JOINT NATURE CONSERVATION COMMITTEE

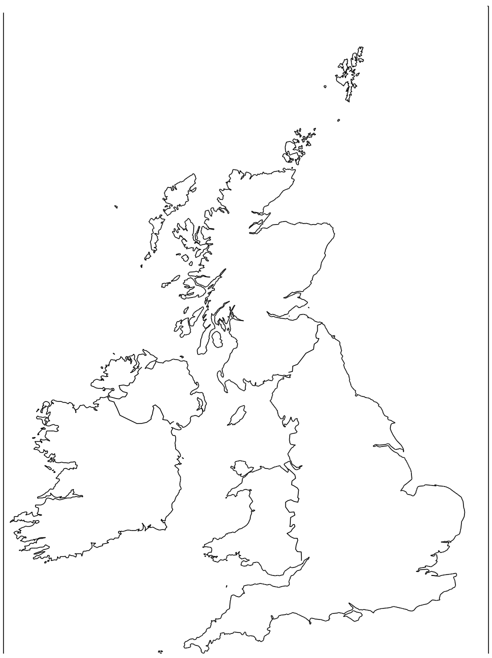
Marine Nature Conservation Review

Marine biotope classification for Britain and Ireland

Volume 2. Sublittoral biotopes

Version 97.06

David W. Connor (co-ordinator), Matthew J. Dalkin, Timothy O. Hill, Rohan H.F. Holt & William G. Sanderson



1997

JNCC Report No. 230

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough PE1 1JY
UK

Recommended citation:

Connor, D.W., Dalkin, M.J., Hill, T.O., Holt, R.H.F., & Sanderson, W.G. 1997. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 2. Sublittoral biotopes. Version 97.06. *JNCC Report*, No. 230.

ISBN 0963 8091

Editor:	David Connor, JNCC
Technical assistance:	Ruth Beaver, JNCC
Photographic images, database export:	Bernard Picton, Ulster Museum, Belfast
Artwork:	Ian Reach, JNCC
Printing:	Ricky Mexson, JNCC
Colour reproduction:	CLE Enterprises Ltd, St Ives, Cambs.

This report contributes to ***BioMar***, a project part-funded by the European Commission under the ***Life*** programme

BioMar partners:

National Parks & Wildlife Service, Ireland

Trinity College Dublin, Ireland

Joint Nature Conservation Committee, UK

University of Newcastle, UK

AID Environment, Netherlands

Companion volume:

Connor, D.W., Brazier, D.P., Hill, T.O., & Northen, K.O. 1997. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes. Version 97.06. *JNCC Report*, No. 229.

The classification is also available in electronic form as:

Connor, D.W., Brazier, D.P., Dalkin, M.J., Hill, T.O., Holt, R.H.F., Northen, K.O., & Sanderson, W.G. 1997. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Version 97.06. *In*: *BioMar biotope viewer: a guide to marine habitats, fauna and flora of Britain and Ireland* ed. by B.E. Picton & M.J. Costello. Dublin, Environmental Sciences Unit, Trinity College.

Contents

Tables, figures and plates

Marine Nature Conservation Review

Marine biotope classification for Britain and Ireland

Volume 2. Sublittoral biotopes

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 sublittoral (subtidal) zone. A full set of descriptions for littoral 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 <u>current</u> 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.

David MacDonald and David Mills have developed and maintained the MNCR database, which has formed an invaluable resource with which to develop the classification.

Other members of the MNCR team, past and present, including Roger Covey, Frank Fortune, Mike Little, Eleanor Murray, Dora Nichols, Ian Reach and Kath Thorpe, have contributed in many ways to the classification, particularly through field survey and data interpretation, and through many hours of discussions on how best to achieve a difficult task.

Malcolm Vincent has provided valuable guidance, especially on the use of coarser units for conservation management purposes and the final report; John Hopkins has shown considerable interest in the MNCR classification.

BioMar - Our BioMar partners, especially Mark Costello, Bernard Picton, Chris Emblow, Paul Tierney, Mona McCrea at Trinity College Dublin, Liz Sides at the National Parks and Wildlife Service Dublin and Bob Foster-Smith and Jon Davies at the University of Newcastle-upon-Tyne, have contributed considerably to discussions on the classification.

Countryside Council for Wales, English Nature and Scottish Natural Heritage - Input from the countryside nature conservation agencies, particularly Mandy Richards, Gabrielle Moffett and Chris Uttley at the Countryside Council for Wales, Dan Laffoley and Paul Gilliland at English Nature and John Baxter and David Donnan at Scottish Natural Heritage, has provided a valuable contribution, especially on conservation management perspectives and practical use in the field.

Ulster Museum - Bernard Picton (formerly with the BioMar team at Trinity College) has provided invaluable help with extracting information from the database classification module for the present report, preparation of the photographic material and inclusion of the classification in the BioMar Viewer.

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 sublittoral (subtidal) zone. A full set of descriptions for littoral (intertidal) types is given in Connor *et al.* (1997b). 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 *eds* 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 habitat 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 *ed*. (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.

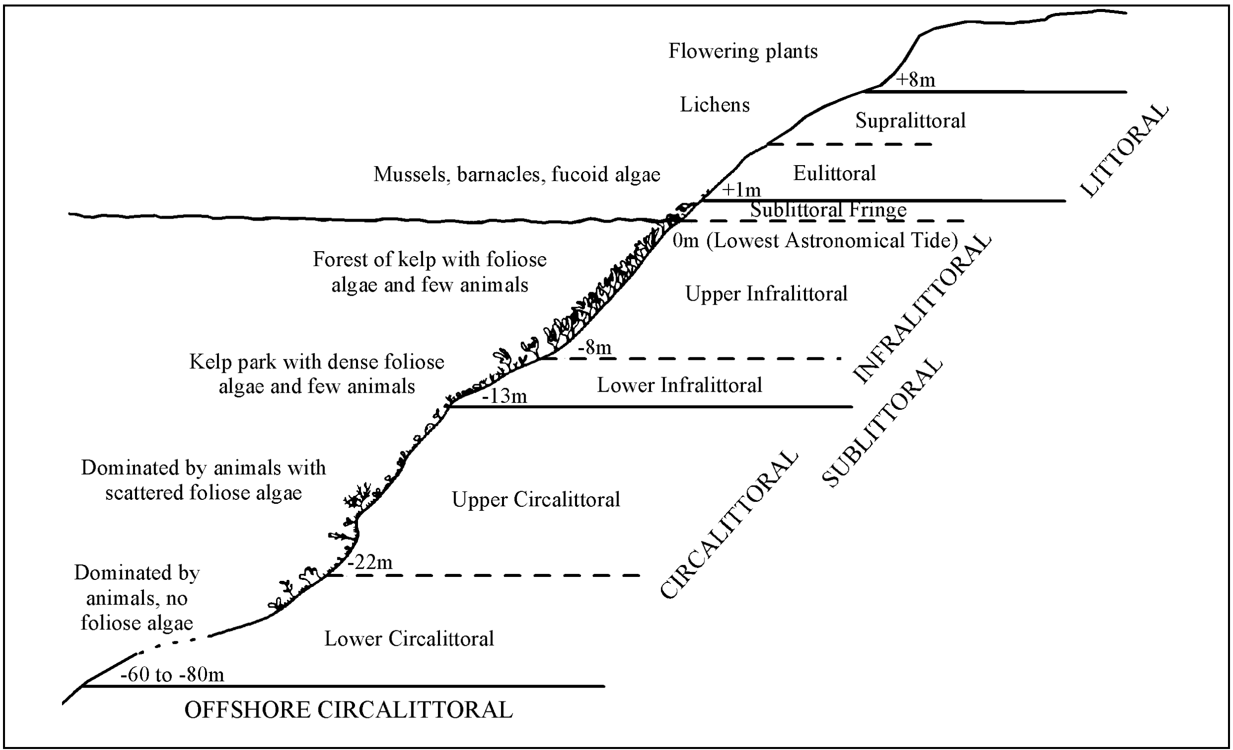


Figure 2.1 Profile of a rocky shore and seabed showing the biological zones (modified from Hiscock *ed*. 1996); heights and depths given are typical values for south-west Britain. In sediment habitats a similar vertical zonation for the main zones is found.

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.

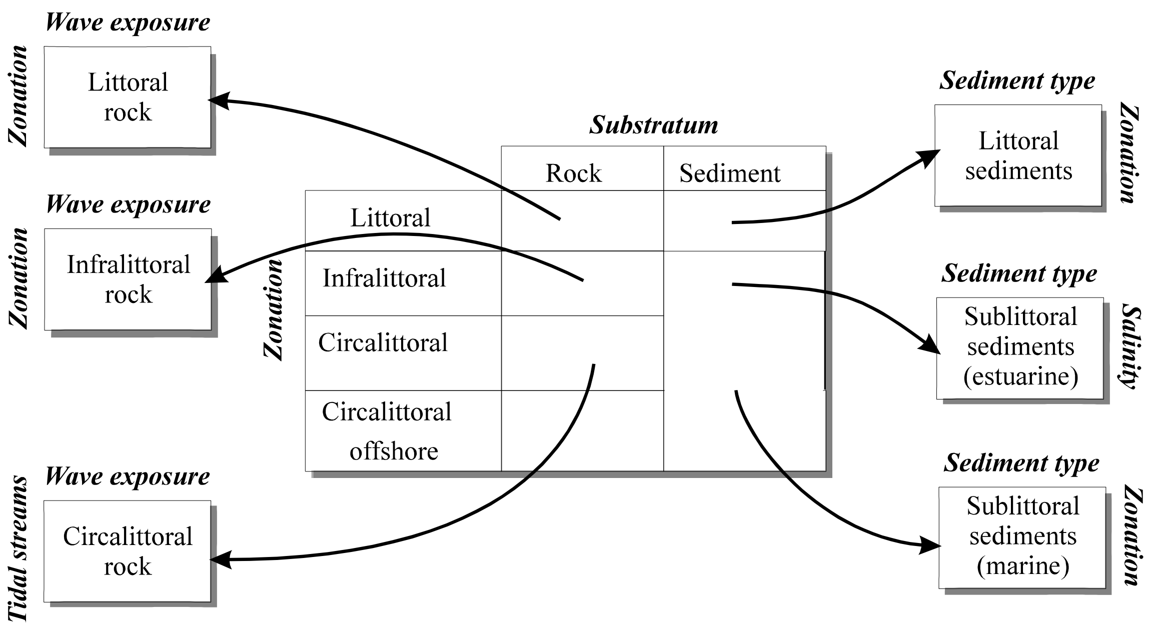


Figure 2.2 The inter-relationship of primary and secondary habitat matrices

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 / **ZONE**		**ROCK [R]** (epibiota)			**SEDIMENT [S]** (infauna + epibiota)			
		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 **bry**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 **ma**e**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		

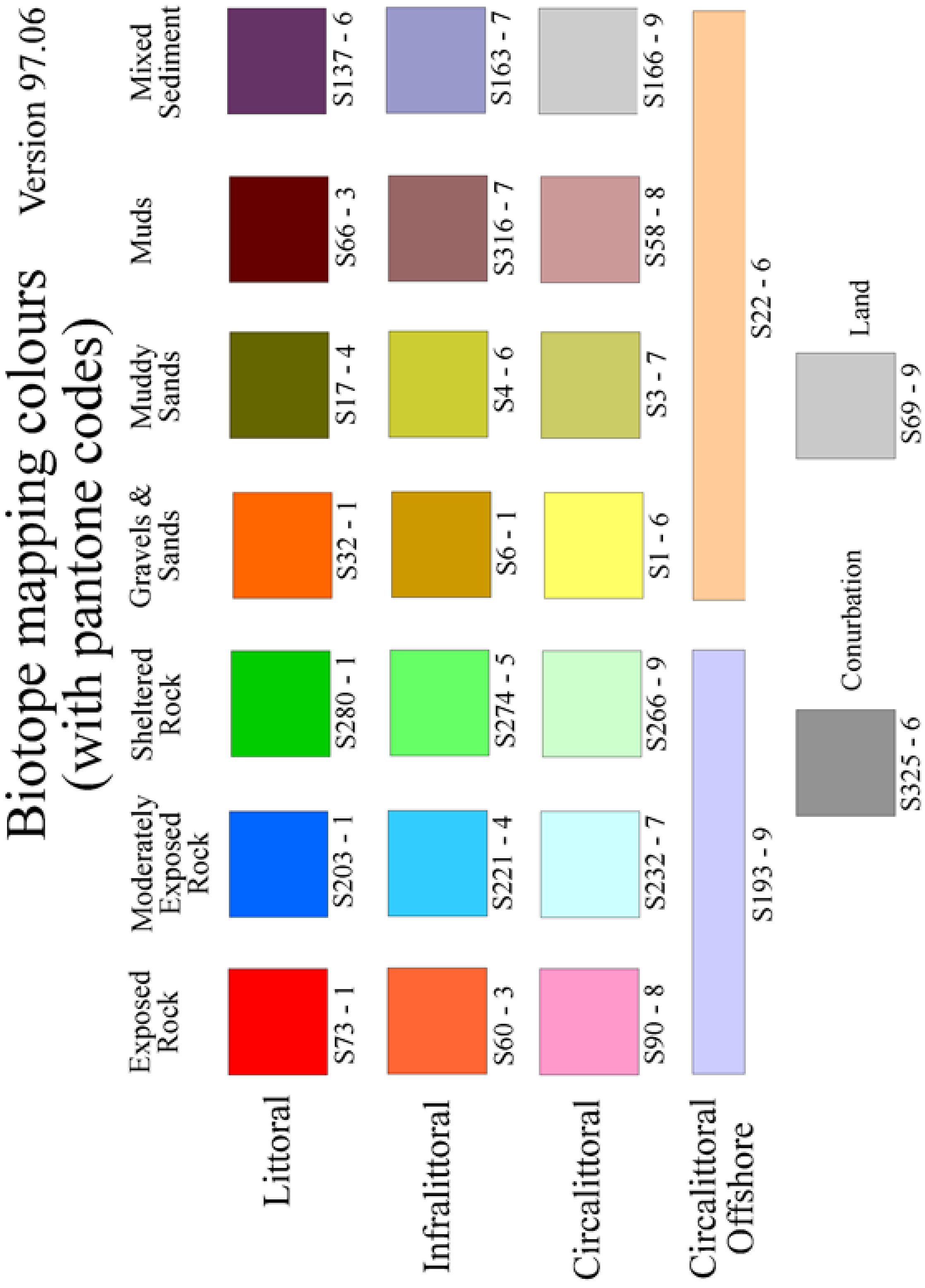


Plate 1 Colour chart for mapping habitat complex types

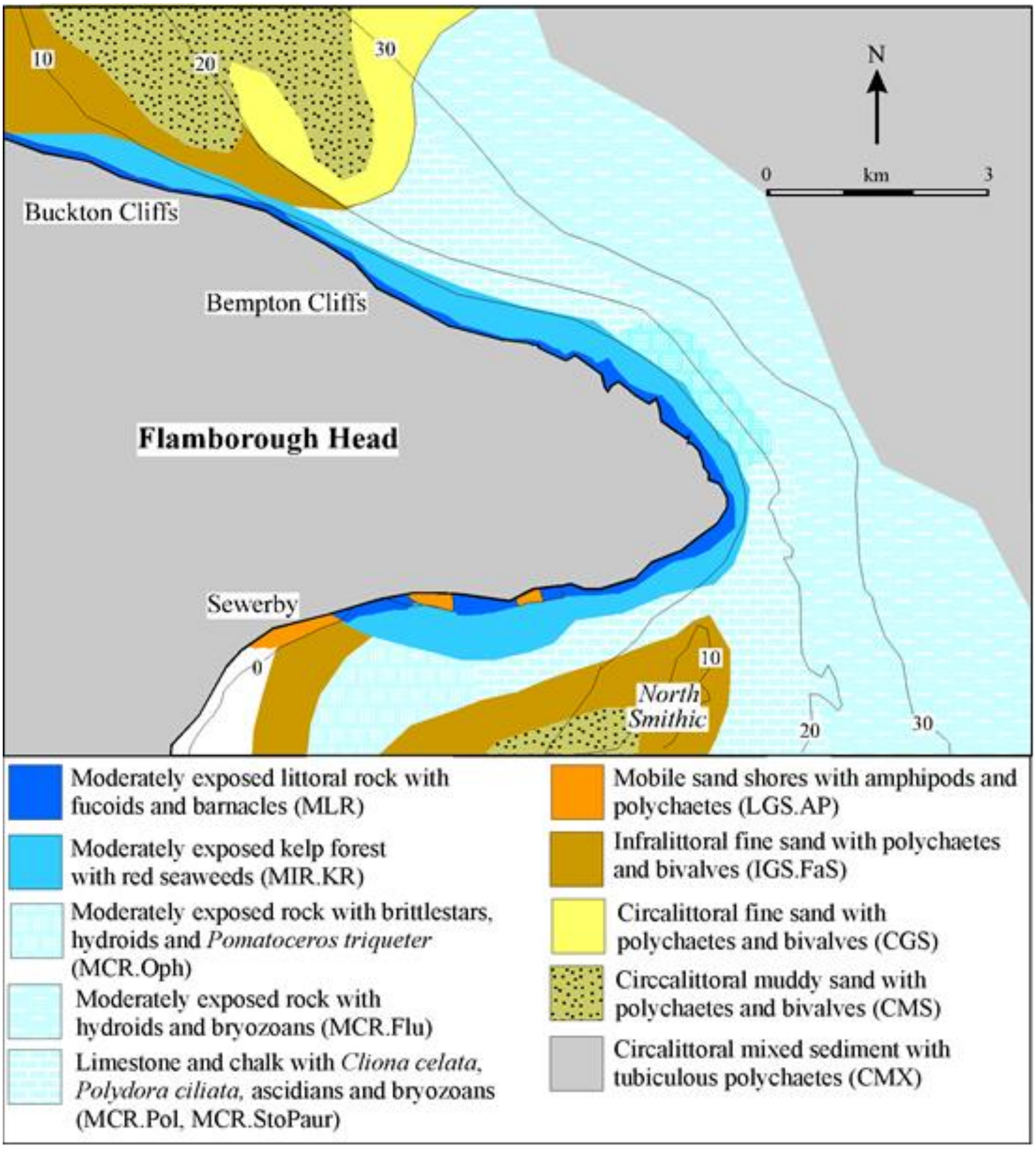


Plate 2 Example of a biotope distribution map using standard habitat complex colours and overlay shading to add further definition (from Brazier et al. In prep.; based on RoxAnn acoustic data, detailed in situ survey and remote grab sampling)

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 *eds* (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)**	
LR.L		**Lichens or algal crusts**	
LR.L	YG	Yellow and grey lichens on supralittoral rock	
LR.L	Pra	*Prasiola stipitata* on nitrate-enriched supralittoral or littoral fringe rock	
LR.L	Ver	*Verrucaria maura* on littoral fringe rock	
LR.L	Ver.Por	*Verrucaria maura* and *Porphyra umbilicalis* on very exposed littoral fringe rock	
LR.L	Ver.B	*Verrucaria maura* and sparse barnacles on exposed littoral fringe rock	
LR.L	Ver.Ver	*Verrucaria maura* on moderately exposed to very sheltered upper littoral fringe rock	
LR.L	Chr	Chrysophyceae on vertical upper littoral fringe soft rock	
LR.L	Bli	*Blidingia* spp. on vertical littoral fringe soft rock	
LR.L	UloUro	*Ulothrix flacca* and *Urospora* spp. on freshwater-influenced vertical littoral fringe soft rock	
ELR		**EXPOSED LITTORAL ROCK (mussel/barnacle shores)**	
ELR.MB		***Mytilus* (mussels) and barnacles**	
ELR.MB	MytB	*Mytilus edulis* and barnacles on very exposed eulittoral rock	
ELR.MB	BPat	Barnacles and *Patella* spp. on exposed or moderately exposed, or vertical sheltered, eulittoral rock	
ELR.MB	BPat.Cht	*Chthamalus* spp. on exposed upper eulittoral rock	
ELR.MB	BPat.Lic	Barnacles and *Lichina pygmaea* on steep exposed upper eulittoral rock	
ELR.MB	BPat.Cat	*Catenella caespitosa* on overhanging, or shaded vertical, upper eulittoral rock	
ELR.MB	BPat.Fvesl	Barnacles, *Patella* spp. and *Fucus vesiculosus* f. *linearis* on exposed eulittoral rock	
ELR.MB	BPat.Sem	*Semibalanus balanoides* on exposed or moderately exposed, or vertical sheltered, eulittoral rock	
ELR.FR		**Robust fucoids or red seaweeds**	
ELR.FR	Fdis	*Fucus distichus* subsp. *anceps* and *Fucus spiralis* f. *nana* on extremely exposed upper eulittoral rock	
ELR.FR	Coff	*Corallina officinalis* on very exposed lower eulittoral rock	

Higher code	Biotope code	Biotope	Pg.
ELR.FR	Him	*Himanthalia elongata* and red seaweeds on exposed lower eulittoral rock	
		See also MLR.Pal & MLR.Mas	
MLR		**MODERATELY EXPOSED LITTORAL ROCK (barnacle/fucoid shores)**	
MLR.BF		**Barnacles and fucoids (moderately exposed shores)**	
MLR.BF	PelB	*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock	
MLR.BF	FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	
MLR.BF	Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	
MLR.BF	Fser.R	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	
MLR.BF	Fser.Fser	Dense *Fucus serratus* on moderately exposed to very sheltered lower eulittoral rock	
MLR.BF	Fser.Fser.Bo	*Fucus serratus* and under-boulder fauna on lower eulittoral boulders	
MLR.BF	Fser.Pid	*Fucus serratus* and piddocks on lower eulittoral soft rock	
		See also ELR.BPat and SLR.Fspi	
MLR.R		**Red seaweeds (moderately exposed shores)**	
MLR.R	XR	Mixed red seaweeds on moderately exposed lower eulittoral rock	
MLR.R	Pal	*Palmaria palmata* on very to moderately exposed lower eulittoral rock	
MLR.R	Mas	*Mastocarpus stellatus* and *Chondrus crispus* on very to moderately exposed lower eulittoral rock	
MLR.R	Osm	*Osmundea (Laurencia) pinnatifida* and *Gelidium pusillum* on moderately exposed mid eulittoral rock	
MLR.R	RPid	*Ceramium* sp. and piddocks on eulittoral fossilised peat	
MLR.Eph		**Ephemeral green or red seaweeds (freshwater or sand-influenced)**	
MLR.Eph	Ent	*Enteromorpha* spp. on freshwater-influenced or unstable upper eulittoral rock	
MLR.Eph	EntPor	*Porphyra purpurea* or *Enteromorpha* spp. on sand-scoured mid or lower eulittoral rock	
MLR.Eph	Rho	*Rhodothamniella floridula* on sand-scoured lower eulittoral rock	
MLR.MF		***Mytilus* (mussels) and fucoids (moderately exposed shores)**	

Higher code	Biotope code	Biotope	Pg.
MLR.MF	MytFves	*Mytilus edulis* and *Fucus vesiculosus* on moderately exposed mid eulittoral rock	
MLR.MF	MytFR	*Mytilus edulis*, *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	
MLR.MF	MytPid	*Mytilus edulis* and piddocks on eulittoral firm clay	
MLR.Sab		**Littoral *Sabellaria* (honeycomb worm) reefs**	
MLR.Sab	Salv	*Sabellaria alveolata* reefs on sand-abraded eulittoral rock	
SLR		**SHELTERED LITTORAL ROCK (fucoid shores)**	
SLR.F		**Dense fucoids (stable rock)**	
SLR.F	Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock	
SLR.F	Fspi	*Fucus spiralis* on moderately exposed to very sheltered upper eulittoral rock	
SLR.F	Fves	*Fucus vesiculosus* on sheltered mid eulittoral rock	
SLR.F	Asc	*Ascophyllum nodosum* on very sheltered mid eulittoral rock	
SLR.F	Asc.Asc	*Ascophyllum nodosum* on full salinity mid eulittoral rock	
SLR.F	Asc.T	*Ascophyllum nodosum*, sponges and ascidians on tide-swept mid eulittoral rock	
SLR.F	Asc.VS	*Ascophyllum nodosum* and *Fucus vesiculosus* on variable salinity mid eulittoral rock	
SLR.F	Fserr	*Fucus serratus* on sheltered lower eulittoral rock	
SLR.F	Fserr.T	*Fucus serratus*, sponges and ascidians on tide-swept lower eulittoral rock	
SLR.F	Fserr.VS	*Fucus serratus* and large *Mytilus edulis* on variable salinity lower eulittoral rock	
SLR.F	Fcer	*Fucus ceranoides* on reduced salinity eulittoral rock	
		See also ELR.BPat.Sem, MLR.Fser.Fser, MLR.Ent and MLR.Rho	
SLR.FX		**Fucoids, barnacles or ephemeral seaweeds (mixed substrata)**	
SLR.FX	BLlit	Barnacles and *Littorina littorea* on unstable eulittoral mixed substrata	
SLR.FX	FvesX	*Fucus vesiculosus* on mid eulittoral mixed substrata	
SLR.FX	AscX	*Ascophyllum nodosum* on mid eulittoral mixed substrata	
SLR.FX	AscX.mac	*Ascophyllum nodosum* ecad. *mackaii* beds on extremely sheltered mid eulittoral mixed substrata	

Higher code	Biotope code	Biotope	Pg.
SLR.FX	FserX	*Fucus serratus* on lower eulittoral mixed substrata	
SLR.FX	FserX.T	*Fucus serratus* with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata	
SLR.FX	EphX	Ephemeral green and red seaweeds on variable salinity or disturbed eulittoral mixed substrata	
SLR.FX	FcerX	*Fucus ceranoides* on reduced salinity eulittoral mixed substrata	
		See also SLR.Pel and SLR.Fspi	
SLR.MX		***Mytilus* (mussel) beds (mixed substrata)**	
SLR.MX	MytX	*Mytilus edulis* beds on eulittoral mixed substrata	

Littoral rock (other)

Higher code	Biotope code	Biotope	Pg.
LR.Rkp		**Rockpools**	
LR.Rkp	G	Green seaweeds (*Enteromorpha* spp. and *Cladophora* spp.) in upper shore rockpools	
LR.Rkp	Cor	*Corallina officinalis* and coralline crusts in shallow eulittoral rockpools	
LR.Rkp	Cor.Par	Coralline crusts and *Paracentrotus lividus* in shallow eulittoral rockpools	
LR.Rkp	Cor.Bif	*Bifurcaria bifurcata* in shallow eulittoral rockpools	
LR.Rkp	Cor.Cys	*Cystoseira* spp. in shallow eulittoral rockpools	
LR.Rkp	FK	Fucoids and kelps in deep eulittoral rockpools	
LR.Rkp	FK.Sar	*Sargassum muticum* in eulittoral rockpools	
LR.Rkp	SwSed	Seaweeds in sediment (sand or gravel)-floored eulittoral rockpools	
LR.Rkp	H	Hydroids, ephemeral seaweeds and *Littorina littorea* in shallow eulittoral mixed substrata pools	
LR.Ov		**Overhangs and caves**	
LR.Ov	RhoCv	*Rhodothamniella floridula* in upper littoral fringe soft rock caves	
LR.Ov	SR	Sponges and shade-tolerant red seaweeds on overhanging lower eulittoral bedrock	
LR.Ov	SByAs	Sponges, bryozoans and ascidians on deeply overhanging lower shore bedrock	

Higher code	Biotope code	Biotope	Pg.
LS		**LITTORAL SEDIMENTS**	
LGS		**LITTORAL GRAVELS AND SANDS**	
LGS.Sh		**Shingle (pebble) and gravel shores**	
LGS.Sh	BarSh	Barren shingle or gravel shores	
LGS.Sh	Pec	*Pectenogammarus planicrurus* in mid shore well-sorted gravel or coarse sand	
LGS.S		**Sand shores**	
LGS.S	Tal	Talitrid amphipods in decomposing seaweed on the strand-line	
LGS.S	BarSnd	Barren coarse sand shores	
LGS.S	AEur	Burrowing amphipods and *Eurydice pulchra* in well-drained clean sand shores	
LGS.S	AP	Burrowing amphipods and polychaetes in clean sand shores	
LGS.S	AP.P	Burrowing amphipods and polychaetes (often with *Arenicola marina*) in clean sand shores	
LGS.S	AP.Pon	Burrowing amphipods *Pontocrates* spp. and *Bathyporeia* spp. in lower shore clean sand	
LGS.S	Lan	Dense *Lanice conchilega* in tide-swept lower shore sand	
LGS.Est		**Estuarine coarse sediment shores**	
LGS.Est	Ol	Oligochaetes in reduced or low salinity gravel or coarse sand shores	
LMS		**LITTORAL MUDDY SANDS**	
LMS.MS		**Muddy sand shores**	
LMS.MS	BatCor	*Bathyporeia* spp. and *Corophium* spp. in upper shore slightly muddy fine sands	
LMS.MS	PCer	Polychaetes and *Cerastoderma edule* in fine sand and muddy sand shores	
LMS.MS	MacAre	*Macoma balthica* and *Arenicola marina* in muddy sand shores	
LMS.MS	MacAre.Mare	*Arenicola marina*, *Macoma balthica* and *Mya arenaria* in muddy sand shores	
LMS.Zos		**Littoral *Zostera* (seagrass) beds**	
LMS.Zos	Znol	*Zostera noltii* beds in upper to mid shore muddy sand	
		See also IMS.Zmar and IMS.Rup	
LMU		**LITTORAL MUDS**	

Higher code	Biotope code	Biotope	Pg.
LMU.Sm		**Saltmarsh**	
LMU.Sm		**Saltmarsh (drift-line)**	
LMU.Sm	NVC SM24	*Elymus pycnanthus* with *Suaeda vera* or *Inulu crithmoides*	
LMU.Sm	NVC SM28	*Elymus repens*	
LMU.Sm	NVC SM25	*Suaeda vera*	
LMU.Sm	NVC SM21	*Suaeda vera-Limonium binervosum*	
LMU.Sm	NVC SM23	*Spergularia marina-Puccinellia distans*	
LMU.Sm	NVC SM22	*Frankenia laevis-Halimione portulacoides*	
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.	
LMU.Sm	NVC SM6	*Spartina anglica*	

Higher code	Biotope code	Biotope	Pg.
EIR.KFaR	LhypFa	*Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed infralittoral rock	142
EIR.KFaR	LhypPar	Sparse *Laminaria hyperborea* and dense *Paracentrotus lividus* on exposed infralittoral limestone	144
EIR.KFaR	LhypR	*Laminaria hyperborea* with dense foliose red seaweeds on exposed infralittoral rock	145
EIR.KFaR	LhypR.Ft	*Laminaria hyperborea* forest with dense foliose red seaweeds on exposed upper infralittoral rock	146
EIR.KFaR	LhypR.Pk	*Laminaria hyperborea* park with dense foliose red seaweeds on exposed lower infralittoral rock	148
EIR.KFaR	LhypR.Loch	Mixed *Laminaria hyperborea* and *Laminaria ochroleuca* forest on exposed infralittoral rock	150
EIR.KFaR	LsacSac	*Laminaria saccharina* and/or *Saccorhiza polyschides* on exposed infralittoral rock	152
EIR.KFaR	FoR	Foliose red seaweeds on exposed or moderately exposed lower infralittoral rock	154
EIR.KFaR	FoR.Dic	Foliose red seaweeds with dense *Dictyota dichotoma* and/or *Dictyopteris membranacea* on exposed lower infralittoral rock	155
EIR.SG		**Robust faunal cushions and crusts (surge gullies & caves)**	77
EIR.SG	FoSwCC	Foliose seaweeds and coralline crusts in surge gully entrances	156
EIR.SG	SCAn	Sponge crusts and anemones on wave-surged vertical infralittoral rock	157
EIR.SG	SCAn.Tub	Sponge crusts, anemones and *Tubularia indivisa* in shallow infralittoral surge gullies	158
EIR.SG	SCAs	Sponge crusts and colonial ascidians on wave-surged vertical infralittoral rock	159
EIR.SG	SCAs.DenCla	*Dendrodoa grossularia* and *Clathrina coriacea* on wave-surged vertical infralittoral rock	161
EIR.SG	SCAs.ByH	Sponge crusts, colonial (polyclinid) ascidians and a bryozoan/hydroid turf on wave-surged vertical or overhanging infralittoral rock	163
EIR.SG	SC	Sponge crusts on extremely wave-surged infralittoral cave or gully walls	165
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	166
EIR.SG	CC.Mob	Coralline crusts and crustaceans on mobile boulders or cobbles in surge gullies	168
MIR		**MODERATELY EXPOSED INFRALITTORAL ROCK**	79

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

<table>
<tr><th colspan="2">SUBSTRATUM</th><th colspan="3">ROCK [R] (epibiota)</th><th colspan="4">SEDIMENT [S] (infauna + epibiota)</th></tr>
<tr><th colspan="2">ZONE</th><th>Exposed rock [E]
(high energy - wave exposed or very tide-swept)</th><th>Moderately exposed rock [M]
(moderate energy - moderately wave-exposed or tide-swept)</th><th>Sheltered rock [S]
(low energy - wave sheltered and weak tidal streams)</th><th>Gravels & sands [GS]</th><th>Muddy sands [MS]
(10-30% silt/clay)</th><th>Muds [MU]
(30-100% silt/clay)</th><th>Mixed sediment [MX]
(gravel, sand and mud)</th></tr>
<tr><td>Littoral [L]
(splash zone, strandline & intertidal)</td><td>(lichens; green algae; fucoid, barnacle & mussel communities; intertidal sediments)</td><td>Exposed littoral rock
[ELR]</td><td>Moderately exposed littoral rock
[MLR]</td><td>Sheltered littoral rock
[SLR]</td><td>Littoral gravels & sands
[LGS]</td><td>Littoral muddy sands
[LMS]</td><td>Littoral muds
[LMU]</td><td>Littoral mixed sediment
[LMX]</td></tr>
<tr><td>Infralittoral [I]
(shallow subtidal)</td><td>(kelp & other algal communities; wave-disturbed animal communities)</td><td>Exposed infralittoral rock
[EIR]</td><td>Moderately exposed infralittoral rock
[MIR]</td><td>Sheltered infralittoral rock
[SIR]</td><td>Infralittoral gravels & sands
[IGS]</td><td>Infralittoral muddy sands
[IMS]</td><td>Infralittoral muds
[IMU]</td><td>Infralittoral mixed sediment
[IMX]</td></tr>
<tr><td>Circalittoral [C]
(nearshore deeper subtidal)</td><td>(animal-dominated communities in semi-stable conditions)</td><td>Exposed circalittoral rock
[ECR]</td><td>Moderately exposed circalittoral rock
[MCR]</td><td>Sheltered circalittoral rock
[SCR]</td><td>Circalittoral gravels & sands
[CGS]</td><td>Circalittoral muddy sands
[CMS]</td><td>Circalittoral muds
[CMU]</td><td>Circalittoral mixed sediment
[CMX]</td></tr>
<tr><td>Circalittoral offshore [CO]
(offshore deep subtidal)</td><td>(animal communities in stable conditions)</td><td colspan="3">Circalittoral offshore rock
[COR]</td><td colspan="4">Circalittoral offshore sediment
[COS]</td></tr>
</table>

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
Littoral (intertidal)		Lichens or algal crusts				Saltmarsh	
	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

<table>
<tr><th></th><th>VERY EXPOSED</th><th>EXPOSED</th><th>MODERATELY EXPOSED</th><th>SHELTERED</th><th>VERY SHELTERED</th></tr>
<tr><td>SUPRA-LITTORAL</td><td colspan="5">Yellow & grey lichens (YG)
Pools - Enteromorpha & Cladophora (G)
Nitrate enrichment - Prasiola stipitata (Pra)</td></tr>
<tr><td>UPPER LITTORAL FRINGE</td><td colspan="2" rowspan="2">Verrucaria with Porphyra umbilicalis (Ver.Por)
Verrucaria with sparse barnacles (Ver.B)
Pools - Coralline crusts & Corallina officinalis (Cor)
Nitrate enrichment - Prasiola stipitata (Pra)</td><td>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)</td><td colspan="2">Verrucaria maura (Ver.Ver)
Pools - Enteromorpha & Cladophora (G)
Freshwater runoff / unstable - Enteromorpha (Ent)</td></tr>
<tr><td>LOWER LITTORAL FRINGE</td><td>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)</td><td colspan="2">Pelvetia canaliculata (Pel)
Vertical - Verrucaria maura (Ver.Ver)
Freshwater runoff / unstable - Enteromorpha (Ent)</td></tr>
<tr><td>UPPER EULITTORAL</td><td>Mytilus edulis & barnacles (MytB)
Barnacles & Patella (BPat.Cht)
Shallow pools - Coralline crusts & Corallina officinalis (Cor)
Extreme exposure - Fucus distichus & Fucus spiralis f. nana (Fdis)</td><td>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)</td><td>Fucus spiralis (Fspi)
Vertical - Barnacles & Patella (BPat.Cht & BPat.Sem)
Shallow pools - Coralline crusts & Corallina officinalis (Cor)
Freshwater runoff / unstable - Enteromorpha (Ent)</td><td>Fucus spiralis (Fspi)
Vertical - Barnacles & Patella (BPat.Cht & BPat.Sem)
Shallow pools - Coralline crusts & Corallina officinalis (Cor)
Mixed - Barnacles & L. littorea (BLlit)</td><td>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)</td></tr>
<tr><td>MID EULITTORAL</td><td>Mytilus edulis & barnacles (MytB)
Vertical - Mastocarpus (Mas); Palmaria (Pal)
Shallow pools - Coralline crusts & Corallina officinalis (Cor)
Deep pools - Fucoids & kelps (FK.*)</td><td>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.*)</td><td>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)</td><td>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.*)</td><td>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)</td></tr>
<tr><td>LOWER EULITTORAL</td><td>Mytilus edulis & barnacles (MytB)
Corallina (Coff)
Shallow pools - Coralline crusts & Corallina officinalis (Cor)
Deep pools - Fucoids & kelps (FK.*)
Surge gullies - Sponges & anemones (SCAn)</td><td>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)</td><td>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)</td><td>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)</td><td>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)</td></tr>
</table>

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: Pebble (shingle) & gravels	GRAVELS & SANDS: Clean sands	MUDDY SANDS (10-30% silt/clay)	MUDS: Sandy muds (30-80% silt/clay)	MUDS: Soft muds (>80% silt/clay)	MIXED SEDIMENTS (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 *ed*. (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*).

