Semibalanus balanoides*, or *Balanus perforatus* in the south-west, and limpets *Patella vulgata*. Pits and crevices in the rock often provide a refuge for anemones, gastropods (*Nucella lapillus* and *Littorina neglecta*) and small mussels *Mytilus edulis*. This biotope generally characterises those shores which are too exposed for *Fucus serratus* to form a dense canopy, often occurring as large patches within the *F. serratus* / red algal turf zone (Fser.R). Consequently, *F. serratus* plants frequently occur amongst the *Himanthalia* and red algae (*F. serratus* common or less). On some shores this biotope may occur as a distinct zone between the *F. serratus* / red algal turf (Fser.R) and the *Alaria esculenta* / *Laminaria digitata* zone (Ala.Ldig). In the south and south-west *Bifurcaria bifurcata* may replace *Himanthalia*, and can sometimes form a distinct band on the lower shore. *Himanthalia* may occur on tide-swept, sheltered shores in sealochs (e.g. Loch Maddy).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Common
Patella vulgata	••••	•	Common
Littorina neglecta	••	••	Frequent
Nucella lapillus	••••	•	Occasional
Mytilus edulis	•••	•	Occasional
Porphyra	••	•	Occasional
Palmaria palmata	•••	•	Frequent
Corallinaceae	•••	•	Frequent
Corallina officinalis	••••	•	Frequent
Mastocarpus stellatus	•••••	•	Frequent
Chondrus crispus	••	•	Occasional
Lomentaria articulata	•••	•	Occasional
Osmundea pinnatifida	••••	•	Frequent
Laminaria digitata	•••	••	Occasional
Fucus serratus	•••	••	Frequent
Himanthalia elongata	•••••	•••	Common
Enteromorpha	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	

R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.10	=
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	
R13	W Scotland		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.5	=
Other	Chalk coast	George, Tittley & Wood In prep	CC.LR24	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Him_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		Him_ir	=
IR6	Greater Galway Bay		Him_ir	=
IR7	Clare Island area		Him_ir	=
IR8	NW Ireland (Erris Head to Malin Head)		Him_ir	=

Frequency of occurrence

In Britain: Common

BF *Barnacles or fucoids (moderately exposed shores)*

MLR.PelB *Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock

Habitat classification

Salinity:	Full	
Wave exposure:	Moderately exposed	
Tidal streams:		
Substratum:	Bedrock; boulders	
Zone:	Littoral fringe - lower	
Height band:	Upper shore	
Other features:	Also on steep sheltered bedrock	

Previous code

LRK.PEL in part 6.95

Biotope description

Moderately exposed, or sheltered steep, lower littoral fringe rock characterised by the upper shore fucoid *Pelvetia canaliculata* and barnacles (moderately exposed southern and western shores are typically characterised by *Chthamalus* spp., with *Semibalanus balanoides* on northern and eastern shores). The *Pelvetia* typically overgrows a crust of the black lichens *Verrucaria maura* and *Verrucaria mucosa*, in contrast to *Hildenbrandia rubra* on very sheltered shores (see Pel). This biotope differs from the sheltered shore *Pelvetia* biotope (Pel) by the presence of some typically exposed-shore species; these include the grazing molluscs *Littorina neritoides* and *L. neglecta* and the black lichen *Lichina pygmaea*. However, the striking difference exists in the greater number of barnacles by comparison to the sheltered shores.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chthamalus montagui	•••	••	Frequent
Semibalanus balanoides	•••	•	Occasional
Patella vulgata	••••	•	Occasional
Melarhaphe neritoides	•••	••	Frequent
Littorina saxatilis	••••	•	Frequent
Fucus spiralis	••	•••	Occasional
Pelvetia canaliculata	•••••	•••	Frequent
Lichina pygmaea	••	•••	Occasional
Verrucaria maura	•••	••	Common
Verrucaria mucosa	••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.11	=
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R11	Irish Sea	Covey In prep.b	R11.7	=
R12	Clyde Sea		MNCR data	
R13	W Scotland		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	
Other	Inlets in SW Britain	Moore In prep	SWI.8	=
IR3	E Ireland (St John's Point to Carnsore Point)		PelB_ir	=

IR4	S Ireland (Carnsore Point to Mizen Head)	PelB_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)	PelB_ir	=
IR6	Greater Galway Bay	PelB_ir	=
IR7	Clare Island area	PelB_ir	=

BF *Barnacles or fucoids (moderately exposed shores)*

MLR.FvesB *Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.FVES.BP	6.95
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral - mid		

Biotope description

Moderately exposed mid eulittoral bedrock and boulders are frequently characterised by a mosaic of barnacles (mainly *Semibalanus balanoides*, but *Chthamalus* spp. in the south-west) and the bladder wrack *Fucus vesiculosus*. The limpet *Patella vulgata* is also typically present, with small *Mytilus edulis* confined to crevices. This biotope forms an intermediate along the wave exposure gradient between the exposed-shore barnacle-*Patella* biotope (BPat) and the sheltered shore *Fucus vesiculosus* biotope (Fves). It is distinguished from BPat by the presence of short, but vesiculate *Fucus vesiculosus* (typically frequent-common in this biotope) and its greater variety of red algae and from Fves by its greater abundance of barnacles and lower abundance of *Fucus vesiculosus*. Vertical surfaces tend to be dominated by the barnacle-*Patella* biotope (BPat). On some shores, particularly those which are moderately exposed to wave action, long-term changes in the abundance of limpets, barnacles and fucoid algae may occur. As a result, over a number of years, a single shore may cycle between the barnacle-Patella dominated biotope (BPat), through this mosaic (FvesB) to a *F. vesiculosus*-dominated biotope (Fves).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chthamalus montagui	•	••	Frequent
Chthamalus stellatus	•	••	Occasional
Semibalanus balanoides	•••••	•	Abundant
Patella vulgata	•••••	•	Common
Littorina littorea	•••	•	Common
Littorina neglecta	•••	••	Common
Nucella lapillus	••••	•	Frequent
Mytilus edulis	••••	•	Occasional
Corallinaceae	••	•	Occasional
Corallina officinalis	•••	•	Occasional
Mastocarpus stellatus	•••	•	Occasional
Osmundea pinnatifida	•••	••	Occasional
Fucus vesiculosus	•••••	••	Frequent
Enteromorpha	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.14	=
R6	Eastern England		MNCR data	
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	
R10	Cardigan Bay and North Wales		MNCR data	

R11	Irish Sea	Covey In prep.b	R11.9	=
R12	Clyde Sea		MNCR data	
R13	W Scotland		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL8	=
Other	Inlets in SW Britain	Moore In prep	SWI.10	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR11	in part
IR4	S Ireland (Carnsore Point to Mizen Head)		FvesB_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		FvesB_ir	=
IR6	Greater Galway Bay		FvesB_ir	=
IR7	Clare Island area		FvesB_ir	=
IR8	(Erris Head to Malin Head)		FvesB_ir	=

Frequency of occurrence

In Britain: Very common

BF *Barnacles or fucoids (moderately exposed shores)*

MLR.Fser *Fucus serratus* on moderately exposed lower eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Eulittoral - lower

Previous code

LRK.FSE	6.95

Biotope description

Lower eulittoral bedrock and stable boulders with a canopy of the serrated wrack *Fucus serratus*. Several variants of this biotope are described. These are *Fucus serratus* with red seaweeds (Fser.R), dense *F. serratus* (Fser.Fser), *F. serratus* with under-boulder communities (Fser.Fser.Bo) and *F. serratus* and piddocks on soft rock (Fser.Pid). Dense *Fucus serratus* also occurs on more sheltered shores (Fserr).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Patella vulgata	••••	•	Frequent
Nucella lapillus	•••	•	Occasional
Corallinaceae	•••	•	Frequent
Mastocarpus stellatus	••••	•	Frequent
Fucus serratus	••••	••	Abundant
Enteromorpha	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.20	=
Other	UK - all coasts			

Frequency of occurrence

In Britain: Very common

BF *Barnacles or fucoids (moderately exposed shores)*

MLR.Fser.R *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.FSE.RED	6.95
Wave exposure:	Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral - lower		
Height band:	Lower shore		

Biotope description

Moderately exposed lower eulittoral bedrock and boulders may be characterised by mosaics of *Fucus serratus* and turf-forming red algae such as *Osmundea* (*Laurencia*) *pinnatifida* or *Mastocarpus stellatus*. The *Fucus serratus* canopy is generally less dense (frequent - abundant) than on more sheltered shores (common - super abundant), and contains a much greater number and abundance of red algae (compare with Fser.Fser). Other canopy algae such as *Himanthalia elongata* and *Laminaria digitata* may also occur, though never at high abundance (generally less than frequent). On boulder shores and uneven bedrock *F. serratus* and red algae often dominate the upper-facing surfaces, while steep or vertical rock is characterised by *Semibalanus balanoides* and *Patella vulgata* (BPat). In addition, such shores provide a greater number of permanently damp refuges between the stones. Within these micro-habitats, anemones (*Actinia equina*), crabs (*Carcinus maenas*), and gastropods (*Gibbula cineraria* and *Littorina littorea*) are found.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••••	••	Occasional
Dynamena pumila	•••	••	Occasional
Actinia equina	••	•	Occasional
Semibalanus balanoides	••••	•	Frequent
Carcinus maenas	••	•	Occasional
Patella vulgata	••••	•	Frequent
Gibbula cineraria	••	•	Occasional
Littorina littorea	••	•	Occasional
Nucella lapillus	••••	•	Occasional
Mytilus edulis	•••	•	Occasional
Palmaria palmata	•••	•	Frequent
Corallinaceae	••••	•	Occasional
Corallina officinalis	••••	•	Occasional
Mastocarpus stellatus	••••	•	Frequent
Chondrus crispus	•••	••	Occasional
Lomentaria articulata	•••	••	Occasional
Osmundea pinnatifida	••••	••	Frequent
Laminaria digitata	•••	••	Occasional
Fucus serratus	•••••	••	Common
Himanthalia elongata	••	••	Occasional
Enteromorpha	•••	•	Occasional
Ulva	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*

Other	Sealochs	Howson, Connor & Holt 1994	SL13	=
Other	Inlets in SW Britain	Moore In prep	SWI.11	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR13	in part
Other	UK - all coasts		MNCR data	
Other	Ireland - all coasts		Fser.R_ir	=

Frequency of occurrence

In Britain: Common

BF *Barnacles or fucoids (moderately exposed shores)*

MLR.Fser.Fser Dense *Fucus serratus* on moderately exposed to very sheltered lower eulittoral rock

Habitat classification

Salinity:	Full		
Wave exposure:	Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Bedrock		
Zone:	Eulittoral - lower		
Height band:	Lower shore		

Previous code

LRK.FSE.FSE 6.95

Biotope description

Moderately exposed to very sheltered lower eulittoral rock subject to fully marine conditions is typically characterised by a dense canopy of *Fucus serratus* (typically common - superabundant). There is a wide range of associated species, including barnacles, limpets *Patella vulgata*, littorinid molluscs, turf-forming red algae and the sponge *Halichondria panicea*. This biotope usually occurs immediately below a *Fucus vesiculosus*-barnacle mosaic (FvesB) on moderately exposed shores or a dense canopy of *F. vesiculosus* (Fves) or *Ascophyllum nodosum* (Asc) on sheltered shores; consequently low abundances of these species (typically less than frequent) may also occur in this biotope.

Similar biotopes

SLR.Fserr.VS	Fser.Fser is distinguished from the variable salinity variant in containing sponges, hydroids and the polychaetes *Pomatoceros triqueter* and *Spirorbis* spp.
SLR.Fserr.T	The tide-swept variant of the *F. serratus* biotope is characterised by its greater abundance and richness of sponges, ascidians, bryozoans and hydroids

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	••	Occasional
Dynamena pumila	••	••	Occasional
Spirorbidae	••	•	Frequent
Semibalanus balanoides	••••	•	Occasional
Patella vulgata	••••	•	Frequent
Gibbula cineraria	••	•	Occasional
Littorina littorea	•••	•	Occasional
Littorina obtusata	••	•	Occasional
Littorina obtusata/mariae	••	•	Common
Nucella lapillus	•••	•	Occasional
Palmaria palmata	••	•	Frequent
Corallinaceae	•••	•	Frequent
Mastocarpus stellatus	••••	•	Frequent
Chondrus crispus	•••	••	Occasional
Lomentaria articulata	••	••	Occasional
Osmundea pinnatifida	••	••	Frequent
Fucus serratus	•••••	••	Abundant
Enteromorpha	•••	•	Occasional
Ulva	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.20	=
Other	Inlets in SW Britain	Moore In prep	SWI.12	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR13	=
Other	Sealochs	Howson, Connor & Holt 1994	SL15	=
Other	UK - all coasts		MNCR data	
IR4	S Ireland (Carnsore Point to Mizen Head)		Fser.Fser_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		Fser.Fser_ir	=
IR6	Greater Galway Bay		Fser.Fser_ir	=
IR7	Clare Island area		Fser.Fser_ir	=
IR8	NW Ireland (Erris Head to Malin Head)		Fser.Fser_ir	=

Frequency of occurrence

In Britain: Very common

BF *Barnacles or fucoids (moderately exposed shores)*

MLR.Fser.Fser.Bo *Fucus serratus* and under-boulder fauna on lower eulittoral boulders

Habitat classification

Salinity:	Full	
Wave exposure:	Exposed, Moderately exposed, Sheltered	
Tidal streams:		
Substratum:	Boulders	
Zone:	Eulittoral - lower	
Other features:	Under-boulder habitats	

Previous code

MLR.Fser.Bo	96.7
LRK.FSE.BO	6.95

Biotope description

This variant of the *Fucus serratus* biotope is found on moderately exposed to sheltered boulder shores. While the upper surfaces of the boulders are colonised by a very similar fauna and flora to Fser.Fser, the presence of the boulders increases the micro-habitat diversity which often results in a greater species richness. The shaded sides of the boulders are often colonised by a variety of red algae, including *Mastocarpus stellatus*, *Lomentaria articulata*, *Osmundea pinnatifida* and *Corallina officinalis*. The species composition on the underside of the boulders varies considerably depending on the substratum underlying the boulders. On muddy shores the fauna living under the boulders may be limited to a few burrowing worms, such as *Cirratulus cirratus*. Where more space is available beneath the boulders there may be a rich assemblage of animals. Characteristic mobile species include the hairy porcelain crab *Porcellana platycheles*, the smooth porcelain crab *Pisidia longicornis* and juvenile edible crabs *Cancer pagurus*. Also present beneath the boulders are often high densities of the barnacle *Balanus crenatus*, the tubeworm *Pomatoceros* spp., spirorbid worms and gammarid amphipods, and a few small gastropods and mussels. Encrusting bryozoans (*Umbonula littoralis* and *Schizoporella unicornis*) and encrusting colonies of the sponges *Hymeniacidon perleve* and *Halichondria panicea* are also typical of the undersides of boulders. The richest examples contain a variety of brittlestars, ascidians and small hydroids.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	●●●●	●●	Frequent
Hymeniacidon perleve	●●	●●	Occasional
Halisarca dujardini	●●	●●	Occasional
Dynamena pumila	●●●	●●	Occasional
Actinia equina	●●●	●	Occasional
Pomatoceros triqueter	●●●	●	Occasional
Spirorbidae	●●●●	●	Frequent
Semibalanus balanoides	●●●●	●	Frequent
Balanus crenatus	●	●	Frequent
Amphipoda indet.	●●	●	Frequent
Pisidia longicornis	●●	●●	Occasional
Porcellana platycheles	●●●●	●●	Frequent
Cancer pagurus	●●●●	●	Occasional
Patella vulgata	●●●●●	●	Common
Gibbula cineraria	●●●●	●	Frequent
Nucella lapillus	●●●●	●	Occasional
Umbonula littoralis	●●●	●	Frequent
Dendrodoa grossularia	●●	●	Occasional
Botryllus schlosseri	●●●	●	Rare
Palmaria palmata	●●●	●	Frequent
Corallinaceae	●●●●●	●	Common

Corallina officinalis	•••	•	Occasional
Mastocarpus stellatus	•••••	•	Frequent
Chondrus crispus	••••	•	Frequent
Lomentaria articulata	••••	•	Occasional
Plumaria plumosa	••	••	Occasional
Membranoptera alata	••	••	Occasional
Osmundea pinnatifida	••••	•	Frequent
Fucus serratus	••••	••	Abundant
Enteromorpha	••••	•	Occasional

Distribution

Sector	***Area***	***Source***	***Section/page***	***Equivalence***
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.21	=
R7	SW Inlets	Moore In prep	SWI.13	=
Other	Ireland - all coasts		Fser.Bo_ir	=

Frequency of occurrence

In Britain: Common

BF *Barnacles or fucoids (moderately exposed shores)*

MLR.Fser.Pid *Fucus serratus* and piddocks on lower eulittoral soft rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	
Substratum:	Bedrock; boulders
Zone:	Eulittoral - lower
Height band:	Mid shore, Lower shore
Other features:	Soft rock (chalk)

Previous code

LRK.FSE.PID 6.95

Biotope description

The lower eulittoral zone on soft rock shores (e.g. chalk) may be characterised by *Fucus serratus* beneath which are dense aggregations of rock-boring piddocks (such as *Barnea* spp. and *Pholas dactylus*) and *Hiatella arctica*. A dense red algal turf occurs beneath the *F. serratus* and includes *Gelidium pusillum*, *Palmaria palmata*, *Corallina officinalis* and *Ceramium nodulosum*. The top few centimetres of the soft rock may be bored by the worm *Polydora ciliata*, while empty piddock holes provide a refuge for species such as the hydroid *Dynamena pumila* and the anemone *Actinia equina*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	••	Frequent
Dynamena pumila	••	••	Present/Not known
Polydora	•••	••	Abundant
Polydora ciliata	••	••	Present/Not known
Pomatoceros lamarcki	•••••	•	Occasional
Semibalanus balanoides	••••	•	Frequent
Patella vulgata	•••••	•	Rare
Littorina littorea	•••••	•	Occasional
Littorina mariae	••••	•	Occasional
Hiatella arctica	••••	•	Occasional
Pholas dactylus	••••	•••	Common
Barnea	•••	•••	Occasional
Barnea candida	••	•••	Present/Not known
Barnea parva	••	•••	Present/Not known
Rhodothamniella floridula	••••	••	Present/Not known
Gelidium pusillum	••••	••	Occasional
Palmaria palmata	••••	•	Occasional
Corallina officinalis	•••••	•	Frequent
Phymatolithon lenormandii	••••	••	Common
Mastocarpus stellatus	••	••	Frequent
Chondrus crispus	•••••	•	Frequent
Ceramium nodulosum	•••	••	Present/Not known
Osmundea pinnatifida	•••	••	Common
Fucus serratus	•••••	••	Abundant
Ulva	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Chalk coasts	George, Tittley & Wood In prep		CC.LR13?

Frequency of occurrence

In Britain: Scarce

R *Red seaweeds (moderately exposed shores)*

MLR.XR Mixed red seaweeds on moderately exposed lower eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	
Substratum:	Bedrock; boulders
Zone:	Eulittoral - lower
Height band:	Mid shore, Lower shore

Previous code

MLR.R.R	96.7
LRK.RED	6.95

Biotope description

Moderately exposed lower eulittoral bedrock and stable boulders may be characterised by a dense turf of red algae. Canopy-forming algae such as *Fucus serratus* and *Himanthalia elongata* are sparse (generally < frequent) in this community. The red algal turf is most frequently characterised by a mixture of species, including *Mastocarpus stellatus*, *Chondrus crispus*, *Osmundea pinnatifida*, *Corallina officinalis* and *Palmaria palmata*. Amongst these many other species, including *Lomentaria articulata*, *Ceramium* spp. and *Gelidium pusillum*, may also occur. Beneath the turf-forming algae, the rock surface is usually covered by coralline algal crusts. Gaps in the dense turf are frequently dominated by barnacles *Semibalanus balanoides* and limpets *Patella vulgata*, while pits and crevices in the rock often provide a refuge for small mussels and gastropods. On moderately exposed shores this biotope is often found in patches amongst the *Himanthalia elongata* zone (Him) or the *F. serratus* and red algal mosaics (Fser.R). It is also common on very steep or vertical faces where canopy algae are absent.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Common
Patella vulgata	••••	•	Common
Littorina saxatilis	••	•	Common
Mytilus edulis	•••	•	Frequent
Porphyra umbilicalis	••	••	Occasional
Palmaria palmata	•••	•	Common
Dumontia contorta	••	•	Occasional
Corallinaceae	•••	•	Frequent
Corallina officinalis	••••	•	Common
Mastocarpus stellatus	•••••	•	Common
Chondrus crispus	••	•	Frequent
Lomentaria articulata	•••	••	Occasional
Ceramium	•••	•	Frequent
Osmundea pinnatifida	•••	••	Frequent
Fucus serratus	•••	••	Rare
Enteromorpha	•••	•	Occasional
Cladophora rupestris	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/ NE England		MNCR data	
R6	Eastern England		MNCR data	
R8	Western English Channel		MNCR data	

R9	Bristol Channel and approaches		MNCR data	
R12	Clyde Sea		MNCR data	
R15	NW Scotland		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR22	=

Frequency of occurrence

In Britain: Scarce

R *Red seaweeds (moderately exposed shores)*

MLR.Pal *Palmaria palmata* on very to moderately exposed lower eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	MLR.R.Pal	96.7
Wave exposure:	Very exposed, Exposed, Moderately exposed	LRK.RED.PAL	6.95
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral - lower		

Biotope description

Moderately exposed lower eulittoral rock may support an often pure stand of dulse *Palmaria palmata* which forms a dense band or occurs in large patches above the main kelp zone (Ldig). It can also occur on very exposed shores (recorded from Orkney). *Palmaria* is a common component of adjacent biotopes; it should only be recorded as Pal where it forms a distinct band or occurs in large patches on the shore. *Palmaria* favours shaded or overhanging rock and often forms a band at the top of overhanging rock. Relatively low abundances of other red algae, such as *Osmundea pinnatifida*, *Chondrus crispus* and *Corallina officinalis*, may also occur in this biotope although *Palmaria* always dominates. It is likely that the *Palmaria* biotope represents an opportunistic assemblage of fast-growing species which occupy gaps within or between the canopies of longer-lived perennials such as *Fucus serratus*. *Palmaria* often forms a luxurious growth on *Mytilus edulis* on exposed shores in which case it should be recorded as MytB.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••••	•	Frequent
Patella ulyssiponensis	••	••	Occasional
Patella vulgata	•••••	•	Frequent
Porphyra umbilicalis	••••	••	Occasional
Palmaria palmata	•••	•	Abundant
Hildenbrandia rubra	•	••	Rare
Corallina officinalis	•••	•	Rare
Mastocarpus stellatus	•••	•	Rare
Fucus serratus	•	••	Rare
Enteromorpha	•••	•	Frequent
Cladophora rupestris	•••	•	Occasional
Verrucaria mucosa	••••	••	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney			
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.20	=
R6	Kent		MNCR data	
R7	E Sussex		MNCR data	
R9	Pembrokeshire		MNCR data	
R10	W Anglesey		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR19	=
IR4	S Ireland (Carnsore Point to Mizen Head)		R.Pal_ir	=

IR8	NW Ireland (Erris Head to Malin Head)	R.Pal_ir	=

Frequency of occurrence

In Britain: Uncommon

R *Red seaweeds (moderately exposed shores)*

MLR.Mas *Mastocarpus stellatus* and *Chondrus crispus* on very to moderately exposed lower eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	MLR.R.Mas	96.7
Wave exposure:	Very exposed, Exposed, Moderately exposed	LRK.RED.MAS	6.95
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral - lower		
Other features:	Vertical faces on very exposed rock		

Biotope description

Moderately exposed lower eulittoral bedrock on some shores is characterised by a dense turf of *Mastocarpus stellatus* and *Chondrus crispus* (either together or separately) which form a band above the main kelp zone, above *Alaria* (Ala) or *Mytilus* (MytB) or within a *Fucus serratus*-red algal mosaic (Fser.R). *Mastocarpus* is more resistant to wave action than *Chondrus*, and may therefore dominate much more exposed shores; it can dominate vertical rock at very exposed sites (e.g. Mingulay, Outer Hebrides). On more sheltered shores, especially in the south-west, *Mastocarpus* may give way to *Chondrus* which has a faster growth rate. Beneath these foliose algae the rock surface is covered by encrusting coralline algae. Although both *Mastocarpus* and *Chondrus* are widespread in the lower eulittoral and the sublittoral fringe, they occur only infrequently in a distinct band, or in large enough patches, to justify separation from Fser.R. Consequently, where only small patches of these species occur within a larger area of mixed red algal turf, then records should be assigned to the more general mixed red algal turf biotope (XR).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••	•	Frequent
Patella vulgata	•••	•	Common
Mytilus edulis	••••	•	Frequent
Porphyra umbilicalis	••	••	Occasional
Palmaria palmata	••	•	Occasional
Corallinaceae	••••	•	Occasional
Corallina officinalis	•••	•	Occasional
Mastocarpus stellatus	••••	•	Abundant
Chondrus crispus	••	•	Occasional
Ceramium	••	•	Common
Osmundea pinnatifida	••	••	Rare
Himanthalia elongata	••	••	Occasional
Ulva	•••	•	Occasional
Cladophora	••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/ NE England		MNCR data	
R9	Pembrokeshire		MNCR data	
R10	Lleyn Peninsula		MNCR data	
R14	Outer Hebrides		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR21	=

IR3	E Ireland (St John's Point to Carnsore Point)	R.Mas_ir	=
IR4	S Ireland (Carnsore Point to Mizen Head)	R.Mas_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)	R.Mas_ir	=
IR7	Clare Island area	R.Mas_ir	=

Frequency of occurrence

In Britain: Scarce

R *Red seaweeds (moderately exposed shores)*

MLR.Osm *Osmundea* (*Laurencia*) *pinnatifida* and *Gelidium pusillum* on moderately exposed mid eulittoral rock

Habitat classification

Salinity:	Full		
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral - mid		

Previous code

MLR.R.Osm	96.7
LRK.RED.LAU	6.95

Biotope description

Exposed to moderately exposed lower eulittoral rock may be characterised by extensive areas or a distinct band of *Osmundea* (*Laurencia*) *pinnatifida* and *Gelidium pusillum* (either together or separately). This community usually occurs on shores on which a fucoid canopy is reduced in extent, or even absent. Other turf-forming red algae, such as *Ceramium* spp. and *Callithamnion hookeri* may be present, although *Osmundea* and/or *Gelidium* always dominate. On flatter, more sheltered shores, *Laurencia hybrida* may also occur. Small patches of bare rock amongst the algal turf are occupied by barnacles *Semibalanus balanoides*, the limpet *Patella vulgata*, dog whelks *Nucella lapillus* and small mussels *Mytilus edulis*. A variation of this biotope has been described for the chalk platforms in Kent where extensive turfs of *Gelidium pusillum* occur in the mid eulittoral above the main *Osmundea* zone.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••	•	Common
Elminius modestus	••	••	Rare
Patella vulgata	•••	•	Common
Gibbula umbilicalis	••	•	Frequent
Littorina littorea	•••	•	Occasional
Littorina neglecta	••	••	Frequent
Littorina saxatilis	••	•	Occasional
Nucella lapillus	••••	•	Occasional
Mytilus edulis	•••	•	Occasional
Gelidium pusillum	••	••	Occasional
Corallinaceae	•••	•	Occasional
Mastocarpus stellatus	•••	•	Occasional
Lomentaria articulata	••	••	Occasional
Osmundea pinnatifida	•••••	••	Abundant
Fucus serratus	••••	••	Occasional
Fucus vesiculosus	•••	••	Occasional
Himanthalia elongata	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/ NE England		MNCR data	
R6	Kent		MNCR data	
R7	Sussex		MNCR data	
R8	S Devon		MNCR data	
R9	Pembrokeshire		MNCR data	
R12	Clyde Sea		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR14	=

IR4	S Ireland (Carnsore Point to Mizen Head)	R.Osm_ir	=
IR7	Clare Island area	R.Osm_ir	=
IR8	NW Ireland (Erris Head to Malin Head)	R.Osm_ir	=

Frequency of occurrence

In Britain: Scarce

R *Red seaweeds (moderately exposed shores)*

MLR.RPid *Ceramium* sp. and piddocks on eulittoral fossilised peat

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	
Substratum:	Peat
Zone:	Eulittoral
Other features:	Soft rock

Previous code

MLR.R.Pid	96.7
LRK.PID.PEAT	6.95

Biotope description

Outcrops of fossilised peat in the eulittoral are soft enough to allow a variety of piddocks (such as *Barnea candida* and *Petricola pholadiformis*) to bore into them. The surface of the peat is characterised by a dense algal mat, predominantly *Ceramium* spp. but also with *Ulva* spp., *Enteromorpha* spp. and *Polysiphonia* spp. Damp areas amongst the algal mat are covered by aggregations of the sand mason worm *Lanice conchilega* and the fan worm *Sabella pavonina*. The anemone *Sagartia troglodytes* and the crabs *Carcinus maenas* and *Cancer pagurus* occur in crevices in the peat. Small pools on the peat may contain hydroids, such as *Obelia longissima* and *Kirchenpaueria pinnata*, the brown alga *Dictyota dichotoma* and the prawn *Crangon crangon*. [Description derived largely from sites in north Norfolk. Further records of this biotope required].