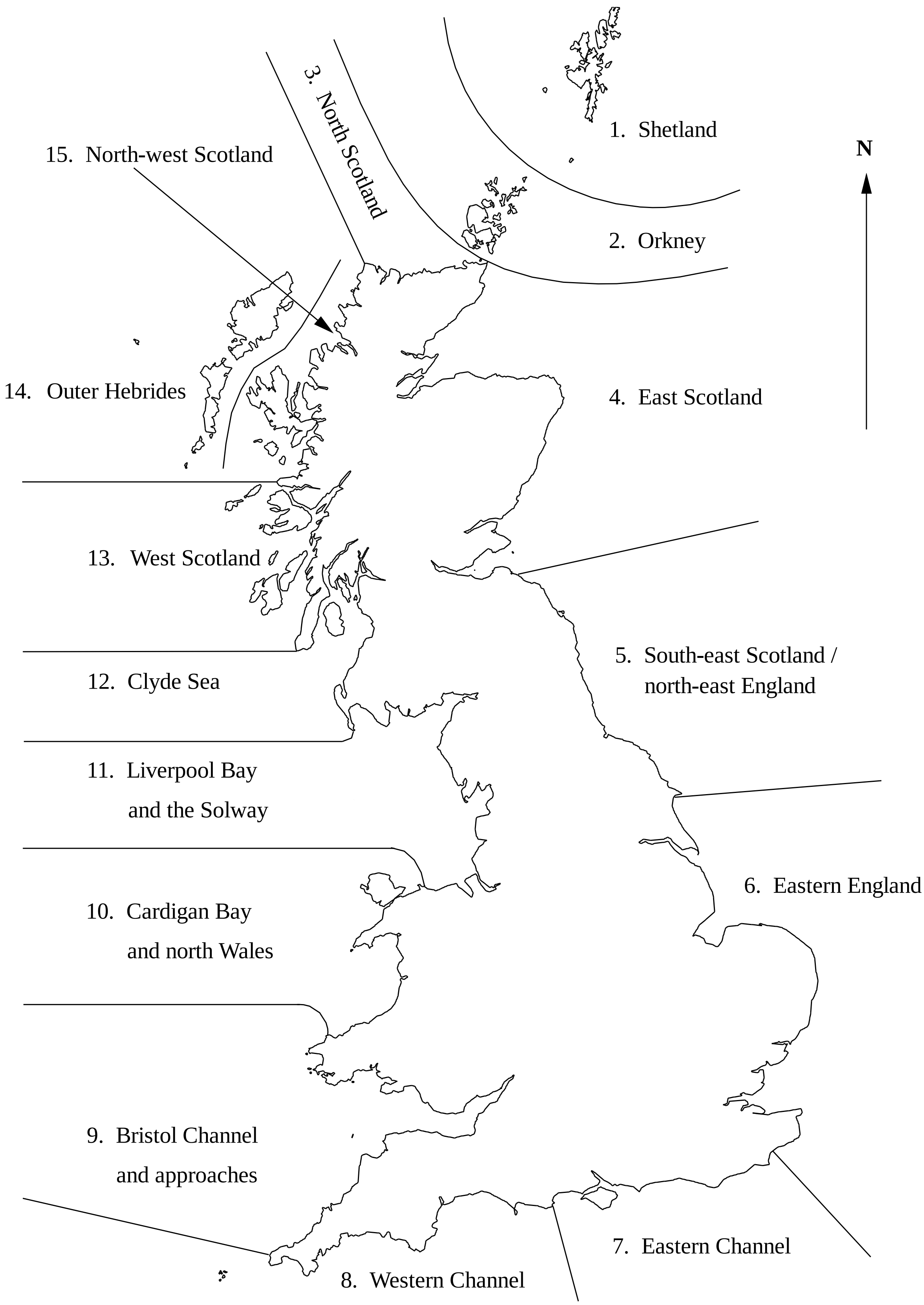


Figure 6.1 MNCR British coastal sectors

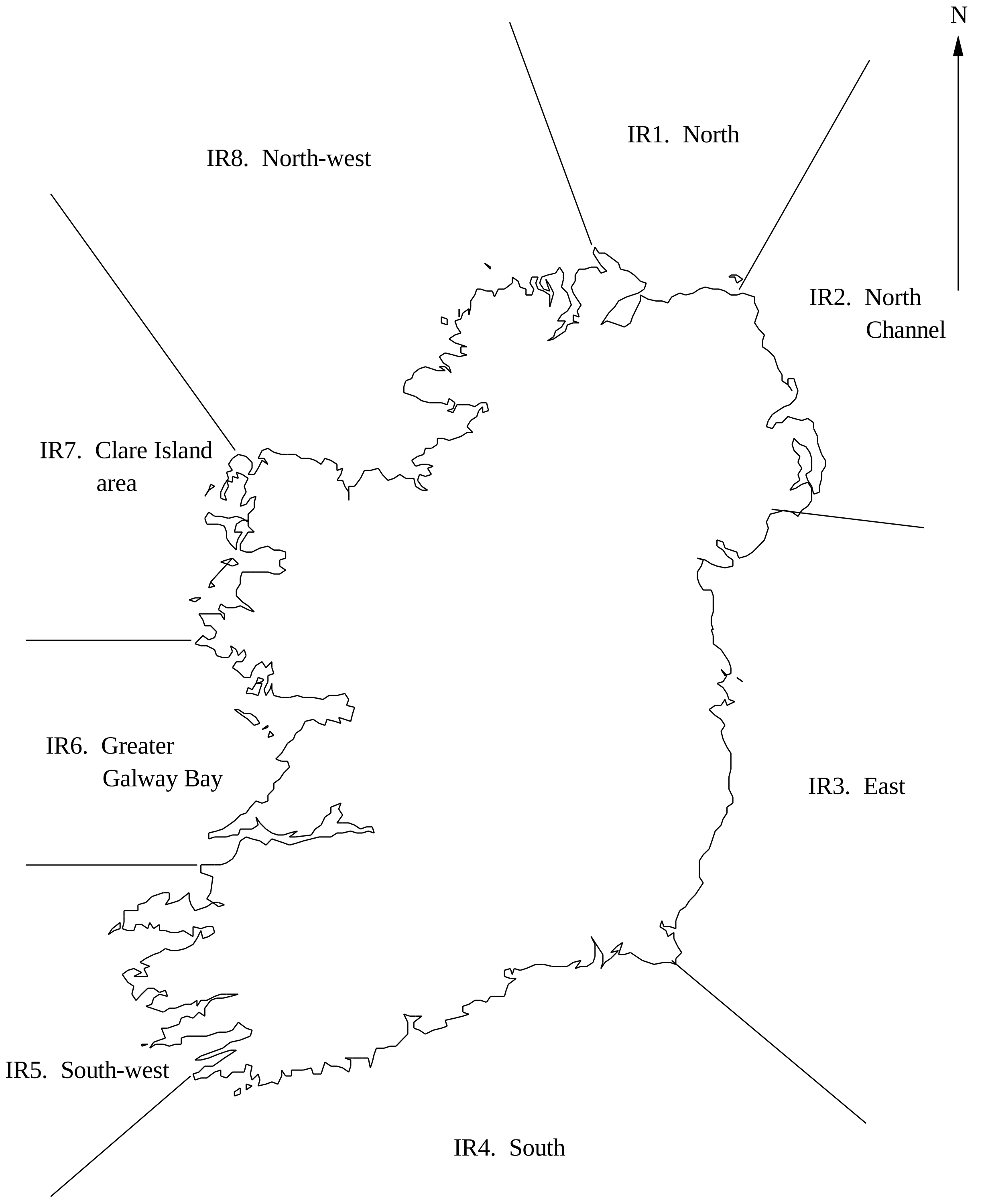


Figure 6.2 BioMar Irish coastal sectors

6.2 Sublittoral (subtidal) main types

IR Infralittoral rock (and other hard substrata)

Habitat classification

		Previous code	
Salinity:	Full, Variable, Reduced / low	SR in part	96.7
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak		
Substratum:	Bedrock; boulders, cobbles; mixed substrata		
Zone:	Sublittoral fringe, Infralittoral		
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m, 30-50m		

Biotope description

Infralittoral rock includes habitats of bedrock, boulders and cobbles which occur in the shallow subtidal zone and typically support seaweed communities. The upper limit is marked by the top of the laminarian kelp zone whilst the lower limit is marked by the lower limit of kelp growth or the lower limit of dense seaweed growth. Infralittoral rock typically has an upper zone of dense kelp (forest) and a lower zone of sparse kelp (park), both with an understorey of erect seaweeds. In exposed conditions the kelp is *Laminaria hyperborea* whilst in more sheltered habitats it is usually *Laminaria saccharina*; other kelp species may dominate under certain conditions. On the extreme lower shore and in the very shallow subtidal (sublittoral fringe) there is usually a narrow band of dabberlocks *Alaria esculenta* (exposed coasts) or the kelps *Laminaria digitata* (moderately exposed) or *L. saccharina* (very sheltered). Areas of mixed ground, lacking stable rock, may lack kelps but support seaweed communities. In estuaries and other turbid-water areas the shallow subtidal may be dominated by animal communities, with only poorly developed seaweed communities.

Distribution

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

Frequency of occurrence

In Britain: Very common

EIR Exposed infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock, boulders, cobbles
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m, 30-50m
Other features:	Includes shallow surge gullies and caves

Biotope description

Rocky habitats in the infralittoral zone subject to exposed to extremely exposed wave action or strong tidal streams. Typically the rock supports a community of kelp *Laminaria hyperborea* with foliose seaweeds and animals, the latter tending to become more prominent in areas of strongest water movement. The depth to which the kelp extends varies according to water clarity, exceptionally (e.g. St Kilda) reaching 45 m. The sublittoral fringe is characterised by dabberlocks *Alaria esculenta*. Surge gullies and caves typically lack kelp, and in reduced light conditions lack red seaweeds and are dominated by communities of sponges, ascidians, bryozoans, mussels and barnacles.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Laminaria hyperborea		••	
Alaria esculenta		•••	

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	GB R1-5, 8-15			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Very common

EIR.KFaR Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock; stable boulders
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m, 30-50m

Biotope description

Rocky habitats in the infralittoral zone subject to exposed to extremely exposed wave action or strong tidal streams. Typically the rock supports a community of kelp *Laminaria hyperborea* with foliose seaweeds and animals, the latter tending to become more prominent in areas of strongest water movement. The depth to which the kelp extends varies according to water clarity, exceptionally (e.g. St Kilda) reaching 45 m. The sublittoral fringe is characterised by dabberlocks *Alaria esculenta*, or occasionally by the kelp *Saccorhiza polyschides*. In very strong wave action the sublittoral fringe *Alaria* zone extends to 5 or 10 m, whilst at Rockall *Alaria* replaces *L. hyperborea* as the dominant kelp in the infralittoral. In some areas, there may be a band of dense foliose seaweeds (reds or browns) below the main kelp zone.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Mytilus edulis	••	•	Common
Echinus esculentus	••	•	Frequent
Palmaria palmata	••	••	Frequent
Corallinaceae	•••	•	Common
Corallina officinalis	••	••	Frequent
Laminaria digitata	••	••	Common
Laminaria hyperborea	••••	•	Common
Alaria esculenta	•••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	GB - R1-5 & 8-15			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Very common

EIR.SG Robust faunal cushions and crusts (surge gullies and caves)

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock (boulders, cobbles, pebbles or coarse sediment in gully floors)
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Wave surge; vertical (and overhanging rock)

Biotope description

Infralittoral rocky habitats subject to strong wave surge conditions, as found in surge gullies and shallow caves, and typically colonised by faunal communities of encrusting or cushion sponges, colonial ascidians, short turf-forming bryozoans, anemones, barnacles and, where there is sufficient light, red seaweeds. These features usually consist of vertical bedrock walls, occasionally with overhanging faces, and support communities which reflect the degree of wave surge they are subject to and any scour from mobile substrata on the cave/gully floors. The larger cave and gully systems, such as found in Shetland, Orkney, the Western Isles and St Kilda, typically show a marked zonation from the entrance to the rear of the gully/cave as wave surge increases and light reduces. This is reflected in communities of anemones, ascidians, bryozoans and red seaweeds near the entrance, leading to sponge crust-dominated communities and finally barnacle and spirorbid worm communities in the most severe surge conditions. Gully/cave floors usually have mobile boulders, cobbles, pebbles or coarse sediment. The mobile nature of the gully/cave floors leads to communities of encrusting species, tolerant of scour and abrasion or fast summer-growing ephemeral species. The lower zone of the gully side walls are also often scoured, and typically colonised by coralline crusts and barnacles.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	•••	Frequent
Grantia compressa	••	•••	Occasional
Halichondria panicea	•••	•	Frequent
Esperiopsis fucorum	••	••	Occasional
Myxilla incrustans	••	••	Occasional
Tubularia indivisa	••	••	Occasional
Metridium senile	••	•	Frequent
Sagartia elegans	•••	•	Occasional
Corynactis viridis	••	••	Frequent
Balanus crenatus	•••	•	Frequent
Cancer pagurus	•••	•	Occasional
Asterias rubens	•••	•	Occasional
Polyclinum aurantium	••	••	Frequent
Morchellium argus	••	••	Occasional
Didemnidae	•	••	Frequent
Dendrodoa grossularia	••	•	Common
Botryllus schlosseri	•••	•	Occasional
Corallinaceae	•••	•	Frequent

Distribution

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

Other GB R1-5 & 8-15
Other Ireland - all coasts

Frequency of occurrence

In Britain: Uncommon

Features of conservation interest

Large cave and gully systems, which support a marked zonation of communities from their entrance to the back of the system, are relatively uncommon and consequently of high interest, particularly when they support uncommon cave species or are species rich.

MIR Moderately exposed infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock; stable boulders and cobbles
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Infralittoral rock subject to moderate wave exposure, or moderately strong tidal streams on more sheltered coasts. On bedrock and stable boulders there is typically a narrow band of kelp *Laminaria digitata* in the sublittoral fringe which lies above a *Laminaria hyperborea* forest and park. Associated with the kelp are communities of seaweeds, predominantly reds and including a greater variety of more delicate filamentous types than found on more exposed coasts (EIR.KFaR). In some areas the rock is subject to intense grazing by urchins and may be devoid of erect seaweeds (MIR.GzK). In areas where rock lies near sediment or is less stable (as in winter storms) different communities develop (MIR.SedK). In particular the kelp *Laminaria saccharina* or sea oak *Halidrys siliquosa* may dominate or the habitat may include more robust scour-tolerant species such as *Polyides rotundus* and *Furcellaria lumbricalis* (MIR.PolAhn).

Distribution

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

Frequency of occurrence

In Britain: Very common

MIR.KR Kelp with red seaweeds (moderately exposed rock)

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock; stable boulders and cobbles
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Infralittoral rock subject to moderate wave exposure, or moderately strong tidal streams on more sheltered coasts. On bedrock and stable boulders there is typically a narrow band of kelp *Laminaria digitata* in the sublittoral fringe which lies above a *Laminaria hyperborea* forest and park. Associated with the kelp are communities of seaweeds, predominantly reds and including a greater variety of more delicate filamentous types than found on more exposed coasts (EIR.KFaR). The faunal component of the understorey is also less prominent than in EIR.KFaR.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Obelia geniculata	••	••	Frequent
Pomatoceros triqueter	•••	•	Occasional
Gibbula cineraria	•••	•	Occasional
Asterias rubens	•••	•	Occasional
Palmaria palmata	••	••	Frequent
Corallinaceae	•••	•	Common
Corallina officinalis	••	••	Frequent
Phycodrys rubens	•••	•	Frequent
Laminaria digitata	•••	••	Abundant
Laminaria hyperborea	••••	•	Common

Distribution

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

Frequency of occurrence

In Britain: Very common

MIR.GzK Grazed kelp with algal crusts

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; stable boulders and cobbles
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Grazed

Biotope description

Infralittoral rock, typically dominated by the kelp *Laminaria hyperborea* but where the rock beneath is intensely grazed by urchins giving a barren algal-encrusted rock surface. In some areas the upper parts of the kelp stipes may be free from grazing pressure and support typical kelp stipe flora. Under intense grazing pressure, erect algae are absent and animals are confined to crevices and under-boulder habitats where urchins cannot penetrate. Where grazing pressure is less severe, some erect algae, such as *Desmarestia aculeata*, and certain animals (e.g. *Alcyonium digitatum* and *Nemertesia antennina*) may occur. Dense aggregations of brittlestars (*Ophiothrix fragilis* and *Ophiocomina nigra*) produce a similarly barren community, through their smothering effect.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Obelia geniculata	••	••	Frequent
Alcyonium digitatum	•••	•	Occasional
Pomatoceros triqueter	•••	•	Frequent
Gibbula cineraria	•••	•	Occasional
Calliostoma zizyphinum	•••	••	Occasional
Antedon bifida	•••	•	Frequent
Asterias rubens	••••	•	Occasional
Ophiocomina nigra	••	•	Frequent
Ophiura albida	••	••	Occasional
Echinus esculentus	•••••	•	Common
Corallinaceae	••••	•	Abundant
Phycodrys rubens	•••	•	Frequent
Aglaozonia (asexual *Cutleria*)	••	••	Frequent
Laminaria hyperborea	••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	GB - R1-5 & 12-15			

Frequency of occurrence

In Britain: Common

Features of conservation interest

Highly grazed habitats tend to be species-poor and of lower conservation interest.

MIR.SedK Sand or gravel-affected or disturbed kelp and seaweed communities

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; unstable boulders and cobbles: often nearby coarse sediment
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Disturbed or sediment-affected

Biotope description

Infralittoral rock habitats, subject to disturbance through mobility of the substratum (boulders or cobbles) or abrasion/covering by nearby coarse sediments or suspended particulate matter (sand). The associated communities can be quite variable in character, depending on the particular conditions which prevail. The typical *Laminaria hyperborea* and red seaweed communities of stable open coast rocky habitats (MIR.KR) are replaced by those which include more ephemeral species or those tolerant of sand and gravel abrasion. As such *Laminaria saccharina*, *Saccorhiza polyschides* or *Halidrys siliquosa* may be prominent components of the community.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	••	•	Frequent
Gibbula cineraria	•••	•	Frequent
Asterias rubens	•••	•	Occasional
Bonnemaisonia asparagoides	••	••	Occasional
Dilsea carnosa	••	••	Occasional
Corallinaceae	•••	•	Common
Phyllophora crispa	••	••	Occasional
Plocamium cartilagineum	•••	•	Frequent
Delesseria sanguinea	•••	•	Occasional
Hypoglossum hypoglossoides	••	••	Occasional
Heterosiphonia plumosa	••	••	Frequent
Dictyota dichotoma	•••	•	Frequent
Laminaria hyperborea	•••	•	Common
Laminaria saccharina	•••	•	Frequent
Saccorhiza polyschides	••	••	Frequent
Halidrys siliquosa	••	••	Frequent

Distribution

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

Frequency of occurrence

In Britain: Common

SIR Sheltered infralittoral rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock, boulders, cobbles and mixed substrata
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Often silty

Biotope description

Infralittoral rock in wave and tide-sheltered conditions, supporting silty communities with *Laminaria hyperborea* and/or *Laminaria saccharina*. Associated seaweeds are typically silt-tolerant and include a high proportion of delicate filamentous types. In turbid-water estuarine areas, the kelp and seaweeds may be replaced by animal-dominated communities (SIR.EstFa) whilst stable hard substrata in lagoons support distinctive communities (SIR.Lag).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Laminaria saccharina		•	

Frequency of occurrence

In Britain: Common

SIR.K Silted kelp (stable rock)

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock, boulders, cobbles and mixed substrata
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Infralittoral rock in wave and tide-sheltered conditions, supporting silty communities with *Laminaria hyperborea* and/or *Laminaria saccharina*. Associated seaweeds are typically silt-tolerant and include a high proportion of delicate filamentous types. Some areas, particularly in the lower infralittoral zone, are subject to intense grazing by urchins and chitons and may have poorly developed seaweed communities.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	•••	•	Frequent
Gibbula cineraria	•••	•	Frequent
Asterias rubens	•••	•	Occasional
Echinus esculentus	•••	•	Occasional
Ascidia mentula	••	••	Occasional
Corallinaceae	•••	•	Common
Laminaria hyperborea	••	•	Common
Laminaria saccharina	••••	•	Common

Frequency of occurrence

In Britain: Common

SIR.EstFa Estuarine faunal communities (shallow rock/mixed substrata)

Habitat classification

Salinity:	Variable
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong, Weak
Substratum:	Bedrock; mixed substrata
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m

Biotope description

Shallow subtidal rocky habitats which support animal-dominated communities, with seaweed communities only poorly developed or absent. In some sealochs (and Norwegian fjords) dense mussel *Mytilus edulis* beds (SIR.MytT) develop in tide-swept channels, whilst upper estuarine rocky habitats in the south-west coast rias may support particular brackish-water tolerant faunas (SIR.CorEle; SIR.HarCon).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cordylophora caspia	•	•••	Occasional
Hartlaubella gelatinosa	••	•••	Common
Balanus crenatus	•••	•	Frequent
Carcinus maenas	•••	•	Occasional
Mytilus edulis	•••	•	Abundant
Bowerbankia imbricata	••	•••	Occasional
Conopeum reticulum	••	•••	Common
Electra crustulenta	•	•••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs			
Other	SW inlets			

Frequency of occurrence

In Britain: Scarce

SIR.Lag Submerged fucoids, green and red seaweeds (lagoonal rock)

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Hard substrata
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Very shallow submerged rocky habitats in lagoons, subject to variable or permanently reduced salinity conditions. These particular habitat conditions lead to a variety of seaweed-dominated communities which include fucoids and green filamentous species. The fucoids, more typical of intertidal habitats, penetrate into the subtidal under the reduced salinity conditions which are not tolerated by kelps.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Mysidae	••	••	Occasional
Carcinus maenas	•••	•	Occasional
Littorina littorea	••	•••	Frequent
Mytilus edulis	••	•	Frequent
Polyides rotundus	•••	••	Frequent
Furcellaria lumbricalis	••	••	Frequent
Ectocarpaceae	•••	••	Frequent
Ascophyllum nodosum	•••	•••	Occasional
Fucus ceranoides	•	•••	Frequent
Fucus serratus	•••	•••	Common
Fucus vesiculosus	•••	•••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Scottish lagoons			

Frequency of occurrence

In Britain: Scarce

IR.FaSwV Fauna and seaweeds (shallow vertical rock)

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock; large boulders
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Vertical rock

Biotope description

Vertical rock faces in the infralittoral zone, supporting animal-dominated communities with various quantities of red seaweeds and occasional kelp plants. Anemones, *Alcyonium digitatum*, short bryozoan turfs (crisiids, *Scrupocellaria* spp. and *Bugula* spp.) are widespread in this habitat.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Myxilla incrustans	••	••	Occasional
Alcyonium digitatum	••••	•	Common
Urticina felina	•••	•	Occasional
Corynactis viridis	••	••	Common
Pomatoceros triqueter	•••	•	Frequent
Cancer pagurus	•••	•	Occasional
Hiatella arctica	••	••	Common
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Frequent
Ophiopholis aculeata	••	••	Frequent
Echinus esculentus	••••	•	Occasional
Corallinaceae	•••	•	Frequent

Distribution

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

Frequency of occurrence

In Britain: Very common

CR Circalittoral rock (and other hard substrata)

Habitat classification

Salinity:	Full, Variable, Reduced / low	SR in part	96.7
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered, Extremely sheltered		
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak		
Substratum:	Bedrock; boulders, cobbles, mixed substrata		
Zone:	Circalittoral		
Depth band:	5-10m, 10-20m, 20-30m, 30-50m		

Previous code

SR in part 96.7

Biotope description

Rocky habitats in the circalittoral zone, in moderate water depths (typically 20-50 m) below the infralittoral seaweed-dominated zone and subject to some variation in temperature and to some wave action influence (compare COR). This habitat is characterised by animal communities, but sparse foliose and filamentous seaweeds may be present in the shallowest depths. The character of the fauna varies enormously and is affected mainly by wave action, tidal stream strength, salinity, turbidity, the degree of scouring and rock topography. It is typical for the community not to be dominated by single species, as is common in shore and infralittoral habitats, but rather comprise a mosaic of species. This, coupled with the range of influencing factors, makes circalittoral rock a difficult area to satisfactorily classify; particular care should therefore be taken in matching species and habitat data to the classification.

Frequency of occurrence

In Britain: Very common

ECR Exposed circalittoral rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock; stable boulders
Zone:	Circalittoral
Depth band:	5-10m, 10-20m, 20-30m, 30-50m

Biotope description

Circalittoral rocky habitats subject to strong wave action or tidal currents and supporting animal communities which are robust enough to survive in such strong water movement. The fauna is generally low-lying faunal crusts, cushions and turfs but also includes communities of the large soft coral *Alcyonium digitatum*. Included here are habitats which occur in very strong tidal streams (ECR.BS) in tidal channels (sounds, sealochs) as well as those found on wave exposed coasts (ECR.EFa, ECR.Alc), as there are strong similarities in species composition in some cases.

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	GB - R1-5, 8-15			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Common

ECR.EFa Faunal crusts or short turfs (wave-exposed rock)

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; stable boulders
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Circalittoral rock on wave-exposed coasts with communities comprising largely of crustose or low-lying species, although some sponges with more massive growths (e.g. *Haliclona viscosa*, *Cliona celata*) may also be present. *Alcyonium digitatum* typically not common.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	•••	•	Occasional
Cliona celata	••••	•	Frequent
Stelligera stuposa	•••	••	Occasional
Hemimycale columella	•••	••	Occasional
Haliclona viscosa	•••	••	Frequent
Nemertesia antennina	••••	•	Occasional
Nemertesia ramosa	•••	•	Occasional
Alcyonium digitatum	••••	•	Occasional
Urticina felina	•••	•	Occasional
Corynactis viridis	•••	••	Frequent
Caryophyllia smithii	••••	•	Frequent
Balanus crenatus	•••	•	Occasional
Cancer pagurus	•••	•	Occasional
Calliostoma zizyphinum	•••	•	Occasional
Parasmittina trispinosa	•••	••	Frequent
Antedon bifida	•••	•	Frequent
Luidia ciliaris	•••	••	Occasional
Henricia oculata	•••	•	Occasional
Stichastrella rosea	••	••	Occasional
Asterias rubens	••••	•	Occasional
Marthasterias glacialis	•••	••	Occasional
Echinus esculentus	••••	•	Occasional
Holothuria forskali	••	••	Frequent
Clavelina lepadiformis	•••	•	Occasional
Labrus bergylta	•••	••	Occasional
Corallinaceae	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	GB - R1-5, 8-15			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Common

ECR.Alc *Alcyonium*-dominated communities (tide-swept/vertical)

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; stable boulders
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Circalittoral rock which is characterised by moderate to dense quantities of dead man's fingers *Alcyonium digitatum*. *Alcyonium* typically thrives in areas with moderate water movement, often on exposed rocky coasts, especially where moderate tides sweep steep and vertical rock faces. Although *Alcyonium* occurs very widely on sublittoral rock it only forms dense masses of large colonies in these conditions. Massive sponges, such as *Pachymatisma johnstonia* and *Cliona celata*, may be found amongst the *Alcyonium* on open coasts as well as in tide-swept narrows (ECR.AlcMaS). Grazing by *Echinus esculentus* can reduce the species richness such that encrusting forms predominate (ECR.AlcC; see also ECR.AlcSec and MCR.FaAlC). In strongly tide-swept narrows *Tubularia indivisa* thrives, particularly noticeable early in the year before the hydranths are grazed away, and is co-dominant with the *Alcyonium* (ECR.AlcTub).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Abietinaria abietina	••	••	Frequent
Alcyonium digitatum	•••••	•	Common
Urticina felina	•••	•	Occasional
Caryophyllia smithii	•••	•	Occasional
Pomatoceros triqueter	•••	•	Frequent
Cancer pagurus	•••	•	Occasional
Calliostoma zizyphinum	•••	•	Occasional
Parasmittina trispinosa	••	••	Frequent
Antedon bifida	•••	•	Occasional
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Echinus esculentus	••••	•	Frequent
Corallinaceae	•••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	GB - R1-5, 8-9, 13-15			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Common

ECR.BS Barnacle, cushion sponge and *Tubularia* communities (very tide-swept/sheltered)

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Exposed, Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Very strong, Strong
Substratum:	Bedrock; stable boulders
Zone:	Circalittoral
Depth band:	5-10m, 10-20m, 20-30m

Biotope description

Circalittoral rock communities subject to very strong tidal streams, typically in wave-sheltered tidal sounds and in sealoch and ria narrows but occasionally on the open coast where moderate to strong wave action may also be present. Faunal composition varies according to the particular degree of current strength, but is typically too strong for significant growths of *Alcyonium digitatum* (see ECR.Alc). Instead the communities are characterised by various combinations of *Tubularia indivisa*, *Balanus crenatus* and cushion-forming sponges (e.g. *Halichondria* spp.).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria bowerbanki	••	•••	Frequent
Halichondria panicea	••••	•	Common
Esperiopsis fucorum	••	••	Frequent
Tubularia indivisa	•••	•	Frequent
Sertularia argentea	•••	••	Frequent
Balanus crenatus	•••	•	Common
Cancer pagurus	•••	•	Occasional
Carcinus maenas	•••	•	Frequent
Eucratea loricata	••	••	Occasional
Asterias rubens	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R8-9 SW rias			
Other	Sealochs			

Frequency of occurrence

In Britain: Uncommon

MCR Moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; stable boulders and cobbles
Zone:	Circalittoral
Depth band:	5-10m, 10-20m, 20-30m

Biotope description

Circalittoral rock subject to moderate wave exposure or some degree of tidal currents in more sheltered conditions. Such habitats occur very widely around the coast and are highly variable in their character, depending on quite subtle differences in water quality (e.g. the degree of suspended silt or sand), tidal current strength, rock topography and rock type. A wide range of biotopes are currently defined, but these may require expansion to fully account for all parts of Britain and Ireland.

Distribution

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

Frequency of occurrence

In Britain: Very common

MCR.XFa Mixed faunal turfs (moderately exposed rock)

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; stable boulders and cobbles
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Circalittoral rock in moderately exposed conditions which supports a quite varied fauna, typically including branching and cup sponges, hydroids, anemones, seafans and turf-forming bryozoans. The habitats are usually influenced by relatively weak currents but not by high levels of suspended silt or sand (compare MCR.ByH, MCR.CSab, MCR.As) or heavily grazed (compare MCR.GzFa). Also included here are more wave-exposed habitats in deep water (40 m or more) which have similar seafan and sponge communities (MCR.PhaAxi).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	•••	•	Occasional
Tethya aurantium	••	••	Occasional
Suberites carnosus	•••	••	Occasional
Polymastia boletiformis	•••	••	Occasional
Polymastia mamillaris	••	••	Occasional
Cliona celata	••••	•	Occasional
Axinella infundibuliformis	•••	••	Occasional
Axinella dissimilis	•••	••	Occasional
Phakellia ventilabrum	••	•••	Frequent
Stelligera rigida	••	••	Occasional
Stelligera stuposa	•••	••	Occasional
Raspailia hispida	••	••	Occasional
Raspailia ramosa	••	••	Occasional
Myxilla fimbriata	•	•••	Frequent
Haliclona viscosa	••	••	Frequent
Dysidea fragilis	•••	•	Occasional
Aglaophenia tubulifera	••	••	Occasional
Nemertesia antennina	••••	•	Occasional
Nemertesia ramosa	•••	•	Occasional
Polyplumaria frutescens	••	•••	Occasional
Alcyonium digitatum	••••	•	Occasional
Alcyonium glomeratum	••	•••	Frequent
Swiftia pallida	••	•••	Frequent
Eunicella verrucosa	••	•••	Occasional
Corynactis viridis	•••	••	Occasional
Caryophyllia smithii	•••••	•	Frequent
Calliostoma zizyphinum	•••	•	Occasional
Pentapora foliacea	••	••	Frequent
Parasmittina trispinosa	•••	••	Frequent
Porella compressa	•••	••	Frequent
Antedon bifida	•••	•	Occasional
Luidia ciliaris	•••	••	Occasional
Henricia oculata	•••	•	Occasional

Asterias rubens	•••	•	Occasional
Marthasterias glacialis	•••	•	Occasional
Echinus esculentus	••••	•	Occasional
Holothuria forskali	•••	••	Frequent
Aslia lefevrei	••	••	Frequent
Clavelina lepadiformis	•••	•	Occasional
Diazona violacea	••	•••	Occasional
Ctenolabrus rupestris	•••	••	Occasional
Labrus bergylta	••	••	Occasional
Labrus mixtus	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R8-15			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Common

MCR.ByH Bryozoan/hydroid turfs (sand-influenced)

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders, cobbles, mixed substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Circalittoral rock or mixed substrata in moderately exposed conditions which typically support a prominent turf of bryozoans and hydroids. The habitat has weak or moderate tidal currents which, with sand nearby, leads to some sand in suspension and influence on the fauna present. Also included here are habitats of mixed rock and coarse sediment, where the latter significantly abrades or periodically covers the rock (MCR.Urt). *Flustra foliacea* and to a lesser extent *Securiflustra securifrons* (or in the south *Chartella papyracea*), often form the bulk of the turf. In some cases other bryozoans, such as *Alcyonidium diaphanum* and *Eucratea loricata* may be prominent. The hydroids *Sertularia* spp. and *Hydrallmania falcata* are particularly characteristic of this habitat (and may dominate), although others also occur.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Haliclona oculata	••	••	Occasional
Nemertesia antennina	•••	•	Frequent
Abietinaria abietina	••	••	Occasional
Hydrallmania falcata	•••	••	Occasional
Sertularia argentea	••	••	Frequent
Alcyonium digitatum	••••	•	Frequent
Urticina felina	••••	•	Occasional
Pomatoceros triqueter	•••	•	Frequent
Alcyonidium diaphanum	••	•	Frequent
Flustra foliacea	••••	•	Frequent
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	••	•	Frequent

Distribution

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

Frequency of occurrence

In Britain: Very common

MCR.CSab — Circalittoral *Sabellaria* reefs

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders, cobbles, mixed substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Previous code

MCR.Sab 96.7

Biotope description

Circalittoral rock or mixed substrata dominated by a crust of *Sabellaria spinulosa*.

Similar biotopes

CMX.SspiMx	Similar crusts/reefs of *Sabellaria* develop on mixed substrata

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scypha ciliata	••••	•	Rare
Halichondria panicea	••	•	Frequent
Tubularia indivisa	•••	••	Occasional
Alcyonium digitatum	••	•	Frequent
Urticina felina	••••	•	Occasional
Sabellaria spinulosa	•••••	••	Super abundant
Pomatoceros triqueter	••	•	Frequent
Balanus balanus	•••	••	Occasional
Cancer pagurus	•••	•	Occasional
Gibbula cineraria	•••	•	Occasional
Pododesmus patelliformis	••	•	Frequent
Securiflustra securifrons	••	••	Frequent
Crossaster papposus	•••	•	Rare
Henricia	•••••	•	Occasional
Asterias rubens	•••••	•	Occasional
Ophiothrix fragilis	••••	•	Occasional
Ophiopholis aculeata	••	••	Occasional
Echinus esculentus	•••	•	Occasional
Corallinaceae	••	•	Occasional

MCR.M Mussel beds (open coast circalittoral rock/mixed substrata)

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders, cobbles, mixed substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Circalittoral rock or mixed substrata dominated by mussel beds. The mussels *Mytilus edulis*, *Musculus discors* or *Modiolus modiolus* dominate under different conditions. Note also that *M. edulis* may dominate in the infralittoral zone (SIR.MytT) and the littoral, whilst *M. modiolus* beds also occur in very still-water conditions (SCR.Mod) and on mixed sediments (CMX).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Frequent
Urticina felina	•••	•	Occasional
Sagartia elegans	•••	•	Occasional
Balanus crenatus	•••	•	Frequent
Cancer pagurus	•••	•	Occasional
Mytilus edulis	•••	•	Abundant
Musculus discors	••	••	Abundant
Modiolus modiolus	••	••	Abundant
Asterias rubens	••••	•	Occasional
Corallinaceae	•••	•	Occasional

Frequency of occurrence

In Britain: Uncommon

MCR.Bri Brittlestar beds

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders, cobbles, mixed substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Circalittoral rock or mixed substrata dominated by dense beds of brittlestars. *Ophiothrix fragilis* or *Ophiocomina nigra* may dominate separately or there may be mixed populations of the two species. More rarely *Ophiopholis aculeata* may form dense aggregations (MCR.Oph.Oacu). The brittlestars tend to have a smothering effect on the rock, significantly reducing species diversity and biomass when they are very dense. The brittlestars are mobile and so some areas may appear highly grazed (MCR.GzFa) if they previously had brittlestar populations on them.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	•••	•	Occasional
Pomatoceros triqueter	•••	•	Frequent
Pagurus bernhardus	•••	•	Occasional
Gibbula cineraria	•••	•	Occasional
Crossaster papposus	•••	•	Rare
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••••	•	Common
Ophiocomina nigra	••••	•	Common
Ophiopholis aculeata	••	••	Frequent
Ophiura albida	•••	••	Frequent
Echinus esculentus	•••••	•	Frequent
Ciona intestinalis	•••	•	Occasional
Corallinaceae	•••	•	Common

Frequency of occurrence

In Britain: Common

MCR.GzFa Grazed fauna (moderately exposed or sheltered rock)

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Moderately exposed circalittoral rock or mixed substrata, typically in weak tidal currents and with a sparse fauna resulting from strong grazing pressure. The rock is predominantly colonised by encrusting species or those able to withstand the grazing pressure. Other species are confined to the shelter of crevices and under-boulder habitats. Brittlestars may be common (see MCR.Bri).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Abietinaria abietina	••	••	Frequent
Alcyonium digitatum	••••	•	Occasional
Pomatoceros triqueter	••••	•	Common
Pododesmus patelliformis	••	••	Occasional
Parasmittina trispinosa	•••	••	Occasional
Antedon bifida	••	•	Frequent
Crossaster papposus	••	•	Rare
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Echinus esculentus	•••••	•	Frequent
Ciona intestinalis	•••	•	Occasional
Corallinaceae	••••	•	Common
Rhodophycota indet.(non-calcareous crusts)	••	••	Frequent

Frequency of occurrence

In Britain: Common

MCR.As Ascidian communities (silt-influenced)

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders; mixed substrata
Zone:	Circalittoral
Depth band:	5-10m, 10-20m, 20-30m
Other features:	Some suspended sediment (sand and silt)

Biotope description

Dense beds of various species of ascidian on silty circalittoral bedrock and boulders. *Polycarpa* spp. and *Molgula* spp. can occur together or on their own in dense aggregations, often with *Sabellaria spinulosa*, *Flustra foliacea* and other bryozoans or sponges in less scoured conditions. In more open coast situations, which tend to be less silty, the characterising species differ with *Polyclinum aurantium* (or other colonial ascidians characteristic of rock with sand in suspension) often covering the rock surface amongst a mat of *F. foliacea*. Solitary ascidian communities, often in sheltered sealochs, are described under sheltered circalittoral rock (SCR).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scypha ciliata	•••	•	Occasional
Cliona celata	••••	•	Frequent
Dysidea fragilis	••	•	Frequent
Tubularia indivisa	•••	•	Occasional
Halecium halecinum	•••	•	Frequent
Nemertesia antennina	••••	•	Occasional
Hydrallmania falcata	•••	••	Occasional
Alcyonium digitatum	••••	•	Occasional
Urticina felina	••••	•	Frequent
Sagartia elegans	••	•	Occasional
Actinothoe sphyrodeta	••	••	Occasional
Sabellaria spinulosa	••	••	Frequent
Balanus crenatus	••	•	Frequent
Pagurus bernhardus	•••	•	Occasional
Cancer pagurus	•••	•	Occasional
Alcyonidium diaphanum	•••••	•	Frequent
Vesicularia spinosa	•	••	Occasional
Cellepora pumicosa	•	••	Occasional
Flustra foliacea	••••	•	Common
Bugula flabellata	•••	•	Occasional
Bugula plumosa	••••	••	Frequent
Crossaster papposus	•••	•	Occasional
Asterias rubens	•••••	•	Frequent
Ophiothrix fragilis	•••	•	Frequent
Clavelina lepadiformis	•••	•	Frequent
Polyclinum aurantium	•••	••	Common
Polycarpa	••	••	Frequent
Dendrodoa grossularia	••	•	Frequent
Botryllus schlosseri	•••	•	Occasional
Molgula manhattensis	••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R6-10			
Other	IR1-4			

Frequency of occurrence

In Britain: Uncommon

MCR.SfR Soft rock communities

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Circalittoral
Depth band:	5-10m, 10-20m, 20-30m
Other features:	Very soft rock (chalk or clay)

Biotope description

Circalittoral communities in very soft rock, such as chalk and clay. The very soft nature of the rock leads to quite distinctive communities, with the rock bored by piddocks or colonised by the tube-dwelling worm *Polydora* spp. The softness of the rock also often means the surface is continually eroded and therefore poorly colonised by other biota.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Urticina felina	●●●●●	●	Occasional
Sagartia troglodytes	●●●●	●●	Occasional
Polydora	●●●	●●	Abundant
Lanice conchilega	●●●	●	Occasional
Pholas dactylus	●●	●●	Occasional
Barnea candida	●●	●●	Common
Barnea parva	●●●	●●	Common

Frequency of occurrence

In Britain: Scarce

SCR Sheltered circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock, boulders and cobbles; mixed substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Circalittoral rock or mixed substrata, sheltered from wave action and from significant tidal currents. The still nature of the habitat is usually accompanied by silty conditions and the rock is often well grazed and dominated by encrusting algae (*Aglaozonia*, *Pseudolithoderma extensum*, coralline crusts). The larger solitary ascidians (*Ascidia* spp., *Ascidiella* spp., *Corella parallelogramma* and *Ciona intestinalis*) are prominent in many of the biotopes. The brachiopods *Neocrania anomala* and *Terebratulina retusa* are particularly characteristic of such sheltered rock. *Modiolus modiolus* beds occur on mixed substrata (see also MCR.ModT).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Bougainvillia ramosa	••	•••	Occasional
Protanthea simplex	••	•••	Frequent
Caryophyllia smithii	•••	•	Occasional
Pomatoceros triqueter	••••	•	Frequent
Protula tubularia	••	••	Occasional
Pagurus bernhardus	•••	•	Occasional
Munida rugosa	•••	••	Occasional
Neocrania anomala	•••	•••	Frequent
Terebratulina retusa	•	•••	Occasional
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Echinus esculentus	••••	•	Occasional
Clavelina lepadiformis	•••	•	Occasional
Ciona intestinalis	••••	•	Occasional
Corella parallelogramma	•••	••	Occasional
Ascidiella aspersa	••	••	Frequent
Ascidia mentula	••••	•	Occasional
Ascidia virginea	•••	••	Occasional
Corallinaceae	•••	•	Common
Pseudolithoderma extensum	•	•••	Common
Aglaozonia (asexual *Cutleria*)	•	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R1-2, 12-15			
Other	IR2, 5-8			

Frequency of occurrence

In Britain: Uncommon

SCR.BrAs Brachiopod and solitary ascidian communities (sheltered rock)

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock, boulders and cobbles; mixed substrata
Zone:	Circalittoral
Depth band:	5-10m, 10-20m, 20-30m, 30-50m

Biotope description

Circalittoral rock or mixed substrata, sheltered from wave action and from significant tidal currents. The still nature of the habitat is usually accompanied by silty conditions and the rock is often well grazed and dominated by encrusting algae (*Aglaozonia*, *Pseudolithoderma extensum*, coralline crusts). The larger solitary ascidians (*Ascidia* spp., *Ascidiella* spp., *Corella parallelogramma* and *Ciona intestinalis*) are prominent in many of the biotopes. The brachiopods *Neocrania anomala* and *Terebratulina retusa* are particularly characteristic of such sheltered rock.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Bougainvillia ramosa	••	•••	Occasional
Protanthea simplex	••	•••	Frequent
Caryophyllia smithii	•••	•	Occasional
Pomatoceros triqueter	••••	•	Frequent
Protula tubularia	••	••	Occasional
Pagurus bernhardus	•••	•	Occasional
Munida rugosa	•••	••	Occasional
Neocrania anomala	•••	•••	Frequent
Terebratulina retusa	•	•••	Occasional
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Echinus esculentus	••••	•	Occasional
Clavelina lepadiformis	•••	•	Occasional
Ciona intestinalis	••••	•	Occasional
Corella parallelogramma	•••	••	Occasional
Ascidiella aspersa	••	••	Frequent
Ascidia mentula	••••	•	Occasional
Ascidia virginea	•••	••	Occasional
Corallinaceae	•••	•	Common
Pseudolithoderma extensum	•	•••	Common
Aglaozonia (asexual *Cutleria*)	•	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R1-2, 12-15			
Other	IR2, 5-8			

Frequency of occurrence

In Britain: Uncommon

SCR.Mod Sheltered *Modiolus* (horse-mussel) beds

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mixed substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Circalittoral mixed substrata, not influenced by significant tidal currents, with clumps or more extensive beds of *Modiolus modiolus*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Terebellidae	•••	•	Occasional
Pomatoceros triqueter	••••	•	Frequent
Serpula vermicularis	••	••	Occasional
Protula tubularia	••	••	Occasional
Pagurus bernhardus	••••	•	Occasional
Munida rugosa	•••	••	Frequent
Hyas araneus	•••	••	Occasional
Liocarcinus depurator	•••	••	Occasional
Carcinus maenas	•••	•	Occasional
Buccinum undatum	••••	••	Occasional
Modiolus modiolus	•••••	••	Frequent
Aequipecten opercularis	•••	••	Frequent
Crossaster papposus	•••	•	Rare
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	••••	•	Frequent
Echinus esculentus	••••	•	Occasional
Ascidiella aspersa	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R1-2, 12-15			
IR2	Strangford Lough	Erwin *et al*. 1990		

Frequency of occurrence

In Britain: Scarce

Features of conservation interest

The horse mussels provide a stable substratum for colonisation by a wide variety of other species, often developing quite rich biotas. The sheltered still nature of the habitat means they are readily susceptible to physical disturbance (e.g. from mobile fishing gear).

CR.FaV Faunal turfs (deep vertical rock)

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered
Tidal streams:	Very strong, Strong, Moderately strong, Weak, Very weak
Substratum:	Bedrock; large boulders
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m
Other features:	Vertical rock

Biotope description

Circalittoral vertical rock faces, which support a varied fauna mostly depending of the degree of water movement.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	•••	•	Occasional
Dysidea fragilis	•••	•	Occasional
Nemertesia antennina	•••	•	Frequent
Alcyonium digitatum	••••	•	Occasional
Pomatoceros triqueter	••••	•	Frequent
Balanus crenatus	•••	•	Frequent
Crisiidae	••	••	Common
Bugula flabellata	•••	••	Frequent
Bugula turbinata	•••	••	Common
Antedon bifida	••	•	Common
Clavelina lepadiformis	••••	•	Occasional
Morchellium argus	••	••	Frequent
Didemnidae	••	••	Frequent
Corallinaceae	•••	•	Occasional

CR.Cv Caves and overhangs (deep)

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m
Other features:	Caves, overhanging rock

Biotope description

Caves and overhanging rock in the circalittoral zone, away from significant influence of strong wave action (compare EIR.SG). This habitat may be colonised by a wide variety of species, with sponges such as *Dercitus bucklandi*, anemones *Parazoanthus* spp. and the cup corals *Caryophyllia inornatus*, *Hoplangia durotrix* and others particularly characteristic.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Porifera indet crusts	•••	•	Occasional
Alcyonium glomeratum	•••	••	Rare
Corynactis viridis	•••	••	Frequent
Caryophyllia smithii	••••	•	Common
Hoplangia durotrix	••	•••	Rare
Balanophyllia regia	••	•••	Common
Leptopsammia pruvoti	••	•••	Common
Crisiidae	•••	••	Common
Bryozoa indet crusts	•••	•	Frequent
Clavelina lepadiformis	•••	•	Occasional

Frequency of occurrence

In Britain: Scarce

COR Circalittoral offshore rock

Habitat classification

Salinity:	Full
Wave exposure:	
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock, boulders, cobbles & other hard substrata
Zone:	
Depth band:	>50 m

Biotope description

Rocky habitats, including biogenic reefs, in the offshore circalittoral zone. Around Britain this habitat typically occurs below 50-70 m in thermally stable conditions and away from the influence of wave action.

COR.Lop *Lophelia* reefs

Habitat classification

Salinity:	Full
Wave exposure:	
Tidal streams:	
Substratum:	*Lophelia*
Zone:	
Depth band:	>50 m

Biotope description

Reefs of the coral *Lophelia pertusa*, typically supporting a range of other biota.

Characterising species

	% Frequency	Faithfulness	Typical abundance
Lophelia pertusa	●●●●●	●●●	Abundant

Distribution

Sector	Area	Source	Section/page	Equivalence
Other	N & W Scotland			
Other	Norway			

Potentially damaging activities

Activity	Degree of effect
Fishing (including use of fixed and mobile gear)	

SS Sublittoral sediments

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong, Weak, Very weak
Substratum:	Gravels, sands, muds
Zone:	Infralittoral, Circalittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m, 30-50m, >50 m

Biotope description

Sediment habitats in the sublittoral nearshore zone (i.e. covering the infralittoral and circalittoral zones), typically extending from the extreme lower shore down to about 50-70 m.

Distribution

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

Frequency of occurrence

In Britain: Very common

IGS Infralittoral gravels and sands

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Strong, Moderately strong, Weak, Very weak
Substratum:	Gravel, sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Gravel and sand habitats in the infralittoral zone, extending from the extreme lower shore into the shallow sublittoral. This habitat may support seaweed communities (e.g. maerl beds) or, more commonly, be characterised by animal communities which are influenced by a high degree of disturbance from wave action or strong tidal currents. Although supporting a wide range of species, these habitats typically include fairly robust infaunal species of amphipods, bivalves and polychaetes.

Distribution

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

Frequency of occurrence

In Britain: Very common

IGS.Mrl Maerl beds (open coast/clean sediments)

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong, Weak, Very weak
Substratum:	Gravels, clean sands
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Beds of maerl in coarse clean sediments of gravels and clean sands, which occur either on the open coast or in tide-swept channels of marine inlets (latter often stony). In fully marine conditions the dominant maerl is typically *Phymatolithon calcareum* (IGS.Phy), whilst under variable salinity conditions in some sealochs beds of *Lithothamnion glaciale* (IGS.Lgla) may develop. Maerl beds in muddier sediments are classified under IMX.MrlMx.

Similar biotopes

IMX.MrlMx	Maerl beds formed in muddier gravels with more 'sheltered' species.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	•••	•	Frequent
Pagurus bernhardus	•••	•	Occasional
Liocarcinus depurator	•••	•	Occasional
Gibbula magus	••	••	Occasional
Asterias rubens	••••	•	Occasional
Echinus esculentus	•••	•	Occasional
Lithothamnion glaciale	••	•	Frequent
Phymatolithon calcareum	••••	••	Common
Polyides rotundus	••	••	Occasional
Halarachnion ligulatum	••	••	Occasional
Nitophyllum punctatum	••	••	Occasional
Brongniartella byssoides	••	••	Occasional
Dictyota dichotoma	•••	•	Occasional
Laminaria saccharina	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R1-2, 12-15			
Other	Ireland - all coasts			

Frequency of occurrence

In Britain: Uncommon

Features of conservation interest

Phymatolithon calcareum and *Lithothamnion corallioides* are listed on the EC Habitats Directive Annex Vb.

IGS.FaG Shallow gravel faunal communities

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong, Weak
Substratum:	Gravel
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Coarse clean gravels (stone, shell or maerl derived) which occur in shallow water, either on the open coast or in tide-swept channels of marine inlets. The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly venerid bivalves.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halcampa chrysanthellum	••	••	Rare
Edwardsia timida	•	•••	Occasional
Spisula elliptica	•••	••	Common
Ophiura albida	••	•	Frequent

IGS.FaS Shallow sand faunal communities

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong, Weak, Very weak
Substratum:	Sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Clean sands which occur in shallow water, either on the open coast or in tide-swept channels of marine inlets. The habitat typically lacks a significant seaweed component and is characterised by robust fauna, particularly venerid bivalves, amphipods and robust polychaetes.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa	••••	••	Common
Spiophanes bombyx	•••	••	Common
Chaetozone setosa	•••	••	Common
Lanice conchilega	••	•	Common
Megaclausia mirabilis	•••	••	Frequent
Bathyporeia	••	•	Frequent
Diastylis bradyi	••	••	Present/Not known
Nucula nitidosa	••	••	Frequent
Fabulina fabula	•••	••	Common
Chamelea gallina	••	••	Common

Distribution

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

Frequency of occurrence

In Britain: Very common

IGS.EstGS Estuarine sublittoral gravels and sands

Habitat classification

Salinity:	Variable, Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Gravel, sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Clean gravels and sands which occur in the upper reaches of marine inlets, especially estuaries, where water movement is sufficiently strong to remove the silt content of the sediment. The habitat typically lacks a significant seaweed component and is characterised by robust brackish-water tolerant fauna, particularly amphipods, robust polychaetes and mysid shrimps.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa	••	••	Common
Capitella capitata	••	•	Frequent
Neomysis integer	•••	•••	Frequent
Gammarus salinus	••	•••	Present/Not known

CGS Circalittoral gravels and sands

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed
Tidal streams:	Strong, Moderately strong, Weak, Very weak
Substratum:	Gravel, sand
Zone:	Circalittoral
Depth band:	20-30m, 30-50m, >50 m

Biotope description

Gravel and sand habitats in the circalittoral zone, occurring below the more wave disturbed infralittoral zone (IGS) down to about 50-70 m where thermally stable conditions develop (COS).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chaetopterus variopedatus	•••	•	Occasional
Lanice conchilega	•••	•	Occasional
Pagurus bernhardus	•••	•	Occasional
Pecten maximus	•••	••	Occasional
Ensis	••	••	Frequent
Clausinella fasciata	•	••	Occasional
Astropecten irregularis	••	••	Rare
Luidia ciliaris	••	••	Rare
Asterias rubens	•••	•	Occasional
Ophiura albida	••	•	Frequent
Neopentadactyla mixta	••••	••	Frequent

IMS Infralittoral muddy sands

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy sands
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Muddy sand habitats in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15-20 m. The habitat supports a variety of animal-dominated communities, particularly of polychaetes, bivalves and the urchin *Echinocardium cordatum*, but also includes beds of seagrass (IMS.Sgr).

Distribution

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

Frequency of occurrence

In Britain: Very common

IMS.Sgr Seagrass beds (sublittoral/lower shore)

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Moderately exposed, Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy sands
Zone:	Infralittoral
Height band:	Lower shore
Depth band:	0-5 m, 5-10m

Biotope description

Beds of seagrass (*Zostera marina* or *Ruppia* spp.) on the extreme lower shore or in shallow sublittoral sediments.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Anemonia viridis	●●	●●	Occasional
Mysidae	●●	●	Frequent
Carcinus maenas	●●	●	Occasional
Ectocarpaceae	●●	●	Frequent
Chorda filum	●●	●●	Frequent
Zostera marina	●●●●	●●	Abundant
Ruppia	●●	●●●	Abundant

Frequency of occurrence

In Britain: Uncommon

IMS.FaMS Shallow muddy sand faunal communities

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy sands
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Muddy sand habitats in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15-20 m. The habitat supports a variety of animal-dominated communities, particularly of polychaetes, bivalves and the urchin *Echinocardium cordatum*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	•••	•	Frequent
Lanice conchilega	•••	•	Occasional
Pagurus bernhardus	•••	•	Occasional
Ensis	••	•	Frequent
Asterias rubens	•••	•	Occasional
Echinocardium cordatum	•••	••	Frequent
Pleuronectidae	••	•	Frequent

Distribution

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

Frequency of occurrence

In Britain: Very common

CMS Circalittoral muddy sands

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy sands
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Muddy sand habitats in the circalittoral zone, extending from the infralittoral zone down to the more stable offshore circalittoral zone. The habitat supports a variety of animal-dominated communities, particularly of polychaetes, bivalves, the urchin *Echinocardium cordatum*, brittlestars *Amphiura* spp. and *Ophiura* spp., and low densities of the seapen *Virgularia mirabilis*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Virgularia mirabilis	••	••	Occasional
Cerianthus lloydii	•••	•	Frequent
Nephtys	••	•	Common
Spiophanes bombyx	••	••	Frequent
Chaetozone setosa	••	••	Common
Lanice conchilega	•••	•	Occasional
Pagurus bernhardus	•••	•	Occasional
Nucula nitidosa	••	••	Frequent
Pecten maximus	••	••	Occasional
Abra alba	••	••	Common
Asterias rubens	•••	•	Occasional
Amphiura filiformis	•••	••	Abundant
Ophiura albida	•••	•	Frequent
Ophiura ophiura	••	••	Frequent

IMU Infralittoral muds

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Moderately exposed, Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Sandy mud, mud
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Sandy muds and soft muddy habitats in the infralittoral zone, extending from the extreme lower shore to depths of about 15-20 m, occurring on the open coast in fully marine conditions or in marine inlets in marine or estuarine conditions. This habitat is typically characterised by animal-dominated communities, particularly of polychaetes, oligochaetes and certain bivalves; lagoonal angiosperm communities are also included here.

IMU.Ang Angiosperm communities (lagoons)

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy sediment
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Lagoon communities, subject to reduced or low salinity conditions, dominated by angiosperms, including *Potamogeton pectinatus* beds and fringing habitats with reeds *Phragmites australis*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Mysidae	••	•	Frequent
Potamopyrgus jenkinsi	••	•••	Frequent
Mytilus edulis	••	•	Occasional
Gasterosteus aculeatus	••	••	Occasional
Enteromorpha intestinalis	••	•	Common
Cladophora flexuosa	••	••	Present/Not known
Cladophora liniformis	••	••	Frequent
Potamogeton pectinatus	••••	•••	Common
Phragmites australis	••	•••	Abundant

Frequency of occurrence

In Britain: Scarce

Features of conservation interest

Lagoons are a priority habitat in Annex I of the EC Habitats Directive.

IMU.MarMu Shallow marine mud communities

Habitat classification

Salinity:	Full
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mud (occasionally with shells or stones)
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Shallow sublittoral muds, extending from the extreme lower shore to about 15 m depth in fully marine or near marine conditions. Such habitats are found in sealochs and some rias and harbours. Populations of seapens *Virgularia mirabilis* may be dense, with anemones, brittlestars *Amphiura* spp., the opisthobranch *Philine aperta* and synaptid holothurians also characteristic of shallow muds. In some cases dense aggregations of the holothurian *Ocnus planci* develop (IMU.Ocn).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Suberites ficus	••	••	Rare
Hydractinia echinata	•••	••	Occasional
Virgularia mirabilis	•••	••	Common
Cerianthus lloydii	•••	•	Occasional
Sagartiogeton laceratus	••	••	Occasional
Sagartiogeton undatus	••	••	Occasional
Terebellidae	•••	•	Occasional
Pagurus bernhardus	••••	•	Occasional
Liocarcinus depurator	•••	•	Occasional
Carcinus maenas	•••	•	Occasional
Philine aperta	•••	••	Frequent
Asterias rubens	••••	•	Occasional
Amphiura chiajei	••	••	Frequent
Amphiura filiformis	••	••	Common
Diatoms - film	••	•	Common

IMU.EstMu Estuarine sublittoral muds

Habitat classification

Salinity:	Variable, Reduced / low
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Shallow sublittoral muds, extending from the extreme lower shore to about 15 m depth in estuarine conditions. Such habitats typically support communities of oligochaetes, and polychaetes such as *Aphelochaeta marioni*. In lowered salinity conditions the sediments may include a proportion of coarser material, where the silt content is sufficient to yield a similar community to that found in purer muds.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys hombergii	•••	•	Common
Polydora ciliata	••	••	Common
Pygospio elegans	••	•	Frequent
Streblospio shrubsolii	••	••	Frequent
Aphelochaeta marioni	••	••	Abundant
Capitella capitata	••	•	Frequent
Tubificoides benedii	••	•	Frequent
Tubificoides swirencoides	••	•	Common
Macoma balthica	••	••	Present/Not known

CMU Circalittoral muds

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mud
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Sublittoral muds, occurring below moderate depths of 15-20 m, either on the open coast or in marine inlets such as sealochs. The relatively stable conditions often lead to the establishment of communities of burrowing megafaunal species, such as *Nephrops norvegicus* and *Callianassa subterranea*, seapen populations and communities with *Amphiura* spp.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Funiculina quadrangularis	●●	●●●	Occasional
Virgularia mirabilis	●●●●	●●	Frequent
Pennatula phosphorea	●●	●●	Occasional
Cerianthus lloydii	●●●	●	Occasional
Nephrops norvegicus	●●●	●●●	Frequent
Calocaris macandreae	●	●●●	Frequent
Callianassa subterranea	●	●●●	Frequent
Pagurus bernhardus	●●●	●	Occasional
Liocarcinus depurator	●●●	●	Occasional
Turritella communis	●●	●●	Frequent
Asterias rubens	●●●	●	Occasional
Amphiura chiajei	●●	●●	Common
Amphiura filiformis	●●	●●	Common

IMX Infralittoral mixed sediments

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Mixed sediment (with shells and stones)
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Shallow sublittoral sediments consisting of various mixtures of mud, sand and gravel, often with shells and stones on the surface. The varied sediment type can lead to a wide variety of communities, many of which include seaweed populations attached to surface shells and stones.

IMX.KSwMx *Laminaria saccharina* (sugar kelp) and filamentous seaweeds (mixed sediment)

Habitat classification

Salinity:	Full, Variable, Reduced / low
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Mixed sediment (with stones and shells)
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Shallow sublittoral mixed sediments which support seaweed communities, typically including the kelp *Laminaria saccharina*, the bootlace weed *Chorda filum* and various red and brown seaweeds, particularly filamentous types. The sheltered nature of these habitats enables the seaweeds to grow on shells and small stones which lie on the sediment surface; some communities develop as loose-lying mats on the sediment surface.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Asterias rubens	•••	•	Occasional
Gracilaria gracilis	••	••	Frequent
Chorda filum	•••	••	Occasional
Laminaria saccharina	••••	•	Frequent
Ulva	•••	•	Occasional

IMX.MrlMx Maerl beds (muddy mixed sediments)

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy gravels
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Maerl beds of the genus *Lithothamnion* which develop on shallow sublittoral muddy gravels. Such sediments are found in marine inlets, such as rias and sealochs, usually in fully marine or near marine conditions where there are not significant tidal currents. Three species of maerl may dominate; *L. corallioides* (IMX.Lcor), which is relatively widespread, and *L. dentatum* and *L. fasciculatum* (IMX.Lden and IMX.Lfas) which have restricted distributions in Ireland.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Suberites ficus	●●	●●	Rare
Cerianthus lloydii	●●●	●	Frequent
Anemonia viridis	●●●	●●	Occasional
Anthopleura ballii	●●●	●●	Occasional
Sagartiogeton undatus	●	●●	Frequent
Terebellidae	●●●	●	Occasional
Myxicola infundibulum	●●●	●●	Common
Liocarcinus depurator	●●●	●	Occasional
Gibbula magus	●●	●●	Occasional
Asterias rubens	●●●●	●	Occasional
Marthasterias glacialis	●●●	●●	Occasional
Dudresnaya verticillata	●●	●●	Frequent
Lithophyllum dentatum	●	●●●	Common
Lithophyllum fasciculatum	●	●●●	Common
Lithothamnion corallioides	●●●●●	●●	Common
Phymatolithon calcareum	●●	●●	Frequent
Phymatolithon purpureum	●	●●●	Occasional
Gracilaria gracilis	●●	●●	Frequent
Halarachnion ligulatum	●●●●	●●	Frequent
Rhodophyllis divaricata	●	●●	Frequent
Dictyota dichotoma	●●●	●	Frequent

Frequency of occurrence

In Britain: Scarce

IMX.Oy Oyster beds

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mixed sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Beds of oysters occurring on shallow subtidal sediments. Populations of the native oyster *Ostrea edulis* occur (IMX.Ost) in southern England, Ireland and south-west Scotland. Non-native oyster *Crassostrea gigas* populations may also be found.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chaetopterus variopedatus	●●●●	●	Occasional
Terebellidae	●●	●	Frequent
Lanice conchilega	●●●	●	Occasional
Myxicola infundibulum	●●	●●	Frequent
Sabella pavonina	●●	●●	Common
Pagurus bernhardus	●●●●	●	Occasional
Gibbula magus	●●	●●	Occasional
Ostrea edulis	●●●●●	●●●	Frequent
Asterias rubens	●●●	●	Occasional
Aplidium punctum	●●●	●●	Occasional
Ascidiella aspersa	●●●	●	Frequent
Ascidiella scabra	●●●	●	Occasional
Pomatoschistus minutus	●●●	●	Occasional
Plocamium cartilagineum	●●	●	Frequent
Spyridia filamentosa	●●	●●	Frequent
Dictyota dichotoma	●●	●	Frequent
Laminaria saccharina	●●●	●	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Estuaries			
R7	Estuaries, Solent			
R12	Loch Ryan	Howson, Connor & Holt 1994		=

Frequency of occurrence

In Britain: Scarce

Features of conservation interest

Undisturbed populations of native oyster *Ostrea edulis* are now scarce.

IMX.FaMx Shallow mixed sediment faunal communities

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Mixed sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Shallow mixed sediments in marine conditions supporting various animal-dominated communities, with relatively low proportions of seaweeds. Due to the quite variable nature of the sediment type, a widely variable array of communities may be found, including those characterised by bivalves (IMX.VsenMtru), anemones (IMX.An) and file shells (IMX.Lim).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	••	•	Frequent
Pomatoceros triqueter	•••	•	Occasional
Pagurus bernhardus	•••	•	Occasional
Buccinum undatum	•••	•	Occasional
Limaria hians	•••	•••	Common
Aequipecten opercularis	••	••	Frequent
Asterias rubens	•••	•	Occasional
Ophiothrix fragilis	••	•	Common
Ophiocomina nigra	••	•	Common
Psammechinus miliaris	••	••	Frequent

IMX.EstMx Estuarine sublittoral mixed sediments

Habitat classification

Salinity:	Variable, Reduced / low
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Mixed sediment (with stones and shells)
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Shallow sublittoral mixed sediments in estuarine conditions, often with surface shells or stones enabling the development of epifaunal communities, e.g. *Crepidula fornicata* (IMX.CreAph) and mussel *Mytilus edulis* beds (IMX.MytV), as well as infaunal communities. The habitat is therefore often quite species rich, compared with purer sediments.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Harmothoe impar	•••	•	Common
Lepidonotus squamatus	••	•	Frequent
Eteone longa	•••	•	Common
Exogone naidina	••	••	Frequent
Sphaerosyllis	••	••	Frequent
Nephtys hombergii	••••	•	Common
Scoloplos armiger	•••	•	Abundant
Polydora ciliata	•••	•	Common
Caulleriella zetlandica	••	••	Common
Aphelochaeta marioni	•••	••	Common
Capitella capitata	•••	•	Frequent
Heteromastus filiformis	••	••	Frequent
Mediomastus fragilis	•••	••	Frequent
Melinna palmata	••	••	Common
Tubificoides benedii	•••	•	Common
Gammarus salinus	••	••	Super abundant
Carcinus maenas	•••	•	Common
Crepidula fornicata	•••	••	Abundant
Mytilus edulis	•••	•	Abundant
Abra alba	••	••	Common

CMX Circalittoral mixed sediments

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Mixed sediment (with stones and shells)
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Mixed sediment habitats in the circalittoral zone. As with infralittoral mixed sediments, the presence of hard substrata (shells and stones) on the surface enables epifaunal communities, e.g. *Sabellaria* reefs (CMX.SspiMx) and *Modiolus* beds (CMX.ModMx and CMX.ModHo), to develop and stabilise the sediment surface. The combination of epifauna and infauna can lead to species rich communities.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	●●●●	●	Frequent
Pomatoceros triqueter	●●●	●	Occasional
Pagurus bernhardus	●●●●●	●	Occasional
Liocarcinus depurator	●●●	●	Occasional
Buccinum undatum	●●●	●	Occasional
Modiolus modiolus	●●●●	●	Frequent
Aequipecten opercularis	●●●	●●	Occasional
Asterias rubens	●●●●	●	Occasional
Ophiura albida	●●●	●	Frequent
Psammechinus miliaris	●●●	●●	Occasional
Echinus esculentus	●●●	●	Occasional
Thyone fusus	●●	●●●	Occasional
Psolus phantapus	●●	●●●	Occasional

COS Circalittoral offshore sediments

Habitat classification

Salinity:	Full
Wave exposure:	
Tidal streams:	Weak, Very weak
Substratum:	Sediment
Zone:	
Depth band:	>50 m

Biotope description

Sublittoral sediments in the offshore circalittoral zone, typically occurring below about 50-70 m on the open coast. A variety of faunal communities may develop, depending upon the particular sediment type and other conditions.