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Obelia longissima	•••••	••	Occasional
Sagartia troglodytes	•••••	••	Occasional
Sabella pavonina	•••••	••	Rare
Cancer pagurus	•••••	•	Occasional
Carcinus maenas	•••••	•	Occasional
Mytilus edulis	•••••	•	Occasional
Petricola pholadiformis	•••••	•••	Common
Barnea candida	•••••	•••	Common
Ceramium	•••••	•	Frequent
Polysiphonia	•••••	•	Present/Not known
Dictyota dichotoma	•••••	••	Rare
Enteromorpha	•••••	•	Common
Ulva	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Inlets in SE England	Hill & Emblow In prep	R6.4	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR20	In part

Frequency of occurrence

In Britain: Rare

Eph *Ephemeral green or red seaweeds*

MLR.Ent *Enteromorpha* spp. on freshwater-influenced or unstable upper eulittoral rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered
Tidal streams:	Weak
Substratum:	Chalk, firm mud, bedrock, boulders
Zone:	Littoral fringe - lower, Eulittoral - upper
Height band:	Upper shore
Other features:	Physical disturbance, (soft rock) or freshwater runoff

Previous code

MLR.Eph.Ent	96.7
LRK.ENT	6.95

Biotope description

Upper shore hard substrata that is relatively unstable (e.g. soft rock) or subject to considerable freshwater runoff is typically characterised by a dense mat of the green filamentous algae *Enteromorpha intestinalis* and *Enteromorpha prolifera*, often together with the red alga *Porphyra umbilicalis*. This band of *Enteromorpha* spp. is usually found above the *Fucus spiralis* zone (Fspi) and may replace the *Pelvetia canaliculata* zone (PelB).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Patella vulgata	••	•	Occasional
Porphyra	•	••	Common
Fucus ceranoides	•	•••	Occasional
Fucus spiralis	••	••	Occasional
Enteromorpha	•••••	•	Frequent
Ulva	•	•	Occasional
Ulva lactuca	•	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Inlets in SE England	Hill & Emblow In prep	R6.5	=
Other	Inlets in SW Britain	Moore In prep	SWI.23	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR15	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR8	=

Frequency of occurrence

In Britain: Uncommon

Eph *Ephemeral green or red seaweeds*

MLR.EntPor *Porphyra purpurea* or *Enteromorpha* spp. on sand-scoured mid or lower eulittoral rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Moderately exposed
Tidal streams:	
Substratum:	Bedrock; boulders
Zone:	Eulittoral
Height band:	Mid shore
Other features:	Sand-scour

Previous code

MLR.Eph.Por	96.7
LRK.EPH	6.95

Biotope description

Moderately exposed mid-shore bedrock and boulders occurring adjacent to areas of sand which significantly affects the rock. As a consequence of sand-abrasion, fucoids are scarce and the community is typically dominated by ephemeral algae, particularly *Porphyra purpurea* and *Enteromorpha* spp. Under the blanket of ephemeral algae, barnacles and limpets occur in the less scoured areas. Few other species are present. In areas where sand abrasion is less severe, the sand-binding red alga *Rhodothamniella floridula* occurs with other sand-tolerant algae and fucoid algae (especially *Fucus serratus*) (Rho).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••	•	Occasional
Patella vulgata	•••	•	Occasional
Littorina littorea	•••	•	Occasional
Littorina saxatilis	••	•	Occasional
Porphyra purpurea	•••	•••	Abundant
Porphyra umbilicalis	•	••	Frequent
Rhodothamniella floridula	•	••	Occasional
Fucus serratus	•	••	Rare
Fucus vesiculosus	••	••	Rare
Enteromorpha	•••	•	Abundant
Enteromorpha intestinalis	•	•	Present/Not known
Enteromorpha prolifera	•	•	Present/Not known
Ulva	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.17	=
IR3	E Ireland (St John's Point to Carnsore Point)		Eph.Por_ir	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Eph.Por_ir	=

Frequency of occurrence

In Britain: Scarce

Eph *Ephemeral green or red seaweeds*

MLR.Rho *Rhodothamniella floridula* on sand-scoured lower eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Eulittoral - lower
Height band:	Lower shore
Other features:	Sand-scour

Previous code

MLR.Aud	96.7
LRK.FSE.AUD	6.95

Biotope description

Lower eulittoral and sublittoral fringe sand-scoured bedrock and boulders are often characterised by canopy algae (usually *Fucus serratus*), beneath which a mat of the sand-binding red alga *Rhodothamniella floridula* occurs. These mats can also form distinct areas without *F. serratus*. The small hummocks of *R. floridula* also contain other small red and brown algae and species of worm and amphipod may burrow into the *Rhodothamniella* mat. Other sand-tolerant algae, such as *Polyides rotundus*, *Furcellaria lumbricalis*, *Gracilaria verrucosa* and *Cladostephus spongiosus*, may be present. Ephemeral algae such as *Enteromorpha* spp., *Ulva* spp. and *Porphyra* spp. may occur. Where sand scour is more severe, fucoids and *Rhodothamniella* may be rare or absent and these ephemeral algae dominate the substratum (EntPor).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••	••	Occasional
Semibalanus balanoides	•••	•	Occasional
Patella vulgata	•••	•	Occasional
Littorina littorea	•••	•	Occasional
Rhodothamniella floridula	•••••	••	Common
Gelidium pusillum	••	••	Frequent
Palmaria palmata	•••	•	Occasional
Corallinaceae	•••	•	Common
Gracilaria gracilis	•	••	Frequent
Mastocarpus stellatus	••••	•	Frequent
Chondrus crispus	•••	•	Frequent
Polyides rotundus	•	••	Occasional
Furcellaria lumbricalis	•	••	Occasional
Cystoclonium purpureum	••	••	Occasional
Ceramium nodulosum	••	••	Frequent
Cladostephus spongiosus	••••	••	Occasional
Fucus serratus	••••	••	Common
Enteromorpha	•••	•	Frequent
Ulva	••••	•	Occasional
Cladophora	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.18	=
R7	Sussex		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.14	In part

Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR18	=
IR1	N Antrim		D.W. Connor pers. obs.	
Other	Ireland - all coasts		Aud_ir	=

Frequency of occurrence

In Britain: Uncommon

MF Mytilus *(mussels) and fucoids (moderately exposed)*

MLR.MytFves *Mytilus edulis* and *Fucus vesiculosus* on moderately exposed mid eulittoral rock

Habitat classification

Salinity:	Full	MLR.Myt.Fves	96.7
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; large boulders		
Zone:	Eulittoral - mid		
Height band:	Mid shore		
Other features:	Silted habitat		

Previous code

MLR.Myt.Fves 96.7

Biotope description

Mid eulittoral exposed to moderately exposed bedrock, often with nearby sediment, may be covered by dense large *Mytilus edulis* which form a band or large patches and support scattered *Fucus vesiculosus* and occasional red algae. This differs from mussels in the lower eulittoral (MytFR) which occur with a wider range of red algae (often in higher abundance than the mid eulittoral). Ephemeral green algae such as *Enteromorpha* spp. and *Ulva lactuca* commonly occur on the shells of the mussels. The barnacle *Semibalanus balanoides* is common on both the mussel valves and on patches of bare rock, where the limpet *Patella vulgata* is also found, often at high abundance. The dog whelk *Nucella lapillus* and a range of littorinids also occur within the mussel bed.

Similar biotopes

SLR.MytX	A similar community on sheltered mixed substrata

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••••	•	Common
Elminius modestus	••	••	Occasional
Patella vulgata	••••	•	Occasional
Littorina littorea	•••	•	Frequent
Littorina saxatilis	••	•	Occasional
Nucella lapillus	••••	•	Occasional
Mytilus edulis	•••••	•	Abundant
Mastocarpus stellatus	••	•	Occasional
Fucus vesiculosus	••	••	Frequent
Enteromorpha	••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R4	E Scotland		MNCR data	
R5	SE Scotland/ NE England		MNCR data	
R6	Kent		MNCR data	
R9	N Cornwall		MNCR data	
R10	N Wales		MNCR data	
R11	Liverpool Bay and The Solway		MNCR data	
R14	Outer Hebrides		MNCR data	
R15	NW Scotland		MNCR data	

Frequency of occurrence

In Britain: Scarce

MF Mytilus *(mussels) and fucoids (moderately exposed)*

MLR.MytFR *Mytilus edulis, Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full	MLR.Myt.R	96.7
Wave exposure:	Moderately exposed		
Tidal streams:			
Substratum:	Bedrock; large boulders		
Zone:	Eulittoral - lower		
Other features:	Sand or silt affected		

Biotope description

Lower eulittoral moderately exposed bedrock, often with nearby sediment covered by dense, large *Mytilus edulis* with a covering of scattered *Fucus serratus* and red algae. The algae include *Porphyra umbilicalis*, *Rhodothamniella floridula*, *Palmaria palmata*, *Mastocarpus stellatus* and *Ceramium nodulosum*. Ephemeral green algae such as *Enteromorpha* spp. and *Ulva lactuca* commonly occur on the shells of the mussels. The barnacle *Semibalanus balanoides* is common on both the mussel valves and on patches of bare rock, where the limpet *Patella vulgata* is also found, often at high abundance. The dog whelk *Nucella lapillus* and a range of littorinids also occur within the mussel bed. This biotope differs from MytFves which has far fewer red algae present and scattered *Fucus vesiculosus*, indicative of the mid eulittoral zone.

Similar biotopes

SLR.MytX	A similar community is found on sheltered mixed substrata (MytX) although MytFR has a greater abundance of red algae, anemones, limpets and coralline algal crusts and occurs on more wave-exposed shores.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••	•	Common
Patella vulgata	••••	•	Occasional
Littorina littorea	•••	•	Frequent
Nucella lapillus	•••	•	Occasional
Mytilus edulis	••	•	Abundant
Porphyra umbilicalis	••	••	Occasional
Rhodothamniella floridula	••	••	Frequent
Palmaria palmata	•••	•	Occasional
Corallinaceae	••	•	Occasional
Mastocarpus stellatus	••••	•	Frequent
Chondrus crispus	••	••	Occasional
Ceramium	•••	•	Frequent
Ceramium nodulosum	••	••	Occasional
Fucus serratus	••••	••	Occasional
Enteromorpha	•••	•	Frequent
Ulva	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.19	=
R6	Kent		MNCR data	

R8	S Devon	MNCR data
R9	N Cornwall	MNCR data
R11	The Solway	MNCR data
R12	Clyde Sea	MNCR data

Frequency of occurrence

In Britain: Rare

MF Mytilus *(mussels) and fucoids (moderately exposed)*

MLR.MytPid *Mytilus edulis* and piddocks on eulittoral firm clay

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	
Substratum:	Clay
Zone:	Eulittoral
Height band:	Lower shore

Previous code

MLR.Myt.Pid	96.7
LRK.PID.CLY	6.95

Biotope description

Clay outcrops in the mid to lower eulittoral which are bored by a variety of piddocks including *Pholas dactylus*, *Barnea* spp. and the American piddock *Petricola pholadiformis*. The surface of the clay is characterised by small clumps of *Mytilus edulis*, with barnacles and the winkle *Littorina littorea*. Algae are generally sparse on the clay, although small patches of *Corallina officinalis* and *Halurus flosculosus* occur, usually attached to loose-lying cobbles or mussel shells. Species richness is generally low. [More data required for this biotope].

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Elminius modestus	•••	••	Frequent
Carcinus maenas	••••	•	Occasional
Littorina littorea	•••	•	Abundant
Mytilus edulis	••••	•	Frequent
Petricola pholadiformis	••	•••	Occasional
Pholas dactylus	••	•••	Frequent
Barnea candida	•••	•••	Frequent
Corallina officinalis	••	•	Occasional
Halurus flosculosus	•••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Inlets in SE England	Hill & Emblow In prep	R6.3	=
R11	The Solway		MNCR data	

Frequency of occurrence

In Britain: Rare

Sab *Littoral* Sabellaria *(honeycomb worm) reefs*

MLR.Salv *Sabellaria alveolata* reefs on sand-abraded eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	
Substratum:	Cobbles; boulders; pebbles; sand
Zone:	Eulittoral - mid, Eulittoral - lower
Height band:	Mid shore, Lower shore
Other features:	Sand-abraded

Previous code

MLR.Sab	96.7
LMXD.SAB	6.95

Biotope description

Many wave-exposed boulder scar grounds in the eastern basin of the Irish Sea (and as far south as Cornwall), are characterised by reefs of *Sabellaria alveolata* which build tubes from the mobile sand surrounding the boulders and cobbles. The tubes formed by *Sabellaria alveolata* form large reef-like hummocks, which serve to further stabilise the boulders. Other species in this biotope include the barnacles *Semibalanus balanoides*, *Balanus crenatus* and *Elminius modestus* and the molluscs *Patella vulgata*, *Littorina littorea*, *Nucella lapillus* and *Mytilus edulis*. Low abundances of algae tend to occur in areas of eroded reef. The main algal species include *Porphyra* spp., *Mastocarpus stellatus*, *Ceramium* spp., *Fucus vesiculosus*, *Fucus serratus*, *Enteromorpha* spp. and *Ulva* spp. On exposed surf beaches in the south-west *Sabellaria* forms a crust on the rocks, rather than the classic honeycomb reef, and may be accompanied by the barnacle *Balanus perforatus* (typically common to abundant). On wave-exposed shores in Ireland, the brown alga *Himanthalia elongata* can also occur.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Sabellaria alveolata	•••••	•••	Common
Semibalanus balanoides	••••	•	Frequent
Balanus crenatus	•••	•	Occasional
Balanus perforatus	•	••	Common
Elminius modestus	••	••	Frequent
Patella vulgata	••••	•	Occasional
Littorina littorea	••••	•	Frequent
Nucella lapillus	••••	•	Frequent
Mytilus edulis	•••	•	Occasional
Porphyra	•••	••	Occasional
Palmaria palmata	••	•	Frequent
Mastocarpus stellatus	•••	•	Occasional
Ceramium	•••	•	Occasional
Cladostephus spongiosus	••	••	Occasional
Fucus serratus	••••	••	Occasional
Fucus vesiculosus	•••	••	Occasional
Enteromorpha	••	•	Occasional
Ulva	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R9	Bristol Channel and approaches			
R10	Cardigan Bay and North Wales			
R11	Irish Sea	Covey In prep.b	R11.5	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Sab_ir	=

Frequency of occurrence

In Britain: Scarce

F *Dense fucoids (stable rock)*

SLR.Pel *Pelvetia canaliculata* on sheltered littoral fringe rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	
Substratum:	Bedrock; stable boulders; cobbles
Zone:	Littoral fringe - lower
Height band:	Upper shore

Previous code

LRK.PEL in part	6.95

Biotope description

Lower littoral fringe bedrock or stable boulders on sheltered shores are characterised by a dense cover of the fucoid *Pelvetia canaliculata*. The fucoid overgrows a crust of black lichens *Verrucaria maura* and *Verrucaria mucosa*, or *Hildenbrandia rubra* on very sheltered shores. This biotope lacks the density of barnacles found amongst the *Pelvetia* on more exposed shores (PelB). The littorinids *Littorina littorea* and *L. saxatilis* occur. The red alga *Catenella caespitosa* is characteristic of this biotope, as is the lichen *Lichina confinis*. Though not typical, this biotope may occur on moderately exposed shores where local topography provides shelter.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••	•	Rare
Littorina saxatilis	•••	•	Frequent
Hildenbrandia rubra	•	••	Occasional
Fucus spiralis	••	•••	Occasional
Pelvetia canaliculata	•••••	•••	Common
Verrucaria maura	•••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.11	=
R11	Irish Sea	Covey In prep.b	R11.7	=
Other	Sealochs	Howson, Connor & Holt 1994	SL5	=
Other	Inlets in SW Britain	Moore In prep	SWI.8	=
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.3	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR7	=
Other	UK - all coasts		MNCR data	
IR4	S Ireland (Carnsore Point to Mizen Head)		Pel_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		Pel_ir	=
IR6	Greater Galway Bay		Pel_ir	=

Frequency of occurrence

In Britain: Very common

F *Dense fucoids (stable rock)*

SLR.Fspi *Fucus spiralis* on moderately exposed to very sheltered upper eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full, Variable	LRK.FSP	6.95
Wave exposure:	Moderately exposed, Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Bedrock; stable boulders; cobbles		
Zone:	Eulittoral - upper		

Biotope description

Moderately exposed to very sheltered upper eulittoral bedrock and boulders are typically characterised by a band of the spiral wrack *Fucus spiralis* overlying the black lichens *Verrucaria maura* and *V. mucosa*. Limpets *Patella vulgata*, winkles *Littorina* spp. and barnacles *Semibalanus balanoides* are usually present under the fucoid fronds and on open rock. During the summer months ephemeral green algae such as *Enteromorpha* spp. and *Ulva lactuca* may also be present. This zone usually lies below a *Pelvetia canaliculata* zone (Pel or PelB); occasional clumps of *Pelvetia* may be present (usually less than common) amongst the *F. spiralis*. In areas of extreme shelter, such as in Scottish sealochs, the *Pelvetia* and *F. spiralis* zones often merge together forming a very narrow band. Fspi occurs above the *Ascophyllum nodosum* (Asc) and/or *Fucus vesiculosus* (Fves) zones and these two fucoids may also occur, although *Fucus spiralis* always dominates. Vertical surfaces in this zone, especially on moderately exposed shores, often lack the fucoids and are characterised by a barnacle-*Patella* community (BPat.Sem).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Patella vulgata	•••	•	Frequent
Littorina littorea	•••	•	Frequent
Littorina saxatilis	•••	•	Frequent
Fucus spiralis	•••••	•••	Common
Enteromorpha	•••	•	Frequent
Verrucaria maura	••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.12	=
R6	Inlets in SE England	Hill & Emblow In prep	R6.6	=
R11	Irish Sea	Covey In prep.b	R11.8	=
Other	Sealochs	Howson, Connor & Holt 1994	SL7	=
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.4	=
Other	Inlets in SW Britain	Moore In prep	SWI.9	=
Other	Inlets in SW Britain	Moore In prep	SWI.25	in part
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR9	=
IR3	E Ireland (St John's Point to Carnsore Point)		Fspi_ir	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Fspi_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		Fspi_ir	=

IR6	Greater Galway Bay	Fspi_ir	=
IR7	Clare Island area	Fspi_ir	=

Frequency of occurrence

In Britain: Very common

F *Dense fucoids (stable rock)*

SLR.Fves *Fucus vesiculosus* on sheltered mid eulittoral rock

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral - mid		
Height band:	Mid shore		

Previous code

LRK.FVES.LIT	6.95

Biotope description

Moderately exposed to sheltered mid eulittoral rock characterised by a dense canopy of large *Fucus vesiculosus* plants (typically abundant to superabundant). Beneath the algal canopy the rock surface has a sparse covering of barnacles (typically rare-frequent) and limpets, with mussels confined to pits and crevices. *Littorina littorea* and *Nucella lapillus* are also found beneath the algae, whilst *Littorina obtusata* and *Littorina mariae* graze on the fucoid fronds. The fronds may be epiphytised by the filamentous brown alga *Elachista fucicola* and the small calcareous tubeworm *Spirorbis spirorbis*. In areas of localised shelter, *Ascophyllum nodosum* may also occur, though never at high abundance (typically rare to occasional) - (compare with Asc). Damp cracks and crevices often contain patches of the red seaweeds *Osmundea* (*Laurencia*) *pinnatifida*, *Mastocarpus stellatus* and encrusting coralline algae. This biotope usually occurs between the *Fucus spiralis* (Fspi) and the *Fucus serratus* (Fser) zones; both of these fucoids may be present in this biotope, though never at high abundance (typically less than frequent). In some sheltered areas *Fucus vesiculosus* forms a narrow zone above the *A. nodosum* zone (Asc). Where freshwater runoff occurs on more gradually sloping shores *F. vesiculosus* may be replaced by *Fucus ceranoides* (Fcer).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Patella vulgata	••••	•	Frequent
Littorina littorea	••••	•	Frequent
Littorina obtusata	••	•	Frequent
Littorina saxatilis	••	•	Frequent
Nucella lapillus	•••	•	Occasional
Mastocarpus stellatus	••	•	Occasional
Ascophyllum nodosum	••	••	Occasional
Fucus serratus	••	••	Occasional
Fucus vesiculosus	•••••	••	Abundant
Enteromorpha	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.15	=
R11	Irish Sea	Covey In prep.b	R11.9	=
Other	Inlets in SW Britain	Moore In prep	SWI.18	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.7	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR11	In part
IR3	E Ireland (St John's Point to Carnsore Point)		Fves_ir	=
IR4	S Ireland (Carnsore Pint to Mizen Head)		Fves_ir	=

IR5	SW Ireland (Mizen Head to Kerry Head)	Fves_ir	=
IR6	Greater Galway Bay	Fves_ir	=
IR7	Clare Island area	Fves_ir	=
IR8	NW Ireland (Erris Head to Malin Head)	Fves_ir	=

Frequency of occurrence

In Britain: Very common

F *Dense fucoids (stable rock)*

SLR.Asc *Ascophyllum nodosum* on very sheltered mid eulittoral rock

Habitat classification

Salinity:	Full, Variable	
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	
Tidal streams:		
Substratum:	Bedrock; stable boulders	
Zone:	Eulittoral - mid	

Previous code

LRK.ASC	6.95

Biotope description

Sheltered to very sheltered mid eulittoral rock with the knotted wrack *Ascophyllum nodosum*. Several variants of this biotope are described. These are: full salinity (Asc.Asc), tide-swept (Asc.T) and variable salinity (Asc.VS).

Characterising species

	% Frequency	Faithfulness	Typical abundance
Semibalanus balanoides	••••	•	Frequent
Carcinus maenas	•••	•	Occasional
Patella vulgata	•••	•	Frequent
Littorina littorea	•••	•	Frequent
Polysiphonia lanosa	•••	•••	Frequent
Ascophyllum nodosum	•••	••	Common
Fucus vesiculosus	••••	••	Frequent

Distribution

Sector	Area	Source	Section/page	Equivalence
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.16	=
R11	Irish Sea	Covey In prep.b	R11.10	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.6	=

Frequency of occurrence

In Britain: Very common

F *Dense fucoids (stable rock)*

SLR.Asc.Asc *Ascophyllum nodosum* on full salinity mid eulittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	
Substratum:	Bedrock; boulders; cobbles
Zone:	Eulittoral - mid
Other features:	Disturbance allows *Fucus vesiculosus* to occupy patches in the canopy

Previous code

LRK.ASC.ASC 6.95

Biotope description

Bedrock, or stable boulders and cobbles, in the mid-eulittoral zone of sheltered to very sheltered shores, typically in fully marine or near fully marine conditions, are characterised by a dense canopy of *Ascophyllum nodosum*. *Fucus vesiculosus* also occurs and in some places may co-dominate the canopy. Such mixed canopies occur when clearings are formed in the *Ascophyllum*, since *F. vesiculosus* is able to colonise such clearings more rapidly. *Ascophyllum* (which may live for up to 25 years) will, however, eventually out-compete any *F. vesiculosus*. Such changes in the overlying canopy have little effect on the under-storey species. Beneath the canopy, filamentous and foliose red algae, including *Mastocarpus stellatus* and *Chondrus crispus*, and the green alga *Cladophora rupestris*, occur in moderate to low densities. The *Ascophyllum* is generally epiphytised by *Polysiphonia lanosa* (compare with Asc.VS). Very steep and vertical surfaces are often characterised by barnacles and limpets (BPat.Sem), but by small fucoids in areas of extreme shelter. Large numbers of the winkle *Littorina obtusata* may be present. This biotope usually lies between the *Fucus spiralis* (Fspi) and *Fucus serratus* (Fser) zones, although on some shores a narrow zone of *Fucus vesiculosus* (Fves) may occur immediately above the *Ascophyllum*. With increasing wave exposure the *Ascophyllum* canopy is replaced by *F. vesiculosus* (Fves). Asc.Asc may also occur on moderately exposed shores, where there is localised shelter.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Dynamena pumila	••	••	Occasional
Semibalanus balanoides	••••	•	Frequent
Elminius modestus	••	••	Frequent
Patella vulgata	•••	•	Frequent
Littorina littorea	•••	•	Frequent
Littorina obtusata/mariae	•••	•	Frequent
Corallinaceae	•••	•	Occasional
Mastocarpus stellatus	••	•	Occasional
Polysiphonia lanosa	•••	•••	Frequent
Ascophyllum nodosum	•••••	•••	Abundant
Fucus serratus	••	••	Abundant
Fucus vesiculosus	••••	••	Frequent
Enteromorpha	••	•	Frequent
Ulva	••	•	Occasional
Cladophora rupestris	••	•	Frequent
Verrucaria mucosa	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.16	=

R6	Inlets in SE England	Hill & Emblow In prep	R6.7	=
Other	Sealochs	Howson, Connor & Holt 1994	SL10	=
Other	Inlets in SW Britain	Moore In prep	SWI.20	=
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.6	=
IR3	E Ireland (St John's Point to Carnsore Point)		Asc.Asc_ir	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Asc.Asc_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		Asc.Asc_ir	=
IR6	Greater Galway Bay		Asc.Asc_ir	=
IR7	Clare Island area		Asc.Asc_ir	=
IR8	NW Ireland (Erris Head to Malin Head)		Asc.Asc_ir	=

Frequency of occurrence

In Britain: Very common

F *Dense fucoids (stable rock)*

SLR.Asc.T *Ascophyllum nodosum*, sponges and ascidians on tide-swept mid eulittoral rock

Habitat classification

		Previous code	
Salinity:	Full, Variable	LRK.ASC.T	6.95
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Very strong, Strong, Moderately strong		
Substratum:	Bedrock; boulders; cobbles		
Zone:	Eulittoral - mid		

Biotope description

Very sheltered areas of mid eulittoral rock that are subject to strong to moderate tidal streams, such as the narrows in sealochs, are characterised by *Ascophyllum nodosum* with a rich associated fauna of sponges and ascidians. Species richness is generally greater than in the non tide-swept *Ascophyllum nodosum* biotope (Asc.Asc), with a greater abundance and wider range of foliose and filamentous red algae such as *Gelidium pusillum*, *Mastocarpus stellatus*, *Chondrus crispus*, *Lomentaria articulata* and *Membranoptera alata*. The increased water movement encourages several filter-feeding groups to occur. The sponges *Leucosolenia* spp., *Halichondria panicea* and *Hymeniacidon perleve* frequently occur on steep and overhanging faces of boulders and bedrock. Large numbers of ascidians, especially *Dendrodoa grossularia* and *Ascidiella scabra*, also occur on steep surfaces and beneath boulders.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••	••	Occasional
Hymeniacidon perleve	••	••	Occasional
Clava multicornis	••	•••	Frequent
Dynamena pumila	•••	••	Frequent
Spirorbidae	••	•	Frequent
Semibalanus balanoides	••••	•	Frequent
Carcinus maenas	••••	•	Occasional
Patella vulgata	•••••	•	Frequent
Littorina obtusata/mariae	•••	•	Occasional
Nucella lapillus	••••	•	Occasional
Ascidiella scabra	••	••	Occasional
Dendrodoa grossularia	•••	••	Frequent
Gelidium pusillum	•••	••	Frequent
Corallinaceae	•••	•	Frequent
Mastocarpus stellatus	•••	•	Occasional
Polysiphonia lanosa	•••••	•••	Frequent
Ascophyllum nodosum	•••••	••	Abundant
Fucus serratus	••••	••	Occasional
Fucus vesiculosus	••••	••	Frequent
Enteromorpha	•••	•	Occasional
Ulva	••••	•	Occasional
Cladophora rupestris	••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL11	=
Other	Inlets in SW Britain	Moore In prep	SWI.20	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Asc.T_ir	=

IR6	Greater Galway Bay	Asc.T_ir	=
IR8	NW Ireland (Erris Head to Malin Head)	Asc.T_ir	=

Frequency of occurrence

In Britain: Scarce

F *Dense fucoids (stable rock)*

SLR.Asc.VS *Ascophyllum nodosum* and *Fucus vesiculosus* on variable salinity mid eulittoral rock

Habitat classification

		Previous code	
Salinity:	Variable	LRK.ASC.VS	6.95
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:	Moderately strong, Weak, Very weak		
Substratum:	Bedrock; boulders; cobbles		
Zone:	Eulittoral - mid		

Biotope description

Very sheltered mid eulittoral bedrock, boulders or cobbles that are subject to variable salinity are characterised by an impoverished community dominated by a mixture of *Ascophyllum nodosum* and *Fucus vesiculosus*. Species richness is generally low compared with Asc.Asc and Asc.T. The epiphytic red alga *Polysiphonia lanosa* is less common on *Ascophyllum* in this biotope than it is in the other *Ascophyllum*-dominated biotopes. Sponges, hydroids and the polychaetes *Pomatoceros triqueter* and *Spirorbis* spp. are also typically absent. On some shores clumps of large *Mytilus edulis* may be found beneath the algal canopy.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••	•	Frequent
Elminius modestus	••	••	Occasional
Carcinus maenas	••••	•	Occasional
Littorina littorea	•••	•	Occasional
Polysiphonia lanosa	•••	•••	Frequent
Ascophyllum nodosum	•••••	••	Abundant
Fucus vesiculosus	••••	••	Frequent
Enteromorpha	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Inlets in SE England	Hill & Emblow In prep	R6.7	=
Other	Sealochs	Howson, Connor & Holt 1994	SL12	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.9	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.6	In part
Other	Inlets in SW Britain	Moore In prep	SWI.21	=

Frequency of occurrence

In Britain: Scarce

F *Dense fucoids (stable rock)*

SLR.Fserr *Fucus serratus* on sheltered lower eulittoral rock

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Bedrock; boulders		
Zone:	Eulittoral - lower		

Previous code

SLR.Fser	96.7
LRK.FSE in part	6.95

Biotope description

Sheltered lower eulittoral rock with *Fucus serratus*. Several variants of this biotope are described. These are: Dense *Fucus serratus* (Fser.Fser), tide-swept *F. serratus*, sponges and ascidians (Fserr.T) and *F. serratus* and large *Mytilus edulis* in variable salinity (Fserr.VS).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	••	Occasional
Semibalanus balanoides	•••	•	Frequent
Patella vulgata	••••	•	Frequent
Gelidium pusillum	•	••	Frequent
Mastocarpus stellatus	••••	•	Frequent
Fucus serratus	••••	••	Abundant
Enteromorpha	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.20	=
R11	Irish Sea	Covey In prep.b	R11.11	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.8	=

Frequency of occurrence

In Britain: Common

F *Dense fucoids (stable rock)*

SLR.Fserr.T *Fucus serratus*, sponges and ascidians on tide-swept lower eulittoral rock

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Very strong, Strong, Moderately strong		
Substratum:	Bedrock; boulders; cobbles		
Zone:	Eulittoral - lower		