6.3 Infralittoral (shallow subtidal) 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

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R1-5, R8-15		MNCR data	

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

		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
Corallinaceae	••	•	Common
Corallina officinalis	••••	•	Frequent
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	Hebrides	Mitchell, Earll & Dipper 1983	p164	
R14	Barra		MNCR data	

R14	St Kilda		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	Wales		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

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.AlaAnSC *Alaria esculenta* forest with dense anemones and sponge crusts on extremely exposed infralittoral bedrock

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed
Tidal streams:	Weak
Substratum:	Bedrock
Zone:	Infralittoral
Depth band:	10-20m, 20-30m, 30-50m
Other features:	Vertical and very steep rock

Previous code

EIR.AlaRAn	96.7
EIR.RAn	96.7

Biotope description

This biotope has only been recorded from Rockall, where *Alaria* appears to replace *L. hyperborea* as the dominant kelp forest species on the extremely wave exposed steep and vertical rock. Some *Laminaria* is reported to occur mixed with *Alaria* on the nearby Helen's reef. Beneath the *Alaria*, the rock surface is covered by a dense turf of anemones (such as *Sagartia elegans*, *Phellia gausapata* and *Corynactis viridis*) and encrusting sponges. *Tubularia indivisa* also occurs, but it does not form such a dense turf as in shallower waters. *Cryptopleura ramosa* is the dominant red seaweed on horizontal surfaces. This zone extends from 14 m - 35 m. Above this zone (about 5 m to 13 m) *Alaria* still dominates, but it more closely resembles the typical sublittoral fringe *Alaria* biotope (EIR.Ala.Myt), though it has a very dense turf of small hydroids and few foliose algae. Towards the lower part of this *Alaria* forest (30 m to 35 m) the *Alaria* thins and the rock surface is characterised by a dense turf of red algae.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Myxilla fimbriata	••	••	Rare
Porifera indet. (crusts)	•••	•	Occasional
Tubularia indivisa	•••••	••	Occasional
Sagartia elegans	•••••	•	Frequent
Phellia gausapata	•••••	•••	Frequent
Corynactis viridis	•••••	••	Frequent
Amphipoda indet.	••••	•	Occasional
Caprellidae	•••	•	Occasional
Cancer pagurus	••••	•	Occasional
Dendronotus frondosus	••	••	Rare
Coryphella browni	••	••	Rare
Botrylloides leachi	••	•	Frequent
Corallinaceae	•••	•	Occasional
Cryptopleura ramosa	•••	•	Common
Alaria esculenta	••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R14	Rockall	Laffoley & Hiscock 1988	3.1.5	=

Frequency of occurrence

In Britain: Rare

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.LhypFa *Laminaria hyperborea* forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed upper infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; massive boulders
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m, 10-20m

Previous code

EIR.LhypFa.Ft 96.7

Biotope description

Very exposed and exposed, but wave-surged, upper infralittoral bedrock and massive boulders characterised by a dense forest of the kelp *Laminaria hyperborea*, beneath which is a rich mixture of sponges, polyclinid ascidians, anemones and dense foliose red seaweeds. The faunal and floral under-storey is generally rich in species due, in part, to the relatively low urchin-grazing pressure in such shallow exposed conditions. The shallowest kelp plants are often short or stunted, while deeper plants are taller with heavily epiphytised stipes. The faunal composition of this biotope varies markedly between sites, but commonly occurring animals are *Alcyonium digitatum*, *Sagartia elegans*, *Corynactis viridis*, the sponges *Halichondria panicea* and *Pachymatisma johnstonia* and polyclinid ascidians. Similarly the foliose seaweed turf may show considerable variation. At some sites it can be virtually mono-specific, comprising stands of *Delesseria sanguinea*, *Ptilota plumosa*, *Cryptopleura ramosa* or *Plocamium cartilagineum* or, in the north, *Odonthalia dentata*. Other sites may contain a dense mixed turf of these and other species. Beneath the under-storey the rock surface is generally covered with encrusting coralline algae. At sites where the rock is fissured and has many vertical and overhanging surfaces, the fauna is particularly diverse. Large areas of vertical rock are often dominated by *Alcyonium digitatum* with *Metridium senile* and or *Corynactis viridis* (IR.CorMetAlc) and encrusting red algae. This kelp forest most commonly occurs beneath a zone of *Alaria/Mytilus* (EIR.Ala.Myt) and may contain small patches of *Alaria esculenta*. At less wave surged sites, or in slightly deeper water beneath this biotope, the kelp forest or park generally lacks the dense faunal turf, and is characterised by kelp and dense red seaweeds (EIR.LhypR.Ft or EIR.LhypR.Pk). In some areas of Shetland the lower infralittoral zone is characterised by a park of *L. saccharina* and or *Saccorhiza polyschides* (EIR.LsacSac).

Similar biotopes

MIR.Lhyp.Ft	Some exposed records may lack a significant faunal component, making it difficult to distinguish these two biotopes.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	••	Occasional
Scypha ciliata	••	•	Occasional
Grantia compressa	••	••	Occasional
Pachymatisma johnstonia	••	••	Occasional
Halichondria panicea	•••	•	Frequent
Esperiopsis fucorum	••	••	Occasional
Myxilla incrustans	••	••	Occasional
Alcyonium digitatum	••••	•	Frequent
Urticina felina	••••	•	Occasional
Metridium senile	••	•	Occasional

Sagartia elegans	••••	•	Occasional
Corynactis viridis	••••	••	Frequent
Calliostoma zizyphinum	••••	•	Occasional
Echinus esculentus	••••	•	Frequent
Polyclinum aurantium	••	••	Frequent
Botryllus schlosseri	••••	•	Frequent
Callophyllis laciniata	•••	••	Occasional
Corallinaceae	••••	•	Common
Plocamium cartilagineum	•••	•	Frequent
Ptilota gunneri	••	•	Frequent
Cryptopleura ramosa	•••	•	Frequent
Delesseria sanguinea	••••	•	Frequent
Phycodrys rubens	••••	•	Frequent
Odonthalia dentata	••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant
Alaria esculenta	••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.LhypFa.Ft	=
R1	Shetland	Hiscock 1986	4.2.2	=
R1	Shetland	Howson 1988	H21/H18/H19	=
R1	Shetland		R1.LhypR.Ft	split
R2	Orkney		R2-4.LhypFa.Ft	=
R2	Orkney		R2-4.LhypScr.Ft	split
R5	SE Scotland / NE England	Foster-Smith 1992	KH2	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.46	In part
R5	Flamborough / Needles(R7)	George, Tittley & Wood In prep	2	=
R8	Open coast		R8.Lhyp.Dend	In part
R8	Plymouth	Devon Wildlife Trust 1993	Plate 14	=
R9	S Pembrokeshire	Cartlidge & Hiscock 1979	4.2.2	?
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.2	In part
R13	Mull	Bishop 1984	3.5.1B	=
R14	Barra		MNCR data	
R14	St Kilda	Howson & Picton 1985	p5/p6	=
IR6	?Galway	Sides *et al*. 1994	KA10	=
IR8	Mulroy Bay	Picton *et al*. 1994	MS29	=
Other	R8-R9 Inlets	Moore In prep	SWI.53	In part

Frequency of occurrence

In Britain: Uncommon

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.LhypPar — Sparse *Laminaria hyperborea* and dense *Paracentrotus lividus* on exposed infralittoral limestone

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed
Tidal streams:	Very weak
Substratum:	Bedrock
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m
Other features:	Limestone platforms

Previous code

EIR.LhypFa.Par 96.7

Biotope description

This biotope is known from only one location, the Aran Islands, Co. Galway. Here a limestone platform between 3 m and 6 m is dominated by a dense population of the urchin *Paracentrotus lividus*, which heavily graze and burrow into the soft limestone. So intense is the grazing pressure that the rock appears completely bare, except for a dense coralline algal crust, and occasional *Laminaria hyperborea* and *Saccorhiza polyschides*. The anemones *Sagartia elegans* and *Corynactis viridis* are also present, though at low abundance. The grazed kelp also extends deeper to 20 to 25 m further offshore.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cliona celata	●●●●●	●	Occasional
Anemonia viridis	●●●●●	●●	Frequent
Urticina felina	●●●●●	●	Rare
Sagartia elegans	●●●●●	●	Frequent
Corynactis viridis	●●●●●	●●	Occasional
Paracentrotus lividus	●●●●●	●●●	Abundant
Laminaria hyperborea	●●●●●	●	Occasional
Saccorhiza polyschides	●●●●●	●●	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
IR6	Aran Islands	Sides *et al*. 1994	LhypFa.Par_ir	=

Frequency of occurrence

In Britain: Rare

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.LhypR *Laminaria hyperborea* with dense foliose red seaweeds on exposed infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Very exposed and exposed upper infralittoral bedrock or large boulders characterised by the kelp *Laminaria hyperborea*, beneath which is a dense turf of foliose red seaweeds. Three variations of this biotope are described: the upper infralittoral kelp forest (EIR.LhypR.Ft), the kelp park below (EIR.LhypR.Pk) and a third type of kelp forest that is characterised by a mixture of *L. hyperborea* and *Laminaria ochroleuca* (EIR.LhypR.Loch). The fauna of these biotopes is markedly less abundant than kelp forests in areas of greater wave surge (EIR.LhypFa); sponges, anemones and polyclinid ascidians may be present, though never at high abundance. Beneath the under-storey the rock surface is generally covered with encrusting coralline algae.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Echinus esculentus	••••	•	Frequent
Callophyllis laciniata	•••	•	Frequent
Plocamium cartilagineum	••••	•	Frequent
Cryptopleura ramosa	••••	•	Frequent
Delesseria sanguinea	••••	•	Frequent
Phycodrys rubens	••••	•	Frequent
Dictyota dichotoma	••••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.LhypR.Ft *Laminaria hyperborea* forest with dense foliose red seaweeds on exposed upper infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; large boulders
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Very exposed and exposed upper infralittoral bedrock or large boulders characterised by a dense forest of the kelp *Laminaria hyperborea*, beneath which is a dense turf of foliose red seaweeds. The dense seaweed turf is due, in part, to the relatively low urchin-grazing pressure in such shallow exposed conditions. The shallowest kelp plants are often short or stunted, while deeper plants are taller with heavily epiphytised stipes. Amongst the red seaweeds, an often dense turf of the bryozoans *Scrupocellaria* spp. and *Securiflustra securifrons* may occur. The cushion fauna in this biotope is markedly less abundant than kelp forests in areas of greater wave surge (EIR.LhypFa) and whilst sponges, anemones and polyclinid ascidians may be present, they do not occur at high abundance. Beneath the under-storey the rock surface is generally covered with encrusting coralline algae. This kelp forest most commonly occurs beneath a zone of *Alaria/Mytilus* (EIR.Ala.Myt) and above a *L. hyperborea* park (EIR.LhypR.Pk) or a park of *L. saccharina* and/ or *Saccorhiza polyschides* (EIR.LsacSac).

Similar biotopes

EIR.LhypFa	Both from exposed areas, but EIR.LhypR.Ft lacks the dense faunal cushion
MIR.Lhyp.Ft	Is from moderately wave exposed areas and generally has a fewer foliose and more filamentous red algae
EIR.LhypR.Pk	Found in similar conditions, but from deeper water where kelp is less dense and more upper circalittoral species occur

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Obelia geniculata	••••	•	Frequent
Botryllus schlosseri	•••	•	Occasional
Callophyllis laciniata	•••	••	Frequent
Plocamium cartilagineum	••••	•	Frequent
Cryptopleura ramosa	••••	•	Frequent
Delesseria sanguinea	••••	•	Frequent
Membranoptera alata	•••	•	Frequent
Phycodrys rubens	••••	•	Frequent
Dictyota dichotoma	••••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.LhypR.Ft	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.51	In part
R8	Open Coast		R8.Lhyp.R	In part
R10	Open Coast		R10.K	In part

R11	Irish Sea	Covey In prep.b	R11.30	In part
R14	St Kilda		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL32	In part

Frequency of occurrence

In Britain: Uncommon

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.LhypR.Pk *Laminaria hyperborea* park with dense foliose red seaweeds on exposed lower infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; large boulders
Zone:	Infralittoral - lower
Depth band:	10-20m, 20-30m, 30-50m

Previous code

EIR.LhypFa.Pk	96.7

Biotope description

Very exposed and exposed lower infralittoral bedrock or large boulders characterised by a park of the kelp *Laminaria hyperborea* with a dense turf of foliose red seaweeds. Dense foliose red seaweeds dominate the under-storey in a similar abundance to the upper infralittoral kelp forest. In addition, moderate to high abundances of foliose brown seaweeds, such as *Dictyota dichotoma* and / or *Dictyopteris membranacea*, are more common in this kelp park than the forest above. At some sites, a dense band of *Dictyota* may form a separate zone (see EIR.FoR.Dic). In the late summer both the kelp and the foliose seaweeds can become heavily encrusted with the bryozoan crusts *Electra pilosa* and *Membranipora membranacea*. This biotope usually occurs below the exposed kelp forests (EIR.LhypFa.Ft and EIR.LhypR.Ft) and all these biotopes have a similar species composition. This biotope does, however, have a much reduced density of large kelp plants.

Similar biotopes

EIR.LhypFa	This has denser kelp and dense faunal cushion
EIR.LhypR.Ft	Main difference is abundance of kelp
MIR.Lhyp.Pk	Main difference is in the density of the cushion fauna

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	•••••	•	Occasional
Urticina felina	•••••	•	Occasional
Corynactis viridis	•••	••	Frequent
Calliostoma zizyphinum	••••	•	Occasional
Antedon bifida	•••	•	Frequent
Echinus esculentus	••••	•	Frequent
Botryllus schlosseri	•••	•	Occasional
Corallinaceae	••••	•	Frequent
Plocamium cartilagineum	•••	•	Occasional
Delesseria sanguinea	••••	•	Frequent
Dictyota dichotoma	•••	•	Occasional
Laminaria hyperborea	•••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	H18/19/21	In part
R1	Shetland		R1.LhypR.Pk	=
R2	Orkney		R2-4.LhypScr.Pk	=
R2	Orkney		R2-4.LhypFa.Pk	check
R11	Irish Sea	Covey In prep.b	R11.30	In part
R14	St Kilda	Howson & Picton 1985	p6	=

R14	Barra		MNCR data	=
IR6	?Galway	Sides *et al*. 1994	KA12	=

Frequency of occurrence

In Britain: Uncommon

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.LhypR.Loch Mixed *Laminaria hyperborea* and *Laminaria ochroleuca* forest on exposed infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Depth band:	5-10m, 10-20m

Previous code

EIR.LhypFa.Loch	96.7

Biotope description

Mixed *Laminaria hyperborea* and *Laminaria ochroleuca* forests on upper infralittoral exposed rock are restricted to the coast of Cornwall and the Isles of Scilly. Superficially, the *L. ochroleuca* biotope looks similar to the more widespread exposed *Laminaria hyperborea* forest (EIR.LhypR.Ft), containing a similar suite of foliose red algae (such as *Phycodrys rubens*, *Plocamium cartilagineum*, *Callophyllis laciniata* and *Delesseria sanguinea*) beneath the canopy. Unlike *L. hyperborea*, however, *L. ochroleuca* has a smooth stipe and so it lacks dense assemblages of epiphytic seaweeds, though some *Palmaria palmata* may occur. This biotope commonly occurs below EIR.LhypR.Ft, since *L. ochroleuca* is less tolerant of wave action than *L. hyperborea*. *L. ochroleuca* occurs at low abundances in other kelp biotopes (sheltered through to exposed) from Dorset to Lundy Island. In such cases, records should be treated as regional variations of the usual kelp biotope. Records should only be assigned to this biotope when the canopy is dominated by *L. ochroleuca* alone, or (more usually) by a mixture of both *L. hyperborea* and *L. ochroleuca* (at similar abundances). This biotope is similar to the mixed *L. hyperborea* and *L. ochroleuca* biotope found on moderate and sheltered coasts (MIR.Lhyp.Loch), though the latter generally occurs in shallower water and has a lower density of *L. hyperborea*, fewer foliose and more filamentous red algae. Both *L. ochroleuca* biotopes are common on the Brittany and Normandy coasts.

Similar biotopes

MIR.Lhyp.Loch	MIR.Lhyp.Loch is distinguished by the lower abundances of foliose red algae
EIR.LhypR.Ft	EIR.LhypR.Ft does not contain *Laminaria ochroleuca*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Caryophyllia smithii	•••••	•	Occasional
Echinus esculentus	•••••	•	Frequent
Holothuria forskali	••••	••	Rare
Callophyllis laciniata	•••••	••	Occasional
Corallinaceae	•••	•	Abundant
Plocamium cartilagineum	••••	•	Occasional
Delesseria sanguinea	•••	•	Present/Not known
Phycodrys rubens	•••	•	Present/Not known
Heterosiphonia plumosa	••••	•	Present/Not known
Dictyota dichotoma	••••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant
Laminaria ochroleuca	•••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Open coast		R8.Loch.Ft	=

R8	Open coast		R8.Lhyp.Loch.Ft	In part?
R8	Scillies	Hiscock 1984c	3.2.12/13	=
R8	The Lizard		MNCR data	=
Other	Brittany / Normandy	Sheppard *et al*. 1978		=

Frequency of occurrence

In Britain: Scarce

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.LsacSac *Laminaria saccharina* and/or *Saccorhiza polyschides* on exposed infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m
Other features:	Often (but not always) disturbance due to scour or seasonal instability of substratum

Previous code

EIR.LsacSpol	96.7

Biotope description

A forest or park of the fast-growing, opportunistic kelps *Laminaria saccharina* and/ or *Saccorhiza polyschides* often occurs on seasonally unstable or scoured infralittoral rock. The substratum varies from large boulders in exposed areas to smaller boulders and cobbles in areas of moderate wave exposure or nearby bedrock. In these cases, movement of the substratum during winter storms prevents a longer-lived forest of *Laminaria hyperborea* from becoming established. This biotope may also develop on bedrock where it is affected by its close proximity to unstable substrata. Other fast-growing algae such as *Ulva* spp., *Alaria esculenta*, *Desmarestia* spp. and *Chorda filum* are often present. This biotope can be found below the *L. hyperborea* zone (EIR.LhypFa or EIR.LhypR), especially where close to a rock/ sand interface (subjected to sand scour in winter?). Some *L. hyperborea* plants may occur in this biotope, but they are typically small since the plants do not survive many years. In St Kilda this biotope is present on steep/vertical rock between the sublittoral fringe of *Alaria esculenta* and the *Laminaria hyperborea* forest below. In such places this biotope occurs because intense wave action in winter storms is too severe to allow *L. hyperborea* to develop and remain in shallow water.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	•••	•	Frequent
Calliostoma zizyphinum	•••	•	Occasional
Asterias rubens	••••	•	Occasional
Echinus esculentus	••••	•	Frequent
Corallinaceae	•••••	•	Abundant
Phycodrys rubens	•••	•	Occasional
Desmarestia aculeata	••	•	Occasional
Desmarestia ligulata	••	•	Occasional
Laminaria saccharina	•••••	•	Common
Saccorhiza polyschides	••••	••	Frequent
Alaria esculenta	••	•••	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.LsacSpol	=
R1	Shetland	Howson 1988	H18, 24	
R1	Shetland	Earll 1982a	E	=
R2	Orkney		R2-4.LsacSpol	=
R4	Isle of May	Bennett 1989	H32, H34	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.48	In part

R9	Skomer	Bunker & Hiscock 1987	Fig. 19/21	=
R9	N Cornwall	Maggs & Hiscock 1979		=
R9	W Pembrokeshire	Hiscock 1980	G	=
R9	Lundy	Hiscock 1981		In part
R10	Sarns	Hiscock 1986	3.2.3.1	In part
R14	St Kilda		MNCR data	

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.FoR Foliose red seaweeds on exposed or moderately exposed lower infralittoral rock

Habitat classification

Salinity:	Full		
Wave exposure:	Very exposed, Exposed, Moderately exposed		
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock; large boulders		
Zone:	Infralittoral - lower		
Depth band:	5-10m, 10-20m, 20-30m		

Previous code

MIR.FoR	96.7

Biotope description

A dense turf of foliose red seaweeds (including *Plocamium cartilagineum*, *Cryptopleura ramosa* and *Delesseria sanguinea*) on exposed or moderately exposed lower infralittoral rock, generally at or below the lower limit of the kelp. Most of the red seaweeds are common to the kelp zone above, while the faunal component of the biotope is made up of species that are found either in the kelp zone or the animal-dominated upper circalittoral below. The red seaweed species composition varies considerably and at some sites a single species may dominate (particularly *Plocamium* or *Cryptopleura*) As well as a varied red seaweed component, this biotope may also contain occasional kelp plants and patches of the brown foliose seaweed *Dictyota dichotoma*. In some areas *Dictyota* may occur at high densities (see EIR.FoR.Dic). Other red seaweed-dominated biotopes occur in less wave-exposed areas (MIR.PolAhn), though they are affected by sand scour and are characterised by seaweeds that are resilient to the scouring.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Corallinaceae	••••	•	Frequent
Corallina officinalis	••	•	Frequent
Plocamium cartilagineum	••••	•	Frequent
Delesseria sanguinea	••••	•	Frequent
Phycodrys rubens	•••	•	Frequent
Brongniartella byssoides	••	•	Occasional
Dictyota dichotoma	••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.FoR	=
Other	North Scotland & Orkney		R2-4.FoR	=
Other	Chalk coasts	George, Tittley & Wood In prep	SR8	=
R11	Irish Sea	Covey In prep.b	R11.29	In part

KFaR *Kelp with cushion fauna, foliose red seaweeds or coralline crusts (exposed rock)*

EIR.FoR.Dic Foliose red seaweeds with dense *Dictyota dichotoma* and/or *Dictyopteris membranacea* on exposed lower infralittoral rock

Habitat classification

Salinity:	Full	
Wave exposure:	Exposed, Moderately exposed	
Tidal streams:	Moderately strong	
Substratum:	Bedrock	
Zone:	Infralittoral - lower	
Depth band:	10-20m	

Previous code

EIR.Dic 96.7

Biotope description

A dense turf of foliose red seaweeds (including *Delesseria sanguinea*, *Plocamium cartilagineum* and *Callophyllis laciniata*) mixed with a dense turf of the brown seaweeds *Dictyota dichotoma* and / or *Dictyopteris membranacea* on exposed and moderately exposed lower infralittoral rock, generally at or below the lower limit of the kelp zone. In some areas the lower infralittoral may be subject to a moderate amount of scour from nearby sand. *Dictyota* is relatively tolerant of such scour and in such areas a zone may form with other tolerant seaweeds, such as *Schottera nicaeensis* and *Desmarestia* spp. *Dictyopteris* is confined to south-western coasts. *Dictyota* also occurs in the kelp park, and records should only be assigned to this biotope where kelp is sparse or absent (less than occasional) and a relatively high density of *Dictyota* and / or *Dictyopteris* (generally greater than common) is present.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nemertesia antennina	••••	•	Occasional
Alcyonium digitatum	••••	•	Frequent
Balanus crenatus	•••	•	Occasional
Clavelina lepadiformis	•••	•	Occasional
Callophyllis laciniata	••	••	Occasional
Kallymenia reniformis	•••	••	Occasional
Corallina officinalis	••	•	Frequent
Schottera nicaeensis	••	•••	Frequent
Plocamium cartilagineum	•••	•	Frequent
Lomentaria clavellosa	••••	••	Rare
Delesseria sanguinea	••••	•	Frequent
Dictyopteris membranacea	••	••	Frequent
Dictyota dichotoma	•••••	•	Frequent
Desmarestia ligulata	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Orkney		R2-4.Dic	=
R5	SE Scotland / NE England	Foster-Smith 1992	MH2	=
R8	Open coast		R8.R.UB	=
R8	Scillies	Hiscock 1984c	3.2.10	=
R9	N Cornwall	Maggs & Hiscock 1979	4.2.4	=
R9	Lundy Island	Hiscock 1981		=
R9	S Pembrokeshire	Cartlidge & Hiscock 1979		=
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.8	=
R13	Scarba	Picton *et al*. 1982		=

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.FoSwCC Foliose seaweeds and coralline crusts in surge gully entrances

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed, Exposed
Tidal streams:	Very weak
Substratum:	Bedrock; boulders; cobbles
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Boulder-scoured and wave-surged

Biotope description

This biotope is often found on steep wave-surged entrances to gullies and caves and on mobile boulders in the entrance to caves and gullies. The rock is abraded by the movement of the boulders and cobbles in heavy surge and is dominated by dense foliose seaweeds that grow rapidly in the calmer summer months. Beneath the foliose seaweeds the rock surface is covered with coralline crusts, which are longer-lived, and tolerant of abrasion. The flora of this biotope is relatively varied, depending upon the amount of light and degree of abrasion or rock mobility with red seaweeds such as *Plocamium cartilagineum*, *Kallymenia reniformis* and *Phyllophora crispa* common. The brown seaweed *Dictyota dichotoma* also occurs in these conditions, since it is tolerant of some sand scour. During the summer months small fast-growing kelp plants may also arise in this biotope, though the mobility of the substratum prevents the kelp from forming a kelp forest. Dense swathes of very young kelp plants are, however, not uncommon and should be included in this biotope. This biotope may appear similar to EIR.LsacSac, though EIR.LsacSac, often occurs further away from the cave / gully entrance on larger boulders. As such, the greater (relative) stability of the boulders allows the opportunistic kelps to survive long enough to form a forest.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Corallinaceae	••••	•	Abundant
Corallina officinalis	••	•	Occasional
Phyllophora crispa	••	•	Frequent
Plocamium cartilagineum	••••	•	Frequent
Cryptopleura ramosa	•••	•	Frequent
Hypoglossum hypoglossoides	•••	•	Occasional
Dictyota dichotoma	••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.FoAlCC	=
R10	Wales		R10.RTurf	?In part
R10	Wales		R10.PomByC	?In part
R14	St Kilda		MNCR data	

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.SCAn Sponge crusts and anemones on wave-surged vertical infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Very weak
Substratum:	Bedrock
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Wave-surged (usually in surge gullies) vertical rock

Previous code

EIR.SCAn.By	96.7

Biotope description

Vertical very exposed and exposed bedrock gullies, tunnels and cave entrances subject to wave-surge dominated by sponge crusts (such as *Clathrina coriacea*, *Leucosolenia botryoides* and *Halichondria panicea*) and anemones, such as *Sagartia elegans* and dwarf *Metridium senile* generally dominate the area, the anemones often appearing to protrude through the sponge layer. This biotope is generally unaffected by sand scour (compare with those dominated by sponge crusts and ascidians (EIR.SCAs). A variant of this biotope has been identified from the very wave-surged sublittoral fringe with dense aggregations of the hydroid *Tubularia* (EIR.SCAn.Tub). Both of these biotopes may contain colonial ascidians, but never at high densities (compare with EIR.SCAs). Encrusting coralline algae and tufts of foliose red seaweeds may also occur on well-illuminated rock faces. Due to the wave-surged nature and vertical orientation of these biotopes, kelps are rare and certainly never dominate (compare with EIR.LhypFa and EIR.Ala.Myt). This biotope may also include a turf of *Crisia* or *Scrupocellaria* spp.

Similar biotopes

EIR.SCAs	Surge gullies very variable; some will be difficult to classify.

Characterising species

	% Frequency	Faithfulness	Typical abundance
Clathrina coriacea	••••	••	Frequent
Leucosolenia botryoides	••••	••	Frequent
Grantia compressa	••	••	Frequent
Halichondria panicea	••••	•	Common
Esperiopsis fucorum	••	••	Frequent
Myxilla incrustans	•••	••	Occasional
Tubularia indivisa	•••	••	Frequent
Alcyonium digitatum	••••	•	Occasional
Urticina felina	••••	•	Occasional
Sagartia elegans	••••	•	Frequent

Distribution

Sector	Area	Source	Section/page	Equivalence
R1	Shetland		R1.SCAn	=
R14	St Kilda		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL30	=

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.SCAn.Tub — Sponge crusts, anemones and *Tubularia indivisa* in shallow infralittoral surge gullies

Habitat classification

		Previous code	
Salinity:	Full	EIR.SCAn.Myt	96.7
Wave exposure:	Extremely exposed, Very exposed, Exposed, Moderately exposed	LRK.SAM	6.95
Tidal streams:	Moderately strong, Weak		
Substratum:	Bedrock		
Zone:	Sublittoral fringe, Infralittoral - upper		
Height band:	Lower shore		
Depth band:	0-5 m		
Other features:	Wave surged (usually in surge gullies) vertical or overhanging rock		

Biotope description

Shallow, vertical or overhanging very exposed and exposed bedrock gullies, tunnels and cave entrances that are subject to strong wave-surge and characterised by sponge crusts (such as *Halichondria panicea*, *Myxilla incrustans* and *Leucosolenia botryoides*), anemones (such as *Sagartia elegans* and dwarf *Metridium senile*), and often dense aggregations of *Tubularia indivisa* and patches of small mussels *Mytilus edulis*. Some patches of colonial ascidians may occur, but they never dominate the biotope (compare with EIR.SCAs). *Corynactis viridis* and *Alcyonium digitatum* may both occur, but only ever at low to moderate abundances (compare with IR.CorMetAlc) due to the high degree of wave-surge at such shallow depths.

Similar biotopes

EIR.SCAn	All biotopes in this group will vary markedly in composition

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	••	Frequent
Grantia compressa	••	••	Frequent
Halichondria panicea	••••	•	Common
Esperiopsis fucorum	••	••	Frequent
Myxilla incrustans	•••	••	Rare
Tubularia indivisa	•••	••	Frequent
Alcyonium digitatum	••	•	Occasional
Metridium senile	•••	•	Common
Sagartia elegans	••••	•	Frequent
Corynactis viridis	••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.SCAn.Tub	=
R5	Farnes, Bass Rock, St Abb's Head	Brazier *et al*. In prep.b	R5.45	=
R5	SE Scotland / NE England	Foster-Smith 1992	SV10/MV10	
R8	R8 open coast		R8.Ldig.Myt	In part
R14	St Kilda		MNCR data	

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.SCAs Sponge crusts and colonial ascidians on wave-surged vertical infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock
Zone:	Infralittoral - upper
Depth band:	0-5 m
Other features:	Wave-surge and some scour on vertical rock

Biotope description

Wave-surged, overhanging, vertical and steep infralittoral rock in caves tunnels and gullies subject to some sand-scour and characterised by sponge crusts and ascidians. This biotope is found in similar locations to the sponge crusts and anemones biotope (EIR.SCAn), but the latter are not subject to as much scour. Sponges include *Clathrina coriacea*, *Leucosolenia botryoides*, *Esperiopsis fucorum* and *Halichondria panicea* while the ascidians include mixtures of *Polyclinum aurantium*, *Dendrodoa grossularia*, *Aplidium* spp., *Diplosoma* spp. and other didemnids. On surfaces that receive sufficient illumination, a moderately dense turf of foliose red seaweeds may also occur. Crevices and other areas that offer some protection from sand scour may contain anemones, such as *Sagartia elegans* and *Metridium senile*, though they never dominate the biotope (compare with EIR.SCAn). On vertical walls towards the back of caves, the rock may be dominated by only *Dendrodoa grossularia* and *Clathrina coriacea* (see EIR.SCAs.DenCla). In deeper, though still scoured gullies, caves and tunnels the rock may be covered by sponge crusts, polyclinid ascidians and a bryozoan and hydroid turf (see EIR.SCAs.ByH).

Similar biotopes

EIR.SCAn	Different abundances of dominant species groups.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	•••	••	Frequent
Scypha ciliata	•••	••	Occasional
Grantia compressa	••	••	Occasional
Halichondria panicea	•••	•	Frequent
Esperiopsis fucorum	•••	••	Occasional
Myxilla incrustans	••	••	Occasional
Polyclinum aurantium	••	••	Frequent
Morchellium argus	••	••	Occasional
Diplosoma listerianum	••	••	Frequent
Lissoclinum perforatum	••	••	Occasional
Dendrodoa grossularia	••	•	Common
Botryllus schlosseri	•••	•	Occasional
Corallinaceae	•••	•	Frequent
Schottera nicaeensis	••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.SCAs	=
R1	Shetland		R1.SCAs.CoAs	=
R2	Orkney		R2-4.SCAs.Clep	?
Other	Chalk coasts	George, Tittley & Wood In prep	CCS13	
Other	Sealochs		MNCR data	=

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.SCAs.DenCla *Dendrodoa grossularia* and *Clathrina coriacea* on wave-surged vertical infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Wave-surge and some scour on vertical and overhanging rock

Biotope description

Vertical and overhanging wave-surged rock that is subject to some scour especially in the middle or back of caves but also in gullies and tunnels, are often dominated by dense sheets of *Dendrodoa grossularia* with the sponge *Clathrina coriacea*. At some sites *Dendrodoa* may form continuous sheets, with few other species present. Other sponges such as *Esperiopsis fucorum*, *Pachymatisma johnstonia* and *Halichondria panicea* regularly occur in this biotope, though generally at low abundance. Other ascidians, especially *Polyclinum aurantium*, *Diplosoma* and other didemnids may also occur, though only *Polyclinum* is ever as abundant as *Dendrodoa*. Being characteristically found in the middle or towards the backs of the caves mean that there is generally insufficient light to support any foliose seaweeds in this biotope, though encrusting coralline algae are not uncommon. As with the other sponge and ascidian- dominated biotopes, anemones may occur, though scouring prevents them dominating over the ascidians. Micro-habitats protected from sand scour may also contain anemones, such as *Sagartia elegans* and *Metridium senile*, though they never dominate this biotope (compare with EIR.SCAn).

Similar biotopes

EIR.SCAs	EIR.SCAs.DenCla has a similar species composition, but is dominated by *Dendrodoa* and *Clathrina*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	•••••	••	Common
Scypha ciliata	••	••	Occasional
Grantia compressa	••	••	Occasional
Pachymatisma johnstonia	•••	••	Frequent
Halichondria panicea	••••	•	Frequent
Esperiopsis fucorum	•••	••	Occasional
Myxilla incrustans	••	••	Occasional
Tubularia indivisa	••	••	Occasional
Sagartia elegans	•••	•	Frequent
Polyclinum aurantium	••	••	Occasional
Aplidium punctum	••	••	Occasional
Lissoclinum perforatum	••	••	Occasional
Dendrodoa grossularia	••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.SCAs.DenCla	=
R1	Bressay/Out Skerries	Earll 1982a		=
R1	Shetland	Howson 1988	H24	In part
R2	Orkney		R2-4.SCAs.DenCla	=
R4	Moray Firth	Earll 1983		=
R5	St Abb's Head	Earll 1981		=
R8	R8 open coast		R8.DendCla.V	=
R8	Scilly	Hiscock 1984c	3.2.6	
R9	N Cornwall	Maggs & Hiscock 1979	4.3	In part
R9	S Pembrokeshire	Cartlidge & Hiscock 1979	5.2.2	=
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.22	=
R13	Jura/Islay	Hiscock 1983	3.2.9	=
R13	Tiree	Mitchell, Earll & Dipper 1983	(I)	=
R14	Barra		MNCR data	
IR1	Rathlin Island	Erwin *et al*. 1990	(F)	=

Frequency of occurrence

In Britain: Scarce

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.SCAs.ByH Sponge crusts, colonial (polyclinid) ascidians and a bryozoan/hydroid turf on wave-surged vertical or overhanging infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m
Other features:	Wave-surged with some scour on vertical and overhanging rock

Biotope description

Vertical and overhanging wave-surged rock, subject to some scour in caves gullies and tunnels, and dominated by sponge crusts, colonial ascidians and a short turf of bryozoans and hydroids. Like the other sponge crust and ascidian-dominated biotopes, this biotope is also subject to a degree of scouring. It is, however, generally found in slightly deeper water and is not subject to as much wave surge as the shallower biotopes (EIR.SCAs or EIR.SCAs.DenCla). This biotope may occur at a similar depth and in similar conditions to the biotope characterised by sponges, *Corynactis*, *Metridium* and *Alcyonium* biotope (IR.CorMetAlc), though the additional scouring in this biotope leads to dominance by ascidians rather than anemones. The sponge and ascidian composition of this biotope is similar to the others in this group, though this biotope is distinguished by the often dense short turf of bryozoans such as *Crisia* and *Scrupocellaria*. Hydroids, particularly *Tubularia indivisa*, may also occur, especially on protruding surfaces. Foliose red seaweeds may occur, though generally not in high abundances, since the biotope is usually (but not always) found where light levels are too low. As with the other sponge and ascidian- dominated biotopes, anemones may occur, although scouring prevents them dominating over the ascidians. Patches of rock that are protected from sand scour may also contain anemones, such as *Sagartia elegans* and *Metridium senile*, though they never dominate (compare with EIR.SCAn).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	••	Occasional
Scypha ciliata	••	•	Rare
Grantia compressa	••	••	Occasional
Halichondria panicea	•••	••	Frequent
Esperiopsis fucorum	•••	••	Occasional
Myxilla incrustans	••	••	Occasional
Dysidea fragilis	•••	••	Occasional
Tubularia indivisa	••	••	Occasional
Balanus crenatus	•••	•	Occasional
Scrupocellaria reptans	••	••	Frequent
Bugula turbinata	••	••	Frequent
Polyclinum aurantium	••	••	Frequent
Morchellium argus	•••	••	Occasional
Diplosoma listerianum	••	••	Occasional
Lissoclinum perforatum	••	••	Occasional
Botryllus schlosseri	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.SCAs.ByH	=
R2	Orkney		R2-4.SCAsByH	=
R4	Isle of May	Bennett 1989	3.3.21(3)	=
R5	Flamborough	George, Tittley & Wood In prep	13	=
R9	S Pembrokeshire	Cartlidge & Hiscock 1979	4.2.4	=
R14	Barra		MNCR data	=
Other	R8-R9 Inlets	Moore In prep	SWI.56	=

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.SC Sponge crusts on extremely wave-surged infralittoral cave or gully walls

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; massive boulders
Zone:	Sublittoral fringe, Infralittoral - upper
Depth band:	0-5 m, 5-10m
Other features:	Extreme wave surge and scour on vertical and overhanging rock

Biotope description

Walls, or massive boulders, in caves or gullies that are subject to severe wave-surge may be characterised by extensive thin crusts of *Halichondria panicea* with smaller patches of other sponges including *Clathrina coriacea* and *Leuconia nivea*. Small turfs of robust hydroids such as *Diphasia rosacea* and *Ventromma halecioides* and patches of *Balanus crenatus* and coralline crusts may be present. This biotope is subject to a greater degree of wave surge and scour than either of sponge crust and ascidian biotopes (EIR.SCAs), or the sponge crust and anemone-dominated biotopes (EIR.SCAn).

Similar biotopes

EIR.SCAs	Lacks significant ascidian component
EIR.SCAn	Lacks significant anemone component

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	••	Occasional
Leuconia nivea	••	•••	Common
Pachymatisma johnstonia	••	••	Rare
Halichondria panicea	•••	••	Abundant
Esperiopsis fucorum	••	••	Occasional
Haliclona viscosa	••	••	
Ventromma halecioides	••	•••	Occasional
Diphasia rosacea	••	••	Occasional
Spirorbidae	•••	•	Common
Balanus crenatus	••	•	Frequent
Corallinaceae	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland			=
R2	Orkney		R2-4.SC	=
R14	Barra		MNCR data	=
R14	St Kilda		MNCR data	

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.CC.BalPom *Balanus crenatus* and/or *Pomatoceros triqueter* with spirorbid worms and coralline crusts on severely scoured vertical infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock
Zone:	Sublittoral fringe, Infralittoral - upper
Depth band:	0-5 m, 5-10m
Other features:	Scoured, vertical and overhanging rock

Previous code

EIR.CCPom	96.7
EIR.BcreSpi	96.7

Biotope description

Severely scoured bedrock in wave-surged caves, tunnels or gullies often look bare, but are characterised by a limited scour-tolerant fauna of *Balanus crenatus* and / or *Pomatoceros triqueter* with spirorbid polychaetes. In areas where sufficient light is available, the rock surface is covered by encrusting coralline algae and non-calcareous crusts, giving a pink appearance. This biotope most commonly occurs at the bottom of walls in caves and gullies, where abrasion by cobbles and stones is severe, especially during winter. In some gullies, extreme scouring and abrasion may produce a narrow band of bare coralline algal crust at the very bottom of the walls, with a band of *Pomatoceros* and or *B. crenatus* immediately above. Other scour-tolerant species, such as encrusting bryozoans may also be common. Crevices and cracks in the rock provide a refuge for sponge crusts, small *Mytilus edulis* and occasional *Actinia equina*, *Urticina felina* and *Sagartia* spp. During periods of relative stability in the summer, small quantities of foliose red seaweeds and opportunistic kelps may occur where sufficient light is available; The seaweeds however do not dominate (compare with EIR.FoSwCC).

Similar biotopes

EIR.CC.Mob	This on mobile boulders on gully / cave floor
EIR.FoSwCC	Less scoured allows foliose seaweeds to develop

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	•	Occasional
Urticina felina	••	•	Frequent
Sagartia elegans	••	•	Occasional
Pomatoceros triqueter	•••	•	Frequent
Balanus crenatus	••••	•	Frequent
Bryozoa indet. crusts	•	•	Common
Corallinaceae	•••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland			=
R1	Shetland	Howson 1988	H24	=
R2	Orkney		R2-4.CCPom	<
R2	Orkney		R2-4.BcreSpi	<
R5	SE Scotland / NE England	Foster-Smith 1992	SV7/MV7	=
R8	Plymouth	Devon Wildlife Trust 1993	Plate 15	In part
R9	Skomer	Bunker & Hiscock 1987	3.2.3	In part

R11	Solway	Covey In prep.b	R11.28	?In part
R14	Barra		MNCR data	
R14	St Kilda		MNCR data	
Other	Chalk coasts	George, Tittley & Wood In prep	18	=
Other	SW Inlets	Moore In prep	SWI.7	=
Other	SW Inlets	Moore In prep	SWI.51	In part

Frequency of occurrence

In Britain: Uncommon

Features of conservation interest

Because of its nature, this biotope is of no conservation importance.

Potentially damaging activities

Activity	*Degree of effect*
Alternative energy sources (inc. wave/wind power)	Moderate

SG *Robust faunal cushions and crusts (surge gullies and caves)*

EIR.CC.Mob Coralline crusts and crustaceans on mobile boulders or cobbles in surge gullies

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Boulders and cobbles
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Mobile substrata

Previous code

EIR.Bcre	96.7

Biotope description

Highly mobile and scoured boulders and cobbles found on cave and gully floors often appear bare. Where there is sufficient light, however, the boulders are encrusted by coralline algal crusts. Decapods such as *Pagurus* spp., *Cancer pagurus* and *Carcinus maenas* also occur, often beneath and between the rocks. The slightly less-scoured walls often found above this biotope in caves and gullies are generally characterised by a similar, but richer community of scour-tolerant *Balanus crenatus*, *Pomatoceros triqueter*, coralline crusts and spirorbid worms (EIR.CC.BalPom). This impoverished biotope may form an intermediate between barren gravel and slightly more stable larger pebbles and cobbles which are covered by algae that are often found in the mouths of caves (EIR.FoSwCC).

Similar biotopes

EIR.CC.BalPom	Is slightly less scoured and often occurs nearby on vertical rock
EIR.FoSwCC	Occurs on similar, but more stable, substratum, and is richer

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	•	••	Rare
Urticina felina	••	•	Frequent
Balanus crenatus	•	•	Frequent
Cancer pagurus	•	•	Occasional
Carcinus maenas	••	•	Rare
Corallinaceae	•	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.BcreD	=
R1	Shetland	Howson 1988	H30	?
R9	Skomer	Bunker & Hiscock 1987	Fig. 24	=
R10	Sarns			
R11	St Bees Head	Covey In prep.b	R11.28	
R14	Barra		MNCR data	

Frequency of occurrence

In Britain: Uncommon

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Ldig *Laminaria digitata* on moderately exposed or tide-swept sublittoral fringe rock

Habitat classification

Salinity:	Full	
Wave exposure:	Exposed, Moderately exposed, Sheltered	
Tidal streams:	Moderately strong, Weak, Very weak	
Substratum:	Bedrock; boulders	
Zone:	Sublittoral fringe	
Height band:	Lower shore	
Depth band:	0-5 m	

Previous code

LRK.LDIG 6.95

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

Distribution

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

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

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Sublittoral fringe
Height band:	Lower shore
Depth band:	0-5 m

Previous code

LRK.LDIG.LDIG 6.95

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

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Boulders
Zone:	Sublittoral fringe
Height band:	Lower shore
Depth band:	0-5 m
Other features:	Under-boulder habitats

Previous code

MIR.Ldig.Bo	96.7
LRK.BSP in part	6.95

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

Salinity:	Full
Wave exposure:	Extremely sheltered
Tidal streams:	Very strong, Strong, Moderately strong
Substratum:	Bedrock; boulders and cobbles
Zone:	Sublittoral fringe
Height band:	Lower shore
Depth band:	0-5 m

Previous code

LRK.LDIG.T 6.95

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

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Sublittoral fringe
Height band:	Lower shore
Other features:	Soft rock such as chalk and limestone

Previous code

LRK.LDIG.PID 6.95

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

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Lhyp *Laminaria hyperborea* and foliose red seaweeds on moderately exposed infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Strong, Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Moderately exposed infralittoral bedrock and boulders characterised by a canopy of the kelp *Laminaria hyperborea* beneath which is an under-storey of foliose red seaweeds. This suite of biotopes differ from the wave exposed *Laminaria hyperborea* biotopes by having a lower diversity of encrusting faunal species. The foliose red seaweed component of the two suites of biotopes may also differ in composition with a tendency for MIR.Lhyp to include some more delicate filamentous species. Several variants of this biotope are described: kelp forests, kelp parks, kelp park and two tide-swept kelp types.

Similar biotopes

EIR.LhypFa	Both have dense red algae, but MIR.Lhyp lacks the dense cushion forming fauna associated with the more exposed biotopes.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Gibbula cineraria	•••	•	Frequent
Asterias rubens	••••	•	Occasional
Echinus esculentus	••••	•	Occasional
Corallinaceae	•••	•	Frequent
Plocamium cartilagineum	••••	•	Frequent
Delesseria sanguinea	••••	•	Frequent
Phycodrys rubens	••••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant
Laminaria saccharina	••	•	Occasional

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Lhyp.Ft *Laminaria hyperborea* forest and foliose red seaweeds on moderately exposed upper infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; large boulders
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Moderately exposed upper infralittoral bedrock and boulders characterised by a dense forest of *Laminaria hyperborea* with dense foliose red seaweeds beneath (such as *Plocamium cartilagineum*, *Cryptopleura ramosa* and *Delesseria sanguinea*). The rock surface is generally covered by encrusting coralline algae, while cracks and crevices are filled with the sponge *Halichondria panicea*. Small vertical surfaces within the kelp forest generally lack kelp plants, instead being characterised by foliose red seaweeds, *Alcyonium digitatum*, *Caryophyllia smithii* and solitary and colonial ascidians. Kelp stipes are usually covered in a rich mixture of red seaweeds including *Palmaria palmata*, *Phycodrys rubens* and *Membranoptera alata*, and sometimes small kelp plants. This biotope generally occurs below the sublittoral fringe *L. digitata* zone (MIR.Ldig). Where urchins are present, the abundance of red seaweeds may be much reduced (though not the species richness?) (see MIR.LhypGz.Ft).

Similar biotopes

EIR.LhypR.Ft	EIR.LhypR.Ft is found in areas of greater wave exposure and has a greater faunal component and fewer filamentous seaweeds, though further work is required to fully distinguish these biotopes
MIR.Lhyp.Pk	Is found below the kelp forest, and has a lower abundance of kelp plants

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	•••	•	Occasional
Pomatoceros triqueter	•••	•	Frequent
Gibbula cineraria	••••	•	Frequent
Asterias rubens	••••	•	Occasional
Echinus esculentus	••••	•	Frequent
Corallinaceae	••••	•	Frequent
Plocamium cartilagineum	••••	•	Frequent
Cryptopleura ramosa	•••	•	Frequent
Delesseria sanguinea	••••	•	Frequent
Phycodrys rubens	••••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Lhyp.Ft	=
R1	Shetland	Moss & Ackers 1987	4.2.2	=
R1	Shetland	Howson 1988	H26	=
R1	Shetland	Earll 1982a	E	=
R2	Orkney		R2-4.Lhyp.Ft	=

R4	Isle of May	Bennett 1989	H50	In part
R5	Flamborough	George, Tittley & Wood In prep	?CC39	=
R5	Flamborough	Wood 1988	S41,42,43	=
R5	SE Scotland/ NE England	Brazier *et al*. In prep.b	R5.51	In part
R5	SE Scotland/ NE England	Foster-Smith 1992	KH1, KV1, KB1	=
R5	St. Abb's Head	Earll 1981		=
R6	Kent	George, Tittley & Wood In prep	4	=
R7	W Sussex	Irving 1994	?	In part
R7	Isle of Wight/ Purbeck	George, Tittley & Wood In prep	5,6	=
R8	R8 open coast		R8.Lhyp.R	=
R8	Dorset	Dixon *et al*. 1978		=
R8	Falmouth	Davies & Sotheran 1995	10	=
R9	N Pembrokeshire	Cartlidge & Hiscock 1980	4.3.1	In part
R9	Padstow	Hiscock 1978	4.4.3	=
R9	Skomer	Bunker & Hiscock 1987	p20; fig. 9	=
R11	Luce Bay	Covey In prep.b	R11.30	=
R13	Scarba	Picton *et al*. 1982	5.1.1	=
Other	Chalk coasts	George, Tittley & Wood In prep	SR1/2	In part
Other	N Ireland	Erwin *et al*. 1990	1	=
Other	R8-R9 Inlets	Moore In prep	SWI.53	=
Other	Sealochs	Howson, Connor & Holt 1994	SL32	=
IR6	Galway Bay	O'Connor *et al*. 1993		In part
IR8	Mulroy Bay	Picton *et al*. 1994	MS35	=

Frequency of occurrence

In Britain: Very common

KR *Kelp and red seaweeds (moderately exposed rock)*

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

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral - lower
Depth band:	5-10m, 10-20m

Biotope description

Below the dense kelp forest (MIR.Lhyp.Ft) on moderately exposed lower infralittoral bedrock and boulders, the kelp thins out to form a park. Beneath the kelp, the rock and kelp stipes are covered by an often dense turf of foliose red seaweeds. The faunal component of this biotope is similar to that found below the kelp in the upper circalittoral zone. Many species of foliose red seaweed found in this biotope, such as *Membranoptera alata* and *Ptilota plumosa*, occur in the shallower kelp forest at greater abundance. Other species such as *Hypoglossum hypoglossoides*, *Pterothamnion plumula* and *Brongniartella byssoides* are more abundant in this zone than the upper infralittoral.

Similar biotopes

MIR.Lhyp.Ft	MIR.Lhyp.Ft has a greater density of kelp plants and has fewer of the upper circalittoral fauna
EIR.LhypR.Pk	EIR.LhypR.Pk is found in more wave exposed areas and contains fewer filamentous red seaweeds, other differences have still to be clarified

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Asterias rubens	••••	•	Occasional
Echinus esculentus	••••	•	Frequent
Corallinaceae	••••	•	Common
Plocamium cartilagineum	•••	•	Occasional
Delesseria sanguinea	••••	•	Occasional
Phycodrys rubens	•••	•	Frequent
Dictyota dichotoma	•••	•	Frequent
Laminaria hyperborea	•••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Lhyp.Pk	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.52	=
R8	R8 open coast		R8.K.Pk	In part
R8	Scillies	Hiscock 1984c	3.2.10	=
R9	Gower	Hiscock 1979	4.2.2	=
Other	SW Inlets	Moore In prep	SWI.54	=
Other	Sealochs	Howson, Connor & Holt 1994	SL33	=
Other	N Ireland	Erwin *et al*. 1990		=
IR5	Bantry Bay	Emblow *et al*. 1994	BB17	=
IR8	Mulroy Bay	Picton *et al*. 1994	MS30	=

Frequency of occurrence

In Britain: Common

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Lhyp.TFt *Laminaria hyperborea* forest, foliose red seaweeds and a diverse fauna on tide-swept upper infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Moderately exposed, tide-swept, rock with dense *Laminaria hyperborea* forest is characterised by a rich under-storey and stipe flora of foliose seaweeds such as *Plocamium cartilagineum*, *Callophyllis laciniata*, *Heterosiphonia plumosa*, *Cryptopleura ramosa* and *Delesseria sanguinea* and crustose algae. Although these species are also found in most kelp forests, in this biotope they are particularly dense. On the rock surface, a rich fauna comprising sponges, anemones (such as *Alcyonium digitatum*, *Sagartia elegans* and *Urticina felina*), hydroids, colonial ascidians and bryozoans. At some sites, instead of being covered by red algae, the kelp stipes may be heavily epiphytised by the sponge *Halichondria panicea* or the bryozoan *Alcyonidium diaphanum*. From some areas (such as Orkney), particularly good examples of this biotope may contain maerl and / or rhodoliths, with associated fauna between boulders. Both the flora and fauna of this biotope can be similar to the wave-exposed kelp forest (EIR.LhypFa) and although MIR.Lhyp.TFt is likely to contain species that are unable to tolerate strong wave action, further data analysis is required to clarify the differences. An example of this biotope was found in Lashy Sound in Orkney where *Laminaria digitata* dominated the tide-swept rock due to the very strong tides and/or non-laminar flow of water.

Similar biotopes

MIR.Lhyp.TPk	Similar species composition, but less dense kelp in the park

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Leucosolenia botryoides	••	••	Occasional
Scypha ciliata	••	•	Occasional
Grantia compressa	••	••	Occasional
Cliona celata	••	•	Rare
Halichondria panicea	•••	•	Occasional
Myxilla incrustans	••	••	Occasional
Alcyonium digitatum	••••	•	Occasional
Urticina felina	••••	•	Occasional
Cancer pagurus	•••	•	Occasional
Asterias rubens	•••••	•	Occasional
Echinus esculentus	••••	•	Occasional
Clavelina lepadiformis	••••	•	Occasional
Botryllus schlosseri	••••	•	Occasional
Plocamium cartilagineum	••••	•	Frequent
Delesseria sanguinea	••••	•	Frequent
Phycodrys rubens	••••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant
Laminaria saccharina	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Lhyp.TFt	=
R1	Shetland	Howson 1988	H28/29	=
R2	Orkney		R2-4.Lhyp.TFt	=
R8	R8 open coast		R8.Lhyp.Dend	In part
R9	S Pembrokeshire	Cartlidge & Hiscock 1979	4.2.9	=
R10	R10 open coast		R10.KT	=
R14	Barra		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL34	In part
Other	SW Inlets	Moore In prep	SWI.59	=
IR8	Mulroy Bay	Picton *et al*. 1994	MS27	=

Frequency of occurrence

In Britain: Uncommon

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Lhyp.TPk *Laminaria hyperborea* park with hydroids, bryozoans and sponges on tide-swept lower infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders and cobbles
Zone:	Infralittoral - lower
Depth band:	10-20m

Biotope description

Moderately exposed, tide-swept, rock with *Laminaria hyperborea* park characterised by a rich under-storey and stipe flora of foliose seaweeds such as *Phycodrys rubens*, *Plocamium cartilagineum*, *Callophyllis laciniata*, *Heterosiphonia plumosa*, *Cryptopleura ramosa* and *Delesseria sanguinea*. Amongst the red seaweeds is a rich fauna comprising sponges, anemones (such as *Alcyonium digitatum*, *Sagartia elegans* and *Urticina felina*), hydroids, colonial ascidians and bryozoans. At some sites, instead of being covered by red seaweeds, the kelp stipes may be heavily epiphytised by the sponge *Halichondria panicea* or the bryozoan *Alcyonidium diaphanum*, with smaller quantities of hydroids such as *Tubularia indivisa*. Both the flora and fauna of this biotope are similar to the wave exposed kelp park (EIR.LhypR.Pk), but this MIR.Lhyp.TPk has a greater faunal component. Further data analysis is required to clarify the differences, however.

Similar biotopes

MIR.Lhyp.TFt	Similar under-storey component, but MIR.Lhyp.TPk has a lower density of kelp plants.
EIR.LhypR.Pk	EIR.LhypR.Pk lacks the rich faunal component, especially on the stipes

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scypha ciliata	••	•	Occasional
Pachymatisma johnstonia	••	••	Frequent
Halichondria panicea	••	•	Occasional
Myxilla incrustans	••	••	Occasional
Obelia geniculata	••••	•	Frequent
Alcyonium digitatum	•••••	•	Common
Sagartia elegans	••••	•	Occasional
Corynactis viridis	•••	••	Occasional
Caryophyllia smithii	•••	•	Occasional
Calliostoma zizyphinum	••••	•	Occasional
Asterias rubens	••••	•	Occasional
Echinus esculentus	•••••	•	Occasional
Corallinaceae	••••	•	Frequent
Delesseria sanguinea	••••	•	Occasional
Phycodrys rubens	••••	•	Frequent
Laminaria hyperborea	•••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Lhyp.TPk	=
R1	Shetland	Howson 1988	H28	=
R2	Orkney		R2-4.Lhyp.TPk	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.47	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.49	?In part
R14	Barra		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL34	In part

Frequency of occurrence

In Britain: Scarce

KR *Kelp and red seaweeds (moderately exposed rock)*

MIR.Lhyp.Loch Mixed *Laminaria hyperborea* and *Laminaria ochroleuca* forest on moderately exposed or sheltered infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Mixed *Laminaria hyperborea* and *Laminaria ochroleuca* forest on upper infralittoral moderately exposed or sheltered rock is restricted to the coast of Cornwall and the Isles of Scilly. Superficially, the *L. ochroleuca* biotope looks similar to a moderately exposed *Laminaria hyperborea* forest (MIR.Lhyp.Ft), containing a similar suite of foliose and filamentous red algae beneath the canopy. Unlike *L. hyperborea*, however, *L. ochroleuca* has a smooth stipe and so it lacks dense assemblages of epiphytic seaweeds. *L. ochroleuca* occurs across a wide range of wave exposures (in common with *L. hyperborea*) and consequently it occurs at low abundance in other kelp biotopes (sheltered through to exposed) that occur between Dorset to Lundy. In such cases, records should be considered as regional variations of the usual kelp biotopes. Records should only be assigned to this biotope when the canopy is dominated by *L. ochroleuca* alone, or by a mixture of both *L. hyperborea* and *L. ochroleuca* (though the latter is usually at greater abundance). This biotope is similar to the mixed *L. hyperborea* and *L. ochroleuca* biotope found on exposed coasts (EIR.LhypR.Loch), though the latter generally occurs in slightly deeper water (often below pure *L. hyperborea* - EIR.LhypR.Ft) as *L. ochroleuca* is less tolerant of strong wave action at its northern distributional limit. Both *L. ochroleuca* biotopes are common on the Brittany and Normandy coasts.

Similar biotopes

EIR.LhypR.Loch	EIR.LhypR.Loch has a greater density of foliose red seaweeds.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Callophyllis laciniata	••••	••	Frequent
Corallinaceae	•••	•	Frequent
Cryptopleura ramosa	•••	•	Frequent
Polyneura bonnemaisonii	•••	••	Frequent
Dictyota dichotoma	•••	•	Frequent
Laminaria hyperborea	••••	•	Occasional
Laminaria ochroleuca	•••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Cornwall		R8.Loch.Ft	=
R8	Cornwall		R8.Lhyp.Loch.Ft	In part?
R8	Scillies	Hiscock 1984c	3.2.12/13	=
R8	The Lizard		MNCR data	=
Other	Brittany / Normandy	Sheppard *et al*. 1978		=

Frequency of occurrence

In Britain: Scarce

GzK *Grazed kelp with algal crusts*

MIR.LhypGz Grazed *Laminaria hyperborea* with coralline crusts on infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Other features:	Grazing

Biotope description

Laminaria hyperborea forests and parks on bedrock and boulders, subject to intense grazing by *Echinus esculentus*, with rock surfaces dominated by encrusting algae (coralline or brown algae). Erect seaweeds are sparse or absent.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Echinus esculentus	●●●●●	●	Frequent
Corallinaceae	●●●●●	●	Frequent
Laminaria hyperborea	●●●●●	●	Frequent

GzK *Grazed kelp with algal crusts*

MIR.LhypGz.Ft Grazed *Laminaria hyperborea* forest with coralline crusts on upper infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; large boulders
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Urchin grazing

Biotope description

Exposed and moderately exposed kelp forest in some areas is intensely grazed by the urchin *Echinus esculentus*. The rock surface lacks any significant turf of foliose seaweeds and generally looks bare, though it is covered by coralline algal crusts. The kelp stipes may or may not be grazed; in the most extremely grazed areas, they too are devoid of epiphytic seaweeds. More usually, however, the stipes offer a refuge from grazing, and are characterised by dense turfs of red seaweeds, especially *Phycodrys rubens*, *Palmaria palmata*, *Membranoptera alata* and *Delesseria sanguinea*. The fauna within a grazed kelp forest is also relatively sparse, though some species will survive in cracks and crevices, or other areas that are protected from grazing. In wave-exposed steep rocky areas, the shallowest water may be characterised by a forest of kelp with red seaweeds (EIR.LhypR.Ft), with a grazed kelp forest beneath. This effect may be a result of the increased wave action in shallower water which regularly dislodges the urchins thereby reducing their impact. With increasing depth, the kelp forest grades into a grazed kelp park (MIR.LhypGz.Pk), the lower limit of which is often abrupt, which represents the balance point between urchin grazing pressure and algal growth capabilities.

Similar biotopes

MIR.LhypGz.Pk	Has a lower density of kelp, but otherwise similar species composition

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Gibbula cineraria	••••	•	Frequent
Membranipora membranacea	•••	•	Frequent
Asterias rubens	••••	•	Occasional
Echinus esculentus	•••••	•	Common
Corallinaceae	••••	•	Abundant
Phycodrys rubens	••••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.LhypGz.Ft	=
R1	Shetland	Howson 1988	H26	=
R1	Shetland	Moss & Ackers 1987	4.2.2	=
R2	Orkney		R2-4.LhypGz.Ft	=
R5	SE Scotland / NE England	Foster-Smith 1992	KH4, KH3, KV3, KB3	=
R13	Small Isles	Dipper 1981a	4.2.1/2	=
R13	Summer Isles	Dipper 1981b	4.3.1.1	=
Other	Sealochs	Howson, Connor & Holt 1994	SL35	In part

Frequency of occurrence

In Britain: Common

GzK *Grazed kelp with algal crusts*

MIR.LhypGz.Pk Grazed *Laminaria hyperborea* park with coralline crusts on lower infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral - lower
Depth band:	10-20m
Other features:	Urchin grazing

Biotope description

Exposed and moderately exposed kelp park in some areas is heavily grazed by the urchin *Echinus esculentus*. The rock surface lacks any significant turf of foliose seaweeds and generally looks bare, though it is covered by coralline algal crusts and some grazing-resistant species such as the keel worm *Pomatoceros triqueter*. The kelp stipes may or may not be grazed; in the most extremely grazed areas, they too are devoid of epiphytic seaweeds. More usually, however, the stipes offer a refuge from grazing, and are characterised by dense turfs of red seaweeds, especially *Phycodrys rubens*, *Palmaria palmata*, *Membranoptera alata* and *Delesseria sanguinea*. The fauna within a grazed kelp park is also relatively sparse, though some species will survive in cracks and crevices, or other areas that are protected from grazing. This biotope generally occurs below a grazed kelp forest (MIR.LhypGz.Ft).

Similar biotopes

MIR.LhypGz.Ft	Has similar species composition, but a greater density of kelp plants

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Frequent
Pomatoceros triqueter	••••	•	Frequent
Gibbula cineraria	••••	•	Occasional
Calliostoma zizyphinum	••••	•	Occasional
Parasmittina trispinosa	•••	•	Occasional
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Ophiocomina nigra	••	•	Occasional
Ophiopholis aculeata	••	•	Occasional
Echinus esculentus	•••••	•	Common
Corallinaceae	•••	•	Abundant
Laminaria hyperborea	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.LhypGz.Pk	=
R1	Shetland	Howson 1988	H26	In part
R2	Orkney		R2-4.LhypGz.Pk	=
R4	Isle of May	Bennett 1989	3.3.9	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.52	In part
R5	SE Scotland / NE England	Foster-Smith 1992	MH1	In part
R13	Small Isles	Dipper 1981a	4.2.1	=
R14	Lewis	Dipper 1983	4.2.2.3	=

R14	Barra		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL35	In part

Frequency of occurrence

In Britain: Common

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

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong, 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)

Previous code

MIR.Spol	96.7
LRK.SPOL	6.95

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

SedK *Sand or gravel-affected or disturbed kelp and seaweed communities*

MIR.LsacChoR *Laminaria saccharina, Chorda filum* and dense red seaweeds on shallow unstable infralittoral boulders or cobbles

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong
Substratum:	Boulders, cobbles, pebbles and gravel
Zone:	Infralittoral - upper
Depth band:	0-5 m
Other features:	Shallow, seasonally unstable substrata

Biotope description

Unstable boulders and cobbles in very shallow water may be seasonally disturbed which prevents a stable *Laminaria hyperborea* forest from developing. Seasonal movement of the substratum results in a community of the opportunistic kelp *L. saccharina*, *Chorda filum* and *Desmarestia* spp. with encrusting algae and sediment-tolerant seaweeds. The shallowest areas of the Sarns in Cardigan Bay are typical examples of this biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	•••	•	Occasional
Corallinaceae	•••	•	Occasional
Cystoclonium purpureum	••••	•	Common
Brongniartella byssoides	•••	•	Frequent
Ectocarpaceae	•••	•	Frequent
Desmarestia aculeata	••••	•	Frequent
Chorda filum	••••	••	Common
Laminaria saccharina	••••	••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland / NE England	Foster-Smith 1992	KM1	
R7	R7 open coast		R7.SpHBrX	?
R7	R7 open coast		R7.Crepidula	?
R7	W Sussex	Irving 1994	Fig. 7	
R8	R8 open coast		R8.Lsac	=
R8	R8 open coast		R8.Cho	=
R8	Scillies	Hiscock 1984c	3.2.19	
R8	Dorset	Dixon *et al*. 1978		
R10	R10 open coast		R10.Cho	=
R10	R10 open coast		R10.K.Lsac	=
R10	Sarns	Hiscock 1986	3.2.2	
Other	Sealochs	Howson, Connor & Holt 1994	SL62	?

SedK *Sand or gravel-affected or disturbed kelp and seaweed communities*

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

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Close proximity to sand

Previous code

MIR.LsacScrR	96.7
MIR.XK	96.7

Biotope description

Bedrock and boulders, often in tide-swept areas, that are subject to scouring, or periodic burial, by sand characterised by a canopy of mixed kelps (including *Laminaria saccharina*, *Laminaria hyperborea* and *Saccorhiza polyschides*) and *Desmarestia* spp; there may also be an under-storey of foliose seaweeds that can withstand scour or burial. This biotope often occurs below a *L. hyperborea* forest, close to a rock-sediment boundary. Red seaweeds such as *Calliblepharis ciliata* are able to withstand the effects of scouring as they have tough fronds and a stoloniferous base from which new growth occurs. Other seaweeds are annuals growing rapidly in the spring, taking advantage of the calmer summer weather. At some times of the year, seaweeds may be sparse (due to urchin grazing?), leaving predominantly kelps and encrusting coralline algae.

Similar biotopes

MIR.HalXK	MIR.HalXK is subject to greater scour than this biotope

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Urticina felina	•••	•	Occasional
Corallinaceae	••••	•	Common
Plocamium cartilagineum	•••	•	Frequent
Calliblepharis ciliata	•	••	Occasional
Delesseria sanguinea	•••	•	Frequent
Desmarestia aculeata	••	•	Occasional
Laminaria hyperborea	••••	•	Common
Laminaria saccharina	••••	••	Frequent
Saccorhiza polyschides	•••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.XKScrR	=
R2	Orkney		R2-4.LsacScrR	=
R4	E Scotland	Tittley *et al*. 1985		
R5	Flamborough	Wood 1988		
R7	R7 open coast		R7.LsacScrR	In part
R7	R7 Open coast		R7.XK	In part
R8	R8 open coast		R8.Lhyp.Snd	In part
R8	R8 open coast		R8.Lhyp.Scr	In part
R8	R8 open coast		R8.R.Snd	In part
R10	R10 open coast		R10.LsacScrR	=
R10	R10 open coast		R10.RTurf	?

R10	R10 open coast		R10.Tao	?In part
R11	Irish sea	Covey In prep.b	R11.31	?
R14	Barra		MNCR data	=
Other	R8-R9 Inlets	Moore In prep	SWI.55	=
Other	Sealochs	Howson, Connor & Holt 1994	SL44	=
Other	Scottish Lagoons	Covey, Thorpe & Nichols In prep	Lag.17	

SedK *Sand or gravel-affected or disturbed kelp and seaweed communities*

MIR.SabKR *Sabellaria spinulosa* with kelp and red seaweeds on sand-influenced infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Other features:	Sand-scoured

Previous code

MIR.SabR	96.7

Biotope description

Sabellaria spinulosa, sediment-tolerant red seaweeds and occasional *Laminaria hyperborea* characterise this biotope. Some of the richer examples of this biotope (e.g. Luce Bay) also have a rich fauna of ascidians, sponges, hydroids and bryozoans. A similar biotope is also found in the circalittoral zone, where it lacks the algal component (MCR.Sspi).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••	•	Common
Urticina felina	••••	•	Frequent
Sabellaria spinulosa	•••••	•••	Abundant
Gibbula cineraria	••••	•	Frequent
Bryozoa indet. crusts	••	•	Frequent
Ophiothrix fragilis	•••	•	Occasional
Echinus esculentus	••••	•	Occasional
Dendrodoa grossularia	••	•	Frequent
Botryllus schlosseri	•••	•	Frequent
Corallinaceae	••••	•	Frequent
Plocamium cartilagineum	•••••	•	Frequent
Delesseria sanguinea	•••	•	Frequent
Laminaria hyperborea	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.54	In part
R5	Flamborough Head	Wood 1988	S8/S42	
R5	SE Scotland / NE England	Foster-Smith 1992	SM2	
R11	Luce Bay	Covey In prep.b	R11.33	In part

SedK *Sand or gravel-affected or disturbed kelp and seaweed communities*

MIR.EphR Ephemeral red seaweeds and kelps on tide-swept mobile infralittoral cobbles

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong
Substratum:	Small boulders, cobbles and pebbles with gravel
Zone:	Infralittoral
Depth band:	5-10m, 10-20m
Other features:	Seasonally-disturbed substrata

Biotope description

Tide-swept infralittoral cobbles and pebbles which are highly mobile, create an environment that is difficult for many algae to survive in. Foliose and filamentous seaweeds with an encrusting phase in their life history, or those that are able to withstand rolling of the substratum and scouring can form dense turfs of seaweed. Characteristic species include *Schmitzia* spp., *Lomentaria orcadensis*, *Halarachnion ligulatum* and *Taonia atomaria*. In addition, ephemeral algae grow rapidly in periods of relative stability. Scattered *Laminaria* and *Desmarestia* plants may also be present on the more stable substrata. Some areas of cobbles may be quite barren, dominated only by encrusting coralline algae and brittlestars. The faunal component of this biotope maybe relatively sparse. Turfs of hydroids (*Nemertesia* spp.) and bryozoans (*Crisia* spp. and *Bugula* spp.) are the major components.