Previous code

SLR.Fser.T	96.7
LRK.FSE.T	6.95

Biotope description

Very sheltered lower eulittoral bedrock, boulders and cobbles that are subject to increased tidal water movement are characterised by *Fucus serratus*, sponges and ascidians. Species richness is generally greater than in the non tide-swept *F. serratus* biotope (Fser.Fser), with a greater abundance and wider range of foliose red seaweeds. The increased water movement encourages several filter-feeding faunal groups to occur. The sponges *Grantia compressa*, *Leucosolenia* spp., *Halichondria panicea* and *Hymeniacidon perleve* occur frequently on steep and overhanging faces. In addition, the ascidians *Ascidiella scabra*, *Dendrodoa grossularia* and colonial ascidians are also found in this biotope. Areas where increased tidal movement influences such a community are in the narrows and/or intertidal sills of Scottish sealochs and rias in south-west England. In the few cases where the rock is also subject to variable salinity, an impoverished community results and records should be classified as Fserr.VS rather than the present biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••••	••	Occasional
Hymeniacidon perleve	••••	••	Occasional
Dynamena pumila	•••	••	Common
Semibalanus balanoides	••	•	Frequent
Balanus crenatus	••••	•	Frequent
Elminius modestus	••	••	Occasional
Carcinus maenas	••••	•	Occasional
Littorina obtusata/mariae	•••	•	Frequent
Alcyonidium gelatinosum	•••	••	Frequent
Dendrodoa grossularia	••	••	Occasional
Botryllus schlosseri	••	••	Occasional
Botrylloides leachi	••	••	Occasional
Corallinaceae	•••	•	Frequent
Mastocarpus stellatus	••••	•	Frequent
Chondrus crispus	••	•	Occasional
Lomentaria articulata	•••••	••	Occasional
Callithamnion	••	•	Frequent
Ceramium nodulosum	•••	•	Frequent
Pterothamnion plumula	••	••	Occasional
Ascophyllum nodosum	•••	••	Occasional
Fucus serratus	•••••	••	Abundant
Ulva	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL16	=

Other	Inlets in SW Britain	Moore In prep	SWI.12	=
R6	Greater Galway Bay		Fser.T_ir	=
R8	NW Ireland (Erris Head to Malin Head)		Fser.T_ir	=

Frequency of occurrence

In Britain: Scarce

F *Dense fucoids (stable rock)*

SLR.Fserr.VS *Fucus serratus* and large *Mytilus edulis* on variable salinity lower eulittoral rock

Habitat classification

Salinity:	Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock; boulders; cobbles
Zone:	Eulittoral - lower
Height band:	Lower shore

Previous code

SLR.Fser.VS	96.7
LRK.FSE.VS	6.95

Biotope description

Areas of very sheltered lower eulittoral bedrock and stable boulders that are influenced by freshwater, such as towards the heads of sealochs and in estuaries, may support an impoverished community dominated by *Fucus serratus* and clumps of large *Mytilus edulis*. This biotope may be found below the variable salinity *Ascophyllum nodosum* biotope (Asc.VS), particularly in Scottish sealochs. The canopy of *F. serratus* is usually less dense (typically common) than in the other *F. serratus* biotopes (Fser.Fser and Fserr.T). Sponges, hydroids and the polychaetes *Pomatoceros triqueter* and *Spirorbis* spp. are generally rare or absent. In areas (such as the Scottish sealochs) where variable salinity water passes through tide-swept narrows and the associated biota is impoverished such records should be classified as Fserr.VS rather than Fserr.T.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Balanus crenatus	•••	•	Occasional
Littorina littorea	•••	•	Common
Mytilus edulis	•••	•	Occasional
Hildenbrandia	••	••	Frequent
Corallinaceae	••	•	Frequent
Mastocarpus stellatus	••	•	Frequent
Ascophyllum nodosum	••	••	Occasional
Fucus serratus	•••••	••	Abundant
Fucus vesiculosus	••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Inlets in SW Britain	Moore In prep	SWI.12	In part
Other	Inlets in SW Britain	Moore In prep	SWI.22	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.8	=
Other	Sealochs	Howson, Connor & Holt 1994	SL17	=

Frequency of occurrence

In Britain: Scarce

F *Dense fucoids (stable rock)*

SLR.Fcer *Fucus ceranoides* on reduced salinity eulittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	
Substratum:	Bedrock; boulders
Zone:	Littoral fringe, Eulittoral - upper

Previous code

LRK.FCER 6.95

Biotope description

Bedrock and stable boulders in the eulittoral zone that are subject to reduced salinity may be characterised by the horned wrack *Fucus ceranoides*. As this fucoid is more tolerant of reduced salinity than the other fucoids, *F. ceranoides* tends to replace *Fucus spiralis*, *Fucus vesiculosus* and *Ascophyllum nodosum* towards the upper reaches of estuaries and sealochs. This biotope may, however, still contain other fucoids, although *Fucus ceranoides* always dominates. Species richness is typically low in this biotope. Since areas of bedrock and stable boulder are generally scarce within estuarine systems, this community is more commonly encountered on stable mixed substrata (see FcerX).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••	•	Occasional
Carcinus maenas	••	•	Occasional
Littorina littorea	••	•	Occasional
Ascophyllum nodosum	••	••	Occasional
Fucus ceranoides	•••••	•••	Common
Fucus spiralis	••	••	Frequent
Enteromorpha	•••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL24	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.10	=
Other	Inlets in SW Britain	Moore In prep	SWI.24	=

Frequency of occurrence

In Britain: Scarce

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.BLlit Barnacles and *Littorina littorea* on unstable eulittoral mixed substrata

Habitat classification

Salinity:	Full, Variable	
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	
Tidal streams:		
Substratum:	Pebbles and small cobbles on sand	
Zone:	Eulittoral	

Previous code

LMXD.BLIT in part 6.95

Biotope description

Banks of cobbles and pebbles which are too unstable or too small to support fucoids are usually colonised by the barnacles *Semibalanus balanoides* (often with *Elminius modestus*) with *Patella vulgata* on larger rocks and often dense aggregations of *Littorina littorea*. Between the cobbles and pebbles *Mytilus edulis* often occurs, but always at low abundance (compare with MytX). Juvenile *Carcinus maenas* occur between pebbles, and where patches of sediment occur, infaunal species such as the lugworm *Arenicola marina* and cockle *Cerastoderma edule* may be present. Fucoids are rare in this biotope. This biotope covers a wide range of wave exposures from mobile exposed and unstable shores to more sheltered stony shores in which fucoids are unable to attach and *Mytilus edulis* is infrequent. [Further data required to split this biotope into two: open coast cobble sites and estuarine stony sediment sites].

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	••••	•	Frequent
Elminius modestus	••	••	Frequent
Gammaridae	••	•	Occasional
Carcinus maenas	•••	•	Occasional
Patella vulgata	••	•	Occasional
Littorina littorea	••••	•	Frequent
Littorina saxatilis	••••	•	Frequent
Mytilus edulis	•••	•	Occasional
Fucus vesiculosus	••	••	Rare
Enteromorpha	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.30	=
R7	E Sussex		MNCR data	
R8	S Devon		MNCR data	
R10	N Wales		MNCR data	
R11	Irish Sea	Covey In prep.b	R11.15	=
R12	Clyde Sea		MNCR data	
R13	W Scotland		MNCR data	
R14	Outer Hebrides		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.31	=
IR6	Greater Galway Bay		BLlit_ir	=
IR7	Clare Island area		BLlit_ir	=

Frequency of occurrence

In Britain: Rare

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.FvesX *Fucus vesiculosus* on mid eulittoral mixed substrata

Habitat classification

		Previous code	
Salinity:	Full, Variable	LMXD.FVES	6.95
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Weak, Very weak		
Substratum:	Pebbles and cobbles on sand/mud		
Zone:	Eulittoral		
Other features:	Silt and/or variable salinity		

Biotope description

Sheltered and very sheltered mid eulittoral pebbles and cobbles lying on sediment are typically characterised by *Fucus vesiculosus*. FvesX is usually subject to some variability in salinity from riverine input or, in more marine conditions, the habitat consists predominantly of smaller stones which are too unstable for *Ascophyllum nodosum* to colonise to any great extent (compare with AscX). This biotope typically differs from Fves in having a less dense canopy and reduced richness of epifaunal species, presumably as a result of the increased siltation, variable salinity and lack of stable substrata. In addition, the sediment between patches of hard substrata often contains the lugworm *Arenicola marina*, cockles *Cerastoderma edule* or the ragworm *Hediste diversicolor*. Littorinids, particularly *Littorina littorea*, commonly graze on the algae. Ephemeral algae such as *Enteromorpha* spp. are often present, especially on any more mobile pebbles during the summer. Limpets are less common than in AscX, because of the limited availability of larger rocks.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor	•	•	Occasional
Arenicola marina	•	•	Occasional
Semibalanus balanoides	••••	•	Frequent
Gammaridae	••	•	Frequent
Littorina littorea	••••	•	Frequent
Mytilus edulis	•••	•	Occasional
Mastocarpus stellatus	••	•	Occasional
Ascophyllum nodosum	••	••	Occasional
Fucus vesiculosus	•••••	••	Common
Enteromorpha	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.31	=
R6	Inlets in SE England	Hill & Emblow In prep	R6.9	=
Other	Sealochs	Howson, Connor & Holt 1994	SL21	In part
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.7	=
Other	Inlets in SW Britain	Moore In prep	SWI.19	In part
Other	Inlets in SW Britain	Moore In prep	SWI.26	=
IR5	SW Ireland (Mizen Head to Kerry Head)		FvesX_ir	=
IR6	Greater Galway Bay		FvesX_ir	=
IR7	Clare Island area		FvesX_ir	=
IR8	NW Ireland (Erris Head to Malin Head)		FvesX_ir	=

Frequency of occurrence

In Britain: Common

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.AscX *Ascophyllum nodosum* on mid eulittoral mixed substrata

Habitat classification

		Previous code	
Salinity:	Full, Variable	LMXD.ASC	6.95
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Mixed cobbles, boulders and pebbles on sediment		
Zone:	Eulittoral - mid		

Biotope description

Very sheltered mixed substrata (cobbles, boulders and pebbles on sediment) in full or near fully marine conditions may be characterised by an *Ascophyllum nodosum* canopy. Like the *Ascophyllum* community that occurs on bedrock (Asc), *Fucus vesiculosus* may be co-dominant. In addition, however, this community also contains a selection of infaunal species, such as *Arenicola marina*, which occur in the sediment between the cobbles. Large mussels *Mytilus edulis* commonly occur in clumps, and provide further suitable substrata for the attachment of fucoids and barnacles. *Littorina littorea* is the most commonly occurring littorinid, and at some sites it may reach high densities. The spaces between cobbles and boulders provide a refuge for crustaceans, especially *Carcinus maenas*. On shores with a smaller proportion of cobbles and boulders, the large *Ascophyllum nodosum* plants become uncommon (presumably since they lack a suitable substrata for attachment) and *Fucus vesiculosus* dominates the canopy (FvesX). *F. vesiculosus* also tends to replace *Ascophyllum* in areas with greater freshwater influence.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	•	•	Occasional
Semibalanus balanoides	••••	•	Frequent
Gammaridae	••	•	Common
Carcinus maenas	•••	•	Occasional
Patella vulgata	•••	•	Occasional
Littorina littorea	••••	•	Frequent
Littorina obtusata	•••	•	Frequent
Littorina saxatilis	•••	•	Frequent
Littorina obtusata/mariae	•	•	Common
Mytilus edulis	•••	•	Occasional
Mastocarpus stellatus	••	•	Occasional
Polysiphonia lanosa	••••	•••	Frequent
Ascophyllum nodosum	•••••	••	Common
Fucus vesiculosus	••••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.16	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.6	=
Other	Inlets in SW Britain	Moore In prep	SWI.27	=
Other	Ireland - all coasts		AscX_ir	=

Frequency of occurrence

In Britain: Uncommon

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.AscX.mac *Ascophyllum nodosum* ecad *mackaii* beds on extremely sheltered mid eulittoral mixed substrata

Habitat classification

Salinity:	Variable
Wave exposure:	Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Pebbles and cobbles on mud and sand
Zone:	Eulittoral - mid

Previous code

LMXD.AMAC	6.95

Biotope description

Extremely sheltered mid shore mixed substrata, usually subject to variable salinity due to freshwater runoff, may support beds of the free-living *Ascophyllum nodosum* ecad *mackaii*. Cobbles and other hard substrata are often characterised by the normal form of *Ascophyllum nodosum* and other fucoids such as *Fucus serratus* and *Fucus vesiculosus*. The loose mats of *A. nodosum* ecad *mackaii* provide a cryptic and humid habitat for mobile species such as gammarids, the shore crab *Carcinus maenas*, littorinid molluscs (especially *Littorina littorea*) and eels *Anguilla anguilla*. *Semibalanus balanoides* and *Mytilus edulis* are commonly attached to pebbles and cobbles on the sediment, while the infauna may contain *Arenicola marina*, *Lanice conchilega* and other polychaetes.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	•••	•	Occasional
Semibalanus balanoides	•••	•	Occasional
Gammaridae	••••	•	Frequent
Littorina littorea	••••	•	Frequent
Littorina saxatilis	•••	•	Frequent
Mytilus edulis	••	•	Occasional
Anguilla anguilla	•	•	Common
Polysiphonia lanosa	•••	•••	Occasional
Ascophyllum nodosum	•••	••	Occasional
Ascophyllum nodosum mackaii	••••	•••	Common
Fucus vesiculosus	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL25	=
IR4	S Ireland (Carnsore Point to Mizen Head		AscX.mac_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		AscX.mac_ir	=

Frequency of occurrence

In Britain: Scarce

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.FserX *Fucus serratus* on lower eulittoral mixed substrata

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	
Substratum:	Mixed cobbles, boulders and pebbles on sediment
Zone:	Eulittoral - lower

Biotope description

Sheltered and very sheltered lower eulittoral mixed substrata often supports *Fucus serratus*. This biotope differs from Fser.Fser in having a less dense canopy and reduced richness of epifaunal species, being subject to increased siltation and disturbance of unstable substrata. Amongst the pebbles and cobbles can be found shore crabs *Carcinus maenas*, numerous gastropods (*Littorina littorea*, *Littorina obtusata/mariae* and *Gibbula cineraria*) and large mussels *Mytilus edulis*, commonly occurring in clumps. Sediment in the spaces between the loose substrata may support infauna such as the lugworm *Arenicola marina* and the sand-mason *Lanice conchilega*. FserX occurs below mid eulittoral fucoids (FvesX or AscX) on mixed substrata shores, or on sediment shores where mixed substrata occurs in discrete patches on the lower shore. One variant of this biotope is described: tide-swept *F. serratus* (FserX.T).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	••	•	Occasional
Lanice conchilega	•	•	Rare
Pomatoceros triqueter	•••	•	Occasional
Semibalanus balanoides	•••	•	Occasional
Carcinus maenas	•••	•	Occasional
Patella vulgata	•••	•	Occasional
Gibbula cineraria	••	•	Occasional
Littorina littorea	••••	•	Frequent
Littorina obtusata/mariae	•	•	Common
Mytilus edulis	••	•	Occasional
Mastocarpus stellatus	•••	•	Occasional
Ascophyllum nodosum	••	••	Occasional
Fucus serratus	•••••	••	Abundant
Fucus vesiculosus	•••	••	Occasional
Enteromorpha	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL21	Part of
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.8	=
Other	SW Inlets	Moore In prep	SWI.28	=

Frequency of occurrence

In Britain: Common

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.FserX.T *Fucus serratus* with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata

Habitat classification

		Previous code	
Salinity:	Full, Variable	LMXD.SAR	6.95
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Moderately strong		
Substratum:	Boulders, cobbles and pebbles on muddy sediments		
Zone:	Eulittoral - lower		
Height band:	Lower shore		

Biotope description

Sheltered lower shore boulders, cobbles and pebbles on muddy sediments that are subject to enhanced tidal water movement may be characterised by a rich community of sponges (*Halichondria panicea* and *Hymeniacidon perleve*), hydroids (*Dynamena pumila*), bryozoans (*Anguinella palmata* and *Walkeria uva*), ascidians (*Ascidiella aspera*, *Ascidiella scabra*, *Styela clava* and *Botryllus schlosseri*) and red seaweed (*Halurus flosculosus*, *Ceramium* sp., *Gracilaria verrucosa* and *Chondrus crispus*). The brown algae *Dictyota dichotoma*, *Fucus serratus* and *Ectocarpus* sp. may be found on any more stable substrata. Patches of sand or mud are often characterised by the sand mason worm *Lanice conchilega*, the peacock worm *Sabella pavonina* and the anemone *Sagartia troglodytes*. Aggregations of the mussel *Mytilus edulis* and, in southern and eastern England, the slipper limpet *Crepidula fornicata* may also be found attached to cobbles and pebbles. Sites in Scottish sealochs may support maerl *Lithothamnion corallioides* and bivalves *Venerupis senegalensis* (see also IMX.VsenMtru).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	●●●	●●	Rare
Hymeniacidon perleve	●	●●	Occasional
Dynamena pumila	●	●●	Occasional
Diadumene cincta	●●	●●	Frequent
Sagartia troglodytes	●●	●●	Common
Lanice conchilega	●●	●	Occasional
Sabella pavonina	●●	●●	Occasional
Semibalanus balanoides	●●	●	Occasional
Elminius modestus	●●●	●●	Frequent
Carcinus maenas	●●●	●	Occasional
Lepidochitona cinerea	●●	●●	Rare
Littorina littorea	●●●	●	Occasional
Crepidula fornicata	●●●	●●	Occasional
Mytilus edulis	●●●	●	Occasional
Cerastoderma edule	●●	●●	Frequent
Anguinella palmata	●●	●●	Frequent
Walkeria uva	●●	●●	Occasional
Ascidiella aspersa	●●●	●●	Occasional
Ascidiella scabra	●●	●●	Occasional
Styela clava	●●●	●●	Occasional
Botryllus schlosseri	●●	●●	Occasional
Gracilaria gracilis	●●	●●	Rare
Chondrus crispus	●●●	●	Rare
Ceramium	●●	●	Occasional
Halurus flosculosus	●●	●●	Occasional
Dictyota dichotoma	●●	●	Occasional

Fucus serratus	••	••	Occasional
Enteromorpha	••	•	Occasional
Ulva	••	•	Occasional
Bryopsis plumosa	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Inlets in SE England	Hill & Emblow In prep	R6.13	=
R11	Irish Sea	Covey In prep.b	R11.12	=
R13	Sealochs	Howson, Connor & Holt 1994	SL23	=
Other	Inlets in SW Britain	Moore In prep	SWI.29	=

Frequency of occurrence

In Britain: Uncommon

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.EphX Ephemeral green and red seaweeds on variable salinity or disturbed eulittoral mixed substrata

Habitat classification

		Previous code	
Salinity:	Variable	LMXD.EPH	6.95
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Pebbles & cobbles on mud and sand		
Zone:	Eulittoral		
Height band:	Mid shore		

Biotope description

Eulittoral mixed substrata (pebbles and cobbles overlying sand or mud) that is subject to variations in salinity and / or siltation are often characterised during the summer months by dense blankets of ephemeral green and red algae. The main species present are *Enteromorpha* spp., *Ulva lactuca* and *Porphyra* spp. Although fucoid algae occur in these areas they are typically rare. Small numbers of other species such as barnacles *Semibalanus balanoides* and *Elminius modestus* and keel worms *Pomatoceros* spp. are confined to any larger cobbles and pebbles. This biotope may be a summer variation of BLlit, in which ephemeral algal growth has exceeded the capacity of the grazing molluscs. In common with the other biotopes found on mixed substrata, patches of sediment are typically characterised by infaunal species including bivalves (*Cerastoderma edule* and *Macoma balthica*) and polychaetes (*Arenicola marina* and *Lanice conchilega*). Occasional clumps of *Mytilus edulis* may also occur, although at considerably lower density than in MytX.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	•	•	Occasional
Lanice conchilega	•	•	Frequent
Semibalanus balanoides	••••	•	Occasional
Elminius modestus	••	••	Occasional
Littorina littorea	••	•	Rare
Mytilus edulis	•••	•	Rare
Cerastoderma edule	••	••	Rare
Porphyra	••••	••	Occasional
Fucus vesiculosus	•••	••	Rare
Enteromorpha	•••••	•	Frequent
Ulva	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.33	=
R6	Inlets in SE England	Hill & Emblow In prep	R6.11	=
R11	Irish Sea	Covey In prep.b	R11.13	=
Other	Sealochs		MNCR data	
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.12	=
Other	Inlets in SW Britain	Moore In prep	SWI.32	=

Frequency of occurrence

In Britain: Common

FX *Fucoids, barnacles or ephemeral seaweeds (mixed substrata)*

SLR.FcerX *Fucus ceranoides* on reduced salinity eulittoral mixed substrata

Habitat classification

Salinity:	Reduced / low	
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	
Tidal streams:	Moderately strong, Weak, Very weak	
Substratum:	Mixed substrata on coarse clean gravel	
Zone:	Littoral fringe - lower, Eulittoral	
Height band:	Upper shore, Mid shore, Lower shore	

Previous code

LMXD.FCER 6.95

Biotope description

Boulders, cobbles and stones in the eulittoral zone that are subject to reduced salinity conditions may be covered by *Fucus ceranoides*. This biotope typically occurs where streams run across the shore, or towards the heads of marine inlets. Other fucoids may occur, but are generally scarce. Amongst the fucoid algae, opportunistic green algae such as *Enteromorpha* spp. and *Ulva lactuca* are frequently encountered. Littorinid molluscs and clumps of large *Mytilus edulis* may be present. Species diversity is generally low with red algae being rare or absent. Sediment, on which the cobbles and boulders frequently lie, often contains infaunal species such as the lugworm *Arenicola marina* and the ragworm *Hediste diversicolor*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor	•	•	Occasional
Arenicola marina	•	•	Occasional
Elminius modestus	••	••	Occasional
Carcinus maenas	••	•	Rare
Littorina littorea	••	•	Occasional
Mytilus edulis	••	•	Occasional
Fucus ceranoides	•••••	•••	Frequent
Enteromorpha	•••	•	Frequent
Ulva	•	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		MNCR data	
R2	Orkney		MNCR data	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.32	=
R6	Inlets in SE England	Hill & Emblow In prep	R6.8	=
R7	Eastern English Channel		MNCR data	
R8	Western English Channel		MNCR data	
R10	N Wales		MNCR data	
R11	The Solway		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL24	In part
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.10	=
Other	Inlets in SW Britain	Moore In prep	SWI.30	=

Frequency of occurrence

In Britain: Common

MX Mytilus *(mussel) beds (mixed substrata)*

SLR.MytX *Mytilus edulis* beds on eulittoral mixed substrata

Habitat classification

		Previous code	
Salinity:	Full, Variable	LMXD.MYT	6.95
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Strong, Moderately strong, Weak		
Substratum:	Mixed boulders, cobbles and pebbles on muddy sediment		
Zone:	Eulittoral - mid, Eulittoral - lower		

Biotope description

Moderately exposed to very sheltered mid and lower eulittoral mixed substrata (mainly cobbles and pebbles on muddy sediments) with dense aggregations of the mussel *Mytilus edulis*. In high densities the mussels bind the substratum and provide a habitat for many species more commonly found on rocky shores. *Fucus vesiculosus* is often found attached to either the mussels or the cobbles and it frequently occurs at high abundance. The mussels are usually encrusted with the barnacle *Semibalanus balanoides* (and/ or *Elminius modestus* in areas of reduced salinity). *Littorina littorea* and small *Carcinus maenas* are common amongst the mussels, whilst areas of sediment may contain *Arenicola marina*, *Lanice conchilega*, *Cerastoderma edule* and other infaunal species. In contrast with the mussel beds found on rocky shores (MLR.MF) this biotope contains few limpets or red algae. This biotope is also found in lower shore tide-swept areas, such as in the tidal narrows of Scottish sealochs.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	••	•	Occasional
Lanice conchilega	••	•	Occasional
Semibalanus balanoides	••••	•	Frequent
Elminius modestus	••	•	Frequent
Carcinus maenas	•••	•	Occasional
Littorina littorea	••••	•	Common
Mytilus edulis	•••••	•	Abundant
Cerastoderma edule	••	••	Occasional
Fucus vesiculosus	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.29	=
R6	Inlets in Se England	Hill & Emblow In prep	R6.10	=
R11	Irish Sea	Covey In prep.b	R11.14	=
Other	Sealochs	Howson, Connor & Holt 1994	SL22	=
Other	Sealochs	Howson, Connor & Holt 1994	SL12	In part
Other	Lagoons	Covey, Thorpe & Nichols In prep	Lag.11	=
Other	Inlets in SW Britain	Moore In prep	SWI.33	In part
Other	Inlets in SW Britain	Moore In prep	SWI.34	In part
Other	UK - all coasts		MNCR data	

Frequency of occurrence

In Britain: Common

Rkp *Rockpools*

LR.G Green seaweeds (*Enteromorpha* spp. and *Cladophora* spp.) in upper shore rockpools

Habitat classification

Salinity:	Variable
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	
Substratum:	Bedrock
Zone:	Supralittoral, Littoral fringe, Eulittoral - upper
Height band:	Upper shore
Other features:	Rockpool

Previous code

RKP.G	96.7
LRK.CHL	95.6

Biotope description

Rockpools in the supralittoral, littoral fringe or upper eulittoral which are subject to variable salinity and widely fluctuating temperatures are characterised by the ephemeral green alga *Enteromorpha* spp. or the filamentous green alga *Cladophora* spp. Due to the physical stress imposed on these upper shore pools, grazing molluscs are generally in lower abundance than eulittoral pools, allowing the green algae to proliferate under reduced grazing pressures. The rock surface is often covered by the black lichen *Verrucaria maura*. On more exposed shores crevices in the rock may contain small *Mytilus edulis*. The bright orange copepod *Tigriopus fulvus* is tolerant of large salinity fluctuations and may also occur in large numbers in these upper shore pools.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Tigriopus fulvus	•	•••	Abundant
Patella vulgata	••	•	Frequent
Littorina littorea	••	•	Frequent
Mytilus edulis	••	•	Rare
Enteromorpha	•••	•	Common
Cladophora	•	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.7	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.35	=
Other	Chalk Coasts	George, Tittley & Wood In prep	CC.LR16	in part
Other	UK - all coasts		MNCR data	
IR5	SW Ireland (Mizen Head to Kerry Head)		G_ir	=
IR6	Greater Galway Bay		G_ir	=
IR7	Clare Island area		G_ir	=

Frequency of occurrence

In Britain: Very common

Rkp *Rockpools*

LR.Cor *Corallina officinalis* and coralline crusts in shallow eulittoral rockpools

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered
Tidal streams:	Weak
Substratum:	Bedrock; boulders
Zone:	Eulittoral - upper, Eulittoral - mid
Height band:	Upper shore, Mid shore
Other features:	Rockpool

Previous code

Includes RKP.Gas 96.7

Biotope description

Shallow rockpools throughout the eulittoral zone may be characterised by a covering of encrusting coralline algae on which *Corallina officinalis* often forms a dense turf. These 'coralline' pools have a striking appearance as they are dominated predominantly by red algae. Filamentous and foliose red algae found in these pools include *Dumontia contorta*, *Mastocarpus stellatus* and *Ceramium rubrum*. The green algae *Cladophora rupestris* and *Enteromorpha* spp. can also occur. The pools may hold large numbers of grazing molluscs, particularly *Littorina littorea* (which often occurs in exceptionally high densities in upper shore pools), *Patella vulgata* and *Gibbula cineraria*. Gastropods may graze these pools to such an extent that they are devoid of any foliose red algae, and are reduced to encrusting coralline algae and large numbers of gastropods. Large brown algae are generally absent (compare with FK), although small *Halidrys siliquosa* may be present. Within the pools, pits and crevices are often occupied by the anemone *Actinia equina* and small *Mytilus edulis*. Similar sized pools in the littoral fringe generally lack the encrusting coralline algae and are characterised by green algae (see G). In Ireland, the sea urchin *Paracentrotus lividus* can dominate these shallow coralline pools (see Cor.Par). In south-west Britain, the brown alga *Bifurcaria bifurcata* (Cor.Bif) or *Cystoseira* spp. (Cor.Cys) can be regionally dominant.

Similar biotopes

LR.FK.Sar	May be regionally dominant in the south-west, colonising the same niche and out competing the red algae usually associated with coralline pools.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	•••	•	Occasional
Semibalanus balanoides	••	•	Occasional
Carcinus maenas	••	•	Occasional
Patella vulgata	•••	•	Frequent
Gibbula cineraria	••	•	Occasional
Littorina littorea	•••	•	Common
Nucella lapillus	••	•	Occasional
Mytilus edulis	••	•	Occasional
Dumontia contorta	••	••	Occasional
Corallinaceae	••••	•	Common
Corallina officinalis	•••••	•	Common
Mastocarpus stellatus	••	•	Occasional
Chondrus crispus	••	•	Occasional
Ceramium nodulosum	••	•	Occasional
Halidrys siliquosa	••	••	Frequent
Enteromorpha	•••	•	Frequent

Ulva	••	•	Occasional
Cladophora rupestris	••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.24	=
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.25	In part
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.36	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR16	In part
IR3	E Ireland (St John's Point to Carnsore Point)		Cor_ir	=
IR4	S Ireland (Carnsore Point to Mizen Head)		Cor_ir	=
IR5	SW Ireland (Mizen Head to Kerry Head)		Cor_ir	=
IR6	Greater Galway Bay		Cor_ir	=
IR8	NW Ireland (Erris Head to Malin Head)		Cor_ir	=

Frequency of occurrence

In Britain: Very common

Rkp *Rockpools*

LR.Cor.Par Coralline crusts and *Paracentrotus lividus* in shallow eulittoral rockpools

Habitat classification

Salinity:	
Wave exposure:	Very exposed, Exposed
Tidal streams:	
Substratum:	Bedrock
Zone:	Eulittoral
Other features:	Rockpool

Biotope description

In south and west Ireland shallow coralline pools may be dominated by the sea urchin *Paracentrotus lividus*. Soft bedrock, such as limestone, allows the urchin to bore into the rock. This biotope is a sub-type of the Coralline rockpool (Cor); the algal diversity is generally limited to coralline crusts and *Corallina officinalis* due to the *Paracentrotus* grazing. The gastropods *Gibbula* spp. and *Littorina littorea* may be numerous in such pools.

Similar biotopes

LR.Cor	Cor.Par is a grazed version of this biotope

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	•••••	•	Common
Anemonia viridis	•••	••	Occasional
Semibalanus balanoides	••	•	Frequent
Patella ulyssiponensis	••	••	Common
Patella vulgata	••••	•	Frequent
Gibbula cineraria	••	••	Frequent
Gibbula umbilicalis	••••	•	Frequent
Littorina littorea	•••	•	Common
Nucella lapillus	•••	•	Occasional
Paracentrotus lividus	•••••	•••	Common
Corallinaceae	••••	•	Abundant
Corallina officinalis	•••••	•	Common
Ceramium	••••	•	Frequent
Leathesia difformis	••	••	Occasional
Dictyota dichotoma	••	••	Occasional
Enteromorpha	••••	•	Occasional
Ulva	••••	•	Frequent
Cladophora	•••	•	Occasional
Codium	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	SW Ireland		TCD data	

Frequency of occurrence

In Britain: Rare

Rkp *Rockpools*

LR.Cor.Bif *Bifurcaria bifurcata* in shallow eulittoral rockpools

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	
Substratum:	Bedrock
Zone:	Eulittoral
Other features:	Rockpool

Biotope description

Eulittoral rockpools in south-west Britain dominated by the brown alga *Bifurcaria bifurcata*. Shallow coralline pools typically dominated by red algae (see Cor) can support dense growths of *B. bifurcata* with little else other than *Corallina officinalis*, encrusting coralline algae and some grazing gastropods and anemones. [*B. bifurcata* is at the edge of its range in Britain; in France it occurs in deeper lower shore pools where the alga forms a noticeable band in the mid pool level, below a band of *Corallina officinalis* and coralline crusts]. *Cystoseira* spp., another warm-water brown algae found in south-west Britain, often occurs in equal abundance in the shallow pools. *B. bifurcata* also occurs in deeper pools (see LR.FK) with the brown algae *Halidrys siliquosa* and *Himanthalia elongata*, below which *Laminaria digitata* may occur.

Similar biotopes

LR.FK	*Bifurcaria bifurcata* replaces the fucoids typically found in these deeper pools, and usually occurs in greater abundance

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	••	•	Occasional
Gibbula umbilicalis	••	•	Frequent
Dumontia contorta	•••	••	Occasional
Corallinaceae	•••	•	Abundant
Corallina officinalis	•••••	•	Abundant
Mesophyllum lichenoides	•••	••	Frequent
Ceramium nodulosum	•••	•	Frequent
Himanthalia elongata	•••	••	Frequent
Bifurcaria bifurcata	•••••	•••	Common
Enteromorpha	•••	•	Frequent
Cladophora	••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	

Frequency of occurrence

In Britain: Rare

Rkp *Rockpools*

LR.Cor.Cys *Cystoseira* spp. in shallow eulittoral rockpools

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	
Substratum:	Bedrock
Zone:	Eulittoral
Other features:	Rockpool

Biotope description

Shallow eulittoral rockpools on exposed to moderately exposed south-western shores can be dominated by the brown alga *Cystoseira* spp. and coralline algae. These pools generally contain some sand and pebbles on the base and support dense red algal growth comprising: *Ceramium* spp., *Calliblepharis jubata*, *Chondrus crispus* and *Gelidium latifolium*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hymeniacidon perleve	•••	••	Occasional
Palaemon serratus	•••	••	Frequent
Patella vulgata	••••	•	Frequent
Gelidium latifolium	•••••	••	Occasional
Corallinaceae	•••••	•	Common
Corallina officinalis	••••	•	Common
Chondrus crispus	•••	•	Frequent
Calliblepharis jubata	•••	••	Occasional
Ceramium	•••	•	Frequent
Cryptopleura ramosa	•••	••	Occasional
Osmundea pinnatifida	••••	••	Occasional
Dictyota dichotoma	•••	••	Frequent
Colpomenia peregrina	••••	••	Occasional
Cystoseira	•••••	••	Abundant
Cystoseira tamariscifolia	•••	••	Abundant
Enteromorpha	•••	•	Occasional
Ulva	•••	•	Frequent
Chaetomorpha melagonium	•••	•	Occasional
Verrucaria mucosa	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	South-west Britain		MNCR data	

Frequency of occurrence

In Britain: Rare

Rkp *Rockpools*

LR.FK Fucoids and kelps in deep eulittoral rockpools

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	
Substratum:	Bedrock
Zone:	Eulittoral - mid, Eulittoral - lower
Height band:	Mid shore, Lower shore
Other features:	Deep rockpool

Previous code

RKP.FK.Bed	96.7
RKP.FK.Bo in part	96.7
LRK.FK.BEP	6.95

Biotope description

Deep rockpools in the mid to lower eulittoral zone often contain a community characterised by *Fucus serratus* and *Laminaria digitata*. Other large brown algae, including *Laminaria saccharina*, *Himanthalia elongata* and *Halidrys siliquosa*, may also occur. The rock surface is usually covered by encrusting coralline algae. A wide variety of filamentous and foliose algae, which are typical of lower shore and shallow sublittoral zones (e.g. *Palmaria palmata*, *Chondrus crispus*, *Ceramium* spp., *Membranoptera alata* and *Gastroclonium ovatum*) occur beneath the brown algal canopy. Algal-free vertical and overhanging faces often support the sponge *Halichondria panicea* and anemones *Actinia equina*. The abundance of grazing molluscs varies considerably. In some, large numbers of littorinids and limpets are probably responsible for the limited variety of red seaweeds present. In other pools, fewer grazers may result in an abundance of these algae. Where boulders occur in these pools they provide a greater variety of micro-habitats which support a variety of fauna. Mobile crustaceans (*Pagurus bernhardus* and *Carcinus maenas*), brittlestars (*Ophiothrix fragilis* and *Amphipholis squamata*), encrusting bryozoans and ascidians are typically found beneath and between boulders.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	•	Occasional
Actinia equina	••	•	Occasional
Pagurus bernhardus	••	••	Occasional
Patella vulgata	•••	•	Occasional
Gibbula cineraria	••	•	Occasional
Littorina littorea	••	•	Frequent
Ophiothrix fragilis	••	•	Occasional
Amphipholis squamata	••	••	Occasional
Palmaria palmata	•••	••	Occasional
Corallinaceae	•••	•	Common
Corallina officinalis	•••••	•	Common
Chondrus crispus	•••	•	Occasional
Gastroclonium ovatum	••	••	Occasional
Ceramium nodulosum	•••	•	Frequent
Membranoptera alata	••	••	Occasional
Laminaria digitata	••••	••	Occasional
Laminaria saccharina	••	••	Occasional
Fucus serratus	•••	••	Frequent
Himanthalia elongata	••	••	Frequent
Halidrys siliquosa	••	••	Occasional
Ulva	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*

R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.26	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.37	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR16	In part
Other	Ireland - all coasts		FK_ir	=

Frequency of occurrence

In Britain: Common

Rkp *Rockpools*

LR.FK.Sar *Sargassum muticum* in eulittoral rockpools

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered
Tidal streams:	
Substratum:	Bedrock
Zone:	Eulittoral - mid, Eulittoral - lower
Height band:	Mid shore, Lower shore
Other features:	Rockpool

Biotope description

The non-native brown alga *Sargassum muticum* has spread extensively around the south-west coast of Britain since its introduction to UK waters in the early 1970s. It is an opportunistic alga which can dominate rockpools in the south-west, often to the exclusion of other species which would otherwise occupy this niche (*Laminaria* spp. and fucoids). Where *S. muticum* dominates shallow to medium-depth pools, this biotope (FK.Sar) should be recorded. At low tide the swards of *Sargassum* thalli lie flat on the water surface, thereby reducing the illumination available to red algae (*Gelidium* spp., *Dumontia contorta*, and *Corallina officinalis*) which subsequently occur in low abundances. The fauna that occur are common to the eulittoral coralline pools (see Cor) and include littorinids, *Patella* and the anemone *Actinia equina*. Where sediment occurs in the pool the red algae *Polyides rotundus* and *Furcellaria lumbricalis* can also be found.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	••	•	Occasional
Cereus pedunculatus	••	••	Rare
Gibbula cineraria	•••	•	Occasional
Littorina littorea	•••	•	Frequent
Gelidium latifolium	••	••	Occasional
Dumontia contorta	••	••	Occasional
Corallinaceae	••••	•	Frequent
Corallina officinalis	•••••	•	Frequent
Chondrus crispus	••••	•	Common
Polyides rotundus	•••	••	Occasional
Furcellaria lumbricalis	••	••	Occasional
Calliblepharis jubata	•••	••	Frequent
Ceramium	••••	•	Common
Laminaria saccharina	••••	•	Occasional
Fucus serratus	••••	••	Occasional
Sargassum muticum	•••••	•••	Abundant
Enteromorpha	••••	•	Frequent
Ulva	•••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Western English Channel		MNCR data	
R9	Bristol Channel and approaches		MNCR data	

Frequency of occurrence

In Britain: Rare

Rkp *Rockpools*

LR.SwSed Seaweeds in sediment (sand or gravel)-floored eulittoral rockpools

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Very weak
Substratum:	Bedrock with cobbles, pebbles and/ or sand
Zone:	Eulittoral
Height band:	Mid shore, Lower shore
Other features:	Sand abrasion/ covered rock in rockpool; or unstable sediment (gravel/pebbles)

Previous code

Includes RKP.RBwn	96.7
RKP.FK.Snd	96.7
LRK.FK.SP	6.95

Biotope description

Rockpools with sediment floors support distinct communities of scour-tolerant algae. Deep pools with sediment are similar to FK, and are typically dominated by fucoids and kelps (*Fucus serratus*, *Laminaria digitata*, *Laminaria saccharina* and *Saccorhiza polyschides*). Areas of hard substrata near to the interface with the sediment are, however, characterised by a range of sand-tolerant algae such as *Furcellaria lumbricalis*, *Polyides rotundus*, *Ahnfeltia plicata* and *Rhodothamniella floridula* (compare with FK). *Chorda filum* may occur attached to pebbles and shells embedded within the sediment. In pools with large areas of sand, infaunal species such as *Arenicola marina* and *Lanice conchilega* often occur. The sea-grass *Zostera* spp. may occur in some pools where stable sand is present. Shallow rockpools with cobble and pebble floors, often with an underlying layer of sediment, support red algal tufts (*Mastocarpus stellatus* mixed with *Ceramium* spp., *Calliblepharis ciliata* and *Cystoclonium purpurea* and green algae).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Actinia equina	••	•	Occasional
Arenicola marina	••	•	Occasional
Lanice conchilega	••	•	Occasional
Rhodothamniella floridula	••	••	Occasional
Corallinaceae	••••	•	Frequent
Corallina officinalis	•••••	•	Frequent
Ahnfeltia plicata	••	••	Occasional
Mastocarpus stellatus	••	•	Frequent
Chondrus crispus	•••	•	Frequent
Polyides rotundus	••	••	Occasional
Furcellaria lumbricalis	•••	••	Occasional
Calliblepharis ciliata	•	••	Occasional
Cystoclonium purpureum	•	••	Occasional
Ceramium	••	•	Occasional
Laminaria digitata	•••	••	Frequent
Laminaria saccharina	•••	•	Occasional
Fucus serratus	••••	••	Frequent
Enteromorpha	•••	•	Frequent
Ulva	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.28	

Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
IR4	S Ireland (Carnsore Point to Mizen Head)		FK.Snd_ir	=
IR8	NW Ireland (Erris Head to Malin Head)		FK.Snd_ir	=

Frequency of occurrence

In Britain: Common

Rkp *Rockpools*

LR.H Hydroids, ephemeral seaweeds and *Littorina littorea* in shallow eulittoral mixed substrata pools

Habitat classification

		Previous code	
Salinity:	Full	RKP.H	96.7
Wave exposure:	Moderately exposed, Sheltered	LMXD.HYD	6.95
Tidal streams:			
Substratum:	Cobbles; pebbles; gravel; sand		
Zone:	Eulittoral		
Height band:	Mid shore		
Other features:	Rockpool		

Biotope description

Shallow pools on mixed cobbles, pebbles, gravel and sand may be colonised by hydroids (*Obelia longissima* and *Kirchenpaueria pinnata*), ephemeral green algae (*Enteromorpha* spp. and *Ulva* sp.) and the winkle *Littorina littorea*. Within these pools, patches of sand may be occupied by the lugworm *Arenicola marina* and sand mason worms *Lanice conchilega*. These pools are often associated with mussel beds (MytX), with *Mytilus edulis* also present in the pools. Barnacles (*Semibalanus balanoides* and *Elminius modestus*) and the keel worm *Pomatoceros triqueter* may be attached to shells and small stones.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Kirchenpaueria pinnata	••	••	Occasional
Obelia longissima	••	•••	Occasional
Arenicola marina	••	•	Present/Not known
Lanice conchilega	••	•	Occasional
Pomatoceros triqueter	••	•	Rare
Semibalanus balanoides	•••	•	Frequent
Elminius modestus	•••	••	Frequent
Crangon crangon	••	•	Present/Not known
Carcinus maenas	•••	•	Rare
Littorina littorea	•••	•	Common
Mytilus edulis	•••	•	Frequent
Corallinaceae	•••	•	Frequent
Chondrus crispus	•••	•	Occasional
Fucus vesiculosus	••	••	Rare
Enteromorpha	•••	•	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	SE estuaries	Hill & Emblow In prep	R6.12	

Frequency of occurrence

In Britain: Rare

Ov *Overhangs and caves*

LR.RhoCv *Rhodothamniella floridula* in upper littoral fringe soft rock caves

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	
Substratum:	Bedrock
Zone:	Littoral fringe - upper
Other features:	Moist, dark caves

Previous code

SUR.PilPse	96.7
LRK.APP	6.95

Biotope description

The upper littoral fringe in the moist dark conditions inside caves on soft rock may be characterised by velvety bands of the red alga *Rhodothamniella floridula*. In chalk caves, on the east and south-east coast of England, a distinctive assemblage of species occurs, including the brown alga *Pilinia maritima* and the bright green alga *Pseudendoclonium submarinum* which often covers the roofs of chalk caves. Where the rock is sufficiently hard, the crustose red alga *Hildenbrandia rubra* may occurs on the cave roofs.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Littorina saxatilis	••	•	Present/Not known
Rhodothamniella floridula	••	••	Common
Hildenbrandia	•	•	Present/Not known
Ectocarpaceae	••	•	Occasional
Waerniella lucifuga	•••	•••	Present/Not known
Pilinia maritima		•••	Present/Not known
Pseudendoclonium submarinum	•••	•••	Present/Not known
Enteromorpha	•	•	Abundant
Arthropyrenia halodytes	••	•••	Frequent
Verrucaria mucosa		•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.4	=
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR2	=

Frequency of occurrence

In Britain: Rare

Ov *Overhangs and caves*

LR.SR Sponges and shade-tolerant red seaweeds on overhanging lower eulittoral bedrock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Weak
Substratum:	Bedrock
Zone:	Eulittoral - lower, Sublittoral fringe
Other features:	Overhanging rock

Previous code

MLR.S.R	96.7
LRK.RSP	6.95

Biotope description

Overhanging bedrock on the lower shore characterised by shade-tolerant red algae (such as *Lomentaria articulata*, *Plumaria elegans* and *Membranoptera alata*) and sponges (e.g. *Grantia compressa*, *Halichondria panicea* and *Hymeniacidon perleve*). The rock surfaces often support dense populations of calcareous tube-worms *Spirorbis* spp. and *Pomatoceros triqueter*. In the south and west the barnacle *Balanus perforatus* may occur at high densities. The anemone *Actinia equina* thrives in the permanently damp conditions.

Similar biotopes

LR.SByAs	SR is distinguished from SByAs by its abundance of red algae; SByAs lacks the red algae, except for perhaps a few on the edge of the overhang.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Grantia compressa	••	••	Frequent
Halichondria panicea	••••	••	Frequent
Hymeniacidon perleve	•••	••	Frequent
Actinia equina	••	•	Occasional
Pomatoceros triqueter	••	•	Occasional
Spirorbidae	••	•	Frequent
Balanus perforatus	••	••	Frequent
Umbonula littoralis	•••	••	Occasional
Morchellium argus	•	••	Occasional
Palmaria palmata	••••	•	Occasional
Lomentaria articulata	••••	•••	Common
Plumaria plumosa	•••	•••	Common
Membranoptera alata	••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.22	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.16	=
Other	Inlets in SW Britain	Moore In prep	SWI.15	In part
Other	Chalk coasts	George, Tittley & Wood In prep	CC.LR23	=

Frequency of occurrence

In Britain: Common

LR.SByAs Sponges, bryozoans and ascidians on deeply overhanging lower shore bedrock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Eulittoral - lower, Sublittoral fringe
Height band:	Lower shore
Other features:	Overhanging and vertical rock

Previous code

MLR.S.ByAs	96.7
LRK.BAS	6.95

Biotope description

Overhanging, and shaded vertical, bedrock on the lower shore, which is not subject to appreciable wave-surge, is characterised by turfs of bryozoans (*Umbonula littoralis* and *Scrupocellaria* spp.), sponges (*Grantia compressa*, *Halichondria panicea* and *Hymeniacidon perleve*) and colonial ascidians (*Botryllus schlosseri* and *Botrylloides leachi*). The overhanging rock frequently supports the barnacles *Balanus crenatus* and *Balanus perforatus* (sometimes at high densities), and the calcareous-tubed polychaetes *Spirorbis* spp. and *Pomatoceros triqueter*. Some overhangs have a high abundance of the ascidian *Dendrodoa grossularia*.

Similar biotopes

LR.SR	SByAs is distinguished from SR by its lack of shade-tolerant red algae, although some may occur on the edges of the overhangs.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Grantia compressa	••	••	Frequent
Halichondria panicea	••••	••	Frequent
Hymeniacidon perleve	•••	••	Occasional
Pomatoceros triqueter	••	•	Occasional
Spirorbidae	••	•	Occasional
Balanus crenatus	•••	••	Frequent
Balanus perforatus	•	••	Frequent
Umbonula littoralis	•••	••	Occasional
Scrupocellaria	•	••	Frequent
Dendrodoa grossularia	••	••	Occasional
Botryllus schlosseri	••	••	Occasional
Botrylloides leachi	•	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.23	=
Other	Sealochs	Howson, Connor & Holt 1994	MNCR data	=
Other	Inlets in SW Britain	Moore In prep	SWI.17	=

Frequency of occurrence

In Britain: Uncommon

6.4 Littoral (intertidal) sediment biotopes

Sh *Shingle (pebble) and gravel shores*

LGS.BarSh Barren shingle or gravel shores

Habitat classification

Previous code

Salinity:	Full	LMXD.BAR	6.95
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Pebbles; cobbles; gravel		
Zone:	Supralittoral, Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Shingle or gravel shores, typically with sediment particle size from 4-256 mm, are normally only found on exposed open coasts in fully marine conditions. Such shores tend to have little associated finer sediment and due to their high degree of mobility support virtually no macrofauna. Larger 'sediment' is considered to be boulders and is addressed in the mixed shores section of the classification. Coarse sand, the next grade of sediment smaller than this size range is also found on exposed open coasts and has no distinct macrofaunal community as described in LGS.BarSnd. The shingle shore and mobile littoral sand biotopes are therefore distinguished solely on the basis of their substratum (i.e. particle size). Macrofauna are absent or extremely sparse in this very mobile and freely draining substratum. Trial excavations are unlikely to reveal macroscopic infauna. However, the few species that may be found are those washed into the habitat by the ebbing tide, including the occasional amphipod or small polychaete. There may be a temporary cover of the green algae *Enteromorpha* or *Ulva* during periods of stability in the summer.

Similar biotopes

LGS.BarSnd	Differentiated on the basis of sediment particle size

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Sealochs		MNCR data	
Other	SW Inlets	Moore In prep.	SWI.38	=

Frequency of occurrence

In Britain:	Uncommon

Sh *Shingle (pebble) and gravel shores*

LGS.Pec *Pectenogammarus planicrurus* in mid shore well-sorted gravel or coarse sand

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Moderately exposed		
Tidal streams:			
Substratum:	Gravel; very coarse sand (no fine sand and or mud)		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore		
Other features:	The lee of obstacles such as rocky outcrops and groynes		

Biotope description

Shores of well-sorted gravel with a predominant particle size of 4.0 mm but ranging between 3 and 6 mm may support populations of the amphipod *Pectenogammarus planicrurus*. Material finer than 2 mm reduces the ability of the amphipod to survive. The biotope is often associated with the lee side (wind or ?tide) of obstacles such as rock outcrops and groynes; this may be due to the deposition of algal debris, shelter from wave action or degree of sorting due to localised tidal flow around the obstacle (most likely a combination of the first and last influences). The biotope is characterised by dense populations of the amphipod *Pectenogammarus planicrurus*, although the species is usually also present as patchy populations within the mid shore band of other moderately wave-exposed sandy shore biotopes (e.g. LGS.Tal, LGS.AP). The amphipod is tolerant of variable salinity, although a preference for a specific salinity regime has not been determined. As this habitat is regularly under-surveyed, its distribution is unclear and may be a variant of LGS.Tal demonstrated by the similarity of species found and presence of strand material.

Similar biotopes

LGS.Tal	Similar habitat, but not restricted to the top of the shore.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pectenogammarus planicrurus	●●●●●	●●●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R7	E English Channel			
R10	Cardigan Bay	Morgan 1970		
R10	Cardigan Bay	Bell & Fish 1996		
R11	Liverpool Bay/Solway Firth			
Other	Isle of Man			

Frequency of occurrence

In Britain:	Scarce

Features of conservation interest

A localised and patchy biotope, so any extensive examples with a high abundance of the amphipod *Pectenogammarus planicrurus*, are of interest.

Potentially damaging activities

Activity	*Degree of effect*
Accretion enhancement (beach feeding)	Moderate
Coastal defences (inc. construction of bunds, groynes, walls)	High

S *Sand shores*

LGS.Tal Talitrid amphipods in decomposing seaweed on the strand-line

Habitat classification

Previous code

Salinity:	Full	LMXD.TAL	6.95
Wave exposure:	Exposed, Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Shingle; sand		
Zone:	Supralittoral		
Height band:	Strandline		
Other features:	Decomposing seaweed		

Biotope description

A community of talitrid amphipods may occur on any shore where decomposing seaweed accumulates on the extreme upper shore strand-line. The community occurs on a wide variety of sediment shores composed of shingle and mixed substrata through to fine sands, but may also occur on mixed and rocky shores in some circumstances. The decaying seaweed provides cover and humidity for *Talitrus saltator* and other components of the community. The amphipods *Orchestia* spp. are also often present, as well as enchytraeid oligochaetes. Polychaetes, molluscs and other crustaceans may be brought in on the tide, but are not necessarily associated with the infaunal community. Further analysis of the data may determine that *Orchestia* spp. are associated with a denser strand and that there are differences in the community dependant upon the substratum-type. *Talitrus saltator* may occur further down the shore, almost invariably accompanied by burrowing amphipods such as *Bathyporeia* spp. (LGS.AEur).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Enchytraeidae	••	••	Frequent
Orchestia gammarellus	•	•••	Occasional
Talitrus saltator	••••	•••	Common
Insecta indet.	•	•	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Britain - all coasts			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain:	Very common

S *Sand shores*

LGS.BarSnd Barren coarse sand shores

Habitat classification

Previous code

Salinity:	Full	LSND.BAR	6.95
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Coarse to medium sand		
Zone:	Supralittoral, Eulittoral		
Height band:	Strandline, Upper shore, Mid shore, Lower shore		

Biotope description

Freely-draining coarse sandy beaches, particularly on the upper shore, which lack a macrofaunal community due to their continual mobility. Trial excavations are unlikely to reveal any macrofauna in these typically steep beaches on exposed coasts. Burrowing amphipods *Bathyporeia* spp. or *Pontocrates* spp. and the isopod *Eurydice pulchra* may be found in extremely low abundances, but if present in any quantity should be classed as LGS.AEur. Other species that may be found in low abundance may be left behind by the ebbing tide.

Similar biotopes

LGS.BarSh	Similarly impoverished habitat but different sediment type

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	SW Inlets	Moore In prep.	SWI.38	

Frequency of occurrence

In Britain:	Common

S *Sand shores*

LGS.AEur Burrowing amphipods and *Eurydice pulchra* in well-drained clean sand shores

Habitat classification

		Previous code	
Salinity:	Full	LSND.AE	6.95
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Medium sand		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

Well-draining beaches of coarse- to medium-grained mobile sand, generally on exposed coasts, support populations of burrowing amphipods and the isopod *Eurydice pulchra*. The degree of drainage appears to be a critical factor in determining the presence of polychaetes; only *Scolelepis squamata* appears to be capable of tolerating the well-drained sediments of this biotope. In more exposed conditions this biotope may extend the full width of the shore or be restricted to the lower part of the shore with barren sands (LGS.BarSnd) higher up. This biotope has two facies; drying upper and mid shore sands, and highly mobile lower shore and shallow sublittoral sand bars. Burrowing amphipods found frequently include *Bathyporeia pelagica*, *B. pilosa*, *Pontocrates arenarius* and *Haustorius arenarius*. *Scolelepis squamata*, if present, occurs in only low densities. Oligochaetes may be present and are often common where there is freshwater influence. This community is distinguished from the Amphipod-polychaete communities (LGS.AP) by its impoverished polychaete fauna (only occasional *Scolelepis squamata* or other polychaetes) and its lack of bivalves.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pontocrates arenarius	••	••	Common
Bathyporeia pelagica	••	••	Common
Bathyporeia pilosa	••	•	Common
Haustorius arenarius	••	••	Common
Eurydice pulchra	••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep	R5.37	=

Frequency of occurrence

In Britain:	Common

LGS.AP Burrowing amphipods and polychaetes in clean sand shores

Habitat classification

		Previous code	
Salinity:	Full	LSND.AP	6.95
Wave exposure:	Exposed, Moderately exposed, Sheltered		
Tidal streams:			
Substratum:	Medium to fine sand		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Mid and lower shore clean sandy shores on wave-exposed or moderately wave-exposed coasts support a community of burrowing amphipods and polychaetes, sometimes with bivalves such as *Angulus tenuis*. The medium to fine-grained sand remains damp throughout the tidal cycle. The community consists of burrowing amphipods (*Pontocrates altamarinus*, *P. arenarius*, *Bathyporeia elegans*, *B. guilliamsoniana*, *B. pelagica*, *B. pilosa* and *B. sarsi*), the isopod *Eurydice pulchra*, the cumacean *Cumopsis goodsiri* and polychaetes (including *Nephtys cirrosa*, *Scolelepis squamata*, *Paraonis fulgens* and *Arenicola marina*). The presence of polychaetes is seen as coloured burrows running down from the surface of the sediment. The sediment is often rippled and typically lacks an anoxic black sub-surface layer. This community differs from the community of burrowing amphipods (LGS.AEur) in its greater variety of polychaete species and the presence of bivalves. The two sub-types are LGS.AP.P and LGS.AP.Pon depending upon the proportion of amphipods and polychaetes and the specific species present in the sand. More stable sediment, such as is found in sandy inlets or extensive coastal sandflats are LMS.PCer or LMS.MacAre.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa	●●●●●	●●	Present/Not known
Scolelepis squamata	●	●●	Frequent
Pontocrates	●●	●●●	Frequent
Bathyporeia	●●●	●●	Present/Not known
Eurydice pulchra	●	●●	Present/Not known

Frequency of occurrence

In Britain:	Common

S *Sand shores*

LGS.AP.P Burrowing amphipods and polychaetes (often *Arenicola marina*) in clean sand shores

Habitat classification / Previous code

Salinity:	Full	LGS.AP.Are	97.6
Wave exposure:	Exposed, Moderately exposed, Sheltered	LGS.AP.Sco	97.6
Tidal streams:			
Substratum:	Medium sand; fine sand		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Mid and lower shore clean sand on wave-exposed or moderately wave-exposed coasts support a community of burrowing amphipods and polychaetes. Amphipods *Bathyporeia pelagica*, *B. pilosa*, *B. sarsi*, *Pontocrates arenarius* and the isopod *Eurydice pulchra* are typically present. Polychaetes make the greater part of the community in terms of species richness and are dominated by *Nephtys cirrosa*, *Scolelepis squamata* and *Arenicola marina*. The medium and fine sand remains damp throughout the tidal cycle and contains little organic matter. The lugworm *Arenicola marina* present are usually as a temporary recruitment that are likely to be washed out during storms. The presence of polychaetes may be seen as coloured burrows running down from the surface of the sediment. The sediment is often rippled and typically lacks an anoxic black sub-surface layer. LGS.AP.P is distinguished from LGS.AP.Pon in that it is more stable sediment with fewer amphipod species and greater density of polychaetes, particularly *Arenicola marina* and *Capitella capitata*. This community differs from the community of burrowing amphipods (LGS.AEur) in its variety of polychaete species. More stable sediment, found in sandy inlets or extensive coastal sandflats are considered to be LMS.PCer or LMS.MacAre, depending upon the community present.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa	••	••	Present/Not known
Scolelepis squamata	•••	••	Common
Arenicola marina	••	•	Frequent
Pontocrates arenarius	••	••	Frequent
Bathyporeia pelagica	••	••	Frequent
Bathyporeia sarsi	••	••	Frequent
Haustorius arenarius	••	••	Frequent
Eurydice pulchra	••	••	Present/Not known

Frequency of occurrence

In Britain:	Common

S Sand shores

LGS.AP.Pon Burrowing amphipods *Pontocrates* spp. and *Bathyporeia* spp. in lower shore clean sand

Habitat classification

		Previous code	
Salinity:	Full	LGS.AP.Ang	97.6
Wave exposure:	Exposed, Moderately exposed		
Tidal streams:			
Substratum:	Medium sand; fine sand		
Zone:	Eulittoral		
Height band:	Lower shore		