Similar biotopes

MIR.PolAhn	Similar substratum, but in MIR.EphR the substratum is more mobile than sand-scoured and has a different red seaweed composition

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nemertesia antennina	●●	●	Occasional
Bugula flabellata	●	●●	Frequent
Corallinaceae	●●●	●	Common
Schmitzia hiscockiana	●●	●●●	Rare
Schmitzia neapolitana	●	●●●	Occasional
Erythrodermis traillii	●	●●	Occasional
Plocamium cartilagineum	●●●●	●	Occasional
Halarachnion ligulatum	●●●	●●●	Occasional
Cystoclonium purpureum	●	●●	Frequent
Lomentaria orcadensis	●●	●●	Occasional
Radicilingua thysanorhizans	●	●●●	Occasional
Rhodomela confervoides	●●	●●	Frequent
Dictyota dichotoma	●●●	●	Frequent
Taonia atomaria	●	●●●	Frequent
Desmarestia viridis	●●	●●	Frequent
Laminaria hyperborea	●●	●	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.49	?In part
R8	R8 open coast		R8.Des.Peb	?=
R10	R10 open coast		R10.RTurf.Pb	=

R10	Skomer	Bunker & Hiscock 1987	3.2.4	=
Other	Obs	Covey, Thorpe & Nichols In prep	Lag.28	?
Other	Sealochs	Howson, Connor & Holt 1994	SL60	=
IR2	Co. Antrim Coast	Erwin *et al*. 1990		

Frequency of occurrence

In Britain: Uncommon

SedK *Sand or gravel-affected or disturbed kelp and seaweed communities*

MIR.HalXK *Halidrys siliquosa* and mixed kelps on tide-swept infralittoral rock with coarse sediment

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock, boulders or cobbles with coarse sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Sediment abrasion

Previous code

MIR.HalXK.Ft	96.7
MIR.HalXK.Pk	96.7

Biotope description

This tide-swept biotope is characterised by *Halidrys siliquosa*, which is often dense and is typically mixed with other kelps including *Laminaria saccharina*, *L. hyperborea* and *Saccorhiza polyschides*. Below the canopy is an undergrowth of foliose red seaweeds which are tolerant of sand scour. There may be a rich epibiota on the *Halidrys* plants, including *Aglaophenia pluma*, ascidians including *Botryllus schlosseri* and sponges. This biotope may occur on the open coast or in rapids areas, and is distinguished from MIR.XKScrR by its greater scour.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scypha ciliata	••	•	Occasional
Esperiopsis fucorum	••	••	Occasional
Urticina felina	•••	•	Occasional
Pomatoceros triqueter	•••	•	Occasional
Gibbula cineraria	•••	•	Frequent
Botryllus schlosseri	•••	•	Frequent
Dilsea carnosa	•••	••	Occasional
Plocamium cartilagineum	•••	•	Frequent
Calliblepharis ciliata	•••	••	Occasional
Delesseria sanguinea	•••	•	Occasional
Brongniartella byssoides	•••	•	Frequent
Dictyota dichotoma	••••	•	Frequent
Halidrys siliquosa	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Whiteness Voe	Hiscock 1989		?
R1	Shetland		R1.HalXK.Ft	=
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.53	In part
R7	R7 open coast		R7.HalXK.Ft	=
R7	Isle of Wight	George, Tittley & Wood In prep	SR5	In part
R8	R8 open coast		R8.Hal	=
R8	Dorset	Dixon *et al*. 1978	H3	
R9	N Cornwall	Maggs & Hiscock 1979	4.2.3	
R10	R10 open coast		R10.Hsil	?
R10	Sarns	Hiscock 1986	3.2.3.2	
R10	W Pembrokeshire	Hiscock 1980	G	
R11	Irish Sea	Covey In prep.b	R11.31	In part
R13	Jura/ Islay	Hiscock 1983	3.2.15	In part

SedK *Sand or gravel-affected or disturbed kelp and seaweed communities*

MIR.PolAhn *Polyides rotundus*, *Ahnfeltia plicata* and *Chondrus crispus* on sand-covered infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock, cobbles and pebbles with mobile sand
Zone:	Infralittoral
Depth band:	5-10m
Other features:	Sand-covered rock

Biotope description

Similar to the *Halidrys siliquosa* biotope (MIR.HalXK) but lack of large boulders or more prominent bedrock prevents dominance by *Halidrys* or kelps. Rock which is surrounded by sand and often subject to burying by the sand with the red seaweeds *Polyides rotundus*, *Furcellaria lumbricalis* and *Ahnfeltia plicata* typically on the rock growing through the sand. Coralline crusts cover the rock, which is grazed by *Tectura virginea* and chitons.

Similar biotopes

MIR.HalXK	Found in similar conditions but MIR.PolAhn generally lacks *Halidrys* or kelps

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Urticina felina	•••	•	Occasional
Tectura virginea	•	•	Common
Dilsea carnosa	•••	••	Occasional
Corallinaceae	•••	•	Frequent
Ahnfeltia plicata	••••	•••	Occasional
Phyllophora crispa	•••	••	Frequent
Chondrus crispus	••••	••	Frequent
Polyides rotundus	••••	••	Frequent
Furcellaria lumbricalis	•••	••	Frequent
Halarachnion ligulatum	••	••	Occasional
Calliblepharis ciliata	••	••	Occasional
Dictyota dichotoma	••	•	Occasional
Carpomitra costata	•	••	Frequent
Sporochnus pedunculatus	•	••	Rare
Halidrys siliquosa	••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Orkney		R2-4.PolAhn	=
R4	Isle of May	Bennett 1989	H31	
R5	SE Scotland / NE England	Foster-Smith 1992	SM1	In part
R8	R8 open coast		R8.R.Ahn	=
R9	S Pembrokeshire	Cartlidge & Hiscock 1979	5.2.1	
R9	Scillies	Hiscock 1984c	3.2.19	In part
R14	Barra		MNCR data	
IR8	Mulroy Bay	Picton *et al.* 1994	MS19	

Frequency of occurrence

In Britain: Uncommon

K *Silted kelp (stable rock)*

SIR.LhypLsac Mixed *Laminaria hyperborea* and *Laminaria saccharina* on sheltered infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral

Biotope description

Mixed *Laminaria hyperborea* and *Laminaria saccharina* on bedrock and boulders in sheltered infralittoral habitats. Typically subject to weak tidal streams and rather silty conditions. Associated under-storey flora of both filamentous and foliose red seaweeds.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Gibbula cineraria	•••	•	Frequent
Asterias rubens	••••	•	Occasional
Echinus esculentus	••••	•	Occasional
Corallinaceae	•••	•	Common
Phycodrys rubens	••••	•	Occasional
Laminaria hyperborea	•••••	•	Common
Laminaria saccharina	••••	•	Common

K *Silted kelp (stable rock)*

SIR.LhypLsac.Ft Mixed *Laminaria hyperborea* and *Laminaria saccharina* forest on sheltered upper infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m
Other features:	Siltation

Biotope description

Sheltered, often silted upper infralittoral bedrock and boulder slopes with mixed kelps *Laminaria hyperborea* and *Laminaria saccharina* beneath which red seaweeds such as *Plocamium cartilagineum*, *Bonnemaisonia asparagoides*, *Delesseria sanguinea* and *Cryptopleura ramosa* occur on top of encrusting coralline algae. The stipes of *L. hyperborea* are generally densely covered with seaweeds such as *Phycodrys rubens*, *Membranoptera alata* and *Plocamium cartilagineum*, as well as solitary ascidians, while the fronds are often epiphytised by *Obelia geniculata* and *Membranipora membranacea*. Beneath the often cape-form kelp canopy, the faunal component is generally less diverse than the more exposed kelp forests.

Similar biotopes

SIR.Lsac.Ft	SIR.Lsac.Ft lacks *Laminaria hyperborea* and generally occurs in more sheltered conditions

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Obelia geniculata	••	•	Frequent
Gibbula cineraria	••••	•	Frequent
Asterias rubens	••••	•	Occasional
Echinus esculentus	••••	•	Frequent
Ascidia mentula	••	•	Occasional
Delesseria sanguinea	•••	•	Occasional
Phycodrys rubens	••••	•	Frequent
Laminaria hyperborea	•••••	•	Common
Laminaria saccharina	••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.LhypLsac.Ft	=
R2	Orkney		R2-4.LhypLsac.Ft	=
R4	Isle of May	Bennett 1989	H30/H33	
R8	Scillies	Hiscock 1984c	3.2.16	
R10	Porth Dinllaen	Hiscock 1984b	3.2.13	
Other	Sealochs	Howson, Connor & Holt 1994	SL36	=
Other	Sealochs	Howson, Connor & Holt 1994	SL37	=
Other	R8-9 Inlets	Moore In prep	SWI.57	In part
Other	Chalk coasts	George, Tittley & Wood In prep	SR6	?

Frequency of occurrence

In Britain: Uncommon

K *Silted kelp (stable rock)*

SIR.LhypLsac.Pk Mixed *Laminaria hyperborea* and *Laminaria saccharina* park on sheltered lower infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral - lower
Depth band:	5-10m, 10-20m
Other features:	Siltation

Biotope description

Sheltered silted bedrock and boulders with a park of mixed *Laminaria hyperborea* and *Laminaria saccharina*. Beneath the kelp canopy, foliose red algae such as *Delesseria sanguinea* and *Callophyllis laciniata* are often present at high densities. Other red algae such as encrusting coralline algae, *Dilsea carnosa*, *Phycodrys rubens* and *Plocamium cartilagineum* are also present. The animal component of this biotope is generally richer than the upper infralittoral mixed kelp forest (SIR.LhypLsac.Ft), with a variety of bryozoans, anemones and ascidians present.

Similar biotopes

SIR.Lsac.Pk	SIR.Lsac.Pk lacks *Laminaria hyperborea* and generally occurs in more sheltered conditions

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cliona celata	●●	●	Rare
Pomatoceros triqueter	●●●●	●	Frequent
Pagurus bernhardus	●●●●	●	Occasional
Gibbula cineraria	●●●●	●	Occasional
Antedon bifida	●●●	●	Occasional
Asterias rubens	●●●●●	●	Occasional
Ophiothrix fragilis	●●●●	●	Frequent
Echinus esculentus	●●●●●	●	Occasional
Clavelina lepadiformis	●●●	●	Frequent
Ascidia mentula	●●●	●	Frequent
Corallinaceae	●●●●●	●	Common
Delesseria sanguinea	●●●●	●	Occasional
Phycodrys rubens	●●●●	●	Occasional
Desmarestia aculeata	●●●	●	Occasional
Desmarestia viridis	●●●●	●●	Occasional
Laminaria hyperborea	●●●●●	●	Common
Laminaria saccharina	●●●●	●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988		
R1	Shetland		R1.LhypLsac.Pk	=
R2	Orkney		R2-4.LhypLsac.Pk	=
R8	Scillies	Hiscock 1984c		
Other	R8/9 Inlets	Moore In prep	SWI.54	
IR5	Bantry Bay	Emblow *et al*. 1994	BB20	

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

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Sublittoral fringe
Height band:	Lower shore
Depth band:	0-5 m

Previous code

LRK.LDIG.LSAC 6.95

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

Salinity:	Full
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Sublittoral fringe, Infralittoral - upper
Height band:	Lower shore
Depth band:	0-5 m

Previous code

LRK.LSAC	6.95

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 1986	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

K *Silted kelp (stable rock)*

SIR.Lsac.Pk *Laminaria saccharina* park on very sheltered lower infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Infralittoral - lower
Depth band:	5-10m, 10-20m

Biotope description

Silty rock with a *Laminaria saccharina* park (often the cape-form). Beneath the canopy, the bedrock and boulders are covered by coralline algal crusts and urchins such as *Echinus esculentus* and *Psammechinus miliaris* are present. Though present, foliose algae are less abundant than in the *Laminaria hyperborea* park (MIR.Lhyp.Pk) with the most common species being *Phycodrys rubens* and *Delesseria sanguinea*. The most conspicuous animals in this biotope are ascidians, particularly *Ascidia mentula*, *Ciona intestinalis* and *Corella parallelogramma*.

Similar biotopes

SIR.Lsac.Ft	SIR.Lsac.Pk occurs in deeper water and has a lower abundance of *L. saccharina*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	•••	•	Frequent
Gibbula cineraria	••••	•	Occasional
Antedon bifida	•••	•	Occasional
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Echinus esculentus	•••••	•	Occasional
Ciona intestinalis	•••	•	Occasional
Corella parallelogramma	••	••	Occasional
Ascidia mentula	•••	••	Frequent
Corallinaceae	••••	•	Common
Delesseria sanguinea	•••	•	Occasional
Phycodrys rubens	•••	•	Frequent
Laminaria saccharina	•••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988		
R1	Shetland		R1.Lsac.Pk	=
Other	Sealochs	Howson, Connor & Holt 1994	SL40	

Frequency of occurrence

In Britain: Uncommon

K *Silted kelp (stable rock)*

SIR.Lsac.T *Laminaria saccharina*, foliose red seaweeds, sponges and ascidians on tide-swept infralittoral rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders, cobbles and pebbles
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Sheltered, tide-swept, rock with dense *Laminaria saccharina* forest and an under-storey (sometimes sparse) of foliose seaweeds such as *Plocamium cartilagineum*, *Brongniartella byssoides*, *Ceramium nodulosum*, *Lomentaria clavellosa* and *Cryptopleura ramosa*. On the rock surface, a rich fauna comprising sponges (particularly *Halichondria panicea*) anemones (such as *Urticina felina*), colonial ascidians (*Botryllus schlosseri*) and the bryozoan *Alcyonidium diaphanum*. Areas that are scoured by sand or shell gravel may have a less rich fauna beneath the kelp, with the rock surface characterised by encrusting coralline algae, *Balanus crenatus* or *Pomatoceros triqueter*. Good examples of this biotope may have maerl gravel or rhodoliths between cobbles and boulders.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••	•	Frequent
Hymeniacidon perleve	•••	••	Common
Balanus crenatus	•••	•	Common
Gibbula cineraria	•••	•	Frequent
Ascidiella aspersa	••	••	Frequent
Dendrodoa grossularia	••	•	Frequent
Botryllus schlosseri	•••	•	Occasional
Cryptopleura ramosa	••••	•	Frequent
Laminaria saccharina	•••••	•	Frequent
Ulva	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Lsac.T	=
R1	Whiteness Voe	Hiscock 1989	H1	In part
R1	Muckle Flugga & Fair Isle	Howson 1988	H28	
R10	Menai Strait	Lumb 1983	4.2.2	?
R14	Barra		MNCR data	=
Other	R8/9 Inlets	Moore In prep	SWI.65	=
Other	R8/9 Inlets	Moore In prep	SWI.60	
Other	Obs	Covey, Thorpe & Nichols In prep	Lag.17	P
Other	N Ireland	Erwin *et al.* 1990	2	
IR8	Mulroy Bay	Picton *et al.* 1994	MS36	

Frequency of occurrence

In Britain: Scarce

K *Silted kelp (stable rock)*

SIR.Lsac.Cod Sparse *Laminaria saccharina* with *Codium* spp. and sparse red seaweeds on heavily silted very sheltered infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Heavy siltation

Previous code

SIR.Lsac.CodR 96.7

Biotope description

This biotope has been recorded from below sublittoral fringe *Laminaria saccharina*. Shallow heavily silted rock is characterised by sparse *Laminaria saccharina* with often dense aggregations of *Codium* spp. and sparse silt-tolerant red algae.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Dysidea fragilis	••	•	Occasional
Crepidula fornicata	••	••	Rare
Morchellium argus	•••	••	Rare
Phallusia mammillata	•••	•••	Rare
Callophyllis laciniata	••••	••	Occasional
Antithamnionella spirographidis	•••••	•••	Occasional
Desmarestia viridis	••••	••	Frequent
Laminaria saccharina	•••	•	Frequent
Ulva	•••	•	Occasional
Bryopsis plumosa	•••	••	Occasional
Codium	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Tittley *et al*. 1985	Codium	
Other	R8/9 Inlets	Moore In prep	SWI.61	
IR8	Mulroy Bay	Picton *et al*. 1994	MS34	

Frequency of occurrence

In Britain: Scarce

K *Silted kelp (stable rock)*

SIR.EchBriCC *Echinus*, brittlestars and coralline crusts on grazed lower infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Infralittoral - lower
Depth band:	5-10m, 10-20m
Other features:	Heavily grazed

Biotope description

This biotope often looks bare, with few large species present. *Laminaria saccharina* may be present, but always at low abundance. The biotope is characterised by relatively high abundances of the urchin *Echinus esculentus* and/ or brittlestars (*Ophiocomina nigra* or *Ophiothrix fragilis*). As a result of the high grazing pressure the rock surfaces look bare, though they are usually covered by coralline algal crusts with scattered tufts of various red and filamentous brown algae. Grazing molluscs may also be abundant in this biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	••••	•	Frequent
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	••••	•	Frequent
Ophiocomina nigra	••	•	Frequent
Echinus esculentus	•••••	•	Frequent
Corallinaceae	••••	•	Common
Laminaria saccharina	••	•	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.EchBriCC	=
R2	Orkney		R2-4.EchBriCC	=
Other	Sealochs	Howson, Connor & Holt 1994	SL38	

Frequency of occurrence

In Britain: Uncommon

K *Silted kelp (stable rock)*

SIR.LsacRS *Laminaria saccharina* on reduced or low salinity infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral

Biotope description

Infralittoral rock in areas of significantly reduced or low salinity with *Laminaria saccharina* and associated seaweeds tolerant of these salinity conditions (e.g. green seaweeds, *Phyllophora* spp.).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	••••	•	Occasional
Balanus crenatus	•••	•	Occasional
Buccinum undatum	•••	•	Occasional
Asterias rubens	••••	•	Frequent
Laminaria saccharina	••••	•	Frequent

K *Silted kelp (stable rock)*

SIR.LsacRS.FiR Sparse *Laminaria saccharina* with dense filamentous red seaweeds, sponges and *Balanus crenatus* on tide-swept variable salinity infralittoral rock

Habitat classification

Salinity:	Variable
Wave exposure:	Extremely sheltered
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Depth band:	0-5 m
Other features:	Heavily silted / turbid water

Previous code

SIR.Lsac.FiR	96.7

Biotope description

Tide-swept variable salinity infralittoral rock in turbid waters (such as rias or estuaries) characterised by sparse *Laminaria saccharina* and a dense covering of filamentous red algae (*Callithamnion* spp., *Ceramium* spp., *Pterothamnion plumula*, *Polysiphonia* spp.). The animal community is dominated by the sponges *Halichondria panicea* and *Hymeniacidon perleve* and the barnacle *Balanus crenatus*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••••	•	Common
Hymeniacidon perleve	•••	••	Frequent
Balanus crenatus	••••	•	Occasional
Antithamnionella spirographidis	••	•••	Common
Ceramium nodulosum	••	••	Occasional
Pterothamnion plumula	••••	••	Frequent
Hypoglossum hypoglossoides	•••••	••	Frequent
Polysiphonia furcellata	••	••	Occasional
Polysiphonia stricta	•••	••	Occasional
Laminaria saccharina	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	R8/R9 Inlets	Moore In prep	SWI.62	
R11	Luce Bay	Covey In prep.b	R11.29	?

K *Silted kelp (stable rock)*

SIR.LsacRS.Psa *Laminaria saccharina* and *Psammechinus miliaris* on slightly reduced salinity grazed infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Heavily urchin-grazed

Biotope description

Dense *Laminaria saccharina*, usually with coralline algal crusts but few foliose seaweeds present. Large numbers of the urchin *Psammechinus miliaris* are typically present, although where absent the brittlestar *Ophiothrix fragilis* may occur, giving a grazed appearance to the habitat.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	•••••	•	Frequent
Buccinum undatum	••••	•	Occasional
Modiolus modiolus	•••	••	Occasional
Aequipecten opercularis	••••	••	Occasional
Ophiothrix fragilis	•••	•	Frequent
Psammechinus miliaris	•••••	••	Common
Echinus esculentus	•••	•	Occasional
Ciona intestinalis	••••	•	Occasional
Corallinaceae	••••	•	Common
Lithothamnion glaciale	•••	••	Common
Dictyota dichotoma	•••	•	Occasional
Laminaria saccharina	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R12	Islay/ Jura	Hiscock 1983	3.2.21	
Other	Sealochs	Howson, Connor & Holt 1994	SL41	
Other	Norway	Connor 1991	NF7	

Frequency of occurrence

In Britain: Rare

K *Silted kelp (stable rock)*

SIR.LsacRS.Phy *Laminaria saccharina* with *Phyllophora* spp. and filamentous green seaweeds on reduced or low salinity infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Infralittoral bedrock or boulder slopes, in reduced or low salinity conditions, characterised by *Laminaria saccharina* and *Phyllophora* spp., with filamentous green seaweeds in low salinity areas. Solitary ascidians, such as *Corella parallelogramma*, *Ciona intestinalis* and *Ascidiella scabra*, dominate the animal community.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Balanus crenatus	••••	•	Occasional
Pagurus bernhardus	••••	•	Occasional
Carcinus maenas	••••	•	Occasional
Eucratea loricata	•••	•••	Occasional
Ciona intestinalis	••	•	Occasional
Corella parallelogramma	••••	••	Frequent
Ascidiella scabra	••••	••	Frequent
Phyllophora crispa	••••	••	Frequent
Phyllophora pseudoceranoides	••••	••	Frequent
Erythrodermis traillii	••	••	Occasional
Laminaria saccharina	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Loch Etive	Howson, Connor & Holt 1994	SL42	=
R13	Loch Etive	Howson, Connor & Holt 1994	SL43	=

Frequency of occurrence

In Britain: Rare

EstFa *Estuarine faunal communities (shallow rock/mixed substrata)*

SIR.MytT *Mytilus edulis* beds on reduced salinity tide-swept infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Strong
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

This biotope is reported to occur in shallow tide-swept conditions and also in reduced salinity tide-swept conditions (may be 2 biotopes?). Some descriptions indicate a wide variety of epifaunal colonisers on the mussel valves, including seaweeds, hydroids and bryozoans. Predatory starfish *Asterias rubens* also occur in this biotope. This biotope generally appears to lack large kelp plants, although transitional examples containing mussels and kelps plants may also occur. [Further data and analysis required for this biotope]

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••••	•	Occasional
Metridium senile	•••••	•	Occasional
Balanus crenatus	•••••	•	Common
Mytilus edulis	•••••	•	Abundant
Scrupocellaria	•••	••	Occasional
Asterias rubens	•••••	•	Frequent
Filamentous brown algae	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R7	W Sussex	Irving 1994	p20	In part
R9	Gower	Hiscock 1979	4.2.4	
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.24	
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.25	
Other	Norway	Connor 1991	NF8, NF9	

Frequency of occurrence

In Britain: Scarce

EstFa *Estuarine faunal communities (shallow rock/mixed substrata)*

SIR.CorEle *Cordylophora caspia* and *Electra crustulenta* on reduced salinity infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Boulders; cobbles
Zone:	Infralittoral
Depth band:	0-5 m

Previous code

SCR.HarCon in part 96.7

Biotope description

Shallow sublittoral rock in the upper estuary of one of the south-west inlets (Tamar) with very high turbidity and therefore no seaweeds. The brackish-water hydroid *Cordylophora caspia* and small colonies of the encrusting bryozoan *Electra crustulenta* and a few *Balanus crenatus* characterise this biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cordylophora caspia	•••••	•••	Occasional
Balanus crenatus	•••	•	Rare
Electra crustulenta	•••	•••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Tamar estuary	Moore In prep	SWI.71	

Frequency of occurrence

In Britain: Rare

EstFa *Estuarine faunal communities (shallow rock/mixed substrata)*

SIR.HarCon *Hartlaubella gelatinosa* and *Conopeum reticulum* on low salinity infralittoral mixed substrata

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong
Substratum:	Boulders, cobbles and mixed sediments
Zone:	Infralittoral
Depth band:	0-5 m

Previous code

SCR.HarCon in part 96.7

Biotope description

Upper estuarine mixed hard substrata colonised by very sparse communities of animals with low species richness and with a few seaweeds in very shallow water. In the Tamar estuary the hydroid *Hartlaubella gelatinosa* and bryozoan *Conopeum reticulum* are found on stones. In the River Dart the bryozoan *Bowerbankia imbricata* is most abundant. A similar brackish-water rocky biotope is recorded from the Bann Estuary, Northern Ireland. There are considerable differences in species composition between sites, but all occur in brackish turbid-water conditions.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hartlaubella gelatinosa	••••	•••	Common
Balanus crenatus	•••	•	Frequent
Bowerbankia imbricata	•••	•••	Occasional
Conopeum reticulum	•••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Tamar/Dart	Moore In prep	SWI.75	
IR1	Bann estuary	Erwin *et al*. 1990		

Frequency of occurrence

In Britain: Rare

Lag *Submerged fucoids, green and red seaweeds (lagoonal rock)*

SIR.FChoG Mixed fucoids, *Chorda filum* and green seaweeds on reduced salinity infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Extremely sheltered
Tidal streams:	Very weak
Substratum:	Bedrock; boulders, cobbles and pebbles
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Permanently submerged mixed fucoids on rock in lagoons. *Laminaria saccharina* absent, possibly due to the low salinity conditions. The main species are *Fucus vesiculosus* and *F. serratus*, with *Chorda filum* and a variety of green seaweeds. Patches of dense *Cladophora rupestris* may occur on vertical rock faces.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Littorina littorea	••••	••	Occasional
Mytilus edulis	••	•	Occasional
Gasterosteus aculeatus	••	••	Occasional
Ectocarpaceae	••••	•	Frequent
Chorda filum	••	••	Occasional
Fucus serratus	•••••	••	Common
Fucus vesiculosus	•••	••	Frequent
Enteromorpha intestinaloides	••	•	Frequent
Cladophora rupestris	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.21	
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.18	

Frequency of occurrence

In Britain: Scarce

Lag *Submerged fucoids, green and red seaweeds (lagoonal rock)*

SIR.AscSAs *Ascophyllum nodosum* with epiphytic sponges and ascidians on variable salinity infralittoral rock

Habitat classification

Salinity:	Variable, Reduced / low
Wave exposure:	Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders and cobbles
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Dense subtidal stands of *Ascophyllum nodosum*, heavily epiphytised by sponges and ascidians in lagoon-like habitats.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Leucosolenia botryoides	•	••	Occasional
Mysidae	••	••	Occasional
Carcinus maenas	•••••	•	Occasional
Syngnathus acus	••	••	Rare
Gobiusculus flavescens	••	•	Occasional
Mastocarpus stellatus	••	•	Occasional
Chondrus crispus	•••	•	Occasional
Polyides rotundus	•••	••	Frequent
Furcellaria lumbricalis	••	••	Occasional
Chorda filum	••	••	Frequent
Laminaria saccharina	••	•	Rare
Ascophyllum nodosum	•••••	••	Common
Fucus serratus	•••	••	Common
Fucus vesiculosus	••••	••	Frequent
Halidrys siliquosa	••	•••	Occasional
Enteromorpha	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.20	

Frequency of occurrence

In Britain: Rare

Lag *Submerged fucoids, green and red seaweeds (lagoonal rock)*

SIR.PolFur *Polyides rotundus* and/or *Furcellaria lumbricalis* on reduced salinity infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Very weak
Substratum:	Bedrock; boulders, cobbles and pebbles
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Bedrock and boulders characterised by a dense turf of *Polyides rotundus* and/or *Furcellaria lumbricalis*, often with a dense mat of filamentous seaweeds. Associated with these seaweeds are the ascidians *Clavelina lepadiformis* and *Distaplia rosea*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Mysidae	•••	••	Occasional
Clavelina lepadiformis	••	•	Frequent
Distaplia rosea	•	••	Occasional
Ascidiella aspersa	••	••	Frequent
Corallinaceae	•••	•	Occasional
Phyllophora pseudoceranoides	••	••	Occasional
Chondrus crispus	•••	•	Occasional
Polyides rotundus	••••	••	Common
Furcellaria lumbricalis	••••	••	Common
Cystoclonium purpureum	••	••	Occasional
Ectocarpaceae	••	•	Abundant
Halidrys siliquosa	••	•••	Occasional
Enteromorpha	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.19	=

Frequency of occurrence

In Britain: Rare

Lag *Submerged fucoids, green and red seaweeds (lagoonal rock)*

SIR.FcerEnt *Fucus ceranoides* and *Enteromorpha* spp. on low salinity infralittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Extremely sheltered
Tidal streams:	Very weak
Substratum:	Bedrock; boulders, cobbles and mixed sediment
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Permanently submerged lagoon fringes with dense *Fucus ceranoides*. There is typically a very limited associated biota due to low salinity conditions.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hydrobia	•••	••	Occasional
Mytilus edulis	•••	•	Rare
Gasterosteus aculeatus	•••	••	Frequent
Ectocarpaceae	•••	•	Frequent
Fucus ceranoides	•••••	•••	Common
Fucus serratus	••	••	Frequent
Enteromorpha intestinalis	•••	•	Occasional
Chaetomorpha linum	•••	••	Occasional
Cladophora rupestris	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.22	=

Frequency of occurrence

In Britain: Rare

IR.CorMetAlc *Corynactis viridis*, *Metridium senile* and *Alcyonium digitatum* on exposed or moderately exposed vertical infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Infralittoral
Depth band:	5-10m, 10-20m
Other features:	Wave-surged vertical rock

Previous code

EIR.CorMet	96.7

Biotope description

Vertical walls in exposed or moderately exposed, wave-surged or tide-swept areas with *Corynactis viridis*, dwarf *Metridium senile* and *Alcyonium digitatum*. This biotope may show a large variation in relative abundances of the characterising species, some appearing to be dominated by *Corynactis* or *Alcyonium* or *Metridium* alone. Beneath and between these species, sponge crusts and polyclinid ascidians may be present and where sufficient light is available, encrusting coralline algae and tufts of foliose red seaweeds. This biotope may be found in deeper gullies below the more wave-surged biotopes (see EIR.SCAs and EIR.SCAn), or on vertical cliffs found within the kelp zone (EIR.LhypFa or EIR.LhypR). When *Alcyonium* occurs at high abundance in this biotope, it may be confused with the more sheltered biotope in which *Alcyonium* also dominates (IR.AlcByH). The latter, deeper biotope, lacks the associated surge-tolerant species such as encrusting sponges and anemones (e.g. *Corynactis* and *Sagartia elegans*). As it is less wave-surged than EIR.SCAn.Tub, this biotope lacks such high densities of *Tubularia* and *Mytilus*, but contains a greater abundance of turf-forming bryozoans such as crisiids. This biotope occurs at a similar depth and in similar conditions to the sponge crust, polyclinid ascidian and bryozoan / hydroid biotope (EIR.SCAs.ByH), although the latter is more affected by sand scour, allowing the ascidians to dominate over the anemones.

Similar biotopes

IR.AlcByH	Where *Alcyonium* occurs at high abundance these biotopes may be confused, but IR.CorMetAlc has a greater abundance of surge-tolerant species.
EIR.SCAs	Is subject to greater surge, and generally lacks the larger turf species such as *Alcyonium* and *Metridium*.
EIR.SCAn	Is subject to greater surge, and lacks *Alcyonium* and *Metridium*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	•	Occasional
Alcyonium digitatum	•••••	•	Frequent
Urticina felina	•••	•	Occasional
Metridium senile	•••	•	Frequent
Sagartia elegans	••••	•	Frequent
Corynactis viridis	•••••	••	Common
Pomatoceros triqueter	•••	•	Occasional
Crisiidae	••	••	Frequent
Antedon bifida	•••	•	Frequent
Asterias rubens	•••••	•	Occasional
Polyclinum aurantium	••	••	Occasional
Sidnyum turbinatum	••	••	Occasional
Aplidium punctum	••	••	Frequent

Botryllus schlosseri	••	•	Occasional
Botrylloides leachi	••	•	Occasional
Corallinaceae	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.SCAn.CorAlc	<
R1	Shetland	Howson 1988	H24	?In part
R2	Orkney		R2-4.CorMet	=
R8	Open coast		R8.Tub.TV	In part
R8	Open coast		R8.Cvir.V	=
R14	St Kilda		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994	SL31	=

FaSwV *Fauna and seaweeds (shallow vertical rock)*

IR.AlcByH *Alcyonium digitatum* with a bryozoan, hydroid and ascidian turf on moderately exposed vertical infralittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Infralittoral
Other features:	Shading; vertical

Previous code

MIR.AlcByH 96.7

Biotope description

Vertical, shaded surfaces in the infralittoral zone tend to lack dense kelp and other red seaweeds and are instead dominated by *Alcyonium digitatum* with a turf of bryozoans such as *Bugula flabellata* and hydroids including *Kirchenpaueria pinnata*. Beneath this turf the rock is generally encrusted by coralline algae, encrusting bryozoans and *Pomatoceros triqueter*. Ascidians such as *Botryllus schlosseri*, *Clavelina lepadiformis* and *Ciona intestinalis* are also common. This biotope has a wide species composition, and warrants further data analysis.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Common
Urticina felina	•••	•	Occasional
Flustra foliacea	••	••	Frequent
Bugula flabellata	••	••	Frequent
Ophiothrix fragilis	•••	•	Frequent
Echinus esculentus	••••	•	Occasional
Clavelina lepadiformis	•••	•	Frequent
Polyclinum aurantium	••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.AlcByH	=
R1	Shetland	Howson 1988	H20	
R1	Shetland	Moss & Ackers 1987	4.2.9	
R1	Shetland	Earll 1982a		
R2	Orkney		R2-4.AlcByH	
R5	SE Scotland / NE England	Foster-Smith 1992	SV5/MV5	
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.59	In part
R6	Kent	George, Tittley & Wood In prep	14	
R8	R8 open coast		R8.Tub.TV	?In part
R8	R8 open coast		R8.ByR.V	?In part
R9	N Pembrokeshire	Cartlidge & Hiscock 1980	4.4	
R13	Summer Isles	Dipper 1981b	4.3.1.2	

Frequency of occurrence

In Britain: Common

FaSwV *Fauna and seaweeds (shallow vertical rock)*

IR.AlcByH.Hia *Hiatella arctica*, bryozoans and ascidians on vertical infralittoral soft rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Infralittoral
Other features:	Vertical, soft (limestone, chalk)

Previous code

MIR.AlcByH.Hia	96.7
MCR.ByAs.Hia	96.7

Biotope description

Vertical faces of soft rock (limestone, chalk, sandstone) bored by *Hiatella arctica*. Bored holes are occupied by brittlestars such as *Ophiopholis aculeata* and *Ophiactis balli* and small crustaceans such as *Pisidia longicornis* and *Porcellana platycheles*. Open rock surfaces are often colonised by tufted bryozoans *Bugula* spp. and *Scrupocellaria* spp., sponges, hydroids and ascidians including *Polycarpa scuba*, *P. pomaria* and *Dendrodoa grossularia*. This biotope is similar to IR.AlcByH, but this biotope additionally has rock-boring bivalves.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Common
Urticina felina	•••	•	Occasional
Hiatella arctica	•••	••	Common
Bugula flabellata	•••	••	Frequent
Ophiothrix fragilis	••••	•	Common
Ophiactis balli	•	•••	Frequent
Ophiopholis aculeata	••	•	Frequent
Clavelina lepadiformis	•••	•	Frequent
Polyclinum aurantium	••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland / NE England	Brazier *et al*. In prep.b	R5.55	
R7	Sussex		?	
R7	R7 open coast		R7.AlcByH.Hia	=
Other	N Ireland	Erwin *et al*. 1990		

6.4 Circalittoral (deeper subtidal) rock biotopes

EFa *Faunal crusts or short turfs (exposed rock)*

ECR.CCParCar Coralline crusts, *Parasmittina trispinosa*, *Caryophyllia smithii*, *Haliclona viscosa*, polyclinids and sparse *Corynactis viridis* on very exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	20-30m, 30-50m

Biotope description

Sparse *Corynactis viridis*, encrusting bryozoans and coralline algae on clean, often deep circalittoral rock. The fauna is often sparse and has the appearance of being grazed but may also be effected by violent wave action working into deep water during winter storms. Other species include large specimens of the sponge *Haliclona viscosa*, the bryozoan *Parasmittina*, the sea cucumber *Holothuria* sp., the cup coral *Caryophyllia* and sparse hydroids such as *Schizotricha frutescens* and *Nemertesia antennina*. This biotope also contains polyclinid ascidians. There appears to be a northern (Shetland/Orkney) variant of this biotope which is virtually devoid of sponges, whilst *Caryophyllia* is less common than in the south and west and grazing by *Echinus* seems to have a marked effect. This biotope may require re-splitting although this is made difficult through the lack of characterising species.