Biotope description

Lower shore clean sand on wave-exposed or moderately wave-exposed coasts support a community of burrowing amphipods and polychaetes. Amphipods make up the greater part of the community and are typically dominated by *Pontocrates altamarinus*, *P. arenarius*, *Bathyporeia elegans*, *B. pelagica*, *B. pilosa* the isopod *Eurydice pulchra* and the cumacean *Cumopsis goodsiri*. Polychaetes are dominated by *Nephtys cirrosa*, *Paraonis fulgens* and *Scolelepis squamata*. *Angulus tenuis* is also frequently found in this biotope. Although the characterising species are not found very frequently, they are faithful to this biotope. The medium and fine sand remains damp throughout the tidal cycle and contains little organic matter. The presence of polychaetes may be seen as coloured burrows running down from the surface of the sediment. The sediment is often rippled and typically lacks an anoxic black sub-surface layer. LGS.AP.Pon is distinguished from LGS.AP.P as being less stable sediment with a community dominated by amphipods, particularly *Pontocrates altamarinus*, *Bathyporeia elegans* and *Cumopsis goodsiri* or the bivalve *Angulus tenuis*. This community differs from the community of burrowing amphipods (LGS.AEur) in its greater variety of polychaete and amphipod species. More stable sediment, found in sandy inlets or extensive coastal sandflats are considered to be LMS.PCer or LMS.MacAre, depending upon the community present.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nemertea indet.	●●	●	Abundant
Nephtys cirrosa	●●●	●●	Abundant
Paraonis fulgens	●●●	●●●	Abundant
Scolelepis squamata	●●●	●●	Common
Pontocrates altamarinus	●●●	●●●	Common
Pontocrates arenarius	●●●	●●	Common
Bathyporeia elegans	●●●	●●●	Common
Bathyporeia pelagica	●●●	●●	Common
Haustorius arenarius	●●	●●	Common
Cumopsis goodsiri	●●	●●●	Common
Angulus tenuis	●●●	●●●	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL26	=

Frequency of occurrence

In Britain:	Common

S *Sand shores*

LGS.Lan Dense *Lanice conchilega* in tide-swept lower shore sand

Habitat classification

Previous code

Salinity:	Full, Variable	LMSND.LAN	6.95
Wave exposure:	Moderately exposed, Sheltered, Very sheltered		
Tidal streams:	Strong, Moderately strong		
Substratum:	Medium sand; fine sand		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Medium to fine sand, which is usually clean but may contain some fines and supports dense populations of *Lanice conchilega*, usually on the lower shore but also sometimes on water-logged mid shores. The biotope occurs under tide-swept conditions in sheltered straits, sounds and fully marine sealochs or on shores moderately exposed to wave action. The biotope is distinguished from others in sandy beaches by the presence of *Lanice conchilega* at levels of common and above or as the main polychaete component. Other polychaetes present are tolerant of sand scour or mobility of the surface levels of the sediment and include glycerid polychaetes, *Anaitides mucosa*, *Nephtys cirrosa*, *Nephtys hombergii* and *Pygospio elegans*. Few crustaceans are found regularly and the bivalve component is restricted to cockles *Cerastoderma edule* and more rarely *Macoma balthica*. Pebbles and cobbles may also be mixed in with lower shore tide-swept sand with dense *Lanice conchilega* between the cobbles, but the infaunal component is rarely sampled. The infaunal community under these circumstances, provided that the cobbles are not packed very close together, will be similar to that in areas of purer sand. Dense *L. conchilega* also occurs in shallow sublittoral sediments (IGS.Lcon).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Anaitides mucosa	●●●	●●	Common
Eumida sanguinea	●●	●●●	Present/Not known
Nephtys cirrosa	●●●	●●	Abundant
Nephtys hombergii	●●	●	Present/Not known
Scoloplos armiger	●●	●●	Common
Pygospio elegans	●●●	●	Common
Lanice conchilega	●●●●●	●●	Abundant
Cerastoderma edule	●●●	●●	Abundant
Macoma balthica	●●	●	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	North Norfolk	Hill & Emblow In prep	R6.19	=
R8	SW inlets	Moore In prep	SWI.43	
R10	Cardigan Bay		MNCR data	=
R11	Irish Sea coast	Covey In prep	R11.20	=

Frequency of occurrence

In Britain:	Uncommon

Est *Estuarine coarse sediment shores*

LGS.Ol Oligochaetes in reduced or low salinity gravel or coarse sand shores

Habitat classification

Previous code

Salinity:	Reduced / low	LMGR.HED	6.95
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Strong, Moderately strong		
Substratum:	Gravel; coarse sand		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Coarse sands and gravel are often associated with the lower shore river channel in estuaries where the sediment is coarse and mobile due to strong river flow and subject to a reduced salinity. There is usually very little mud in the sediment. Oligochaetes, including *Heterochaeta costata* and enchytraeid oligochaetes dominate the infaunal assemblage with a few polychaetes being recorded in most cases. Other species that may be found, but only sporadically include *Bathyporeia* spp., *Hediste* (*Nereis*) *diversicolor*, *Nephtys hombergii*, *Scolelepis squamata*, *Corophium volutator* and *Hydrobia* spp. Depending on the degree of mobility, any pebbles and small cobbles that are present may have *Enteromorpha* attached. This biotope is restricted in mid and upper estuary situations to areas where finer material is consistently washed out by draining water or river flow.

Similar biotopes

LMU.HedOl	LMU.HedOl can have a similar faunal component as this biotope, but occurs in a much finer sediment type.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Oligochaeta indet.	•••	•	Common
Heterochaeta costata	•	••	Abundant
Tubificoides benedii	•	••	Present/Not known
Enchytraeidae	••	••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	SW Inlets		SWI.39	

Frequency of occurrence

In Britain:	Uncommon

MS *Muddy sand shores*

LMS.BatCor *Bathyporeia pilosa* and *Corophium* spp. in upper shore slightly muddy fine sand shores

Habitat classification

Salinity:	Variable		
Wave exposure:	Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Muddy fine sand		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore		

Biotope description

Wave-sheltered upper and mid shore sandflats containing a small amount of silt with the amphipods *Bathyporeia pilosa*, *Corophium arenarium* and *Corophium volutator*. This biotope is typically found higher up the shore than sandflats with the cockle *Cerastoderma edule* (LMS.PCer) in the large sandy estuaries of the west coast of England and Wales. The salinity, although predominantly recorded as variable probably varies little from fully marine on the upper shore of these broad estuaries. Polychaetes and bivalves (with the exception of *Macoma balthica*) are limited in their abundance and variety. Tidal streams may be strong during spring tides, accounting for the low mud fraction and the presence of amphipods *Bathyporeia pilosa* that are more commonly associated with open coast sandflats. *Cerastoderma edule* and numerous polychaetes are found in the neighbouring biotopes LMS.PCer and LMS.MacAre whilst the polychaetes *Hediste* (*Nereis*) *diversicolor* and *Pygospio elegans* and bivalves *Macoma balthica*, *Scrobicularia plana* and *Mya* spp. are associated with the muddier estuarine biotopes LMU.HedMac, LMU.HedStr, LMU.HedScr and LMU.HedOl.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Bathyporeia pilosa	●●●●●	●	Abundant
Corophium arenarium	●●●●●	●●	Common
Corophium volutator	●●●	●	Common
Hydrobia ulvae	●●●	●	Abundant
Macoma balthica	●●●	●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R10	Cardigan Bay estuaries		MNCR data	
R11	Irish Sea estuaries	Covey In prep		

Frequency of occurrence

In Britain:	Uncommon

MS *Muddy sand shores*

LMS.PCer Polychaetes and *Cerastoderma edule* in fine sand or muddy sand shores

Habitat classification

		Previous code	
Salinity:	Full	LMSND.PC	6.95
Wave exposure:	Moderately exposed, Sheltered		
Tidal streams:			
Substratum:	Fine sand or muddy sand		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Fine sand on extensive moderately wave-exposed and sheltered shores, where the sediment is sufficiently stable to accommodate populations of *Cerastoderma edule* (at least occasional) and other bivalves. The community is found mainly on the mid and lower shore where the sediment is water-saturated most of the time. Slightly muddy conditions at some sites are reflected in a reduced amphipod population and a wider range of polychaetes compared to Amphipod-polychaete biotopes (LGS.AP). The community consists of polychaetes *Nephtys hombergii*, *Scoloplos armiger*, *Pygospio elegans*, *Spio filicornis* and *Capitella capitata*, oligochaetes, the amphipod *Bathyporeia sarsi*, and the bivalves *Cerastoderma edule* and *Macoma balthica*. This biotope carries commercially viable stocks of cockles *Cerastoderma edule*. It is therefore possible to find areas of this habitat where the infauna may have been changed through recent cockle dredging. Higher on the shore, adjacent to this biotope, LMS.BatCor is found with fewer polychaete and bivalve species due to the drier sediment found on the upper shore. LMS.PCer has broad transition areas with LMS.MacAre, LMU.HedMac.Pyg and LMU.HedMac.Are. LMS.MacAre and LMU.HedMac.Are are indicated by the presence of *Arenicola marina*, the latter also having *Hediste* (*Nereis*) *diversicolor*, oligochaetes and other species that indicate a more sheltered, muddy sand biotope. LMU.HedMac.Pyg has a greater proportion of the polychaetes *Hediste diversicolor*, *Pygospio elegans* and *Eteone longa*, oligochaetes and the amphipod *Corophium volutator*. The species richness of LMS.PCer, particularly for polychaetes and bivalves, is greater than the more wave-exposed biotopes LGS.AP.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys hombergii	•••	•	Present/Not known
Scoloplos armiger	•••	••	Common
Pygospio elegans	••••	•	Common
Spio filicornis	••	•••	Present/Not known
Capitella capitata	••	•	Frequent
Oligochaeta indet.	•••	•	Frequent
Bathyporeia sarsi	••	••	Frequent
Hydrobia ulvae	••	•	Abundant
Cerastoderma edule	•••••	••	Abundant
Macoma balthica	•••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	SE estuaries	Hill & Emblow In prep	R6.22	In part
R10	Estuaries		R10.AP.Cer	In part
R11	Irish Sea	Covey In prep	R11.21	
R12	Clyde sealochs	Howson, Connor & Holt 1994	SL28	In part

Frequency of occurrence

In Britain:	Common

Potentially damaging activities

Activity	***Degree of effect***
Shell fisheries	High

MS *Muddy sand shores*

LMS.MacAre *Macoma balthica* and *Arenicola marina* in muddy sand shores

Habitat classification

Previous code

Salinity:	Full, Variable	LMS.AreBv	96.7
Wave exposure:	Moderately exposed, Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Fine sand or muddy sand		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		
Other features:	Anoxic layer present		

Biotope description

Muddy sand and fine sand flats on the mid and lower shore tend to occur on extensive moderately exposed shores and sheltered shores, on open coasts and in marine inlets. The sediment generally remains water-saturated during low water and the habitat may be subject to variable salinity conditions in marine inlets. The lugworm *Arenicola marina* and *Scoloplos armiger* are typically common along with the Baltic tellin *Macoma balthica* and cockle *Cerastoderma edule*. Amphipods such as the mud burrowing-amphipod *Corophium volutator* can be common, as well as polychaetes *Pygospio elegans* and *Nephtys hombergii*. The lugworm *Arenicola marina*, due to the variable recruitment success, may be absent, but *Scoloplos armiger* and other components of this biotope are still to be found. A black layer of anoxia is usually present within 5 cm of the sediment surface can be seen in the worm casts on the surface. The presence of *Hediste* (*Nereis*) *diversicolor* and oligochaetes usually indicates the more sheltered and muddy biotope LMU.HedMac.Are. The presence of *Mya arenaria* in abundance is described in LMS.MacAre.Mare. The biotope LMS.PCer is similar to this biotope, but is generally less muddy and has a higher frequency of amphipods such as *Bathyporeia* spp. and *Cerastoderma edule*. *Arenicola marina* may be dense (usually due to temporary recruitment) on more wave-exposed sandy shores with *Nephtys cirrosa* and *Bathyporeia* spp., LGS.AP.P.

Similar biotopes

LMS.PCer	Similar habitat but without the numerical dominance of *Arenicola marina*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys hombergii	●●	●	Common
Scoloplos armiger	●●●	●●	Super abundant
Pygospio elegans	●●●●	●	Common
Chaetozone setosa	●	●●●	Present/Not known
Arenicola marina	●●●●	●	Abundant
Oligochaeta indet.	●●	●	Abundant
Hydrobia ulvae	●●●	●	Common
Cerastoderma edule	●●●	●	Common
Macoma balthica	●●●●	●	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	SW Inlets	Moore In prep.	SWI.44	

Frequency of occurrence

In Britain:	Common

MS *Muddy sand shores*

LMS.MacAre.Mare *Macoma balthica*, *Arenicola marina* and *Mya arenaria* in muddy sand shores

Habitat classification

Previous code

Salinity:	Full, Variable	LMX.Mya in part	96.7
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Muddy sand, fine sand		
Zone:	Eulittoral		
Height band:	Upper shore		

Biotope description

Sheltered muddy sand and fine sand on very and extremely sheltered shores of estuaries, lagoons and marine inlets with polychaetes and bivalves. The biotope is distinguishable from LMU.HedMac by the high abundance of *Mya arenaria* and other bivalves. The polychaetes *Nephtys hombergii*, *Scoloplos armiger*, *Pygospio elegans* and *Arenicola marina* and the bivalves *Cerastoderma edule*, *Macoma balthica* and *Mya arenaria* are characterising species. The substratum varies from fine sand to muddy sand, but the mud content is typically lower than that found in the biotopes LMU.HedMac, LMU.HedStr and LMU.HedScr and the frequency of *Hediste* (*Nereis*) *diversicolor* and oligochaetes is also lower. The presence of *Mya arenaria* is often very localised, such that specific estuaries or tributaries may show consistently high populations of the bivalve over many years e.g. River Orwell, Suffolk. Records of this biotope are currently limited; it is possible that this is a transition between the biotopes LMS.MacAre and LMU.HedMac.Mare. It is important to distinguish between the two species of *Mya* - *M. arenaria* and *M. truncata*.

Similar biotopes

LMU.HedMac.Mare	Similar bivalve component to the community
LMS.MacAre	Similar infaunal community, but lacking *Mya arenaria*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys hombergii	•••	•	Abundant
Scoloplos armiger	•••	••	Super abundant
Pygospio elegans	••••	•	Common
Arenicola marina	•••••	•	Super abundant
Hydrobia ulvae	•••	•	Common
Cerastoderma edule	•••	•	Abundant
Macoma balthica	••••	•	Abundant
Mya arenaria	•••••	••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	SE estuaries		MNCR data	

Frequency of occurrence

In Britain:	Scarce

Features of conservation interest

Mya arenaria is a slow-growing, long-lived bivalve species.

Potentially damaging activities

Activity	*Degree of effect*
Bait collecting	High
Introduction of non-native species	Moderate

Zos *Littoral Zostera (seagrass) beds*

LMS.Znol *Zostera noltii* beds in upper to mid shore muddy sand

Habitat classification — Previous code

Salinity:	Full, Variable	LMS.PCer.Znol	96.7
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	LMUD.HS.Z	6.95
Tidal streams:			
Substratum:	Muddy fine sand; sandy mud		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore		

Biotope description

Mid and upper shore wave-sheltered muddy fine sand or sandy mud with narrow-leafed eel grass *Zostera noltii* at an abundance of frequent or above. This is similar to polychaetes and *Cerastoderma edule* (LMS.PCer) since it is most frequently found on lower estuary and sheltered coastal muddy sands with a similar infauna. Exactly what determines the distribution of the *Zostera noltii* is, however, not entirely clear. *Zostera noltii* is often found in small lagoons and pools, remaining permanently submerged, and on sediment shores where the muddiness of the sediment retains water and stops the roots from drying out. A black layer is usually present below 5 cm sediment depth. The infaunal community is characterised by polychaetes *Pygospio elegans* and *Arenicola marina*, mud amphipods *Corophium volutator* and bivalves *Cerastoderma edule*, *Macoma balthica* and *Scrobicularia plana*. Typically an epifaunal community is found that includes the mud snail *Hydrobia ulvae*, shore crabs *Carcinus maenas* and the green alga *Enteromorpha* sp. This biotope should not be confused with IMS.Zmar which is a *Zostera marina* bed on the lower shore or shallow sublittoral clean or muddy sand.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pygospio elegans	•••	•	Common
Arenicola marina	••••	•	Frequent
Tubificoides	•••	•	Common
Corophium volutator	••	•	Frequent
Carcinus maenas	•••	•	Occasional
Littorina littorea	••	•	Frequent
Hydrobia ulvae	•••	•	Abundant
Cerastoderma edule	••••	•	Abundant
Macoma balthica	•••	•	Frequent
Scrobicularia plana	••	•••	Common
Enteromorpha	•••	•	Common
Zostera noltii	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	SE estuaries	Hill & Emblow In prep	R6.25	In part
Other	Sealochs	Howson, Connor & Holt 1994	SL27	=
Other	UK	Rodwell In prep	NVC SM1	In part

Frequency of occurrence

In Britain:	Scarce

Features of conservation interest

Best examples of this biotope would have extensive expanses of *Zostera noltii* in high abundance. *Z. noltii* is an important food source for shore birds. An apparently declining biotope possibly due to the pressure of land claim and pollution.

Potentially damaging activities

Activity	*Degree of effect*
Bait collecting	Moderate
Land take/claim/reclaim	Moderate

Sm *Saltmarsh*

LMU.NVC SM8 *Salicornia* spp.

Habitat classification

Previous code

Salinity:	Variable, Reduced / low	LMUD.SAL	6.95
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Muddy sediments		
Zone:	Supralittoral, Littoral fringe		
Height band:	Strandline, Upper shore		

Biotope description

Mud, often consolidated with coarse sand or gravel, on the extreme upper shore with *Salicornia* spp. plants forming a pioneer saltmarsh community. This habitat typically occurs in very sheltered estuarine conditions. Usually a reduced marine fauna is present which may include the amphipod *Corophium volutator*, the ragworm *Hediste* (*Nereis*) *diversicolor* and often the mud snail *Hydrobia ulvae*. The fucoid alga *Pelvetia canaliculata* may be found on hard substrata, consolidated mud or lying unattached. This community is equivalent to saltmarsh community SM8 in the National Vegetation Classification (Rodwell in prep.).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor			Abundant
Oligochaeta indet.			Common
Corophium volutator			Common
Hydrobia ulvae			Common
Pelvetia canaliculata			Occasional
Salicornia	••••	•••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	River Aln	Brazier & Murray 1994		
R6	Brancaster and Blakeney	Hill & Emblow In prep.		
R10	Mawddach Estuary		MNCR data	
Other	UK	Rodwell In prep.	NVC SM8	

Frequency of occurrence

In Britain:	Uncommon

SMu *Sandy mud shores*

LMU.HedMac *Hediste diversicolor* and *Macoma balthica* in sandy mud shores

Habitat classification

		Previous code	
Salinity:	Full, Variable	LMU.HedMac.Nhom in part	96.7
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	LMUD.HM	6.95
Tidal streams:			
Substratum:	Sandy mud; mud		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		
Other features:	Anoxic layer present		

Biotope description

Littoral sandy mud and mud in sheltered, often estuarine, conditions with a community of polychaetes together with the bivalve *Macoma balthica*. The most abundant large polychaete is typically *Hediste* (*Nereis*) *diversicolor*, which can be readily seen when digging over the sediment. Other smaller polychaetes include *Eteone longa*, *Nephtys hombergii*, *Tharyx marioni*, *Pygospio elegans*, *Arenicola marina* and *Manayunkia aestuarina*. Oligochaete worms (e.g. *Tubificoides benedii*, *T. pseudogaster* and enchytraeids) are common or abundant and the amphipod *Corophium volutator* may be abundant. The mud snail *Hydrobia ulvae* is often common, with individuals or their fine tracks visible on the mud surface. The bivalve *Macoma balthica* may be accompanied by *Cerastoderma edule*, *Abra tenuis* and *Mya arenaria*. The surface of the mud may be covered with green algae such as *Enteromorpha* spp. or *Ulva lactuca*. There is usually a black anoxic layer close to the sediment surface. LMU.HedStr is a similar biotope that is associated with muddier sediment in reduced salinity conditions with *Streblospio shrubsolii*, *Manayunkia aestuarina* or *Tharyx killariensis* and with fewer bivalves. Three variations of this biotope are recognised: HedMac.Are, HedMac.Pyg and HedMac.Mare.

Similar biotopes

LMU.HedStr	Transition to a more sheltered, muddier habitat

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Eteone longa		•	Common
Hediste diversicolor	•••••	•	Abundant
Nephtys hombergii		••	Common
Pygospio elegans		•	Common
Oligochaeta indet.	••	•	Common
Tubificoides		••	Common
Corophium volutator	•••	•	Common
Hydrobia ulvae	•••	•	Common
Cerastoderma edule		••	Occasional
Macoma balthica	•••••	•	Common

Frequency of occurrence

In Britain:	Common

SMu *Sandy mud shores*

LMU.HedMac.Are *Hediste diversicolor*, *Macoma balthica* and *Arenicola marina* in muddy sand or sandy mud shores

Habitat classification / Previous code

Salinity:	Full, Variable	LMU.HedMac.Cer in part	96.7
Wave exposure:	Moderately exposed, Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Muddy sand		
Zone:	Eulittoral		
Height band:	Mid shore		
Other features:	Anoxic layer present		

Biotope description

Mid shore muddy sand in estuaries, sheltered bays and marine inlets. This is the least sheltered and least muddy sub-type of LMU.HedMac, with the lugworm *Arenicola marina* usually abundant or as the numerically dominant polychaete and *Cerastoderma edule* relatively frequent. The following characterising species are typically present *Eteone longa*, *Hediste* (*Nereis*) *diversicolor*, *Pygospio elegans*, oligochaetes, the mud-burrowing amphipod *Corophium volutator*, the mud snail *Hydrobia ulvae* and the Baltic tellin *Macoma balthica*. Typically a black anoxic layer is present below 5 cm and this can be seen in the *Arenicola marina* casts. The community differs from LMS.MacAre in the muddiness of the sand and the high abundance of certain species including *Hediste diversicolor*, oligochaetes and *Corophium volutator*. LMU.HedMac.Pyg is similar to this biotope, but does not have the significant numbers of *Arenicola marina*, whilst LMU.HedMac.Mare has a rich bivalve content including *Mya arenaria*. This biotope can be considered as intermediate between LMS.MacAre and LMU.HedMac.Pyg.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Eteone longa	•••	•	Abundant
Hediste diversicolor	•••••	•	Abundant
Pygospio elegans	••••	•	Common
Arenicola marina	•••••	•	Abundant
Oligochaeta indet.	•••	•	Common
Tubificoides benedii	••	•	Common
Corophium volutator	•••	•	Common
Hydrobia ulvae	•••	•	Common
Cerastoderma edule	••	•	Abundant
Macoma balthica	•••••	•	Common

Frequency of occurrence

In Britain:	Common

SMu *Sandy mud shores*

LMU.HedMac.Pyg *Hediste diversicolor*, *Macoma balthica* and *Pygospio elegans* in sandy mud shores

Habitat classification

		Previous code	
Salinity:	Full, Variable	LMU.HedMac in part	96.7
Wave exposure:	Sheltered, Very sheltered		
Tidal streams:			
Substratum:	Sandy mud		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Mid and lower shore muddy sand in estuaries, sheltered bays and marine inlets sometimes subject to variable salinity. This sub-type of LMU.HedMac is characterised by the polychaetes *Eteone longa*, *Hediste* (*Nereis*) *diversicolor*, *Pygospio elegans*, *Capitella capitata*, oligochaetes (particularly *Tubificoides benedii*), the mud-burrowing amphipod *Corophium volutator*, the mud snail *Hydrobia ulvae* and the Baltic tellin *Macoma balthica*. The polychaetes *Mediomastus fragilis* and *Marenzelleria* spp. are found predominantly in this biotope. None of the characterising species are especially faithful to this biotope, since they are found in most littoral muddy sediments. Bivalves other than *Macoma balthica* and the cockle *Cerastoderma edule* are typically only present in low abundance, as are the polychaetes *Arenicola marina*, *Streblospio shrubsolii* and *Manayunkia aestuarina*. The similar biotope LMU.HedMac.Are contains the polychaetes *Arenicola marina* and *Scoloplos armiger* in higher abundance than in this biotope, and *Nephtys cirrosa* is also usually found in LMU.HedMac.Are. LMU.HedMac.Pyg is typically muddier than LMU.HedMac.Are, but not as muddy as LMU.HedStr, whilst the similar biotope LMU.HedOl has a much reduced polychaete fauna.

Similar biotopes

LMU.HedMac.Are	Very similar infauna, but is slightly less muddy and characterised by *Arenicola marina* and *Scoloplos armiger*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Eteone longa	•••	•	Abundant
Hediste diversicolor	••••	•	Abundant
Marenzelleria	••	•••	Common
Pygospio elegans	•••••	•	Common
Capitella capitata	••	•	Common
Oligochaeta indet.	•••	•	Abundant
Corophium volutator	•••	•	Common
Hydrobia ulvae	••	•	Common
Macoma balthica	••••	•	Common

Frequency of occurrence

In Britain:	Common

SMu *Sandy mud shores*

LMU.HedMac.Mare *Hediste diversicolor*, *Macoma balthica* and *Mya arenaria* in sandy mud shores

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Sandy mud		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Mid and low shore sandy mud in fully marine and variable salinity, sheltered to extremely sheltered estuaries, bays and marine inlets. This sub-type biotope of LMU.HedMac is differentiated from other LMU.HedMac biotopes in having *Mya arenaria* in high densities in most cases. Polychaetes *Eteone longa*, *Hediste* (*Nereis*) *diversicolor*, *Pygospio elegans*, oligochaetes, the mud-burrowing amphipod *Corophium volutator*, the mud snail *Hydrobia ulvae*, the cockle *Cerastoderma edule*, the Baltic tellin *Macoma balthica* and the soft clam *Mya arenaria* are the most frequently recorded and characterising species. The sediment is typically anoxic below 1 cm. The presence of *Mya* is usually indicated by jets of water of up to 50 cm high over the sediment surface, but should be confirmed through digging up the bivalve. The species that are found in LMU.HedStr can sometimes be present in high abundance in this biotope, reflecting the similarity of LMU.HedStr to this biotope. The tolerance to reduced salinity and substratum type of *Mya arenaria* is such that this biotope overlaps with LMS.MacAre and with LMU.HedStr; the significance of *Mya arenaria* as a characterising species is therefore unclear, but the conspicuousness of this species makes it a useful indicator of this habitat type. LMU.HedMac.Pyg is similar to this biotope, but contains very few *Mya arenaria*. LMU.HedScr can have a similarly rich bivalve component, but is usually restricted to reduced salinity mud habitats. LMU.HedOl has a much reduced polychaete and bivalve fauna compared to LMU.HedMac.Mare. This biotope is more muddy and probably more influenced by variable salinity than LMS.MacAre.Mare. A similar biotope that has a substratum with more gravel and pebbles and is limited to the lower shore is LMX.Mare. Like LMS.MacAre.Mare, the high densities of *Mya arenaria* can be very localised and be specific to certain estuaries or tributaries within estuaries over long periods of time.

Similar biotopes

LMU.HedMac.Pyg	Similar infaunal assemblage, but lacking high abundance of *Mya arenaria*
LMS.MacAre.Mare	Not so influenced by reduced salinity, more sandy

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nematoda indet.	••	••	Common
Eteone longa	•••	•	Abundant
Hediste diversicolor	•••••	•	Super abundant
Pygospio elegans	••••	•	Common
Oligochaeta indet.	••••	•	Abundant
Corophium volutator	•••	•	Abundant
Hydrobia ulvae	••	•	Common
Cerastoderma edule	•••	•	Rare
Macoma balthica	••••	•	Common
Mya arenaria	•••••	••	Super abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Invergowrie Bay, Firth of Tay	Jones, Herbert & McManus 1989		
R6	River Orwell	Beardall, Gooch & Pilcher 1990		
R7	Poole Harbour	Institute of Offshore Engineering 1986		
R11	Inner Solway	Covey & Emblow 1992		

Frequency of occurrence

In Britain:	Scarce

Features of conservation interest

Mya arenaria is a long-lived species that may have a slow rate of recruitment.

Potentially damaging activities

Activity	*Degree of effect*
Bait collecting	Moderate
Introduction of non-native species	Moderate

Mu *Soft mud shores*

LMU.HedScr *Hediste diversicolor* and *Scrobicularia plana* in reduced salinity mud shores

Habitat classification

Previous code

Salinity:	Variable, Reduced / low	LMUD.HS	6.95
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Mud; sandy mud		
Zone:	Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		
Other features:	Anoxic layer present		

Biotope description

Mid and upper shore sandy mud and mud that is subject to variable and reduced salinity is typically colonised by the polychaete *Hediste* (*Nereis*) *diversicolor* and the bivalve *Scrobicularia plana*. The polychaetes *Eteone longa*, *Pygospio elegans* and *Streblospio shrubsolii*, oligochaetes, particularly *Tubificoides benedii* and the isopod *Cyathura carinata* are all characteristic of the infaunal assemblage. Other bivalves, such as the Baltic tellin *Macoma balthica* and cockle *Cerastoderma edule*, are also frequently recorded. The mud snail *Hydrobia ulvae* is usually common. The green alga *Ulva lactuca* may colonise the surface of the mud in the summer months or it may be covered by a mat of filamentous algae such as *Enteromorpha* spp. Typically, the sediment is wet in appearance and has an anoxic layer below 1 cm depth. The surface of the mud has the distinctive 'crows foot' pattern formed by *Scrobicularia plana*. The biotope LMU.HedStr is very similar, but with some differences in the polychaetes and bivalves recorded. In LMU.HedStr, the frequency and abundance of *Eteone longa* is lower, whilst the frequency of the polychaetes *Nephtys hombergii*, *Streblospio shrubsolii*, *Aphelochaeta marioni* and *Melinna palmata* is greater. The bivalve richness in LMU.HedScr is typically higher with a greater frequency of *Cerastoderma edule*, *Macoma balthica*, *Scrobicularia plana* and *Abra tenuis*. LMU.HedScr may be intermediate between LMU.HedStr and LMU.HedMac or LMU.HedMac.Mare. It is muddier and is subject to a lower salinity level than LMU.HedMac. The diversity of species recorded is much greater than in LMU.HedOl.

Similar biotopes

LMU.HedStr	Habitat very similar, but LMU.HedStr has fewer bivalve species and more polychaete species.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Eteone longa	●●●	●	Abundant
Hediste diversicolor	●●●●●	●	Abundant
Nephtys hombergii	●●	●	Common
Pygospio elegans	●●●	●	Common
Streblospio shrubsolii	●●●	●●●	Common
Tubificoides benedii	●●●	●	Abundant
Cyathura carinata	●●	●●	Common
Carcinus maenas	●●	●	Present/Not known
Hydrobia ulvae	●●●	●	Common
Cerastoderma edule	●●●	●	Common
Macoma balthica	●●●	●	Common
Scrobicularia plana	●●●●●	●●●	Super abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Blakeney	Hill & Emblow In prep.		
R6	Colne and Blackwater Estuaries	Dyer, Grist & Smith 1991		
R8	Christchurch Harbour	Dixon 1988		
R8	Axe Estuary	National Rivers Authority South West Region 1992		
R8	Exe Estuary	Dixon 1986		
R8	Teign Estuary	Frid 1989		
R8	Falmouth	Rostron 1985		
R9	Taw and Torridge estuaries	Little 1989		
R9	River Taf	Mercer 1989		
R9	Burry Inlet	Moore 1989	SWI.47	
R10	Estuaries		MNCR data	
R11	Inner Solway	Covey & Emblow 1992		

Frequency of occurrence

In Britain:	Uncommon

Mu *Soft mud shores*

LMU.HedStr *Hediste diversicolor* and *Streblospio shrubsolii* in sandy mud or soft mud shores

Habitat classification

		Previous code	
Salinity:	Variable, Reduced / low	LMU.HedMac.Man in part	96.7
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Mud; sandy mud		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		
Other features:	Black due to sediment anoxia; disturbed; possibly nutrient-enriched		

Biotope description

Sandy mud and mud shores in sheltered marine inlets and estuaries subject to variable or reduced salinity. The biotope is typically found on the mid and lower shores and is often associated with the presence of sea defences, rocky outcrops, rubble training walls or shallow layers of cobbles and pebbles in the sediment in the upper and mid estuary. In addition, the presence of nearby sewage outfalls or a high organic content probably influences the infaunal community. Tidal streams can be strong, further supporting the possibility that this biotope has a disturbed habitat. The infaunal polychaete community includes species with a limited salinity range tolerance such as *Streblospio shrubsolii*, *Tharyx killariensis* and *Manayunkia aestuarina*. In addition to the mentioned polychaetes, *Hediste* (*Nereis*) *diversicolor*, *Nephtys hombergii*, *Pygospio elegans*, the burrowing amphipod *Corophium volutator*, the mud snail *Hydrobia ulvae* and the bivalves *Macoma balthica* and *Abra tenuis* are characterising species. In the absence of the more frequently encountered characterising species, the presence of the isopod *Cyathura carinata* or polychaetes *Polydora* spp., *Heteromastus filiformis* or *Ampharete grubei* are also indicative of this biotope. The sediment is anoxic and black close to the surface and remains water saturated throughout the tidal cycle. The frequency and abundance of oligochaetes, particularly *Tubificoides benedii* and *Tubificoides pseudogaster*, is greater than in LMU.HedMac, whilst the closely related LMU.HedMac.Pyg rarely has *Streblospio shrubsolii* or *Manayunkia aestuarina* and has a greater frequency and abundance of *Cerastoderma edule* and *Eteone longa*. LMU.HedScr is similar to this biotope, but is slightly less muddy, has a higher frequency and abundance of bivalve species and a less diverse range of polychaete species, reflecting the more stable habitat of LMU.HedScr. The polychaete species richness is greater than in LMU.HedOl. The number of species that may be present in this biotope and the number of transition areas along salinity, wave-exposure and sediment particle size continua make this biotope potentially very variable in species content.

Similar biotopes

LMU.HedMac.Pyg	Similar substratum and more common species but LMU.HedMac.Pyg has fewer *Streblospio shrubsolii* and *Manayunkia aestuarina*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor	●●●●●	●	Abundant
Nephtys hombergii	●●●	●	Abundant
Pygospio elegans	●●●	●	Common
Streblospio shrubsolii	●●●●	●●●	Common
Tharyx killariensis	●	●●●	Common

Aphelochaeta marioni	••	•••	Abundant
Manayunkia aestuarina	••	••	Common
Tubificoides benedii	••••	•	Common
Corophium volutator	••	•	Common
Hydrobia ulvae	•••	•	Common
Macoma balthica	•••	•	Common
Abra tenuis	••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	River Orwell	Baxter 1989		
R6	Hamford Water, River Stour	Dyer, Grist & Smith 1991		
R6	Breydon Water	Johnson 1988		
R6	Rivers Blyth, Alde, Ore, Deben	Dyer, Grist & Smith 1991		
R7	Newtwon & Bembridge Harbours	Howard, Moore & Dixon 1988		
R7	Poole Harbour	Farnham [1977]		
R7	Langstone Harbour			
R8	Fal Estuary	Rostron 1985		
R8	Kingsbridge Estuary	Hiscock 1986		
R8	Plymouth Sound	Hiscock & Moore 1986		
R8	Christchurch Harbour	Dixon 1988		
R8	River Dart	Moore 1988		
R9	Severn Estuary			
R9	Cleddau, Daucleddau estuaries			

Frequency of occurrence

In Britain:	Common

Mu *Soft mud shores*

LMU.HedOl *Hediste diversicolor* and oligochaetes in low salinity mud shores

Habitat classification

Habitat classification		Previous code	
Salinity:	Reduced / low	LMUD.HO	6.95
Wave exposure:	Extremely sheltered		
Tidal streams:			
Substratum:	Mud; sandy mud		
Zone:	Littoral fringe, Eulittoral		
Height band:	Upper shore, Mid shore, Lower shore		

Biotope description

A low species-rich community found in soft mud in low salinity conditions, typically at the head of estuaries. Oligochaete worms (*Heterochaeta costata*, *Tubificoides benedii*, *T. pseudogaster* and enchytraeids) are common or abundant together with the ragworm *Hediste* (*Nereis*) *diversicolor* and sometimes the mud amphipod *Corophium volutator*. This biotope is distinguishable from other reduced salinity muddy sand communities (LMU.HedMac.Pyg, LMU.HedMac.Mare) and mud communities (LMU.HedStr and LMU.HedScr) by the absence of bivalves (except possibly for a few *Macoma balthica*) and a generally reduced polychaete fauna. The polychaete *Manayunkia aestuarina* may be common in more saline conditions, whilst at the very upper limit of the estuary only oligochaetes would be expected. *Corophium volutator* can be present in firmer mud. Filamentous algae such as *Enteromorpha* spp. may form mats on the surface of the mud during the summer months. The mud is often very soft and fluid, with a 'wet' surface appearance. LMU.HedStr has a similar habitat but is not exposed to such low salinity levels.

Similar biotopes

LMU.HedStr	Similar substratum, high levels of oligochaetes

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor	••••	•	Abundant
Oligochaeta indet.		•	Abundant
Heterochaeta costata	••	•••	Common
Tubificoides benedii	••	•	Abundant
Corophium volutator	••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Findhorn	Wells & Boyle 1974		
R5	NE England estuaries	Brazier & Murray 1994		
R6	River Orwell	Beardall, Gooch & Pilcher 1990		
R6	River Stour	Hill & Emblow In prep		
R8	Fal Estuary	Moore In prep.	SWI.48	
R9	Severn estuary	Morrisey & Sait 1988		
R10	Estuaries		MNCR data	
R11	Inner Solway Firth	Covey & Emblow 1992		
R11	Ravenglass estuary	Davies 1992		
R11	Inner Mersey estuary	Bamber 1988		
R13	Loch Etive	Gage 1974		?

Frequency of occurrence

In Britain:	Uncommon

LMX.MytFab *Mytilus edulis* and *Fabricia sabella* on poorly-sorted muddy sand or muddy gravel shores

Habitat classification

Salinity:	Full		
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:			
Substratum:	Muddy sand; gravel; stones		
Zone:	Littoral fringe, Eulittoral		
Other features:	Strand algae usually present		

Biotope description

Pebbles, gravel or sand with mud in sheltered Firths with strand of fucoid algae which has a limited infauna characterised by juvenile infaunal *Mytilus edulis*, often in very high numbers. Polychaetes such as *Fabricia sabella*, *Scoloplos armiger*, *Pygospio elegans* and *Hediste* (*Nereis*) *diversicolor* and bivalves *Macoma balthica* and *Cerastoderma edule* typical of muddy sediments characterise the community. *Fabricia sabella* is typically found amongst algal holdfasts and between cobbles on rocky shores. This biotope description is devised mainly from records from the Dornoch Firth and Moray Firth. [More records are needed to verify this biotope].

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Lineus	●●●	●●	Abundant
Scoloplos armiger	●●●●	●●	Super abundant
Pygospio elegans	●●●●●	●	Abundant
Arenicola marina	●●●	●	Abundant
Fabricia sabella	●●●●●	●●●	Common
Oligochaeta indet.	●●●●●	●	Common
Hydrobia ulvae	●●●	●	Abundant
Mytilus edulis	●●●●●	●	Abundant
Cerastoderma edule	●●●	●	Abundant
Macoma balthica	●●●●●	●	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Dornoch Firth	Wells & Boyle 1973		
R4	Moray Firth	Wells & Boyle 1975		
R8	Plymouth	Hiscock & Moore 1986		

Frequency of occurrence

In Britain:	Uncommon

LMX.Mare *Mya arenaria* and polychaetes in muddy gravel shores

Habitat classification / Previous code

Salinity:	Reduced / low	LMX.Mya	96.7
Wave exposure:	Very sheltered	LMGR.MYA	6.95
Tidal streams:			
Substratum:	Mixed sediment		
Zone:	Eulittoral		
Height band:	Mid shore, Lower shore		

Biotope description

Lower shore mixed sediment subject to reduced salinity in very sheltered marine inlets with the clam *Mya arenaria*, polychaetes and amphipods. The substratum consists of sand, gravel, pebbles and cobbles in varying degrees, usually with a small amount of silt. The infauna are characterised by the polychaetes *Eteone longa*, *Anaitides maculata*, *Hediste* (*Nereis*) *diversicolor*, *Scoloplos armiger*, *Pygospio elegans* and *Tharyx killariensis*, oligochaetes, amphipods including *Urothoe poseidonis*, *Bathyporeia pilosa* and *Gammarus locusta*, the mud snail *Hydrobia ulvae* and the bivalves *Cerastoderma edule* and *Mya arenaria*. Due to the stony nature of the sediment it is often not particularly well sampled. The presence of larger stones and cobbles on the surface leads to the growth of fucoids and other seaweeds (see SLR.FserX.T). [Further records are required to substantiate this biotope].

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hediste diversicolor	••	•	Present/Not known
Nephtys hombergii	••	•	Present/Not known
Cirriformia tentaculata	••	••	Present/Not known
Arenicola marina	•••	•	Occasional
Lanice conchilega	••	•	Occasional
Littorina littorea	••	•	Occasional
Mytilus edulis	••	•	Frequent
Cerastoderma edule	•••	•	Frequent
Mya arenaria	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Falmouth	Rostron 1985		
R8	River Dart	Horsman 1986		
R12	Loch Fyne	Davies 1989		
R13	Loch Sween	Earll 1984		
R15	Loch Inchard	Holt 1991		

Frequency of occurrence

In Britain:	Scarce

Features of conservation interest

Epifaunal species include a number of delicate species that are susceptible to trampling.

Potentially damaging activities

Activity	*Degree of effect*
Bait collecting	Very high
Introduction of non-native species	Moderate
Recreation (inc. establishment of facilities and use of all terrain vehicles)	High
Refuse and resultant beach litter	Low

6.5 Sublittoral (extreme lower shore) rock biotopes

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.Ala *Alaria esculenta* on exposed sublittoral fringe bedrock

Habitat classification

Salinity:	Full		
Wave exposure:	Extremely exposed, Very exposed, Exposed		
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock; very large boulders		
Zone:	Sublittoral fringe		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

Alaria esculenta forest on exposed sublittoral fringe bedrock with an encrusting fauna of mussels and barnacles. The rock surface is covered with encrusting coralline red algae. Two variants of this biotope are described. The more wave exposed of the two lacks *Laminaria digitata* and is also characterised by patches of mussels (EIR.Ala.Myt). The other variant is slightly less exposed and is characterised by a mixture of *A. esculenta* and *L. digitata* (EIR.Ala.Ldig).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	●●●	●	Frequent
Balanus crenatus	●	●	Frequent
Corallina officinalis	●●●	●	Frequent
Alaria esculenta	●●●●●	●●●	Abundant

Frequency of occurrence

In Britain:	Very common

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.Ala.Myt *Alaria esculenta*, *Mytilus edulis* and coralline crusts on very exposed sublittoral fringe bedrock

Habitat classification

Habitat classification		Previous code	
Salinity:	Full	LRK.AL	6.95
Wave exposure:	Very exposed		
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock		
Zone:	Sublittoral fringe		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

Very exposed sublittoral fringe bedrock characterised by the kelp *Alaria esculenta* and dense patches of small *Mytilus edulis*, both of which grow over a dense cover of encrusting coralline algae. Foliose red algae may also be present, but the species composition and their abundance varies between sites. Species such as *Corallina officinalis*, *Mastocarpus stellatus* and *Plocamium cartilagineum* occur widely. Limpets and barnacles are often common. Patches of anemones (such as *Sagartia elegans*) and the hydroid *Tubularia indivisa* also occur in wave-surged areas. *Laminaria digitata* is usually absent, although stunted plants may be present at a few sites (typically greater than frequent). On very exposed shores this biotope is usually found beneath the *Mytilus edulis*-barnacle zone (ELR.MytB) and above the sublittoral *Laminaria hyperborea* forest (EIR.LhypR or EIR.LhypFa). In extremely exposed areas the *Alaria* zone may extend as deep at 15 m, where it generally has less *Mytilus* and greater densities of *Tubularia* (e.g. Barra and shallow areas of Rockall). This biotope is, however, distinguished from the deep *Alaria* forest (EIR.AlaAnSC) found on Rockall by its lack of short turf-forming hydroids. On less exposed shores an *Alaria*-dominated zone may, however, lie immediately above a narrow *Laminaria digitata* zone (MIR.Ldig). This biotope can also occur on exposed steep or vertical shores, where wave-crash restricts the growth of *Laminaria digitata*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Semibalanus balanoides	•••	•	Frequent
Patella vulgata	••••	•	Common
Mytilus edulis	•••	•	Abundant
Corallina officinalis	••••	•	Frequent
Lithothamnion	••	•	Common
Alaria esculenta	••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	H18	
R1	Shetland		R1.Ala.Myt	=
R3	N Scotland	Tittley *et al*. 1985		
R5	SE Scotland / NE England	Foster-Smith 1992		
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.44	In part
R8	Open coast		R8.Aesc	=
R9	Pembrokeshire	Cartlidge & Hiscock 1980	4.2	
R9	Pembrokeshire	Cartlidge & Hiscock 1979	4.2.2/3	
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.10	
R13	Inner Hebrides	Mitchell, Earll & Dipper 1983	p164	

R14	Barra		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL18	In part
Other	Chalk coasts	George, Tittley & Wood In prep	LR26	In part

Frequency of occurrence

In Britain:	Common

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.Ala.Ldig *Alaria esculenta* and *Laminaria digitata* on exposed sublittoral fringe bedrock

Habitat classification

		Previous code	
Salinity:	Full	LRK.LDIG.AL	6.95
Wave exposure:	Exposed		
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock		
Zone:	Sublittoral fringe		
Height band:	Lower shore		
Depth band:	0-5 m		
Other features:	On vertical and very steep rock on moderately exposed shores		

Biotope description

Exposed sublittoral fringe bedrock characterised by a mixture of *Laminaria digitata* and *Alaria esculenta* with anemones, mussels *Mytilus edulis* and barnacles growing over a coralline algal crust. The bryozoan crust *Umbonula littoralis* is typical of this zone on the shore and the barnacle *Verruca stroemia* may be present. This biotope also occurs on less exposed steep and vertical shores where a localised increase in wave action restricts the growth of *L. digitata*. As a result of this increased wave action the *L. digitata* plants are usually small and often show signs of damage. EIR.Ala.Ldig represents an intermediate on the wave exposure gradient, with pure stands of *Alaria esculenta* (EIR.Ala.Myt) being found on more exposed shores and pure *Laminaria digitata* (MIR.Ldig) on more sheltered shores. This biotope has a greater abundance of *Mytilus edulis*, limpets and coralline algae compared with MIR.Ldig. In contrast with the more exposed EIR.Ala.Myt, this biotope has a greater diversity of foliose red algae, including *Cryptopleura ramosa*, *Osmundea (Laurencia) pinnatifida* and *Lomentaria articulata*. This biotope usually occurs immediately above a sublittoral *Laminaria hyperborea* forest (EIR.LhypR or MIR.Lhyp), although a narrow band of *L. digitata* (MIR.Ldig) may occur between these two zones. On exposed shores in the north, *Alaria* alone tends to occupy the sublittoral fringe. A number of different biotopes may be found above EIR.Ala.Ldig; most commonly these are *Himanthalia elongata* (ELR.Him), a red algal turf (MLR.R) or a *Fucus serratus*-red algal mosaic (MLR.Fser.R).

Similar biotopes

EIR.Ala.Myt	Is also characterised by *Alaria*, but EIR.Ala.Ldig has *L. digitata* as well.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	••	Occasional
Semibalanus balanoides	••	••	Occasional
Patella vulgata	••	•	Frequent
Helcion pellucidum	••	•	Frequent
Mytilus edulis	•••	•	Frequent
Umbonula littoralis	••	••	Occasional
Palmaria palmata	•••	•	Frequent
Corallina officinalis	•••	•	Frequent
Mastocarpus stellatus	•••	•	Frequent
Laminaria digitata	•••••	•••	Abundant
Alaria esculenta	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Ala.Ldig	=
R5	SE Scotland /NE England	Brazier *et al*. In prep.b	R5.44	In part
R9	N Cornwall	Maggs & Hiscock 1979	4.2.2	
R9	Padstow	Hiscock 1978	4.4.1	=
R9	Scillies	Hiscock 1984a		
R10	R10		R10.AlaLdig	=
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.6	
R13	Jura/Islay	Hiscock 1983	3.2.5	
Other	Sealochs	Howson, Connor & Holt 1994	SL18	=
Other	Chalk coasts	George, Tittley & Wood In prep	LR26	In part
Other	SW inlets	Moore In prep	SWI.50	=

Frequency of occurrence

In Britain:	Common

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Ldig *Laminaria digitata* on moderately exposed or tide-swept sublittoral fringe rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.LDIG	6.95
Wave exposure:	Exposed, Moderately exposed, Sheltered		
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock; boulders		
Zone:	Sublittoral fringe		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

Exposed to sheltered sublittoral fringe rock with a canopy of the kelp *Laminaria digitata*. Several variants of this biotope are described for moderately exposed, sheltered, tide-swept and boulder shores.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••	••	Occasional
Dynamena pumila	••	••	Occasional
Urticina felina	••	••	Occasional
Palmaria palmata	•••	•	Frequent
Corallinaceae	•••	•	Common
Corallina officinalis	•••	•	Frequent
Laminaria digitata	•••••	•••	Abundant

Frequency of occurrence

In Britain:	Very common

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Ldig.Ldig *Laminaria digitata* on moderately exposed sublittoral fringe rock

Habitat classification / Previous code

Salinity:	Full	LRK.LDIG.LDIG	6.95
Wave exposure:	Moderately exposed, Sheltered		
Tidal streams:	Weak		
Substratum:	Bedrock; boulders		
Zone:	Sublittoral fringe		
Depth band:	0-5 m		

Biotope description

Moderately exposed to sheltered sublittoral fringe bedrock or boulders dominated by a dense canopy of *Laminaria digitata* often with a wide range of filamentous and foliose red seaweeds beneath. The rocky substratum is usually covered by encrusting coralline algae, on which occasional limpets *Patella vulgata* and topshells *Gibbula* spp. graze. A wide variety of fauna occurs, including the sponge *Halichondria panicea*, barnacles (*Balanus crenatus* and *Semibalanus balanoides*) and occasional small mussels *Mytilus edulis*. Kelp holdfasts provide a refuge for a varied assemblage of species including sponges (e.g. *Leucosolenia* spp.), anemones (*Urticina felina*), limpets (*Helcion pellucidum*), crustaceans, encrusting bryozoans and colonial ascidians. This biotope is usually found beneath the *Fucus serratus* zone (MLR.Fser) and above the truly sublittoral *Laminaria hyperborea* zone (MIR.Lhyp). Other canopy-forming kelps such as *Alaria esculenta* and *Laminaria saccharina*, may occur although never at high abundance (compare with EIR.Ala.Ldig and SIR.Lsac.Ldig respectively). In areas where tidal water movement is increased, a richer *L. digitata*-dominated biotope (MIR.Ldig.T) generally replaces the sheltered shore *Laminaria saccharina* (SIR.Lsac) biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••	••	Frequent
Balanus crenatus	••	•	Frequent
Patella vulgata	••	•	Occasional
Helcion pellucidum	••	••	Occasional
Gibbula cineraria	•••	•	Occasional
Mytilus edulis	••	•	Occasional
Electra pilosa	•••	•	Occasional
Botryllus schlosseri	••	•	Occasional
Palmaria palmata	•••	•	Frequent
Corallinaceae	•••	•	Common
Corallina officinalis	•••	•	Frequent
Laminaria digitata	•••••	•••	Abundant
Fucus serratus	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Ldig.Ldig	=
R1	Sullom Voe	Tittley *et al*. 1985		=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.50	=
R7	R7 open coast		R7.Ldig.Ldig	=
R8	R8 open coast		R8.Ldig.R	=

R8	R8 open coast		R8.Ldig.CC	=
R8	Scillies	Hiscock 1984a	3.2.15	=
R11	E Irish Sea	Covey In prep.b	R11.27	In part
Other	Sealochs	Howson, Connor & Holt 1994	SL19	=
Other	Chalk coasts	George, Tittley & Wood In prep	SR3/4	In part
Other	SW inlets	Moore In prep	SWI.52	=

Frequency of occurrence

In Britain:	Very common

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Ldig.Ldig.Bo *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders

Habitat classification

Habitat classification		Previous code	
Salinity:	Full	MIR.Ldig.Bo	96.7
Wave exposure:	Moderately exposed, Sheltered	LRK.BSP in part	6.95
Tidal streams:	Moderately strong, Weak		
Substratum:	Boulders		
Zone:	Sublittoral fringe		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

This *Laminaria digitata* biotope is found on moderately exposed to sheltered boulder shores. Upper surfaces of the boulders are similar to MIR.Ldig.Ldig and are colonised by dense *Laminaria digitata*, beneath which are a variety of red seaweeds including *Mastocarpus stellatus*, *Lomentaria articulata*, *Osmundea (Laurencia) pinnatifida* and *Corallina officinalis*. Where space is available beneath the boulders there may be a rich assemblage of animals. Characteristic species include the hairy porcelain crab *Porcellana platycheles*, the smooth porcelain crab *Pisidia longicornis* and juvenile edible crabs *Cancer pagurus*. Also present beneath the boulders are often high densities of the barnacle *Balanus crenatus*, the keel worm *Pomatoceros* spp., spirorbid worms, gammarid amphipods and a few small gastropods and mussels. The encrusting bryozoans *Umbonula littoralis* and *Schizoporella unicornis* and encrusting colonies of the sponges *Hymeniacidon perleve* and *Halichondria panicea* are also typical of this habitat. The richest examples also contain a variety of brittlestars, ascidians and small hydroids.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••••	••	Frequent
Hymeniacidon perleve	••	••	Occasional
Halisarca dujardini	••••	••	Occasional
Pomatoceros triqueter	••••	•	Frequent
Spirorbidae	•••	•	Frequent
Balanus crenatus	•••	•	Frequent
Pisidia longicornis	•••	•	Occasional
Porcellana platycheles	••	•	Frequent
Cancer pagurus	•••	•	Rare
Gibbula cineraria	••••	•	Occasional
Mytilus edulis	••	•	Occasional
Umbonula littoralis	••	••	Frequent
Electra pilosa	•••••	•	Frequent
Botryllus schlosseri	••••	•	Occasional
Palmaria palmata	••••	•	Frequent
Corallinaceae	••••	•	Abundant
Corallina officinalis	••••	•	Occasional
Mastocarpus stellatus	••••	•	Frequent
Chondrus crispus	••••	•	Frequent
Membranoptera alata	••••	•	Occasional
Osmundea pinnatifida	••	•	Occasional
Laminaria digitata	••••	••	Common

Laminaria hyperborea	●●●	●	Frequent
Fucus serratus	●●●●	●●	Occasional
Ulva	●●●●	●	Occasional
Cladophora rupestris	●●●	●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R10	Wales open coast		R10.Ldig.Lsac	In part?
R11	Irish Sea	Covey In prep.b	R11.27	In part

Frequency of occurrence

In Britain:	Uncommon

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Ldig.T *Laminaria digitata*, ascidians and bryozoans on tide-swept sublittoral fringe rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.LDIG.T	6.95
Wave exposure:	Extremely sheltered		
Tidal streams:	Very strong, Strong, Moderately strong		
Substratum:	Bedrock; boulders; cobbles		
Zone:	Sublittoral fringe		
Height band:	Lower shore		

Biotope description

Very sheltered bedrock, boulders and cobbles that are subject to moderate to strong tidal water movement characterised by dense *Laminaria digitata*, ascidians and bryozoans. Species richness is generally greater than in the non tide-swept *L. digitata* biotope (MIR.Ldig.Ldig), with a greater abundance and wider range of foliose red seaweeds. The increased water movement encourages several filter-feeding faunal groups to occur. The sponges *Leucosolenia* spp., *Halichondria panicea* and *Hymeniacidon perleve* frequently occur on steep and overhanging faces. In addition, the ascidians *Ascidia conchilega*, *Dendrodoa grossularia* and colonial ascidians are also found. Areas where increased tidal movement influences such a community are in the narrows and/or intertidal sills of sealochs. This biotope may be found immediately below the tide-swept *Fucus serratus* biotope (SLR.Fserr.T). The sublittoral fringe of similarly sheltered shores that are not tide-swept are generally characterised by mixed *L. saccharina* and *L. digitata* (SIR.Lsac.Ldig) or *L. saccharina* (SIR.Lsac).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••	••	Occasional
Dynamena pumila	••	••	Occasional
Pomatoceros triqueter	••••	•	Occasional
Verruca stroemia	••	••	Occasional
Carcinus maenas	••••	•	Rare
Gibbula cineraria	••••	•	Occasional
Alcyonidium gelatinosum	••	••	Occasional
Alcyonidium hirsutum	•••	••	Frequent
Membranipora membranacea	•••	•	Occasional
Ascidia conchilega	••	•	Rare
Dendrodoa grossularia	•••	••	Occasional
Botryllus schlosseri	••••	•	Occasional
Botrylloides leachi	••	••	Occasional
Corallinaceae	••••	•	Common
Laminaria digitata	•••••	••	Abundant
Ulva	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL20	=
IR8	Mulroy Bay	Picton *et al.* 1994	MS13	?=

Frequency of occurrence

In Britain:	Scarce

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Ldig.Pid *Laminaria digitata* and piddocks on sublittoral fringe soft rock

Habitat classification

Previous code

Salinity:	Full	LRK.LDIG.PID	6.95
Wave exposure:	Moderately exposed		
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock; boulders		
Zone:	Sublittoral fringe		
Height band:	Lower shore		
Depth band:	0-5 m		
Other features:	Soft rock such as chalk and limestone		

Biotope description

Soft rock, such as chalk, in the sublittoral fringe characterised by *Laminaria digitata* and rock-boring animals such as piddocks (*Barnea candida*, *Pholas dactylus* and *Petricola pholadiformis*), the bivalve *Hiatella arctica* and worms *Polydora* spp. Beneath the kelp forest, a wide variety of red seaweeds, including *Corallina officinalis*, *Palmaria palmata*, *Chondrus crispus*, *Membranoptera alata* and *Halurus flosculosus*, may occur. Empty piddock burrows are often colonised by the anemones *Sagartia elegans* or by the sand-tube building worm *Sabellaria spinulosa*. The undersides of small chalk boulders are colonised by encrusting bryozoans, colonial ascidians and the keel worm *Pomatoceros lamarcki*. The boulders and any crevices within the chalk provide a refuge for small crustaceans such as *Carcinus maenas*, young *Cancer pagurus*, *Pagurus bernhardus* and *Porcellana platycheles*. [Further data and analysis still required].