Similar biotopes

MCR.FaAlC	ECR.CCParCar is more exposed with much greater variety of sponges

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	●●●●●	●●	Occasional
Cliona celata	●●●●●	●●	Frequent
Haliclona viscosa	●●●●●	●●	Frequent
Polyplumaria frutescens	●●	●●	Occasional
Alcyonium digitatum	●●●●●	●	Frequent
Corynactis viridis	●●●●	●	Common
Caryophyllia smithii	●●●●●	●	Common
Calliostoma zizyphinum	●●●●●	●	Occasional
Parasmittina trispinosa	●●●	●	Frequent
Porella compressa	●●●	●●	Frequent
Henricia oculata	●●●●●	●●	Occasional
Marthasterias glacialis	●●●●●	●●	Occasional
Echinus esculentus	●●●●●	●	Occasional
Holothuria forskali	●●●●	●●	Frequent
Corallinaceae	●●	●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	H18 & H19	
R1	Shetland	Hiscock 1986	2	
R2	Orkney		MNCR data	
R8	Scillies	Hiscock 1984c	5	

R13	Tiree	Mitchell, Earll & Dipper 1983	2	
R13	Mull		MNCR data	
R14	St Kilda	Howson & Picton 1985	5.3, 5.7	
R14	Rockall	Laffoley & Hiscock 1988	3.1.7	
R14	Outer Hebrides		MNCR data	
R15	Rum	Mitchell, Earll & Dipper 1983	2	
R15	Summer Isles	Dipper 1981b	4.3.1.3	
R15	Skye, Lochs Laxford & Inchard		MNCR data	
Other	Ireland		CCParCar_ir	Most records
IR5	Kenmare River			
IR8	Donegal			
IR6	Kilkieran Bay			

Frequency of occurrence

In Britain: Common

EFa *Faunal crusts or short turfs (exposed rock)*

ECR.CorCri *Corynactis viridis* and a crisiid/*Bugula*/*Cellaria* turf on slightly tide-swept exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Strong, Moderately strong, Weak
Substratum:	Bedrock; very large boulders
Zone:	Circalittoral
Other features:	Particularly on vertical or steep rock

Biotope description

Wave exposed steep or vertical bedrock, often subject to moderate or strong tidal streams, with dense aggregations of the jewel anemone *Corynactis viridis* and a short bryozoan turf of *Crisia* spp., *Cellaria* spp. and *Bugula* spp. Occasional large growths of the sponge *Cliona celata* and the soft coral *Alcyonium digitatum* present. *Caryophyllia smithii* is often frequent and anemones, such as *Sagartia elegans* and *Metridium senile*, and the featherstar *Antedon bifida* are often common. *Alcyonium glomeratum* and *Parazoanthus axinellae* may be present in the south-west. Branching sponges are typically scarce or absent.

Similar biotopes

CR.Ant	*Antedon bifida* may be common in ECR.CorCri, although not as dense as in CR.Ant, and these more exposed sites also have more *Corynactis* than CR.Ant

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	••••	••	Occasional
Cliona celata	••	•	Rare
Tubularia indivisa	•••	•	Occasional
Halecium halecinum	•••	•	Frequent
Alcyonium digitatum	••••	•	Occasional
Metridium senile	••	•	Occasional
Sagartia elegans	••••	•	Rare
Corynactis viridis	•••••	••	Common
Caryophyllia smithii	••••	•	Occasional
Crisiidae	••	•	Common
Scrupocellaria scruposa	•••	•	Occasional
Bugula flabellata	•••	•	Frequent
Bugula turbinata	••	•	Frequent
Antedon bifida	••	•	Abundant
Clavelina lepadiformis	••••	•	Occasional
Morchellium argus	••	•	Common
Plocamium cartilagineum	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Scilly Isles	Hiscock 1984c	Table 21	
R9	Lundy Island	Hiscock 1981	3.3.5	
R9	Skomer Island	Bunker & Hiscock 1987	Fig. 15 & text	
R9	N Pembrokeshire	Cartlidge & Hiscock 1980	4.4.3	

R9	Bishops & Clerks		MNCR data	
R10	Bardsey			
R14	Loch Roag	Dipper 1983	4.2.2.4	
R14	Rockall	Laffoley & Hiscock 1988	3.1.6	
R15	Small Isles	Dipper 1981a	R10.CorCri	=
Other	Sealochs	Howson, Connor & Holt 1994	SL47	In part
IR6	Aran Islands	Sides *et al*. 1994	KA14	?

Frequency of occurrence

In Britain: Uncommon

EFa *Faunal crusts or short turfs (exposed rock)*

ECR.PomByC *Pomatoceros triqueter*, *Balanus crenatus* and bryozoan crusts on mobile circalittoral cobbles and pebbles

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Strong, Moderately strong, Weak, Very weak
Substratum:	Cobbles and pebbles with sand
Zone:	Circalittoral
Other features:	Mobile substrata

Biotope description

Cobbles and pebbles with *Balanus crenatus*, *Pomatoceros* and a few bryozoan and coralline algal crusts are often found at the base of exposed cliff faces where scour action prevents colonisation by more delicate species. Occasionally in tide-swept conditions tufts of hydroids such as *Sertularia argentea* and *Hydrallmania falcata* are present. This biotope often grades into Flu.SerHyd which is characterised by large amounts of the above hydroids on stones also covered in *Pomatoceros* and barnacles. The main difference here is that Flu.SerHyd seems to develop on more stable, consolidated cobbles and pebbles in moderate tides - these stones may be disturbed in the winter and therefore long-lived species are not found.

Similar biotopes

EIR.CC.Mob	Similar habitat and species-distinction to be clarified

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	••••	•	Abundant
Balanus crenatus	•••••	•	Common
Bryozoa indet. (crusts)	••••	•	Frequent
Asterias rubens	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	H23, H31	
R8	Portland Harbour			
R9	Lundy Island	Hiscock 1981	3.3.6	In part
R9	Skomer Island	Bunker & Hiscock 1987	Plate 12, Fig. 22	
R9	Bishops & Clerks		MNCR data	
R10	Bardsey/Lleyn Peninsula			
R10	Menai Straits			
R13	Tiree	Mitchell, Earll & Dipper 1983	1	
R14	Loch Roag	Dipper 1983	4.2.2.1	
R14	St Kilda		B.E. Picton pers. comm. 1997	

Alc Alcyonium-*dominated communities (tide-swept/vertical)*

ECR.AlcTub *Alcyonium digitatum* with dense *Tubularia indivisa* and anemones on strongly tide-swept circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	10-20m
Other features:	Often on vertical rock faces

Biotope description

Occurs mainly in sounds, narrows and around tide-swept promontories in accelerated tidal streams. *Alcyonium digitatum* forms an almost continuous cushion in some locations with dense tufts to continuous cover of *Tubularia indivisa* on exposed edges and ridges. *Actinothoe sphyrodeta*, *Sagartia elegans*, *Cliona celata* and *Corynactis viridis* are often prominent components of the community. Hydroids, such as *Sertularia argentea* and *Abietinaria abietina*, and the horn wrack *Flustra foliacea* may be present. In some situations, e.g. Kyle Rhea, Strangford Narrows, Skye and the Mull of Galloway, the sponge and anemone component is more prominent (may warrant inclusion in AlcMaS). In increased tidal flow species richness falls and a *Balanus crenatus* biotope (ECR.BalTub) develops. In weaker tides, and in some parts of the country in similar habitat conditions (e.g. Welsh coasts), *Alcyonium* can still be fairly dense but a more species-rich biotope prevails (ECR.AlcMaS). In some cases dense *Tubularia* is found growing through sheets of sponges (see ECR.TubS).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cliona celata	●●	●●	Occasional
Myxilla incrustans	●●	●●	Occasional
Tubularia indivisa	●●●●●	●●	Common
Sertularia argentea	●●	●●	Frequent
Alcyonium digitatum	●●●●●	●	Frequent
Urticina felina	●●●	●	Occasional
Sagartia elegans	●●●●	●	Frequent
Actinothoe sphyrodeta	●●	●●	Frequent
Corynactis viridis	●●	●●	Frequent
Pomatoceros triqueter	●●●●	●	Frequent
Flustra foliacea	●●●	●●	Occasional
Clavelina lepadiformis	●●●	●●	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Earll 1982a		
R1	Shetland	Howson 1988	Habitat 28	
R2	Pentland Firth	Earll 1982		
R5	Farnes-Tees Bay	Brazier *et al*. In prep.b		
R5	SE Scotland/NE England	Foster-Smith 1992	MW1-DW1	
R5	St Abbs	Earll 1981		??
R8	SW Inlets		SWI.67	In part
R9	Skomer	Bunker & Hiscock 1987	Plate 3 etc.	
R9	Garland Stone, W Pembrokeshire	Hiscock 1980		

R10	Bardsey/Lleyn	Hiscock 1984b	3.2.5	
R11	Mull of Galloway	Covey In prep.b		
R13	Jura/Islay	Hiscock 1983	3.2.18	
R13	Scarba	Picton *et al*. 1982	(III)	
R13	Firth of Lorne	Buehr 1984	4.2.2.2	
R13	Inner Hebrides	Mitchell, Earll & Dipper 1983	(IV)	
R13	Sealochs	Howson, Connor & Holt 1994	SL50	=
IR1	N Ireland	Erwin *et al*. 1990	1 Bedrock (II)	

Frequency of occurrence

In Britain: Uncommon

Alc Alcyonium-*dominated communities (tide-swept/vertical)*

ECR.AlcMaS *Alcyonium digitatum* with massive sponges (*Cliona celata* and *Pachymatisma johnstonia*) and *Nemertesia antennina* on moderately tide-swept exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Variable amounts of *Alcyonium digitatum* but with large growths of *Cliona celata* and *Pachymatisma johnstonia* in moderately strong tides. In some locations *Myxilla incrustans* forms cushions amongst the other sponges. This biotope also has many hydroids (*Nemertesia* spp., tufts of *Tubularia indivisa*, sometimes *Aglaophenia* spp. and *Gymnangium montagui*) and bryozoans (*Bugula plumosa*, *Scrupocellaria*), which form a short turf. *Antedon*, *Flustra*, *Caryophyllia*, *Corynactis* and *Actinothoe* may be present. Usually lacks many branching sponges, although *Stelligera* spp. and *Raspailia* spp. are often present, particularly in deeper water at the same sites.

Similar biotopes

ECR.AlcTub	Has denser *Alcyonium* and much more *Tubularia* in stronger tides

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	•••	••	Frequent
Polymastia boletiformis	•••	••	Frequent
Cliona celata	••••	••	Frequent
Tubularia indivisa	••	••	Frequent
Nemertesia antennina	••••	••	Frequent
Alcyonium digitatum	••••	•	Frequent
Sagartia elegans	•••	••	Frequent
Caryophyllia smithii	••••	••	Common
Aslia lefevrei	•••	••	Occasional
Clavelina lepadiformis	•••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Scillies		R8.AlcMaS.H	
R8	Devon/Cornwall inlets	Moore In prep	SWI.67	
R8	Plymouth Sound	Devon Wildlife Trust 1993	pp74-76	
R9	Milford Haven	Moore In prep	SWI.67	
R10	Bardsey		R10.MaSCor	
R13	Inner Hebrides	Mitchell, Earll & Dipper 1983	2	?
IR4	Lough Hyne, Gascanane Sound			
IR5	Bantry Bay	Emblow *et al*. 1994	BB18	
IR6	Aran Islands			
IR8	Mulroy/Swilly	Picton *et al*. 1994	MS43	

Alc Alcyonium-*dominated communities (tide-swept/vertical)*

ECR.AlcSec *Alcyonium digitatum* with *Securiflustra securifrons* on weakly tide-swept or scoured moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Previous code

MCR.Flu in part	96.7

Biotope description

Found on generally moderately exposed bedrock and boulders with *Alcyonium digitatum*, often appearing fairly clean and grazed but with more erect species than FaAlC, including *Securiflustra securifrons* and *Flustra foliacea*. *Pomatoceros* is abundant at some sites, and other species include *Parasmittina trispinosa*, coralline crusts, *Sagartia elegans*, *Abietinaria abietina*, *Leptasterias muelleri*, *Antedon bifida*, *Filograna/Salmacina* and sometimes *Tubularia*. This biotope tends to occur in areas which are less turbid/silty than Flu.Flu and is found mainly in south-east Scotland and just across the border as well as in some sealochs. ECR.AlcC has fewer species with less *Alcyonium*.

Similar biotopes

MCR.Flu	ECR.AlcSec is 'cleaner' (less silty) than the *Flustra* biotopes

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nemertesia antennina	••••	••	Frequent
Abietinaria abietina	••••	••	Frequent
Thuiaria thuja	••••	•••	Occasional
Alcyonium digitatum	•••••	•	Common
Pomatoceros triqueter	••••	•	Common
Calliostoma zizyphinum	••••	••	Occasional
Parasmittina trispinosa	••••	••	Occasional
Cellepora pumicosa	••••	••	Occasional
Flustra foliacea	••••	••	Frequent
Securiflustra securifrons	•••••	••	Frequent
Asterias rubens	•••••	•	Frequent
Ophiothrix fragilis	••••	•	Frequent
Ophiura albida	•••••	••	Frequent
Echinus esculentus	•••••	•	Frequent
Ciona intestinalis	••••	•	Occasional
Zeugopterus punctatus	•••	••	Rare
Corallinaceae	•••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Orkney			=
R5	SE Scotland, Northumberland	Brazier *et al*. In prep.b	R5.60	In part
R13	Mull			
R14	Harris & Lewis			

Alc Alcyonium-*dominated communities (tide-swept/vertical)*

ECR.AlcC *Alcyonium digitatum*, *Pomatoceros triqueter*, algal and bryozoan crusts on vertical exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; very large boulders; wrecks
Zone:	Circalittoral
Depth band:	10-20m, 20-30m
Other features:	Often on vertical rock

Biotope description

Often found on exposed bedrock walls with dense *Alcyonium digitatum*, having the appearance of being grazed and is sometimes species poor on North Sea coasts. *Pomatoceros* can be highly abundant in some situations, sometimes covering far more rock than the *Alcyonium digitatum*. Other species include *Parasmittina trispinosa*, coralline crusts, *Sagartia elegans*, *Abietinaria abietina*, *Leptasterias muelleri*, *Antedon bifida*, *Filograna/Salmacina* and sometimes tufts of *Tubularia*. Vertical faces of wrecks may have a similar community or with a greater density of anemones, particularly *Metridium senile*. This biotope includes some records where dense *Alcyonium* occurs with *Metridium* and brittlestars in narrows in sealochs. This biotope does not usually have many of the larger sponges as in AlcMaS and has far less *Tubularia* than AlcTub or TubS. Where very grazed and in slower tides or less wave action the faunal and algal crusts (FaAlC) biotope predominates.

Similar biotopes

ECR.AlcSec	*Securiflustra securifrons* as an addition in some northern moderately tide-swept locations

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	•••••	•	Abundant
Urticina felina	••••	•	Frequent
Metridium senile	•••	•	Frequent
Sagartia elegans	•••	•	Frequent
Pomatoceros triqueter	•••••	•	Common
Calliostoma zizyphinum	••••	••	Occasional
Parasmittina trispinosa	•••	•	Frequent
Antedon bifida	•••	••	Occasional
Asterias rubens	•••••	•	Frequent
Ophiothrix fragilis	•••	•	Frequent
Echinus esculentus	•••••	•	Frequent
Corallinaceae	••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	Habitat 20	
R1	Shetland	Moss & Ackers 1987	4.2.1	
R4	Isle of May	Bennett 1989	Habitat 37	

R5	NE England	Foster-Smith 1992	SV2-DV2, SV3-DV3, SV6, MV6 & DV6; SV8-MV8, SV9-MV9	
R5	Bass Rock, St Abbs, Farnes	Brazier *et al*. In prep.b	R5.56	
R8	Dorset	Dixon *et al*. 1978	Habitat 8	
R9	Skomer	Bunker & Hiscock 1987	3.2.5	
R10	Menai Strait			
R13	Firth of Lorne	Buehr 1984	4.2.2.3	??
R13	Loch Sunart/Ardnamurchan			
R13	Mull			
R15	Skye			

BS *Barnacle, cushion sponge and* Tubularia *communities (very tide-swept / sheltered)*

ECR.BalTub *Balanus crenatus* and *Tubularia indivisa* on extremely tide-swept circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Very strong
Substratum:	Bedrock
Zone:	Circalittoral

Biotope description

Dense *Balanus crenatus* covering most surfaces in extremely tide-swept conditions, with short turfs of *Tubularia indivisa* in localised tide-sheltered spots. There also may be areas of *Mytilus edulis*, *Corynactis viridis*, *Sertularia argentea* and *Clathrina coriacea* although the cover of these species varies between locations. Very large *Balanus balanus* are associated with this community on the extremely tide-swept pinnacle in the Gulf of Coryvreckan, Firth of Lorne. *Alcyonium digitatum* is often found at the same sites with these extreme conditions although not on the most tide-exposed parts of the habitat. See also TubS and AlcTub which occur in strong, but not as strong, tides as this biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	••	Rare
Grantia compressa	•••	••	Common
Tubularia indivisa	•••••	••	Frequent
Sertularia argentea	•••	••	Frequent
Alcyonium digitatum	•••	•	Frequent
Sagartia elegans	•••••	•	Frequent
Corynactis viridis	•••	••	Occasional
Balanus crenatus	•••••	•	Abundant
Cancer pagurus	•••••	•	Rare
Nucella lapillus	•••	•	Occasional
Asterias rubens	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R10	Menai Strait	Lumb 1983		?
R13	Coryvreckan, Jura	Hiscock 1983	3.2.2	
R13	Coryvreckan, Jura	Picton *et al*. 1982	Site 33	

BS *Barnacle, cushion sponge and* Tubularia *communities (very tide-swept / sheltered)*

ECR.TubS *Tubularia indivisa*, sponges and other hydroids on tide-swept circalittoral bedrock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed
Tidal streams:	Very strong, Strong
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	10-20m

Biotope description

This biotope falls somewhere between the extremely tide-swept rock with little more than *Tubularia* and *Balanus crenatus* (BalTub) and the biotope characterised by large cushion sponges and/or dense *Alcyonium* and *Tubularia* (AlcTub). It is found in strongly tide-swept and exposed locations where turbidity levels are consistently high. This biotope does not include the *Tubularia*/*Halichondria* communities (CuSH and BalHpan) as found in the Menai Strait but does include the examples of dense *Tubularia* growing through sheets of *Myxilla rosacea* as well as patches of dense *Jassa* tubes and *Dendrodoa grossularia* as found off the Skerries, Anglesey. There is relatively little *Alcyonium digitatum* in this biotope, particularly around the Welsh coast, although in the few examples surveyed so far *Actinothoe sphyrodeta* is often frequent to common.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••••	••	Frequent
Scypha ciliata	•••••	•	Frequent
Pachymatisma johnstonia	•••••	••	Common
Esperiopsis fucorum	••••	••	Common
Myxilla incrustans	••••	••	Occasional
Myxilla rosacea	•••	••	Common
Hemimycale columella	•••••	••	Occasional
Dysidea fragilis	•••••	••	Occasional
Tubularia indivisa	•••••	••	Abundant
Nemertesia antennina	•••••	••	Frequent
Alcyonium digitatum	•••••	•	Occasional
Urticina felina	••••	•	Frequent
Sagartia elegans	••••	•	Occasional
Actinothoe sphyrodeta	•••••	••	Frequent
Balanus balanus	••••	••	Occasional
Balanus crenatus	••••	•	Common
Jassa falcata	••••	•	Frequent
Dyopedos porrectus	••••	••	Frequent
Crisiidae	••••	••	Common
Dendrodoa grossularia	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R10	Bardsey / Lleyn Peninsula & Skerries, Anglesey		R10.Tub	=

Frequency of occurrence

In Britain: Uncommon

BS *Barnacle, cushion sponge and* Tubularia *communities (very tide-swept / sheltered)*

ECR.BalHpan *Balanus crenatus, Halichondria panicea* and *Alcyonidium diaphanum* on extremely tide-swept sheltered circalittoral rock

Habitat classification

Salinity:	Variable
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Very strong
Substratum:	Bedrock
Zone:	Circalittoral
Depth band:	5-10m, 10-20m

Biotope description

Strong tides of variable to low salinity water run through the narrows such as parts of the Menai Strait and the Falls of Lora in Loch Etive with dense *Balanus crenatus* covering most surfaces. Few other species are present other than large growths of *Halichondria panicea* a few tufts of *Tubularia indivisa* and often dense *Alcyonidium diaphanum* (see CuSH). In these extreme conditions species richness is generally low and limited to those species which can tolerate variable salinity and hang on to the substratum (hence this biotope often has shore species such as *Nucella lapillus* and *Carcinus maenas*). In slightly less strong tides and/or less variable salinity dense *Tubularia indivisa* (ECR.BalTub) and/or dense cushions of sponge (ECR.CuSH) develops.

Similar biotopes

ECR.BalTub	Similar barnacle domination, but more exposed location, occurs in extreme wave surge on Mingulay, Outer Hebrides.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••••	•	Frequent
Tubularia indivisa	•••	••	Frequent
Sertularia argentea	•••••	••	Common
Urticina felina	•••	•	Occasional
Metridium senile	•••	••	Occasional
Pomatoceros triqueter	•••	•	Frequent
Balanus crenatus	•••••	•	Abundant
Pagurus bernhardus	••••	•	Occasional
Cancer pagurus	••••	•	Occasional
Carcinus maenas	••••	•	Frequent
Nucella lapillus	•••	•	Frequent
Alcyonidium diaphanum	••••	••	Frequent
Eucratea loricata	•••	•••	Rare
Flustra foliacea	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R10	Menai Strait	Lumb 1983	4.2.1 & 4.2.2	
R13	Loch Etive	Howson, Connor & Holt 1994	SL58	=

Frequency of occurrence

In Britain: Rare

BS *Barnacle, cushion sponge and* Tubularia *communities (very tide-swept / sheltered)*

ECR.CuSH Cushion sponges, hydroids and ascidians on tide-swept sheltered circalittoral rock

Habitat classification

Salinity:	Variable
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Turbid water

Biotope description

Often turbid variable salinity water in straits or sounds with low wave exposure where circalittoral communities occur in relatively shallow water. This biotope seems to have close links with the sponge and *Alcyonium*-rich biotope AlcTub but has been modified by high turbidity, possible organic enrichment and some (slight?) freshwater influence which when combined encourage luxuriant, fast-growing sponges. Large growths of *Halichondria bowerbanki*, often with *Haliclona oculata* (although large *H. oculata* are characteristic of slightly more sheltered conditions in the biotope Flu.Hocu) and *Esperiopsis fucorum*, various hydroids (particularly *Nemertesia* spp. and *Tubularia indivisa*) and ascidians. Typically this biotope occurs where hard substrata is present in the tide-swept narrows / sounds of marine inlets and in particular in the Menai Strait.

Similar biotopes

ECR.HbowEud	Low salinity variant

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria bowerbanki	•••	••	Frequent
Halichondria panicea	•••••	•	Common
Hymeniacidon perleve	•••	••	Frequent
Esperiopsis fucorum	••	••	Frequent
Haliclona oculata	••	••	Occasional
Dysidea fragilis	•••	••	Occasional
Tubularia indivisa	•••	••	Occasional
Hydrallmania falcata	••	••	Rare
Balanus crenatus	••	•	Common
Bugula plumosa	•••	••	Frequent
Clavelina lepadiformis	••••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R7	Poole Harbour	Dyrynda 1983	V	
R8	Rias	Moore In prep	SWI.68	
R8	Tamar	Devon Wildlife Trust 1993	pp79-80	
R8	Plymouth Sound	Devon Wildlife Trust 1993	pp81-83	
R8	Portland Harbour, Dart Estuary			
R9	River Cleddau, Milford Haven	Moore In prep	SWI.68	
R10	Bardsey / Lleyn Peninsula			
R10	Menai Strait	Lumb 1983	4.2.3	
IR3	Wexford			

IR4	Lough Hyne		
IR6	Kilkieran Bay	Sides *et al*. 1994	KA15
IR8	Mulroy/Swilly	Picton *et al*. 1994	MS42

Frequency of occurrence

In Britain: Scarce

BS *Barnacle, cushion sponge and* Tubularia *communities (very tide-swept / sheltered)*

ECR.HbowEud *Halichondria bowerbanki*, *Eudendrium arbusculum* and *Eucratea loricata* on reduced salinity tide-swept circalittoral mixed substrata

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders, cobbles and pebbles
Zone:	Circalittoral
Depth band:	5-10m, 10-20m

Previous code

SCR.HbowEud 96.7

Biotope description

Circalittoral mixed substrata (bedrock, boulders, cobbles and pebbles) in reduced salinity conditions and strong tidal streams. *Halichondria bowerbanki*, *Mycale lobata*, *Eudendrium arbusculum* and *Alcyonidium diaphanum* are particularly characteristic of these conditions. This biotope is only known from Loch Etive, a very impoverished low salinity version is present in the upper basin of Loch Etive.

Similar biotopes

ECR.CuSH	CuSH on strongly tide-swept rock, possibly subject to variable salinity, with related fauna.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria bowerbanki	•••••	••	Occasional
Mycale lobata	•••	•••	Occasional
Eudendrium arbusculum	•••	•••	Frequent
Hydrallmania falcata	••	••	Rare
Sertularia argentea	••	••	Rare
Metridium senile	••	•	Occasional
Balanus crenatus	•••••	•	Frequent
Alcyonidium diaphanum	•••	••	Occasional
Eucratea loricata	•••••	•••	Occasional
Asterias rubens	••••	•	Occasional
Corella parallelogramma	••••	••	Occasional
Ascidiella scabra	••••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Loch Etive	Howson, Connor & Holt 1994	SL57	??
R13	Loch Etive	Howson, Connor & Holt 1994	SL59	=

Frequency of occurrence

In Britain: Rare

XFa *Mixed faunal turfs (moderately exposed rock)*

MCR.PhaAxi *Phakellia ventilabrum* and axinellid sponges on deep exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Extremely exposed, Very exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; stable boulders
Zone:	Circalittoral
Depth band:	30-50m, >50 m

Previous code

ECR.Axi	96.7

Biotope description

In deep water (40-50m+) in exposed and very exposed conditions erect cup and branching sponges are found on bedrock and boulders. The sponge *Phakellia ventilabrum* tends to dominate, although *Axinella infundibuliformis*, *Stelligera* spp. and *Axinella dissimilis* are also characteristic. In deep water *Axinella flustra* may also be found. Other species included *Porella compressa*, large *Cliona celata* and *Pachymatisma johnstonia*. There are also instances of a variant of this biotope on similarly very exposed, upward- facing bedrock where *Phakellia ventilabrum* is in relatively high abundance with the ball-shaped sponges *Tetilla zetlandica* and *Tetilla cranium* amongst it. Most records of this biotope are from the west coast of Ireland. Nearest similar biotopes (species-wise) are ErSEun which has similar axinellid species, although mainly *Axinella dissimilis*, and CCParCar which has a few similar elements and might occur at the same sites although in shallower water within reach of wave action / mixing.

Similar biotopes

MCR.ErSEun	Similar cup and branching sponges but different associated biota in more moderate wave exposure.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	••••	•	Occasional
Tetilla cranium	•••	•••	Frequent
Tetilla zetlandica	•••	•••	Frequent
Polymastia boletiformis	•••••	•	Occasional
Cliona celata	•••••	•	Frequent
Axinella flustra	••	•••	Occasional
Axinella infundibuliformis	•••••	••	Frequent
Axinella dissimilis	••••	••	Occasional
Phakellia ventilabrum	•••••	••	Frequent
Stelligera rigida	••••	•	Occasional
Stelligera stuposa	••••	•	Occasional
Haliclona viscosa	•••••	••	Occasional
Dysidea fragilis	•••••	•	Occasional
Sertularella gayi	••••	•	Occasional
Alcyonium digitatum	•••••	•	Frequent
Caryophyllia smithii	•••••	•	Frequent
Pentapora foliacea	••••	••	Occasional
Porella compressa	•••••	••	Frequent
Henricia oculata	••••	•	Occasional
Labrus mixtus	••••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
IR4	Lough Hyne		Axi_ir	
IR6	Aran Is.	Sides *et al*. 1994	KA16	
IR6	Aran Is.	O'Connor *et al*. 1993	P133	
IR8	Donegal Bay			
IR6	Kilkieran Bay		Axi_ir	

XFa *Mixed faunal turfs (moderately exposed rock)*

MCR.ErSEun Erect sponges, *Eunicella verrucosa* and *Pentapora foliacea* on slightly tide-swept moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral

Previous code

MCR.ErS.Eun 96.7

Biotope description

Mainly found on exposed and moderately exposed rock, in slight tidal currents and often relatively silty, with a rich variety of species typically including branching and cup sponges, the seafan *Eunicella verrucosa* and the ross coral *Pentapora foliacea*. Typically a bryozoan turf of *Cellaria* spp. and *Bugula* spp. is present amongst the larger species (see Bug). The branching sponges *Axinella dissimilis*, *Stelligera* spp. and *Raspailia* spp. are typically present, with cup sponges *Axinella infundibuliformis* and *Phakellia ventilabrum* found in some cases. *Alcyonium glomeratum* and *Parerythropodium coralloides* may also be present and short vertical faces sometimes have the star anemone *Parazoanthus axinellae* and/or *P. anguicomus*. There are numerous examples of sites with lots of branching and cup sponges where seafans have not been found (but are often known to be present within the same geographical area); some of these are included in ErSPbolSH. *Diazona violacea* is also often recorded in this biotope although it occurs in ErSSwi also. There are a few instances of *Swiftia pallida* being found at the same sites (in SW Ireland) as *Eunicella verrucosa*. Where this biotope occurs on more open coast (e.g. SW Britain and W Ireland) the cotton spinner sea cucumber *Holothuria forskali* is often present.

Characterising species

	% Frequency	Faithfulness	Typical abundance
Pachymatisma johnstonia	●●●●●	●●	Occasional
Tethya aurantium	●●●●	●●	Occasional
Suberites carnosus	●●●●	●●	Occasional
Polymastia boletiformis	●●●●●	●●	Frequent
Polymastia mamillaris	●●●	●●	Occasional
Cliona celata	●●●●●	●●	Frequent
Axinella infundibuliformis	●●●●●	●●	Occasional
Axinella dissimilis	●●●●●	●●●	Occasional
Stelligera rigida	●●●	●●	Occasional
Stelligera stuposa	●●●●●	●●	Frequent
Raspailia ramosa	●●●	●●	Occasional
Hemimycale columella	●●●●	●●	Occasional
Dysidea fragilis	●●●●●	●●	Occasional
Nemertesia antennina	●●●●●	●●	Occasional
Nemertesia ramosa	●●●●●	●●	Occasional
Sertularella gayi	●●●	●●	Frequent
Alcyonium digitatum	●●●●●	●	Frequent
Alcyonium glomeratum	●●●●	●●●	Frequent
Eunicella verrucosa	●●●●●	●●●	Frequent
Parazoanthus axinellae	●●●	●●●	Occasional
Urticina felina	●●●	●	Occasional
Actinothoe sphyrodeta	●●●	●●	Occasional
Corynactis viridis	●●●	●●	Frequent
Caryophyllia smithii	●●●●●	●●	Frequent

Balanus crenatus	•••	•	Occasional
Calliostoma zizyphinum	•••••	••	Occasional
Pentapora foliacea	•••	•••	Frequent
Parasmittina trispinosa	•••	••	Occasional
Porella compressa	••••	••	Frequent
Luidia ciliaris	••••	•	Occasional
Henricia oculata	••••	••	Occasional
Asterias rubens	••••	•	Occasional
Marthasterias glacialis	••••	••	Occasional
Echinus esculentus	•••••	•	Occasional
Holothuria forskali	••••	••	Frequent
Clavelina lepadiformis	••••	••	Occasional
Ctenolabrus rupestris	•••	••	Occasional
Labrus bergylta	••••	••	Occasional
Labrus mixtus	••••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R7	Dorset	Dixon *et al*. 1978		
R8	Plymouth Sound	Devon Wildlife Trust 1993	pp77-78	
R8	Falmouth Bay	Davies & Sotheran 1995	12	
R8	Isles of Scilly	Hiscock 1984c	3.2.17	
R9	N Cornwall	Maggs & Hiscock 1979	4.2.5	
R9	Lundy Island	Hiscock 1981	3.3.3	
R9	Skomer Island	Bunker & Hiscock 1987	Plate 4, 5, 7, Figs. 12, 13, 14, 17, 18, 11 & text	
R10	Sarns	Hiscock 1986	3.2.5.2	?
R10	Bardsey Island	Hiscock 1984b	3.2.4, 3.2.7	
IR6	Aran Islands	Sides *et al*. 1994	KA14 Cave	?

XFa *Mixed faunal turfs (moderately exposed rock)*

MCR.ErSPbolSH Cushion sponges (*Polymastia boletiformis*, *Tethya*), branching sponges, *Nemertesia* spp. and *Pentapora foliacea* on moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Bedrock; boulders; cobbles
Zone:	Circalittoral

Previous code

MCR.ErsPenPol	96.7
?MCR.SAs	96.7

Biotope description

Bedrock, boulders and cobbles in a variety of wave exposures (usually exposed and moderately exposed), often with a light covering of silt. This biotope does not usually occur deeper than 15-20 m and therefore often borders the upper circalittoral and lower infralittoral. The sponge cover usually appears patchy with no one species obviously dominant although the yellow *Polymastia* spp. orange *Esperiopsis fucorum* and tufts of hydroids *Nemertesia* spp. on the tops of boulders and rocky ridges tend to stand out more clearly then the under-storey of finer hydroids and bryozoans. *Polymastia boletiformis* forms frequent cushions on the silty rock, often with *Tethya*, *P. mamillaris*, *Hemimycale* and *Pentapora* nearby at similar densities. Some branched sponges, particularly *Raspailia ramosa* and *Stelligera stuposa* are found in moderate abundance. Under-boulders may have sponge crusts such as *Terpios fugax* with the tubeworm *Bispira volutacornis* between the boulders. Candy-striped flatworm *Prostheceraeus vittatus* often found at sites with this biotope in Cardigan Bay as well *Epizoanthus couchii* and less often *Isozoanthus sulcatus*. The physical habitat in this biotope is somewhere between that described in the ErSEun and the less stable cobble and pebble plains in SNemAdia and is characterised by species typical of a moderate degree of stability although also contains some typical of the more ephemeral and/or scoured biotopes.