Similar biotopes

MIR.Ldig.Ldig	MIR.Ldig.Pid is distinguished by its rock-boring species

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	●●●●●	●●	Occasional
Hymeniacidon perleve	●●●●	●●	Occasional
Tubularia indivisa	●●●●	●●	Present/Not known
Dynamena pumila	●●●●●	●●	Occasional
Actinia equina	●●●●	●	Rare
Nereis pelagica	●●●●	●	Rare
Polydora	●●●●●	●●	Common
Sabellaria spinulosa	●●●	●●	Common
Pomatoceros lamarcki	●●●●●	●	Rare
Semibalanus balanoides	●●●●	●	Occasional
Elminius modestus	●●●	●●	Rare
Amphipoda indet.	●●●●	●	Common
Porcellana platycheles	●●●●	●	Occasional
Mytilus edulis	●●●●	●	Occasional
Hiatella arctica	●●●●●	●●	Common
Pholas dactylus	●●●●●	●●	Common
Barnea candida	●●●●●	●●	Common
Membranipora membranacea	●●●●	●	Occasional
Electra pilosa	●●●●	●	Common

Bryozoa indet crusts	••••	•	Common
Palmaria palmata	••••	•	Common
Corallinaceae	••••	•	Abundant
Corallina officinalis	•••••	•	Common
Chondrus crispus	•••••	•	Common
Halurus flosculosus	••	•	Frequent
Membranoptera alata	••	•	Occasional
Polysiphonia fucoides	••••	•	Common
Laminaria digitata	••••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Thanet	Tittley & George 1993		
R7	Kent	Fincham & George 1986		
R7	Open coast		R7.Ldig.Pid	=
R7	East Sussex / Kent	Tittley *et al*. 1986		
R7	E & W Sussex	Tittley & George 1993		

Frequency of occurrence

In Britain:	Scarce

SedK *Sand or gravel-affected or disturbed kelp and seaweed communities*

MIR.Sac *Saccorhiza polyschides* and other opportunistic kelps on disturbed sublittoral fringe rock

Habitat classification

Habitat classification		Previous code	
Salinity:	Full	MIR.Spol	96.7
Wave exposure:	Exposed, Moderately exposed, Sheltered	LRK.SPOL	6.95
Tidal streams:	Weak		
Substratum:	Bedrock; boulders		
Zone:	Sublittoral fringe, Infralittoral - upper		
Height band:	Lower shore		
Depth band:	0-5 m		
Other features:	Disturbed (by storms or sand scour)		

Biotope description

The sublittoral fringe mainly in the south-west and west may be dominated by the kelp *Saccorhiza polyschides*. This opportunistic coloniser may replace *Laminaria digitata*, or *L. hyperborea* as the dominant kelp following disturbance of the canopy (such as through storm losses or sand scour). Being essentially a summer annual (it occasionally lasts into a second year), *S. polyschides* is particularly common close to rock/sand interfaces which are too scoured during winter months to allow the longer-living kelps to survive. As a result of its transient nature, the composition of this biotope is varied and it may contain several other kelp species, including *Laminaria digitata*, *Laminaria saccharina* and *Alaria esculenta*, at varying abundances. Beneath the kelp, the under-storey seaweeds include *Cladostephus spongiosus*, *Ceramium nodulosum*, *Dilsea carnosa* and coralline algae, all of which are tolerant to sand scour. On some shores (for example in Cornwall and south-west Ireland), *Saccorhiza polyschides* may compete so effectively with the other laminarians that it forms a well-defined zone between the *L. digitata* and *L. hyperborea* zones. In addition, in wave exposed areas, it may also dominate the infralittoral zone (see EIR.LsacSac).

Similar biotopes

EIR.LsacSac	EIR.LsacSac is found in the infralittoral on more wave exposed areas

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	••	Occasional
Gibbula cineraria	••	•	Frequent
Palmaria palmata	••	•	Common
Dilsea carnosa	••	•	Occasional
Callophyllis laciniata	••	•	Occasional
Corallinaceae	••	•	Frequent
Chondrus crispus	•••	•	Occasional
Polyides rotundus	••	•	Frequent
Plocamium cartilagineum	••	•	Occasional
Ceramium nodulosum	•••	•	Frequent
Cryptopleura ramosa	•••	•	Occasional
Brongniartella byssoides	••	•	Occasional
Cladostephus spongiosus	••	•	Occasional
Laminaria hyperborea	••	•	Common
Laminaria saccharina	•••	••	Occasional
Saccorhiza polyschides	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	R8 open coast		R8.Spol	=
R8	R8 open coast		R8.Spol.R	=
Other	Chalk coasts	George, Tittley & Wood In prep	LR29	=

Frequency of occurrence

In Britain:	Uncommon

K *Silted kelp (stable rock)*

SIR.Lsac *Laminaria saccharina* on very sheltered infralittoral rock

Habitat classification

Salinity:	Full, Variable		
Wave exposure:	Very sheltered		
Tidal streams:	Weak, Very weak		
Substratum:	Bedrock; boulders		
Zone:	Infralittoral		

Biotope description

Very sheltered infralittoral rock dominated by *Laminaria saccharina*. Typically very silty and often with few associated seaweeds due to siltation, grazing or shading from the dense kelp canopy.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Gibbula cineraria	●●●	●	Occasional
Asterias rubens	●●●	●	Occasional
Echinus esculentus	●●●	●	Occasional
Corallinaceae	●●●	●	Frequent
Laminaria saccharina	●●●●●	●	Frequent

Frequency of occurrence

In Britain:	Common

K *Silted kelp (stable rock)*

SIR.Lsac.Ldig *Laminaria saccharina* and *Laminaria digitata* on sheltered sublittoral fringe rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.LDIG.LSAC	6.95
Wave exposure:	Moderately exposed, Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Weak		
Substratum:	Bedrock; boulders; cobbles		
Zone:	Sublittoral fringe		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

Sheltered bedrock and boulders in the sublittoral fringe may be characterised by a mixed canopy of the kelps *Laminaria digitata* (usually in its broad-fronded cape form) and *Laminaria saccharina* (both species generally frequent or greater). Beneath the canopy a wide variety of red seaweeds, including *Palmaria palmata*, *Corallina officinalis*, *Mastocarpus stellatus*, *Chondrus crispus* and *Plocamium cartilagineum*, may be present. The surface of the rock is usually covered with encrusting coralline algae; there may be patches of the sponge *Halichondria panicea* frequently occurs in cracks in the rock. Beneath and between boulders a variety of mobile crustaceans (*Carcinus maenas*, *Cancer pagurus* and *Porcellana platycheles*), spirorbid worms, starfish (*Asterias rubens*) and encrusting bryozoans are common. On such sheltered shores the transition between sublittoral fringe and the true sublittoral zone may not be distinct; this biotope therefore extends into the shallow sublittoral.

Similar biotopes

SIR.Lsac.Ft	SIR.Lsac.Ft lacks *Laminaria digitata* and generally occurs in the upper infralittoral, below SIR.Lsac.Ldig

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	••	Occasional
Gibbula cineraria	••	•	Frequent
Electra pilosa	••	•	Frequent
Botryllus schlosseri	••	•	Occasional
Palmaria palmata	••	•	Frequent
Corallinaceae	•••	•	Frequent
Corallina officinalis	••	•	Frequent
Mastocarpus stellatus	••	•	Frequent
Chondrus crispus	•••	•	Occasional
Ceramium nodulosum	••	•	Occasional
Laminaria digitata	•••••	••	Common
Laminaria saccharina	•••••	••	Frequent
Fucus serratus	••	••	Frequent
Enteromorpha	••	•	Occasional
Ulva	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*

R1	Shetland		R1.Lsac.Ldig	=
R1	Foula	Penny, Young & Goodman 1982		
R1	Shetland	Institute of Terrestrial Ecology 1975		
R7	R7 open coast		R7.Lsac.Ldig	=
R7	Seven Sisters	Wood & Jones 1986		
R8	Scillies	Hiscock 1984a		
R10	R10 open coast		R10.Ldig.Lsac	In part
R14	Harris/Lewis	Howson 1989		
R15	Lochs Duich/Long/Alsh	Connor 1989	4.2.4	
Other	SW inlets	Moore In prep	SWI.58	
Other	Chalk coast	George, Tittley & Wood In prep	LR27/SR7	In part

Frequency of occurrence

In Britain:	Common

K *Silted kelp (stable rock)*

SIR.Lsac.Ft *Laminaria saccharina* forest on very sheltered upper infralittoral rock

Habitat classification

		Previous code	
Salinity:	Full	LRK.LSAC	6.95
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:	Weak		
Substratum:	Bedrock; boulders; cobbles		
Zone:	Sublittoral fringe, Infralittoral - upper		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

Very to extremely sheltered sublittoral fringe and infralittoral bedrock, boulders and cobbles may be characterised by a dense canopy of *Laminaria saccharina*. In such sheltered conditions a distinct sublittoral fringe is not always apparent and this biotope often extends from below the *Fucus serratus* zone (SLR.Fserr) into the upper infralittoral zone, though there may be a mixed *Laminaria saccharina* and *Laminaria digitata* (SIR.Lsac.Ldig) zone between. This biotope has a relatively low species richness due to heavy siltation of the habitat and the lack of light penetrating through the dense kelp canopy. Only a few species of red seaweed, such as *Ceramium* spp., *Chondrus crispus* and *Palmaria palmata* may be present (compare with SIR.Lsac.Ldig), whilst limpets, barnacles and littorinids are rare. Saddle oysters *Pododesmus patelliformis* and chitons may occur in high abundance at some sites. In very sheltered but tide-swept habitats, the *L. saccharina* tends to be replaced by *L. digitata* (MIR.Ldig.T) in the sublittoral fringe.

Similar biotopes

SIR.Lsac.Ldig	SIR.Lsac.Ft may occur below and lacks *Laminaria digitata*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	●●●	●	Frequent
Pagurus bernhardus	●●	●	Occasional
Carcinus maenas	●●	●	Occasional
Gibbula cineraria	●●●	●	Occasional
Asterias rubens	●●●	●	Occasional
Echinus esculentus	●●●	●	Occasional
Corallinaceae	●●●	●	Common
Delesseria sanguinea	●●	●	Occasional
Phycodrys rubens	●●	●	Frequent
Chorda filum	●●●	●	Frequent
Laminaria saccharina	●●●●●	●●	Abundant
Ulva	●●	●	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Lsac.Ft	=
R1	Shetland	Hiscock 1989		
R1	Shetland	Hiscock 1986a	8	
R1	Shetland	Earll 1982a	D	

R1	Shetland	Moss & Ackers 1987	4.2.3	
R1	Shetland	Howson 1988	H25	
R2	Orkney		R2-4.Lsac.Ft	=
R9	Padstow	Hiscock 1978	5.1.4	
Other	Sealochs	Howson, Connor & Holt 1994	SL39	
Other	Sealochs	Howson, Connor & Holt 1994	SL45	?
Other	Sealochs	Howson, Connor & Holt 1994	SL46	?
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.16	
Other	Chalk coasts	George, Tittley & Wood In prep	SR7	In part

Frequency of occurrence

In Britain:	Common

6.6 Sublittoral (extreme lower shore) sediment biotopes

Sgr *Seagrass beds (sublittoral / lower shore)*

IMS.Zmar *Zostera marina/angustifolia* beds in lower shore or infralittoral clean or muddy sand

Habitat classification / Previous code

Salinity:	Full	IGS.Zmar	96.7
Wave exposure:	Sheltered, Very sheltered	IMS.ZmarBv	96.7
Tidal streams:	Very weak	LMSND.ZOS	6.95
Substratum:	Clean sand to muddy fine sand or mud		
Zone:	Infralittoral		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

Expanses of clean or muddy fine sand in shallow water and on the lower shore (typically to about 5 m depth) can have dense stands of *Zostera marina/angustifolia* [Note: the taxonomic status of *Z. angustifolia* is currently under consideration]. In IMS.Zmar the community composition may be dominated by these *Zostera* species and therefore characterised by the associated biota. Other biota present can be closely related to that of areas of sediment not containing *Zostera marina*, for example, *Laminaria saccharina*, *Chorda filum* and infaunal species such as *Ensis* spp. and *Echinocardium cordatum* (e.g. Bamber 1993) and other bivalves listed below. It should be noted that sparse beds of *Zostera marina* may be more readily characterised by their infaunal community. Beds of this biotope in the south-west of Britain may contain conspicuous and distinctive assemblages of Lusitanian fauna such as *Laomedea angulata*, *Hippocampus* spp. and Stauromedusae. Some examples of *Zostera marina* beds have markedly anoxic sediments associated with them.

Similar biotopes

IMS.EcorEns	The overlap between these two biotopes requires examination

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Anemonia viridis	••	•	Frequent
Arenicola marina	••	•	Occasional
Lanice conchilega	••	•	Occasional
Pagurus bernhardus	••	•	Occasional
Carcinus maenas	•••	•	Occasional
Gibbula cineraria	••	•	Occasional
Hinia reticulata	••	•	Occasional
Chorda filum	••	•	Frequent
Laminaria saccharina	••	•	Occasional
Zostera marina	•••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Hiscock 1989		
R1	Whiteness Voe	Rostron 1989		
R1	Shetland	Howson 1988	H42	
R2	Orkney lagoons	Covey, Thorpe & Nichols In prep	Lag.32	
R4	East Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.32	
R8	Salcombe, Plymouth Sound, Fal	Moore In prep	SWI.82	

R8	Isles of Scilly	Rostron 1983	ST 17 & 63	
R8	Isles of Scilly	Hiscock 1984a	11 & 3.2.20	
R9	W. Pembrokeshire	Hiscock 1980		
R9	Skomer	Bunker & Hiscock 1987		
R10			R10.Zmar	
R12	Loch Ryan/Fyne	Howson, Connor & Holt 1994	SL75	
R13	Loch Sween	Howson, Connor & Holt 1994		
R13	Islay/Jura	Hiscock 1983	3.2.21	
R13	Loch Ailort/Sunart	Howson, Connor & Holt 1994	SL75	
R13	Mull	Bishop 1984		
R14	Loch Roag	Dipper 1983	4.2.3.1	
R14	Loch Boisdale	Howson, Connor & Holt 1994	SL75	
R14	Outer Hebrides lagoons	Covey, Thorpe & Nichols In prep	Lag.32	
R15	Small Isles	Dipper 1981	4.2.5	
R15	Loch na Cairidh/Gairloch	Howson, Connor & Holt 1994	SL75	
IR1	N. Ireland	Erwin *et al*. 1990	p38	
IR8	Mulroy Bay	Picton *et al*. 1994	MS12, MS16	
Other	Norway	Connor 1991	NF14	
Other	UK	Rodwell In prep	NVC SM1	In part

Frequency of occurrence

In Britain:	Uncommon

Features of conservation interest

Seagrass beds are a 'key habitat' in the UK Biodiversity Action Plan (see Anon. 1995)

Sgr *Seagrass beds (sublittoral / lower shore)*

IMS.Rup *Ruppia maritima* in reduced salinity infralittoral muddy sand

Habitat classification

Salinity:	Reduced / low		
Wave exposure:	Extremely sheltered		
Tidal streams:	Very weak		
Substratum:	Muddy fine sand to mud		
Zone:	Infralittoral		
Depth band:	0-5 m		

Biotope description

In sheltered brackish muddy sand and mud, beds of *Ruppia maritima* and more rarely *Ruppia spiralis* may occur. These beds may be populated by fish such as *Gasterosteus aculeatus* and *Spinachia spinachia* which are less common on filamentous algal-dominated sediments. Seaweeds such as *Chaetomorpha* spp., *Enteromorpha* spp., and *Chorda filum* are also often present. In some cases the stoneworts *Chara aspera* and *Lamprothamnium papulosum* occur.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	••	•	Occasional
Mysidae	••••	•	Frequent
Carcinus maenas	••	•	Occasional
Gasterosteus aculeatus	••	••	Occasional
Spinachia spinachia	••	••	Occasional
Enteromorpha	••	•	Occasional
Chaetomorpha linum	••	••	Occasional
Filamentous green algae	••	•	Frequent
Chara aspera	••	•••	Occasional
Ruppia maritima	••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland lagoons	Covey, Thorpe & Nichols In prep	Lag.33	
R2	Orkney lagoons	Covey, Thorpe & Nichols In prep	Lag.33	
R3	N. Scotland lagoons	Covey, Thorpe & Nichols In prep	Lag.33	
R12	Clyde Sea area lagoons	Covey, Thorpe & Nichols In prep	Lag.33	
R13	West Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.33	
R13	Loch Sween	Howson, Connor & Holt 1994	SL86	
R14	Outer Hebridean lagoons	Covey, Thorpe & Nichols In prep	Lag.33	
R14	Loch Mharabhig	Howson, Connor & Holt 1994	SL86	
R15	Loch na Aird, Skye	Howson, Connor & Holt 1994	SL86	
R15	North-west Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.33	
Other	UK	Rodwell In prep	NVC SM2	

Frequency of occurrence

In Britain:	Uncommon

FaMS *Shallow muddy sand faunal communities*

IMS.EcorEns *Echinocardium cordatum* and *Ensis* spp. in lower shore or shallow sublittoral muddy fine sand

Habitat classification / Previous code

Salinity:	Full	IGS.EcorEsil	96.7
Wave exposure:	Moderately exposed, Sheltered		
Tidal streams:	Weak, Very weak		
Substratum:	Medium to fine sand		
Zone:	Infralittoral		
Depth band:	0-5 m, 5-10m		

Biotope description

Sheltered lower shore and shallow sublittoral sediments of sand or muddy fine sand in fully marine conditions, support populations of the urchin *Echinocardium cordatum* and the razor shell *Ensis siliqua* or *Ensis arcuatus*. A rich variety of polychaetes, such as *Notomastus latericeus*, *Mediomastus fragilis* and *Scoloplos armiger*, may occur in abundance. Bivalves such as *Mysella bidentata*, *Tellimya ferruginosa*, *Dosinia lupinus*, *Chamelea gallina* and *Gari fervensis* are typical of this habitat (but may not be present all at once), as are the predatory worms *Pholoe inornata* and *Harmothoe* spp. Seagrass *Zostera marina* may occur in low density (see also IMS.Zmar). *Amphiura brachiata* is common in fine sandy sediments and *Labidoplax media* in slightly muddier sediments. This biotope is currently broadly defined and needs further consideration, especially in relation to IGS.FabMag and IMS.MacAbr.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	•••	•	Occasional
Arenicola marina	•••	•	Frequent
Lanice conchilega	•••	•	Occasional
Pagurus bernhardus	••••	•	Occasional
Liocarcinus depurator	•••	•	Occasional
Ophiura albida	•••	•	Occasional
Echinocardium cordatum	••••	••	Frequent
Pleuronectidae	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Earll 1982a	C	
R4	St Abbs Bay	Earll 1982b		
R4	St Abbs	Earll 1981		
R5	Flamborough Head	Wood 1988	E.	
R10	Wales		R10.PBv.Ech	
R11	Morecambe Bay	Rostron 1992	MS1	
R11	Luce Bay	Covey In prep.b	R11.39	=
R14	Tiree, Summer Isles, Armada, Elgol	Mitchell, Earll & Dipper 1983		
Other	Sealochs	Howson, Connor & Holt 1994	SL76	=
IR2	Dundrum Bay	Erwin *et al.* 1990	Table 25	=
IR8	Mulroy Bay	Picton *et al.* 1994	MS20	

Frequency of occurrence

In Britain:	Uncommon

FaMx *Shallow mixed sediment faunal communities*

IMX.VsenMtru *Venerupis senegalensis* and *Mya truncata* in lower shore or infralittoral muddy gravel

Habitat classification

Previous code

Salinity:	Full	IMX.VenMya	96.7
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	LMGR.VEN	5.96
Tidal streams:	Weak, Very weak		
Substratum:	Muddy gravel		
Zone:	Infralittoral		
Height band:	Lower shore		
Depth band:	0-5 m		

Biotope description

Intertidal and shallow sublittoral muddy gravel in sheltered inlets that do not have a significantly reduced salinity (sea lochs) with *Venerupis senegalensis* and occasionally with *Mya truncata*. This biotope is perhaps best considered as an extension onto the extreme lower shore of a sublittoral biotope. Other typical components of the community include the polychaetes *Notomastus latericeus*, *Aphelochaeta marioni* and *Tubificoides benedii*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cirriformia tentaculata	••	•	Present/Not known
Notomastus latericeus	••	•	Frequent
Arenicola marina	•••	•	Occasional
Lanice conchilega	••	•	Rare
Tubificoides benedii	••	•	Present/Not known
Tectura testudinalis	••	•	Rare
Gibbula cineraria	•••	•	Occasional
Littorina littorea	•••	•	Abundant
Mytilus edulis	••	•	Rare
Ensis ensis	••	•	Present/Not known
Venerupis senegalensis	•••••	•	Frequent
Mya truncata	••	•	Occasional
Corallinaceae	•••	•	Abundant
Chondrus crispus	••	•	Frequent
Osmundea hybrida	••	•	Frequent
Osmundea pinnatifida	•••	•	Occasional
Scytosiphon lomentaria	•••	•	Occasional
Fucus serratus	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Orkney		D. Donnan pers. comm. (1997)	
R14	Sealochs		MNCR data	=
Other	Great Britain Coasts	Bishop & Holme 1980		

Frequency of occurrence

In Britain:	Scarce

7 The classification of physiographic types

7.1 The physiographic classification

The following is a classification of physiographic features which occur around the coast of the Britain and Ireland. Each feature encompasses a relatively distinct array of biotopes, some of which are highly characteristic of that feature. Note, however, that there is also considerable overlap in the biotope composition between the features (see Section 7.2); it is for this reason that the physiographic features are not used as the upper-end units in the hierarchical classification (see Section 1.6).

The classification outlined in Table 7.1 is based primarily on the physical character of each type; there are two main divisions (open and enclosed coast), each of which is further divided. Although the physical character has a significant bearing on the range of biotopes which occur within the feature, more detailed analysis of the biotopes present may suggest a different division of the features or, more likely, that sub-divisions within a category (e.g. estuaries) may be justified to better reflect the biological nature rather than the physical nature of the system. Sub-divisions are currently defined for sealochs, estuaries and lagoons based on their physical characteristics.

Table 7.1 The classification of physiographic types

Open coast	Any part of the coast, including offshore rocks and islands, which is not within a marine inlet or lagoon.
Linear coast	Areas of open coast including large islands which do not comply with categories below.
Islands / rocks	Features separated from the coast of the mainland or large islands.
Offshore seabed	Seabed beyond 3 miles (~ 5 km) from the shore.
Semi-enclosed coast	An area of coast bounded by headlands which provide some shelter from along-shore winds but which is predominantly open to onshore winds (compare 'embayment').
Strait / sound	Channels between the mainland and an island, or between two islands which are open at both ends to the open coast (it does not refer to similar features or narrows within marine inlets).
Barrier beach	Coastal features caused by long-shore drift which create sheltered areas (of sediment) behind them.
Enclosed coast	Marine inlets and lagoons which are fully enclosed from the open sea except at the entrance. They include sealochs, voes, estuaries, rias and harbours.
Embayment	An enclosed area of coast in which the entrance provides shelter from onshore winds for the major part of the coast inside, but which is not a sealoch, ria, voe, estuary or lagoon.
Sealoch	Glacially formed inlets (fjords, fjards) of western Scotland and Ireland; typically elongate and deepened by glacial action with little freshwater influence. Often with narrows and sills dividing the loch into a series of basins. For sub-divisions (fjordic, fjardic and open sealochs) see Howson, Connor & Holt (1994).
Ria / voe	Drowned river valleys of south-west Britain (ria) and Shetland (voes). Often with a greater presence of rock and more marine in character than estuaries.
Estuary	Downstream part of a river where it widens to enter the sea; often with significant freshwater influence and predominantly comprising sediment habitats. For sub-divisions (coastal plain, bar-built and complex) see Davidson *et al*. (1991).
Isolated saline water (lagoon)	Enclosed bodies of water, separated or partially separated from the sea by shingle, sand or sometimes rock and with a restricted exchange of water with the sea, yielding varying salinity regimes. For sub-divisions (isolated saline lagoon, percolation saline lagoon, sluiced saline lagoon, silled saline lagoon, saline lagoon inlet) see Joint Nature Conservation Committee (1996).

Some of these categories can be further divided into smaller scale features of rock and sediment coasts. Such ***site types***, encompassing a suite of biotopes (often of quite different biological character) which consistently occur together, have been used to classify some rocky shores (e.g. Mills *et al*. 1993; Richardson, Rickards & Foster-Smith 1996). These offer useful units for nature conservation management and for mapping at particular scales (e.g. 1:50, 000). Consideration is being given to the further development of this approach.

7.2 Inter-links between the physiographic and biotope classifications

A subset of biotopes can be selected from the full biotopes classification (Section 4.3) to give a list of biotopes which occur in each physiographic feature. This is often required for use in site designation and management programmes (e.g. designation of Special Areas of Conservation for the EC Habitats Directive; Biodiversity Action Plans for key habitats such as estuaries) where the 'habitats' are at the physiographic level but there is a need to consider the component biotopes within them for site assessment, monitoring and management purposes. The present CORINE (Commission of the European Communities 1991) and Palaearctic classifications (Devilliers & Devilliers-Terschuren 1996) use physiographic features as part of their marine classification sections, in a similar parallel manner.

The table below illustrate the relationship between physiographic and biotope types, and also the duplication of biotopes in different physiographic features.

Table 7.2 Examples to illustrate relationship between the biotope and physiographic classifications

			Physiographic types					
Substratum	***Zone***	***Biotope***	***Linear coast***	***Islands & rocks***	***Strait / sound***	***Sealoch***	***Estuary***	***Lagoon***
Rock	Supra-littoral	Yellow & grey lichens (splash zone)	●	●	●	●	●	●
or	Eulittoral	*Mytilus* & barnacles (very exposed shores))	●	●	●			
Mixed rock & sediment		*Ascophyllum nodosum* (very sheltered shores)	●		●	●	●	●
		Fucus ceranoides (low salinity/freshwater runoff)				●	●	●
Mud	Littoral	*Hediste diversicolor* & *Scrobicularia plana*				●	●	
Rock	Infralittoral	Sponges, anemones & colonial ascidians (in wave-surged gullies)	●	●		●		
Sand	Shallow sublittoral	*Zostera marina* seagrass beds	●		●	●	●	●

8 Correlation with other major classifications

8.1 Physiographic type correlations

A correlation of physiographic types with those used in the EC Habitats Directive and the CORINE/Palaearctic European classifications is given below.

Table 8.1 Physiographic types and their correlation with the EC Habitats Directive and CORINE/Palaearctic classifications

MNCR BioMar	Habitats Directive	CORINE 1991	Palaearctic 1996
OPEN COAST			
Ä **Linear coast**	-	-	12.1
Ä **Islands / rocks**	-	19	19.2
Ä **Offshore seabed**	-	-	-
Ä **Semi-enclosed coast**	-	-	12.2
Ä **Strait / sound**	-	12	12.3
Ä **Barrier beach**	-	-	?19.3
ENCLOSED COAST			
Ä **Embayment**	Large shallow inlets and bays	12	12.4
Ä **Sealoch**		12	12.5
Ä Fjordic sealoch	-	12	12.51
Ä Fjardic sealoch	Large shallow inlets and bays	12	12.52
Ä Open sealoch	(Large shallow inlets and bays)	12	12.53
Ä **Ria /voe**	Large shallow inlets and bays	12	12.6
Ä **Estuary**	Estuaries	13.2	13.2
Ä Coastal plain estuary	Estuaries	13.2	13.21
Ä Bar-built estuary	Estuaries	13.2	13.22
Ä Complex estuary	Estuaries	13.2	13.23
Ä **Isolated saline water (lagoon)**	Lagoons	21	21
Ä Isolated saline lagoon	Lagoons	21	21.2
Ä Percolation saline lagoon	Lagoons	21	21.3
Ä Sluiced saline lagoon	Lagoons	21	21.4
Ä Silled saline lagoon	Lagoons	21	21.4
Ä Saline lagoon inlet	Lagoons	21	21.1
See biotope complexes (Littoral overhangs & caves; robust faunal cushions and crusts in surge gullies & caves; circalittoral caves and overhangs) in the habitat classification	Submerged or partly submerged sea caves	11.26 + 18.14	11.26 + 11.294

8.2 Correlation with SSSI selection units

There is a direct correlation of the main habitat types in the MNCR BioMar classification with the SSSI selection units used for the designation of intertidal areas in the United Kingdom (Joint Nature Conservation Committee 1996). This is illustrated below.

Table 8.2 Correlation of the main habitat types with SSSI selection units

Substratum	**ROCK** **[R]** (epibiota)			**SEDIMENT** **[S]** (infauna + epibiota)			
Zone	**Exposed rock [E]**	**Moderately exposed rock [M]**	**Sheltered rock [S]**	**Gravels & sands [GS]**	**Muddy sands [MS]**	**Muds [MU]**	**Mixed sediment [MX]**
Littoral [L]	Exposed rocky shores	Moderately exposed rocky shores	Sheltered rocky shores & Shores of mixed substrata	Wave-exposed sandy shores	Moderately exposed sandy shores	Sheltered muddy shores	Muddy gravel shores
Infralittoral							
Circalittoral			**Not covered by**				
Circalittoral offshore			**SSSI designations**				

8.3 Habitat type correlations

A correlation of the higher MNCR types with those in Annex I of the Habitats Directive, the CORINE, Palaearctic and UK Biodiversity Action Plan classifications is given below. The UK Biodiversity Action Plan (Anon. 1995) employs a series of 'broad habitats' from which are selected 'key habitats' requiring specific action. The BAP Targets Group has recently recommended adoption of a revised series of 'broad habitats' which now have much closer correlation with the MNCR classification than did the previous categories.

Table 8.3 The main habitat types and their correlation with the CORINE, Palaearctic, HELCOM and ZNIEFF-MER classifications, Habitats Directive Annex I (habitat) types and the revised Biodiversity Action Plan 'broad habitat' types

Britain & Ireland	**EC**	**Europe**	**Europe**	**Baltic**	**France**	**UK**
MNCR BioMar	**Habitats Directive**	**CORINE 1991**	**Palaearctic 1996**	**HELCOM 1997**	**ZNIEFF-MER 1994**	**BAP 1997**
Littoral rock	May be	18.1	11.28 + 11.29	2.1.1.3 + 2.1.2.3	I.4 + II.4 + II.5	Littoral rock
Exposed littoral rock	included in		+ 11.2A	+ 2.2.3 + 2.3.3		
Mod. exposed littoral rock	Reefs			+ 2.11.2		
Sheltered littoral rock						
Littoral sediments	Mudflats and	14	11.27	-	-	Littoral
Littoral gravels and sands	sandflats not covered by	16.11 + 17.1	-	2.4.3 + 2.5.3 + 2.6.3	I.2 + I.3 + II.3	sediment
Littoral muddy sands	seawater at low	includes 11.321	includes 11.321	2.5.3	II.2	
Littoral muds	tide (not all	includes 15	includes 15	2.7.3	I.1 + II.1	
Littoral mixed sediments	types covered)	-	-	2.8.3	-	
Infralittoral rock	Reefs	11.23 +	11.23 +	2.1.1.2 +	III.6 + III.9	Inshore rock
Exposed infralittoral rock		11.24 +	11.24 +	2.1.2.2 +		
Mod. exposed infra. rock		11.25 +	11.25 +	2.2.2 + 2.3.2 +		
Sheltered infralittoral rock		11.26	11.26	2.11.1		
Circalittoral rock				2.1.1.1 +	IV.6	
Exposed circalittoral rock				2.1.2.1 +		
Mod. exposed circa. rock				2.2.1 + 2.3.1 +		
Sheltered circalittoral rock				2.11.1		
Circalittoral offshore rock				-	-	Offshore shelf rock
Sublittoral sediments	-	11.22	11.22	-	-	Inshore
Infralittoral gravels and sands	Sandbanks slightly covered	includes 11.31	includes 11.31	2.4.2 + 2.5.2 + 2.6.2	III.3 + III.4 + III.5 + III.7	sediment
Infralittoral muddy sands	by seawater all the time	& 11.41	& 11.41	2.5.2	III.1	
Infralittoral muds	-			2.7.2	III.2	
Infralit. mixed sediments	-			2.8.2	-	
Circalittoral gravels and sands	-	-	-	2.4.1 + 2.5.1 + 2.6.1	IV.3 + IV.4 + IV.5	
Circalittoral muddy sands	-	-	-	2.5.1	IV.2	
Circalittoral muds	-	-	-	2.7.1	IV.1	
Circalit. mixed sediments	-	-	-	2.8.1	-	
Circalittoral offshore sediments	-	-	-	-	-	Offshore shelf sediment

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Appendix 1 MNCR SACFOR abundance scales

S = Superabundant, A = Abundant, C = Common, F = Frequent, O = Occasional, R = Rare

GROWTH FORM			SIZE OF INDIVIDUALS / COLONIES					
% COVER	**CRUST / MEADOW**	**MASSIVE / TURF**	**<1 cm**	**1-3 cm**	**3-15 cm**	**>15 cm**	**DENSITY**	
>80%	S		S				>1 / 0.0001 m^2 (1x1 cm)	>10,000/ m^2
40-79%	A	S	A	S			1-9 / 0.001 m^2	1000-9999 / m^2
20-39%	C	A	C	A	S		1-9 / 0.01 m^2 (10x10 cm)	100-999 / m^2
10-19%	F	C	F	C	A	S	1-9 / 0.1 m^2	10-99 / m^2
5-9%	O	F	O	F	C	A	1-9 / m^2	
1-5% or density	R	O	R	O	F	C	1-9 / 10 m^2 (3.16x3.16 m)	
<1% or density		R		R	O	F	1-9 / 100 m^2 (10x10 m)	
					R	O	1-9 / 1000 m^2 (31.6x31.6 m)	
						R	>1 / 10,000 m^2 (100x100 m)	<1 / 1000 m^2
PORIFERA	Crusts *Halichondria*	Massive spp. *Pachymatisma*		Small solitary *Grantia*	Large solitary *Stelligera*			
HYDROZOA		Turf species *Tubularia* *Abietinaria*		Small clumps *Sarsia* *Aglaophenia*	Solitary *Corymorpha* *Nemertesia*			
ANTHOZOA	*Corynactis*	*Alcyonium*		Small solitary *Epizoanthus* *Caryophyllia*	Med. solitary *Virgularia* *Cerianthus* *Urticina*	Large solitary *Eunicella* *Funiculina* *Pachycerianthus*		
ANNELIDA	*Sabellaria spinulosa*	*Sabellaria alveolata*	*Spirorbis*	Scale worms *Nephtys* *Pomatoceros*	*Chaetopterus* *Arenicola* *Sabella*			
CRUSTACEA	Barnacles Tubiculous amphipods		*Semibalanus* Amphipods	*B. balanus* *Anapagurus* *Pisidia*	*Pagurus* *Galathea* Small crabs	*Homarus* *Nephrops* *Hyas araneus*		
MOLLUSCA	*Mytilus* *Modiolus*		Small gastropod *L. neritoides* Small bivalves *Nucula*	Chitons Med. gastropod *L. littorea* *Patella* Med. bivalves *Mytilus* *Pododesmus*	Large gastropod *Buccinum* Lge bivalves *Mya, Pecten* *Arctica*			Examples of groups or species for each category
BRACHIOPODA				*Neocrania*				
BRYOZOA	Crusts	*Pentapora* *Bugula Flustra*			*Alcyonidium* *Porella*			
ECHINO-DERMATA				*Echinocyamus* *Ocnus*	*Antedon* Small starfish Brittlestars *Echinocardium* *Aslia, Thyone*	Large starfish *Echinus* *Holothuria*		
ASCIDIACEA	Colonial *Dendrodoa*			Small solitary *Dendrodoa*	Large solitary *Ascidia, Ciona*	*Diazona*		
PISCES					Gobies Blennies	Dog fish Wrasse		
PLANTS	Crusts, Maerl *Audouinella* Fucoids, Kelp *Desmarestia*	Foliose Filamentous			*Zostera*	Kelp *Halidrys* *Chorda* *Himanthalia*		

Use of the MNCR SACFOR abundance scales

The MNCR cover/density scales adopted from 1990 provide a unified system for recording the abundance of marine benthic flora and fauna in biological surveys. The following notes should be read before their use:

1. Whenever an attached species covers the substratum and percentage cover can be estimated, that scale should be used in preference to the density scale.
2. Use the *massive/turf* percentage cover scale for all species, excepting those given under *crust/meadow*.
3. Where two or more layers exist, for instance foliose algae overgrowing crustose algae, total percentage cover can be over 100% and abundance grades will reflect this.
4. Percentage cover of littoral species, particularly the fucoid algae, must be estimated when the tide is out.
5. Use quadrats as reference frames for counting, particularly when density is borderline between two of the scale.
6. Some extrapolation of the scales may be necessary to estimate abundance for restricted habitats such as rockpools.
7. The species (as listed over) take precedence over their actual size in deciding which scale to use.
8. When species (such as those associated with algae, hydroid and bryozoan turf or on rocks and shells) are incidentally collected (i.e. collected with other species that were specifically collected for identification) and no meaningful abundance can be assigned to them, they should be noted as present (P).

Appendix 2 Terms used for field recording and habitat definition

The following definitions are taken from guidance notes for MNCR field recording (Appendix 8 in Hiscock *ed*. 1996). Some terms are modified for use in the classification.

Salinity - The categories are defined as follows (the points of separation approximate to critical tolerance limits for marine species):

Fully marine	30-40 ‰
Variable	18-40 ‰
Reduced	18-30 ‰
Low	<18 ‰

Wave exposure - These categories take account of the aspect of the coast (related to direction of prevailing or strong winds), the fetch (distance to nearest land), the degree of open water offshore and the depth of water adjacent to the coast. Estimation of wave exposure will require inspection of charts and maps.

Extremely exposed	This category is for the few open coastlines which face into prevailing wind and receive oceanic swell without any offshore breaks (such as islands or shallows) for several thousand km and where deep water is close to the shore (50 m depth contour within about 300 m, e.g. Rockall).
Very exposed	These are open coasts which face into prevailing winds and receive oceanic swell without any offshore breaks (such as islands or shallows) for several hundred km but where deep water is not close (>300 m) to the shore. They can be adjacent to extremely exposed sites but face away from prevailing winds (here swell and wave action will refract towards these shores) or where, although facing away from prevailing winds, strong winds and swell often occur (for instance, the east coast of Fair Isle).
Exposed	At these sites, prevailing wind is onshore although there is a degree of shelter because of extensive shallow areas offshore, offshore obstructions, a restricted (<90°) window to open water. These sites will not generally be exposed to strong or regular swell. This can also include open coasts facing away from prevailing winds but where strong winds with a long fetch are frequent.
Moderately exposed	These sites generally include open coasts facing away from prevailing winds and without a long fetch but where strong winds can be frequent.
Sheltered	At these sites, there is a restricted fetch and/or open water window. Coasts can face prevailing winds but with a short fetch (say <20 km) or extensive shallow areas offshore or may face away from prevailing winds.
Very sheltered	These sites are unlikely to have a fetch greater than 20 km (the exception being through a narrow (<30°) open water window, they face away from prevailing winds or have obstructions, such as reefs, offshore.
Extremely sheltered	These sites are fully enclosed with fetch no greater than about 3 km.
Ultra sheltered	Sites with fetch of a few tens or at most 100s of metres.

In the classification ***exposed*** (as in *exposed littoral rock*) encompasses the *extremely exposed*, *very exposed* and *exposed* categories, whilst ***sheltered*** (as in *sheltered littoral rock*) encompasses *sheltered* to *ultra sheltered* categories.

Tidal streams/currents (maximum at surface) - This is maximum tidal stream strength which affects the actual area surveyed. Note for shores and inshore areas this may differ considerably from the tidal streams present offshore. In some narrows and sounds the top of the shore may only be covered at slack water, but the lower shore is subject to fast running water.

Very strong	>6 knots	(>3 m/sec.)
Strong	3-6 knots	(1.5-3 m/sec.)
Moderately strong	1-3 knots	(0.5-1.5 m/sec.)
Weak	<1 knot	(<0.5 m/sec.)
Very weak	negligible	

In the classification tide-swept habitats typically have moderately strong or stronger tidal streams.

Zone - These definitions primarily relate to rocky habitats or those where algae grow (e.g. stable shallow sublittoral sediments). For use of the terms ***infralittoral*** and ***circalittoral***, especially for sediments, in the classification refer also to Table 2.2.

Supralittoral	Colonised by yellow and grey lichens, above the *Littorina* populations but generally below flowering plants.
Upper littoral fringe	This is the splash zone above High Water of Spring Tides with a dense band of the black lichen by *Verrucaria maura*. *Littorina saxatilis* and *Littorina neritoides* often present. May include saltmarsh species on shale/pebbles in shelter.
Lower littoral fringe	The *Pelvetia* (in shelter) or *Porphyra* (exposed) belt. With patchy *Verrucaria maura, Verrucaria mucosa* and *Lichina pygmaea* present above the main barnacle population. May also include saltmarsh species on shale/pebbles in shelter.
Upper eulittoral	Barnacles and limpets present in quantity or with dense *Fucus spiralis* in sheltered locations.
Mid eulittoral	Barnacle-limpet dominated, sometimes mussels or dominated by *Fucus vesiculosus* and *Ascophyllum nodosum* in sheltered locations. *Mastocarpus stellatus* and *Palmaria palmata* patchy in lower part. Usually quite a wide belt.
Lower eulittoral	*Fucus serratus, Mastocarpus stellatus, Himanthalia elongata* or *Palmaria palmata* variously dominant; barnacles sparse.
Sublittoral fringe	Dominated by *Alaria esculenta* (very exposed), *Laminaria digitata* (exposed to sheltered) or *Laminaria saccharina* (very sheltered) with encrusting coralline algae; barnacles sparse.
Upper infralittoral	Dense forest of kelp.
Lower infralittoral	Sparse kelp park, dominated by foliose algae except where grazed. May lack kelp.
Upper circalittoral	Dominated by animals, lacking kelp but with sparse foliose algae except where grazed.
Lower circalittoral	Dominated by animals with no foliose algae but encrusting coralline algae.

Substratum

Bedrock	Includes very soft rock-types such as chalk, peat and clay.

Boulders	Very large (>1024 mm), large (512-1024 mm), small (256-512 mm)
Cobbles	64-256 mm
Pebbles	16-64 mm
Gravel	4-16 mm
Coarse sand	1-4 mm
Medium sand	0.25-1 mm
Fine sand	0.063 - 0.25 mm
Mud	<0.063 mm (the silt/clay fraction)

Each division above represents two divisions on the Wentworth scale (Wentworth 1922).

In the classification, bedrock, stable boulders, cobbles or pebbles and habitats of mixed boulder, cobble, pebble and sediment (***mixed substrata***). as well as artificial substrata (concrete, wood, metal) are collectively referred to as ***rock***. Highly mobile cobbles and pebbles (shingle), together with gravel, coarse, medium and fine sand are collectively referred to as ***gravels and sands***. ***Mixed sediment*** consists of various mixtures of gravel, sand and mud and may often have shells and stones also.

Appendix 3 EUNIS-compatible alpha-numeric codes

An alternative alpha-numeric code list is given below which is compatible with the proposed EUNIS European classification coding system. Additional numbers have been inserted where necessary to ensure the biotope complexes and biotopes are retained at the same level in the alpha-numeric code system.

Higher code	*Biotope code*	*Alpha-numeric code*
LR		A
LR.L		A1.1
LR.L	YG	A1.1.1
LR.L	Pra	A1.1.2
LR.L	Ver	A1.1.3
LR.L	Ver.Por	A1.1.3.1
LR.L	Ver.B	A1.1.3.2
LR.L	Ver.Ver	A1.1.3.3
LR.L	Chr	A1.1.4
LR.L	Bli	A1.1.5
LR.L	UloUro	A1.1.6
ELR		A2
ELR.MB		A2.1
ELR.MB	MytB	A2.1.1
ELR.MB	BPat	A2.1.2
ELR.MB	BPat.Cht	A2.1.2.1
ELR.MB	BPat.Lic	A2.1.2.2
ELR.MB	BPat.Cat	A2.1.2.3
ELR.MB	BPat.Fvesl	A2.1.2.4
ELR.MB	BPat.Sem	A2.1.2.5
ELR.FR		A2.2
ELR.FR	Fdis	A2.2.1
ELR.FR	Coff	A2.2.2
ELR.FR	Him	A2.2.3
MLR		A3
MLR.BF		A3.1
MLR.BF	PelB	A3.1.1
MLR.BF	FvesB	A3.1.2
MLR.BF	Fser	A3.1.3
MLR.BF	Fser.R	A3.1.3.1
MLR.BF	Fser.Fser	A3.1.3.2
MLR.BF	Fser.Fser.Bo	A3.1.3.3
MLR.BF	Fser.Pid	A3.1.3.4
MLR.R		A3.2
MLR.R	XR	A3.2.1
MLR.R	Pal	A3.2.2
MLR.R	Mas	A3.2.3
MLR.R	Osm	A3.2.4
MLR.R	RPid	A3.2.5
MLR.Eph		A3.4
MLR.Eph	Ent	A3.4.1
MLR.Eph	EntPor	A3.4.2
MLR.Eph	Rho	A3.4.3
MLR.MF		A3.5
MLR.MF	MytFves	A3.5.1
MLR.MF	MytFR	A3.5.2
MLR.MF	MytPid	A3.5.3
MLR.Sab		A3.6
MLR.Sab	Salv	A3.6.1
SLR		A4
SLR.F		A4.1
SLR.F	Pel	A4.1.1
SLR.F	Fspi	A4.1.2
SLR.F	Fves	A4.1.3
SLR.F	Asc	A4.1.4
SLR.F	Asc.Asc	A4.1.4.1
SLR.F	Asc.T	A4.1.4.2
SLR.F	Asc.VS	A4.1.4.3
SLR.F	Fserr	A4.1.5
SLR.F	Fserr.T	A4.1.5.1
SLR.F	Fserr.VS	A4.1.5.2
SLR.F	Fcer	A4.1.6
SLR.FX		A4.2
SLR.FX	BLlit	A4.2.1
SLR.FX	FvesX	A4.2.2
SLR.FX	AscX	A4.2.3
SLR.FX	AscX.mac	A4.2.3.1
SLR.FX	FserX	A4.2.4
SLR.FX	FserX.T	A4.2.4.1
SLR.FX	EphX	A4.2.5
SLR.FX	FcerX	A4.2.6
SLR.MX		A4.3
SLR.MX	MytX	A4.3.1
LR.Rkp		A5.1
LR.Rkp	G	A5.1.1
LR.Rkp	Cor	A5.1.2
LR.Rkp	Cor.Par	A5.1.2.1
LR.Rkp	Cor.Bif	A5.1.2.2
LR.Rkp	Cor.Cys	A5.1.2.3
LR.Rkp	FK	A5.1.3
LR.Rkp	FK.Sar	A5.1.3.1
LR.Rkp	SwSed	A5.1.4
LR.Rkp	H	A5.1.5
LR.Ov		A5.2
LR.Ov	RhoCv	A5.2.1
LR.Ov	SR	A5.2.2
LR.Ov	SByAs	A5.2.3
LS		B
LGS		B1
LGS.Sh		B1.1
LGS.Sh	BarSh	B1.1.1
LGS.Sh	Pec	B1.1.2
LGS.S		B1.2
LGS.S	Tal	B1.2.1
LGS.S	BarSnd	B1.2.2
LGS.S	AEur	B1.2.3
LGS.S	AP	B1.2.4
LGS.S	AP.P	B1.2.4.1
LGS.S	AP.Pon	B1.2.4.2
LGS.S	Lan	B1.2.5
LGS.Est		B1.3
LGS.Est	Ol	B1.3.1
LMS		B2
LMS.MS		B2.1
LMS.MS	BatCor	B2.1.1
LMS.MS	PCer	B2.1.2
LMS.MS	MacAre	B2.1.3
LMS.MS	MacAre.Mare	B2.1.3.1
LMS.Zos		B2.2

LMS.Zos	Znol	B2.2.1
LMU		B3
LMU.Sm		B3.1
LMU.Sm	NVC SM24	B3.1.1
LMU.Sm	NVC SM28	B3.1.2
LMU.Sm	NVC SM25	B3.1.3
LMU.Sm	NVC SM21	B3.1.4
LMU.Sm	NVC SM23	B3.1.5
LMU.Sm	NVC SM22	B3.1.6
LMU.Sm	NVC SM26	B3.1.7
LMU.Sm	NVC SM27	B3.1.8
LMU.Sm	NVC SM18	B3.1.9
LMU.Sm	NVC SM15	B3.1.10
LMU.Sm	NVC SM20	B3.1.11
LMU.Sm	NVC SM19	B3.1.12
LMU.Sm	NVC SM17	B3.1.13
LMU.Sm	NVC SM16	B3.1.14
LMU.Sm	NVC SM16	B3.1.14.1
LMU.Sm	NVC SM14	B3.1.15
LMU.Sm	NVC SM13	B3.1.16
LMU.Sm	NVC SM13	B3.1.16.1
LMU.Sm	NVC SM10	B3.1.17
LMU.Sm	NVC SM12	B3.1.18
LMU.Sm	NVC SM11	B3.1.19
LMU.Sm	NVC SM7	B3.1.20
LMU.Sm	NVC SM9	B3.1.21
LMU.Sm	NVC SM8	B3.1.22
LMU.Sm	NVC SM6	B3.1.23
LMU.Sm	NVC SM5	B3.1.24
LMU.Sm	NVC SM4	B3.1.25
LMU.Sm	NVC SM3	B3.1.26
LMU.SMu		B3.2
LMU.SMu	HedMac	B3.2.1
LMU.SMu	HedMac.Are	B3.2.1.1
LMU.SMu	HedMac.Pyg	B3.2.1.2
LMU.SMu	HedMac.Mare	B3.2.1.3
LMU.Mu		B3.3
LMU.Mu	HedScr	B3.3.1
LMU.Mu	HedStr	B3.3.2
LMU.Mu	HedOl	B3.3.3
LMX		B4
LMX	MytFab	B4.1.1
LMX	Mare	B4.1.2
IR		C
EIR		C1
EIR.KFaR		C1.1
EIR.KFaR	Ala	C1.1.1
EIR.KFaR	Ala.Myt	C1.1.1.1
EIR.KFaR	Ala.Ldig	C1.1.1.2
EIR.KFaR	AlaAnSC	C1.1.2
EIR.KFaR	LhypFa	C1.1.3
EIR.KFaR	LhypPar	C1.1.4
EIR.KFaR	LhypR	C1.1.5
EIR.KFaR	LhypR.Ft	C1.1.5.1
EIR.KFaR	LhypR.Pk	C1.1.5.2
EIR.KFaR	LhypR.Loch	C1.1.5.3
EIR.KFaR	LsacSac	C1.1.6
EIR.KFaR	FoR	C1.1.7
EIR.KFaR	FoR.Dic	C1.1.7.1
EIR.SG		C1.2
EIR.SG	FoSwCC	C1.2.1
EIR.SG	SCAn	C1.2.2

EIR.SG	SCAn.Tub	C1.2.2.1
EIR.SG	SCAs	C1.2.3
EIR.SG	SCAs.DenCla	C1.2.3.1
EIR.SG	SCAs.ByH	C1.2.3.2
EIR.SG	SC	C1.2.4
EIR.SG	CC	C1.2.5
EIR.SG	CC.BalPom	C1.2.5.1
EIR.SG	CC.Mob	C1.2.5.2
MIR		C2
MIR.KR		C2.1
MIR.KR	Ldig	C2.1.1
MIR.KR	Ldig.Ldig	C2.1.1.1
MIR.KR	Ldig.Ldig.Bo	C2.1.1.2
MIR.KR	Ldig.T	C2.1.1.3
MIR.KR	Ldig.Pid	C2.1.1.4
MIR.KR	Lhyp	C2.1.2
MIR.KR	Lhyp.Ft	C2.1.2.1
MIR.KR	Lhyp.Pk	C2.1.2.2
MIR.KR	Lhyp.TFt	C2.1.2.3
MIR.KR	Lhyp.TPk	C2.1.2.4
MIR.KR	Lhyp.Loch	C2.1.2.5
MIR.GzK		C2.2
MIR.GzK	LhypGz	C2.2.1
MIR.GzK	LhypGz.Ft	C2.2.1.1
MIR.GzK	LhypGz.Pk	C2.2.1.2
MIR.SedK		C2.3
MIR.SedK	Sac	C2.3.1
MIR.SedK	LsacChoR	C2.3.2
MIR.SedK	XKScrR	C2.3.3
MIR.SedK	SabKR	C2.3.4
MIR.SedK	EphR	C2.3.5
MIR.SedK	HalXK	C2.3.6
MIR.SedK	PolAhn	C2.3.7
SIR		C3
SIR.K		C3.1
SIR.K	LhypLsac	C3.1.1
SIR.K	LhypLsac.Ft	C3.1.1.1
SIR.K	LhypLsac.Pk	C3.1.1.2
SIR.K	Lsac	C3.1.2
SIR.K	Lsac.Ldig	C3.1.2.1
SIR.K	Lsac.Ft	C3.1.2.2
SIR.K	Lsac.Pk	C3.1.2.3
SIR.K	Lsac.T	C3.1.2.4
SIR.K	Lsac.Cod	C3.1.2.5
SIR.K	EchBriCC	C3.1.3
SIR.K	LsacRS	C3.1.4
SIR.K	LsacRS.FiR	C3.1.4.1
SIR.K	LsacRS.Psa	C3.1.4.2
SIR.K	LsacRS.Phy	C3.1.4.3
SIR.EstFa		C3.2
SIR.EstFa	MytT	C3.2.1
SIR.EstFa	CorEle	C3.2.2
SIR.EstFa	HarCon	C3.2.3
SIR.Lag		C3.3
SIR.Lag	FChoG	C3.3.1
SIR.Lag	AscSAs	C3.3.2
SIR.Lag	PolFur	C3.3.3
SIR.Lag	FcerEnt	C3.3.4
IR.FaSwV		C4.1
IR.FaSwV	CorMetAlc	C4.1.1
IR.FaSwV	AlcByH	C4.1.2
IR.FaSwV	AlcByH.Hia	C4.1.2.1

CR		D
ECR		D1
ECR.EFa		D1.1
ECR.EFa	CCParCar	D1.1.1
ECR.EFa	CorCri	D1.1.2
ECR.EFa	PomByC	D1.1.3
ECR.Alc		D1.2
ECR.Alc	AlcTub	D1.2.1
ECR.Alc	AlcMaS	D1.2.2
ECR.Alc	AlcSec	D1.2.3
ECR.Alc	AlcC	D1.2.4
ECR.BS		D1.3
ECR.BS	BalTub	D1.3.1
ECR.BS	TubS	D1.3.2
ECR.BS	BalHpan	D1.3.3
ECR.BS	CuSH	D1.3.4
ECR.BS	HbowEud	D1.3.5
MCR		D2
MCR.XFa		D2.1
MCR.XFa	PhaAxi	D2.1.1
MCR.XFa	ErSEun	D2.1.2
MCR.XFa	ErSPbolSH	D2.1.3
MCR.XFa	ErSSwi	D2.1.4
MCR.ByH		D2.2
MCR.ByH	SNemAdia	D2.2.1
MCR.ByH	Flu	D2.2.2
MCR.ByH	Flu.Flu	D2.2.2.1
MCR.ByH	Flu.HByS	D2.2.2.2
MCR.ByH	Flu.SerHyd	D2.2.2.3
MCR.ByH	Flu.Hocu	D2.2.2.4
MCR.ByH	Urt	D2.2.3
MCR.ByH	Urt.Urt	D2.2.3.1
MCR.ByH	Urt.Cio	D2.2.3.2
MCR.CSab		D2.3
MCR.CSab	Sspi	D2.3.1
MCR.M		D2.4
MCR.M	MytHAs	D2.4.1
MCR.M	Mus	D2.4.2
MCR.M	ModT	D2.4.3
MCR.Bri		D2.5
MCR.Bri	Oph	D2.5.1
MCR.Bri	Oph.Oacu	D2.5.1.1
MCR.GzFa		D2.6
MCR.GzFa	FaAlC	D2.6.1
MCR.GzFa	FaAlC.Abi	D2.6.1.1
MCR.As		D2.7
MCR.As	StoPaur	D2.7.1
MCR.As	MolPol	D2.7.2
MCR.As	MolPol.Sab	D2.7.2.1
MCR.SfR		D2.8
MCR.SfR	Pid	D2.8.1
MCR.SfR	Pol	D2.8.2
SCR		D3
SCR.BrAs		D3.1
SCR.BrAs	AntAsH	D3.1.1
SCR.BrAs	SubSoAs	D3.1.2
SCR.BrAs	AmenCio	D3.1.3
SCR.BrAs	AmenCio.Met	D3.1.3.1
SCR.BrAs	Aasp	D3.1.4
SCR.BrAs	NeoPro	D3.1.5
SCR.BrAs	NeoPro.CaTw	D3.1.5.1
SCR.BrAs	NeoPro.Den	D3.1.5.2

SCR.Mod		D3.2
SCR.Mod	ModCvar	D3.2.1
SCR.Mod	ModHAs	D3.2.2
CR.FaV		D4.1
CR.FaV	Ant	D4.1.1
CR.FaV	Bug	D4.1.2
CR.Cv		D4.2
CR.Cv	SCup	D4.2.1
COR		E
COR.Lop		E1
SS		F
IGS		F1
IGS.Mrl		F1.1
IGS.Mrl	Phy	F1.1.1
IGS.Mrl	Phy.R	F1.1.1.1
IGS.Mrl	Phy.HEc	F1.1.1.2
IGS.Mrl	Lgla	F1.1.2
IGS.FaG		F1.2
IGS.FaG	HalEdw	F1.2.1
IGS.FaG	Sell	F1.2.2
IGS.FaS		F1.3
IGS.FaS	Mob	F1.3.1
IGS.FaS	NcirBat	F1.3.2
IGS.FaS	ScupHyd	F1.3.3
IGS.FaS	Lcon	F1.3.4
IGS.FaS	FabMag	F1.3.5
IGS.EstGS		F1.4
IGS.EstGS	MobRS	F1.4.1
IGS.EstGS	Ncir	F1.4.2
IGS.EstGS	NeoGam	F1.4.3
CGS		F2
CGS	Ven	F2.1.1
CGS	Ven.Neo	F2.1.1.1
CGS	Ven.Bra	F2.1.1.2
IMS		F3
IMS.Sgr		F3.1
IMS.Sgr	Zmar	F3.1.1
IMS.Sgr	Rup	F3.1.2
IMS.FaMS		F3.2
IMS.FaMS	EcorEns	F3.2.1
IMS.FaMS	SpiSpi	F3.2.2
IMS.FaMS	MacAbr	F3.2.3
IMS.FaMS	Cap	F3.2.4
CMS		F4
CMS	AbrNucCor	F4.1.1
CMS	AfilEcor	F4.1.2
CMS	VirOph	F4.1.3
CMS	VirOph.HAs	F4.1.3.1
CMS	Ser	F4.1.4
IMU		F5
IMU.Ang		F5.1
IMU.Ang	NVC A12	F5.1.1
IMU.Ang	NVC S4	F5.1.2
IMU.MarMu		F5.2
IMU.MarMu	TubeAP	F5.2.1
IMU.MarMu	AreSyn	F5.2.2
IMU.MarMu	PhiVir	F5.2.3
IMU.MarMu	Ocn	F5.2.4
IMU.EstMu		F5.3
IMU.EstMu	PolVS	F5.3.1
IMU.EstMu	AphTub	F5.3.2
IMU.EstMu	NhomTub	F5.3.3

IMU.EstMu	MobMud	F5.3.4
IMU.EstMu	CapTub	F5.3.5
IMU.EstMu	Tub	F5.3.6
IMU.EstMu	LimTtub	F5.3.7
CMU		F6
CMU	BriAchi	F6.1.1
CMU	SpMeg	F6.1.2
CMU	SpMeg.Fun	F6.1.2.1
CMU	Beg	F6.1.3
IMX		F7
IMX.KSwMx		F7.1
IMX.KSwMx	LsacX	F7.1.1
IMX.KSwMx	Tra	F7.1.2
IMX.KSwMx	Pcri	F7.1.3
IMX.KSwMx	FiG	F7.1.4
IMX.MrlMx		F7.2
IMX.MrlMx	Lcor	F7.2.1
IMX.MrlMx	Lfas	F7.2.2
IMX.MrlMx	Lden	F7.2.3
IMX.Oy		F7.3
IMX.Oy	Ost	F7.3.1
IMX.FaMx		F7.4
IMX.FaMx	VsenMtru	F7.4.1
IMX.FaMx	An	F7.4.2
IMX.FaMx	Lim	F7.4.3
IMX.EstMx		F7.5
IMX.EstMx	CreAph	F7.5.1
IMX.EstMx	MytV	F7.5.2
IMX.EstMx	PolMtru	F7.5.3
CMX		F8
CMX	SspiMx	F8.1.1
CMX	ModMx	F8.1.2
CMX	ModHo	F8.1.3
COS		G
COS	AmpPar	G1.1.1
COS	ForThy	G1.1.2
COS	Sty	G1.1.3

PLEASE NOTE:

Appendix 4 Comparative tables of habitat and species data

This should appear between pages 307 and 360. The data are available as four separate files on the report Resource Hub entry:

(https://hub.jncc.gov.uk/assets/643ed9a6-8011-44c0-a264-e5b821ade017)

- JNCC-Report-229-Appendix4-Comparative-Tables-Explanatory-Notes.document (33kb)
- JNCC-Report-229-Appendix4-Biological-Comparative-Tables-97.xls (22,525kb)
- JNCC-Report-229-Appendix4-Biological-Comparative-Tables-2000.xls (5,275kb)
- JNCC-Report-229-Appendix4-Physical-Comparative-Tables.xls (2,741kb)

Index to codes