Similar biotopes

MCR.SNemAdia	Similar suites of species although with more long-lived sponges

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	•••	••	Occasional
Tethya aurantium	••••	••	Occasional
Polymastia boletiformis	••••	••	Frequent
Polymastia mamillaris	•••••	••	Occasional
Axinella infundibuliformis	•••	••	Rare
Axinella dissimilis	••••	•••	Occasional
Stelligera stuposa	•••	••	Frequent
Raspailia hispida	•••	••	Frequent
Raspailia ramosa	•••	••	Occasional
Esperiopsis fucorum	•••	••	Frequent
Myxilla incrustans	•••	••	Occasional
Hemimycale columella	••••	••	Frequent
Dysidea fragilis	•••••	••	Occasional
Halecium halecinum	••••	••	Frequent
Aglaophenia tubulifera	•••	••	Occasional
Gymnangium montagui	•••	•••	Occasional
Nemertesia antennina	•••••	••	Frequent
Nemertesia ramosa	•••	••	Occasional

Sertularia argentea	•••	••	Frequent
Alcyonium digitatum	•••••	•	Frequent
Actinothoe sphyrodeta	•••	••	Occasional
Corynactis viridis	•••	••	Occasional
Caryophyllia smithii	••••	••	Frequent
Balanus crenatus	•••	•	Frequent
Cancer pagurus	•••	•	Occasional
Calliostoma zizyphinum	•••	••	Occasional
Crisiidae	•••	••	Frequent
Pentapora foliacea	••••	••	Frequent
Flustra foliacea	•••••	••	Occasional
Bugula flabellata	••••	••	Frequent
Bugula plumosa	••••	••	Frequent
Bugula turbinata	•••	••	Frequent
Asterias rubens	•••••	•	Occasional
Echinus esculentus	•••	•	Occasional
Clavelina lepadiformis	•••	••	Occasional
Ctenolabrus rupestris	••••	••	Rare
Labrus bergylta	••••	••	Occasional
Delesseria sanguinea	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8			R8.By	
R8			R8.H.Cio	
R8	Lundy			
R8	Dart			
R9	Skomer		R9.ECR.SPBYAS	
R10	Sarns		R10.ErsPenPol	
R10	Bardsey Lleyn			
R10	Menai Strait			
IR4	Lough Hyne			

XFa *Mixed faunal turfs (moderately exposed rock)*

MCR.ErSSwi Erect sponges and *Swiftia pallida* on slightly tide-swept moderately exposed circalittoral rock

Habitat classification

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

Previous code

MCR.ErS.Swi 96.7

Biotope description

Circalittoral rock subject to slight tidal currents, with the seafan *Swiftia pallida* and various erect branching and cup sponges, including *Axinella infundibuliformis*, *Stelligera* spp. and *Raspailia* spp. The rocky surfaces usually have a sparse turf of hydroids including *Aglaophenia tubulifera* and *Schizotricha frutescens*, bryozoans *Bugula* spp., *Caryophyllia smithii*, *Porella compressa* and occasionally *Alcyonium glomeratum* and *Diazona violacea*. The feather stars *Antedon bifida* and *Antedon petasus* (the latter more numerous in deeper water than the former) and large solitary ascidians *Ascidia mentula* and *Polycarpa pomaria* (see AmenCio) are also characteristic of the less exposed sites with this biotope. Rock surfaces often with *Neocrania anomala* - found both in Irish and Scottish examples of this biotope. Short verticals and overhangs occasionally with *Parazoanthus anguicomus*. *Mycale lingua* recorded in deep water at some of the sites in Scottish sealochs. There are a few records from Kenmare River in SW Ireland which have *Swiftia* and *Eunicella* at the same sites. These records have been included in ErSEun although there were several other biotopes in Kenmare River which share close links with those from Scottish sealochs.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cliona celata	●●●	●●	Occasional
Axinella infundibuliformis	●●●	●●	Occasional
Aglaophenia tubulifera	●●●	●●	Occasional
Nemertesia antennina	●●●	●●	Occasional
Polyplumaria frutescens	●●●	●●●	Occasional
Alcyonium digitatum	●●●	●	Occasional
Alcyonium glomeratum	●●	●●●	Occasional
Swiftia pallida	●●●●●	●●●	Frequent
Caryophyllia smithii	●●●●●	●●	Common
Pomatoceros triqueter	●●●●	●	Occasional
Munida rugosa	●●●	●●	Occasional
Calliostoma zizyphinum	●●●	●●	Occasional
Parasmittina trispinosa	●●●	●●	Frequent
Porella compressa	●●●	●●	Occasional
Antedon bifida	●●●●	●●	Frequent
Antedon petasus	●●●	●●	Frequent
Luidia ciliaris	●●●	●●	Occasional
Porania pulvillus	●●	●●	Occasional
Asterias rubens	●●●●	●	Occasional
Marthasterias glacialis	●●●	●●	Occasional
Echinus esculentus	●●●●	●	Occasional
Clavelina lepadiformis	●●●	●●	Occasional
Diazona violacea	●●●	●●●	Occasional
Ascidia mentula	●●●●	●●	Occasional
Polycarpa pomaria	●●●	●●	Occasional

Labrus mixtus	•••	••	Occasional
Corallinaceae	•••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Firth of Lorne	Buehr 1984	4.2.2.1	
R13	Scarba	Picton *et al*. 1982	5.1.2 (I)	
R13	Inner Hebrides	Mitchell, Earll & Dipper 1983	(III) Shelter	
R13	Mull	Bishop 1984	3.5.1.A	
R15	Small Isles	Dipper 1981a	4.2.4	
Other	Sealochs	Howson, Connor & Holt 1994	SL48	=

XFa *Mixed faunal turfs (moderately exposed rock)*

MCR.SNemAdia Sparse sponges, *Nemertesia* spp., *Alcyonidium diaphanum* and *Bowerbankia* spp. on circalittoral mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Boulders; cobbles; mixed sediments
Zone:	Circalittoral

Biotope description

Mixed substrata of cobbles and coarse silty sediment with occasional boulders and small outcrops of bedrock. A variety of small sponges including erect sponges and fast growing cushions such as *Esperiopsis fucorum*, ephemeral and robust hydroids and bryozoans tolerant of some silt such as *Nemertesia* spp., *Cellaria* spp., *Bugula* spp., *Bowerbankia* spp. and sparse *Flustra*. There are also some records with *Epizoanthus couchii* and *Isozoanthus sulcatus*. This biotope sits somewhere between the *Polymastia* and erect sponge biotope (ErSPbolSH) which occurs on fairly stable substrata and the ephemeral hydroids biotope Flu.SerHyd which cannot develop further presumably because of periodic disturbance from wave and/or tide-scouring action. It therefore has a mixture of scour-tolerant species, ephemeral species and a few 'stable' substratum species on the larger or more consolidated rocks and boulders. Large areas of cobbly seabed in open but moderately exposed bays (e.g. Cardigan Bay) may comprise this biotope.

Similar biotopes

MCR.ErSPbolSH	Similar but with less stability - part way to Flu.SerHyd
MCR.Flu.SerHyd	Similar but with more stability - part way to ErSPbolSH

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Raspailia hispida	•••	••	Rare
Hemimycale columella	•••	••	Occasional
Dysidea fragilis	••••	••	Occasional
Halecium halecinum	•••	••	Frequent
Nemertesia antennina	•••••	••	Frequent
Nemertesia ramosa	•••••	••	Occasional
Hydrallmania falcata	•••	••	Occasional
Alcyonium digitatum	•••••	•	Occasional
Epizoanthus couchii	•••	••	Frequent
Urticina felina	••••	•	Occasional
Metridium senile	•••	•	Occasional
Pomatoceros triqueter	•••••	•	Frequent
Balanus balanus	•••	••	Occasional
Balanus crenatus	••••	•	Occasional
Pagurus bernhardus	••••	•	Frequent
Pisidia longicornis	••••	•	Common
Cancer pagurus	••••	••	Occasional
Liocarcinus depurator	•••	••	Occasional
Gibbula cineraria	••••	••	Occasional
Calliostoma zizyphinum	•••	••	Occasional
Hinia incrassata	•••	••	Occasional
Chlamys varia	•••	••	Frequent

Pododesmus patelliformis	●●●	●●	Frequent
Crisiidae	●●●	●●	Frequent
Alcyonidium diaphanum	●●●●	●●	Frequent
Cellepora pumicosa	●●●	●●	Occasional
Flustra foliacea	●●●●●	●●	Occasional
Bugula flabellata	●●●●●	●●	Frequent
Bugula plumosa	●●●●	●●	Occasional
Bugula turbinata	●●●●	●●	Frequent
Asterias rubens	●●●●●	●	Frequent
Clavelina lepadiformis	●●●	●●	Frequent
Perophora listeri	●●●	●●	Frequent
Callionymus lyra	●●●	●●	Occasional
Corallinaceae	●●●	●	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R10	Cardigan Bay		R10.SHyBy	
R10	Lleyn & Anglesey			
IR4	Saltee Islands			
IR8	Mulroy Bay			

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Flu *Flustra foliacea* and other hydroid/bryozoan turf species on slightly scoured circalittoral rock or mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders; mixed substrata
Zone:	Circalittoral

Previous code

Includes MIR.RHBy 96.7

Biotope description

A widespread biotope which has been split into several related entities. The biotope is characterised by silt- and scour-tolerant species which occur in varying proportions around the country, but *Flustra foliacea* tends to dominate. This biotope is characteristic of silty rocky habitats, tending to be moderately exposed to wave action and with a moderate tidal flow which create the slight scour conditions (compared to silted rocky habitats in sheltered conditions). The species associated with and therefore characterising the different *Flustra* biotopes vary from region to region, ranging from the relatively low species-rich Flu.Flu found on North Sea coasts to the similar but far richer biotopes with sponges and hydroids on the west of Britain and Irish Sea coasts (Flu.HByS). There are also several other related biotopes: these include the *Urticina* (Urt.Urt) and *Ciocalypta* (Urt.Cio) biotopes which occur at rock-sediment interfaces; ascidian-dominated biotopes with *Flustra* (StoPaur) and several other biotopes characterised by other slight scour-tolerant or turbid-water species such as *Sabellaria spinulosa* which include *Flustra* (Sspi and MolPol.Sab) and *Alcyonidium diaphanum* (SNemAdia). Only use this biotope if records do not fit into other categories.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Polymastia boletiformis	•	••	Occasional
Polymastia mamillaris	•	••	Occasional
Esperiopsis fucorum	•	••	Occasional
Haliclona oculata	••	••	Occasional
Dysidea fragilis	•	••	Occasional
Tubularia indivisa	•••	••	Occasional
Halecium halecinum	••	••	Occasional
Nemertesia antennina	••	••	Frequent
Nemertesia ramosa	••	••	Occasional
Abietinaria abietina	••	••	Occasional
Hydrallmania falcata	•••	••	Occasional
Thuiaria thuja	•	•••	Occasional
Sertularia argentea	••	••	Frequent
Alcyonium digitatum	••••	•	Frequent
Urticina felina	•••	•	Occasional
Sabella pavonina	••	••	Occasional
Pomatoceros triqueter	•••	•	Frequent
Hyas coarctatus	•	••	Frequent
Jujubinus miliaris	•	•••	Occasional
Alcyonidium diaphanum	••	••	Frequent
Alcyonidium parasiticum	•	•••	Occasional
Vesicularia spinosa	•	•••	Frequent
Eucratea loricata	•	•••	Frequent
Flustra foliacea	••••	••	Frequent
Chartella papyracea	•	•••	Frequent

Securiflustra securifrons	•	••	Occasional
Bugula	•	••	Frequent
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Frequent
Echinus esculentus	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Moray Firth	Earll 1983	1	
R4	Isle of May	Bennett 1989	3.3.14, 3.3.19	
R5	St Abbs-Farnes	Brazier *et al*. In prep.b	R5.60	
R5	Berwick-Tyne	Brazier *et al*. In prep.b	R5.61	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.62	
R5	Flamborough	Brazier *et al*. In prep.b	R5.63	
R5	Flamborough, N Norfolk, Kent	George, Tittley & Wood In prep	CCS9,CCS10	
R5	St Abb's Head	Earll 1982b	3 & 4	
R5	SE Scotland/NE England	Foster-Smith 1992	DH2, MW2, DW2, DG4	
R5	Flamborough	Wood 1988	Sites 11, 18, 21/22, 23	
R5	Flamborough	George, Tittley & Wood In prep	CCS16, CCS20	
R6	Kent	Wood 1989	C) Stable low boulders/outcrops	
R7	East Sussex	Wood 1990	SE/K/01	
R7	Brighton	Wood 1992		
R7	Mixon Hole	Ackers 1977	D. Stone boulders	
R9	Skomer Island	Bunker & Hiscock 1987	Figs. 26, 27, 28	
R10	Sarns	Hiscock 1986	3.2.7.3	
R10	Menai Strait	Lumb 1983	4.4	In part
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.3, 3.2.18	In part
R11	Morecambe Bay	Rostron 1992	MS8, MS10	
R11	N Solway coast	Covey In prep.b	R11.35	
R11	Lune Deep	Covey In prep.b	R11.36	
R13	Scarba	Picton *et al*. 1982	(II)	
R13	Mull	Bishop 1984	3.5.2.A	
R14	Loch Roag	Dipper 1983	4.2.2.1	
R15	Small Isles	Dipper 1981a	4.2.3	
R15	Summer Isles	Dipper 1981b	4.3.1.4	
Other	Sealochs	Howson, Connor & Holt 1994	SL64	
IR2	N Ireland	Erwin *et al*. 1990	p35 & 39, 2 Pebble, 3 mixed	

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Flu.Flu *Flustra foliacea* on slightly scoured silty circalittoral rock or mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders and cobbles
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Previous code

MCR.Flu	96.7

Biotope description

The biotope is characterised by the silt/scour-tolerant species *Flustra foliacea*. It is characteristic of the large bedrock terraces along the Northumberland coast which are generally fairly species-poor compared to similar situations on the west coasts which have more sponges, hydroids and bryozoans. *Thuiaria thuja* is often present, as are patches of *Sabellaria spinulosa* (see also Sspi). With increased turbidity, species-richness is lower, although the abundance of *Flustra foliacea* remains high. Similar assemblages occur on mixed substrata although these tend to be dominated by ephemeral hydroids (see Flu.SerHyd and SNemAdia). Other similar biotope include those dominated by ascidians (As), also characteristic of slight scour and turbidity, although they usually occur in different regions of the country tending to the west/Irish Sea. In increased tides, but more shelter, a similar biotope dominated by *Flustra* and a variety of sponges such as *Haliclona oculata* and *Halichondria panicea* occurs (Flu.Hocu).

Similar biotopes

MCR.Flu	Several other biotopes in the *Flustra* 'group' have similar suites of species although species richness and abundances vary considerably

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Tubularia indivisa	••••	••	Occasional
Nemertesia antennina	•••	••	Occasional
Abietinaria abietina	•••	••	Occasional
Thuiaria thuja	•••	•••	Occasional
Alcyonium digitatum	•••••	•	Frequent
Urticina felina	••••	••	Occasional
Sabella pavonina	••	••	Occasional
Pomatoceros triqueter	••••	•	Frequent
Pagurus bernhardus	•••	•	Occasional
Flustra foliacea	•••••	••	Common
Bryozoa indet. (crusts)	••	•	Frequent
Asterias rubens	•••••	•	Frequent
Ophiothrix fragilis	••••	•	Occasional
Ophiura albida	••	••	Frequent
Echinus esculentus	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Orkney		MNCR data	
R5	NE England/SE Scotland		MNCR data	
R9	N Devon		MNCR data	

Frequency of occurrence

In Britain: Very common

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Flu.HByS *Flustra foliacea* with hydroids, bryozoans and sponges on slightly tide-swept circalittoral mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock, boulders or cobbles with sediment
Zone:	Circalittoral
Depth band:	5-10m, 10-20m

Biotope description

Often dense *Flustra foliacea* with a variety of slightly scour/silt-tolerant species forming a dense turf on bedrock, boulders, cobbles and mixtures of sediment. This biotopes does not include the ascidians found in the silty biotope StoPaur although it can have similar suite of 'ubiquitous' species and the more scour-tolerant ascidian *Polyclinum aurantium*. Other species can include *Alcyonidium diaphanum* (see SNemAdia which has more hydroids and less *Flustra*), various robust hydroids such as *Abietinaria abietina* and *Nemertesia antennina* and sponges such as *Dysidea fragilis*, *Polymastia boletiformis* and *Cliona celata*. Has been recorded adjacent to exposed circalittoral rock communities with dense *Corynactis viridis*, although the data has not always been recorded separately. *Securiflustra securifrons* often occurs in this biotope.

Similar biotopes

MCR.Flu	See other *Flustra*-dominated biotopes

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scypha ciliata	•••	•	Occasional
Polymastia boletiformis	••	••	Frequent
Cliona celata	•••	••	Frequent
Dysidea fragilis	•••	••	Occasional
Nemertesia antennina	••••	••	Frequent
Nemertesia ramosa	•••	••	Frequent
Abietinaria abietina	•••	••	Frequent
Hydrallmania falcata	••••	••	Frequent
Sertularia argentea	••••	••	Frequent
Alcyonium digitatum	•••••	•	Frequent
Urticina felina	••••	•	Frequent
Metridium senile	••••	••	Occasional
Sagartia elegans	••••	••	Occasional
Pomatoceros triqueter	••••	•	Frequent
Balanus crenatus	•••	•	Frequent
Calliostoma zizyphinum	••••	••	Occasional
Alcyonidium diaphanum	••••	••	Frequent
Flustra foliacea	•••••	••	Frequent
Securiflustra securifrons	•••	••	Frequent
Antedon bifida	•••	••	Frequent
Crossaster papposus	•••	••	Occasional
Henricia oculata	•••	••	Occasional
Asterias rubens	•••••	•	Frequent
Marthasterias glacialis	•••	••	Occasional
Echinus esculentus	•••	•	Occasional

Clavelina lepadiformis	●●●	●●	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R9	N Devon			
R10	Bardsey, Lleyn			
R10	Menai Strait			
R10	Sarns			
R10	Cardigan Bay			
R11	Lune Deep			
R13	Loch Creran			
R13	Mull Sealochs			
IR8	Lough Swilly, Mulroy Bay			
IR8	Tory Island			

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Flu.SerHyd *Sertularia argentea, S. cupressina* and *Hydrallmania falcata* on tide-swept circalittoral cobbles and pebbles

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Moderately exposed
Tidal streams:	Strong, Moderately strong
Substratum:	Boulders, cobbles or pebbles with gravel and sand
Zone:	Circalittoral

Biotope description

Circalittoral cobbles and pebbles amongst clean sand or shell gravel in strong tides were covered in hydroids over *Balanus crenatus*. *Sabella pavonina* and *Lanice conchilega* were often common in the coarse sediment around the stones. With increased scouring *S. cupressina* becomes more common (see ScupHyd) although eventually, as tidal stream strength increases to a point at which the stones are kept mobile, all hydroids are scoured off leaving just *Pomatoceros*, bryozoan crusts, *Balanus crenatus* and coralline algae (PomByC).

Similar biotopes

IGS.ScupHyd	This biotope tends to be primarily on sand with fragments of hard substratum but has a similar suite of species as Flu.SerHyd

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Haliclona oculata	••	••	Occasional
Tubularia indivisa	•••	••	Occasional
Abietinaria abietina	•••	••	Occasional
Hydrallmania falcata	••••	••	Frequent
Sertularia argentea	••••	••	Frequent
Sertularia cupressina	•••	•••	Frequent
Alcyonium digitatum	••••	•	Occasional
Cerianthus lloydii	••	•	Frequent
Urticina felina	••••	••	Occasional
Sagartia troglodytes	••	••	Occasional
Lanice conchilega	••	•	Occasional
Sabella pavonina	•••	••	Occasional
Pomatoceros triqueter	••••	•	Frequent
Pandalus montagui	••	•	Occasional
Pagurus bernhardus	••••	•	Occasional
Alcyonidium diaphanum	•••	••	Frequent
Flustra foliacea	••••	••	Occasional
Asterias rubens	•••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Unst			
R5	St Abbs			
R6	Margate			
R8	Plymouth			
R9	Cleddau			
R10	Farnes			

R10	Bardsey / Lleyn
R10	Menai Strait
R11	Lune Deep
R11	Walney Island

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Flu.Hocu *Haliclona oculata* and *Flustra foliacea* with a rich faunal turf on tide-swept sheltered circalittoral mixed substrata

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Moderately exposed, Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders; cobbles; mixed substrata
Zone:	Circalittoral
Depth band:	5-10m, 10-20m

Biotope description

Localised areas of relative shelter in tide-swept sounds and inlets with large 'finger' growths of *Haliclona oculata* amongst dense *Flustra foliacea*. Also polyclinid ascidians, patches of large *Halichondria panicea*, *Esperiopsis fucorum* and a hydroid turf. Some areas also have *Alcyonidium diaphanum*. Generally in the upper circalittoral although borders with the lower infralittoral at some sites. This biotope is more species-rich than Flu.Flu and occurs on west coasts in similarly silty conditions, although its distribution may overlap with the dense ascidian biotopes (e.g. StoPaur and MolPol). This biotope is typically found in locations such as the Menai Strait, Plymouth Sound, Milford Haven and Lune Deep area.

Similar biotopes

MCR.Flu	See other biotopes in *Flustra* complex

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	••	•	Frequent
Esperiopsis fucorum	••••	••	Occasional
Haliclona oculata	•••••	••	Frequent
Dysidea fragilis	••••	••	Frequent
Nemertesia antennina	•••	••	Frequent
Nemertesia ramosa	•••	••	Occasional
Hydrallmania falcata	••••	••	Frequent
Sertularia argentea	••	••	Occasional
Alcyonium digitatum	••	•	Frequent
Urticina felina	•••	•	Occasional
Sagartia elegans	•••	••	Occasional
Terebellidae	•••	•	Occasional
Balanus crenatus	••••	•	Frequent
Cancer pagurus	•••	•	Occasional
Carcinus maenas	•••	•	Rare
Alcyonidium diaphanum	•••	••	Occasional
Flustra foliacea	•••	••	Frequent
Asterias rubens	•••	•	Occasional
Clavelina lepadiformis	•••	••	Occasional
Dendrodoa grossularia	•••	•	Common
Botryllus schlosseri	•••	•	Occasional
Ctenolabrus rupestris	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Dartmouth			
R8	Portland			
R8	N Devon			
R8	Salcombe			
R8	Plymouth Sound			
R9	Milford Haven	Moore In prep	SWI.70	In part
R10	Menai Strait	Lumb 1983		In part
R11	Lune Deep			

Frequency of occurrence

In Britain: Uncommon

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Urt *Urticina felina* on sand-affected circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock and boulders covered in sand and gravel
Zone:	Infralittoral - lower, Circalittoral

Biotope description

Urticina felina frequently occurs on rocks at the sand-rock interface where scour levels are high and few other species seem to be able to colonise. This biotope is only occasionally recorded as a separate entity. More often the *Urticina* are included as part of whatever biotope occurs on the nearby hard substrata. These neighbouring biotopes vary considerably but often include other scour-tolerant species. Most data has been assigned to Urt.Urt and Urt.Cio.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Urticina felina			

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Urt.Urt *Urticina felina* on sand-scoured circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Strong
Substratum:	Bedrock or boulders with sand/gravel
Zone:	Infralittoral, Circalittoral

Biotope description

Urticina felina on boulder or sand-scoured rock often adjacent to sandy sediment plains. On more open coasts sand-covered rock often has *Ciocalypta penicillus* (Urt.Cio) whereas this biotope seems to occur in more coastal conditions where turbidity is higher and scour possibly greater. This biotope occurs in tide-swept conditions at many sites, but seems to be rarely recorded as a separate entity from adjacent rocky substrata. The inclusion of data from this sediment-interface biotope often distorts the adjacent rocky biotope's species composition.

Similar biotopes

MCR.Urt.Cio	Similar sand-rock interface although with *Ciocalypta* on more open coast

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Myxilla incrustans	••••	••	Occasional
Tubularia indivisa	••••	••	Occasional
Nemertesia ramosa	••••	••	Occasional
Sertularia argentea	•••••	••	Occasional
Alcyonium digitatum	••••	•	Occasional
Urticina felina	•••••	•	Abundant
Sagartia elegans	••••	••	Frequent
Lanice conchilega	••••	•	Common
Pomatoceros triqueter	••••	•	Frequent
Alcyonidium diaphanum	••••	••	Occasional
Parasmittina trispinosa	••••	••	Frequent
Crossaster papposus	••••	••	Occasional
Asterias rubens	•••••	•	Frequent
Corallinaceae	•••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland			
R10	Menai Strait		R10.Urt	
R10	Sarns, Bardsey & Lleyn			
R10	Cardigan Bay			
R15	Skye			
Other	Chalk coasts			
IR6	Galway Bay / Clifden			

ByH *Bryozoan/hydroid turfs (sand-influenced)*

MCR.Urt.Cio *Urticina felina* and *Ciocalypta penicillus* on sand-covered circalittoral rock

Habitat classification

Salinity:	Full	
Wave exposure:	Exposed, Moderately exposed	
Tidal streams:	Strong, Moderately strong	
Substratum:	Bedrock and boulders covered by gravel and coarse sand	
Zone:	Circalittoral	
Depth band:	10-20m, 20-30m	
Other features:	Low-lying rock with sand cover	

Previous code

MCR.PolCio 96.7

Biotope description

Sand-covered low-lying rock with some scouring effect which has dense *Urticina felina* with *Ciocalypta penicillus* attached to the underlying rock. *Polymastia* spp., particularly *P. mamillaris* and sometimes *P. agglutinans* are also present. Has links with the ephemeral hydroid (Flu.SerHyd) and *Pomatoceros* and bryozoan crust biotopes (PomByC) and can occur adjacent to them. Not regularly recorded as a separate entity but is often recognisable in this habitat where rock and coarse sediment interface.

Similar biotopes

MCR.Urt	Rock sediment interface biotopes have similar suites of scour-tolerant species

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Polymastia agglutinans	•	•••	Occasional
Polymastia boletiformis	••••	••	Occasional
Polymastia mamillaris	•	••	Occasional
Cliona celata	••••	••	Occasional
Ciocalypta penicillus	•••••	•••	Frequent
Nemertesia antennina	•••••	••	Frequent
Nemertesia ramosa	••••	••	Frequent
Hydrallmania falcata	••••	••	Occasional
Alcyonium digitatum	••••	•	Occasional
Urticina felina	•••••	•	Frequent
Actinothoe sphyrodeta	••••	••	Rare
Pomatoceros triqueter	••••	•	Frequent
Balanus crenatus	••••	•	Common
Calliostoma zizyphinum	•••••	•	Occasional
Alcyonidium diaphanum	••••	••	Occasional
Pentapora foliacea	••••	••	Occasional
Flustra foliacea	••••	••	Occasional
Ophiothrix fragilis	••••	•	Frequent
Echinus esculentus	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Dart			
R9	Skomer		R10.UrtCio	
R9	Lundy			
R10	Menai Strait			

R10	Bardsey / Lleyn peninsula
IR8	Donegal Bay
IR8	Lough Swilly
IR6	Aran Islands

Frequency of occurrence

In Britain: Uncommon

CSab *Circalittoral* Sabellaria *reefs*

MCR.Sspi *Sabellaria spinulosa* crusts on silty turbid circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Other features:	High turbidity

Previous code

MCR.Sab.C	96.7

Biotope description

Bedrock in moderately exposed, slightly tide-swept conditions with high turbidity with an almost entire crust of *Sabellaria spinulosa* tubes; few other species present. *Ciona celata*, *Alcyonium digitatum* and *Hypoglossum hypoglossoides* present in NE England, very extensive *Mytilus edulis* in South Wales (Gower). The fauna attached to the *Sabellaria* crust in many cases seem to reflect the biotopes on nearby rock.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Urticina felina	•••	•	Occasional
Sabellaria spinulosa	•••••	•••	Super abundant
Pagurus bernhardus	•••	•	Occasional
Gibbula cineraria	•••	•	Occasional
Ophiothrix fragilis	••	•	Frequent
Ophiopholis aculeata	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	NE England	Brazier *et al*. In prep.b	R5.54	in part
R5	NE England	Foster-Smith 1992	DH1	
R9	Gower	Hiscock 1979		

M *Mussel beds (open coast circalittoral rock/mixed substrata)*

MCR.MytHAs *Mytilus edulis* beds with hydroids and ascidians on tide-swept moderately exposed circalittoral rock

Habitat classification

		Previous code	
Salinity:	Full, Variable	MCR.MytH	96.7
Wave exposure:	Exposed, Moderately exposed, Sheltered		
Tidal streams:	Strong, Moderately strong		
Substratum:	Bedrock; boulders; mixed substrata		
Zone:	Circalittoral		

Biotope description

Dense mussel *Mytilus edulis* beds occur in strong tides on a variety of substrata. Apart from a continuous bed of mussels species richness is not particularly high. *Asterias* are usually common, as are crabs such as *Cancer pagurus*, *Carcinus maenas* and *Necora [Liocarcinus] puber*. Hydroids such as *Kirchenpaueria* and those characteristic of strong tides and a little scour are also often present such as *Sertularia argentea* and *Tubularia indivisa*. Ascidians such as *Molgula manhattensis* and *Polycarpa* spp. and *Flustra foliacea* may be present, particularly in silty conditions, although not often on the mussels themselves.

Similar biotopes

SIR.MytT	See other *Mytilus*-dominated biotopes

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Occasional
Urticina felina	•••••	•	Frequent
Sagartia elegans	••••	•	Occasional
Balanus crenatus	•••••	•	Frequent
Mytilus edulis	•••••	•	Super abundant
Flustra foliacea	••••	••	Occasional
Asterias rubens	•••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	Flamborough Head	Brazier *et al*. In prep.b	R5.64	
R7	Sussex	Wood 1984		In part
R7	Seven Sisters	Wood & Jones 1986		In part
R9	Skomer	Bunker & Hiscock 1987		
R10	Menai Strait	Lumb 1983	4.4(B)	In part
R10	Lleyn	Hiscock 1984b	3.2.9, 3.2.18	In part
R10	Anglesey			
R13	Jura & Islay	Hiscock 1983	3.2.3	In part

M *Mussel beds (open coast circalittoral rock/mixed substrata)*

MCR.Mus *Musculus discors* beds on moderately exposed circalittoral rock

Habitat classification

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

Biotope description

Musculus discors beds on moderately exposed rock (with mucous-congealed mats of silt/pseudofaeces). Variety of sponges, hydroids and bryozoans typical of the open coast situation in the area also present such as *Phorbas fictitius*, *Hemimycale columella*, *Polymastia boletiformis*, *Balanus crenatus*, *Urticina felina*, *Salmacina dysteri* and *Pentapora foliacea*. Some of the sites with this biotope exposed to moderately strong tides such as found near Maen Mellt on the Lleyn Peninsula.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Polymastia boletiformis	••••	••	Occasional
Stelligera stuposa	••••	••	Occasional
Hemimycale columella	••••	••	Rare
Nemertesia antennina	••••	••	Frequent
Alcyonium digitatum	••••	•	Frequent
Cancer pagurus	••••	•	Occasional
Musculus discors	•••••	••	Super abundant
Henricia oculata	••••	••	Occasional
Asterias rubens	•••••	•	Occasional
Clavelina lepadiformis	••••	••	Occasional
Corallinaceae	••••	•	Occasional
Delesseria sanguinea	••••	•	Occasional
Hypoglossum hypoglossoides	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R9	N Pembrokeshire	Cartlidge & Hiscock 1980	4.3.3	In part
R10	N Lleyn	Hiscock 1984b	3.2.9	In part
R10	Anglesey		R10.Mus	
IR4	Glandore Bay			
IR8	Rathlin o'Birne			

Frequency of occurrence

In Britain: Uncommon

M *Mussel beds (open coast circalittoral rock/mixed substrata)*

MCR.ModT *Modiolus modiolus* beds with hydroids and red seaweeds on tide-swept circalittoral mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Cobbles, pebbles and Modiolus shells
Zone:	Infralittoral - lower, Circalittoral

Biotope description

Modiolus beds on mixed substrata (cobbles, pebbles and coarse muddy sediments) in moderately strong currents, typically on the open coast but also in tide-swept channels of marine inlets. Often with sponges such as *Hemimycale columella*, hydroids such as *Sertularia argentea*, *Hydrallmania* and *Abietinaria abietina*, *Alcyonium digitatum*, barnacles, *Alcyonium digitatum*, bryozoans such as *Alcyonidium mytili* and ascidians *Dendrodoa grossularia*. This biotope is typified by examples off the north-west Lleyn Peninsula in N Wales and off Co. Down, Northern Ireland.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Sertularia argentea	•••	••	Frequent
Alcyonium digitatum	•••	•	Frequent
Pomatoceros triqueter	•••	•	Frequent
Balanus crenatus	•••	•	Common
Pagurus bernhardus	•••	•	Occasional
Hyas araneus	•••	••	Frequent
Buccinum undatum	•••	•	Occasional
Modiolus modiolus	••••	••	Abundant
Electra pilosa	•••	•	Frequent
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Corallinaceae	•••	•	Frequent
Phycodrys rubens	•••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Pearson, Coates & Duncan 1994	SH1 (facies 1 & 2)	
R1	Shetland	Howson 1988	H40	? atypical
R1	Shetland	Howson 1988	H39	
R6	Humber, Norfolk		Kenny & Rees Mixed Sed. 7	
R9	Bristol Channel		Kenny & Rees Mixed Sed. 7	
R9	Swansea	Conneely 1988	Group C	Poor description
Other	Sealochs	Howson, Connor & Holt 1994	SL65	
IR2	N Ireland	Erwin *et al*. 1990	Tables 35 & 37	

Frequency of occurrence

In Britain: Uncommon

Bri *Brittlestar beds*

MCR.Oph *Ophiothrix fragilis* and/or *Ophiocomina nigra* beds on slightly tide-swept circalittoral rock or mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders; mixed substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Moderately exposed or sheltered slightly tide-swept rock or mixed substrata with dense brittlestar beds, usually dominated by *Ophiothrix fragilis* but often with *Ophiocomina nigra* amongst them. At some sites *O. nigra* was found in larger numbers at some sites particularly in deeper water than the main *Ophiothrix* bed. Brittle star beds tend to be rather species-poor with coralline crusts, *Pomatoceros triqueter*, *Bolocera tuediae*, *Urticina felina*, *Urticina eques*, occasional *Metridium senile*, a few hydroids such as *Abietinaria abietina* and echinoderms such as *Luidia ciliaris* and *Crossaster papposus* fairly typical of the biotope. *Alcyonium digitatum* may be present, especially on protruding rocks. In the far north of Britain (Shetland, NW Scotland) and part of Ireland *Ophiopholis aculeata* often replaces *Ophiothrix* as the dominant brittlestar occurring in dense aggregations (Oph.Oacu).

Similar biotopes

MCR.Oph.Oacu	Some examples of brittle star beds are predominantly *Ophiopholis aculeata*.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Occasional
Urticina felina	•••	•	Occasional
Pomatoceros triqueter	••••	•	Frequent
Pagurus bernhardus	••••	•	Occasional
Gibbula cineraria	•••	•	Occasional
Parasmittina trispinosa	••	••	Occasional
Antedon bifida	••	••	Occasional
Crossaster papposus	•••	••	Rare
Asterias rubens	•••••	•	Occasional
Ophiothrix fragilis	•••••	•	Common
Ophiocomina nigra	••••	•	Common
Ophiopholis aculeata	••	••	Frequent
Ophiura albida	•••	••	Frequent
Echinus esculentus	•••••	•	Frequent
Ciona intestinalis	•••	••	Occasional
Corallinaceae	••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Earll 1982a	2.2	In part
R1	Shetland	Hiscock 1986	3	Variety
R1	Shetland	Moss & Ackers 1987	4.2.5	
R1	Shetland	Howson 1988	Habitat 22	?
R4	Isle of May	Bennett 1989	3.3.15 (H42)	

R5	NE England	Foster-Smith 1992	MH3/DH3, MC2/DC2, MG3/DG3	
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.67	
R5	St Abb's Head	Earll 1981		
R9	Lundy Island	Hiscock 1981	3.3.6	In part
R9	Skomer Island	Bunker & Hiscock 1987	Fig. 28	In part
R10	Menai Strait	Lumb 1983	4.4(A)	
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.18	In part
R13	Scarba	Picton *et al*. 1982	5.1.3	
R13	Colonsay, Islay, Jura	Farrow *et al*. 1979	(I) Bare rock	
R13	Mull	Bishop 1984	3.5.1.C	
Other	Sealochs	Howson, Connor & Holt 1994	SL51	
Other	Sealochs	Howson, Connor & Holt 1994	SL66	
R15	Small Isles	Dipper 1981a	4.2.3	
IR2	Co. Down, E Co. Antrim	Erwin *et al*. 1990	Tables 18-20	
IR2	Off Mournes	Erwin *et al*. 1990	2. Boulder	In part
IR8	Mulroy/Swilly	Picton *et al*. 1994	MS41	

Frequency of occurrence

In Britain: Very common

Bri *Brittlestar beds*

MCR.Oph.Oacu *Ophiopholis aculeata* beds on slightly tide-swept circalittoral rock or mixed substrata

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Moderately strong
Substratum:	Cobbles, pebbles and mixed sediment
Zone:	Circalittoral

Biotope description

Sheltered, slightly tide-swept rock or mixed substrata with dense beds of the brittlestar *Ophiopholis aculeata*. These brittlestar beds occur in very similar conditions to *Ophiothrix* / *Ophiocomina* beds and may very well be a northern variant. Tends to be rather species-poor with coralline crusts, *Pomatoceros triqueter*, and several ubiquitous scavenging species such as *Pagurus bernhardus* and *Buccinum undatum* present in most of the records. The horse mussel *Modiolus modiolus* is often found amongst dense *Ophiopholis* and there may well be overlaps with the *Modiolus* biotopes. There are also a few species typical of these northern locations, although not necessarily confined to this biotope, such as the urchin *Strongylocentrotus droebachiensis* and holothurian *Cucumaria frondosa*. The most representative examples of this biotope are known from Shetland, with other examples found in Loch Alsh and from Ireland.

Similar biotopes

MCR.Oph	Brittle star bed with similar suites of species, although this biotope is characterised by *Ophiopholis aculeata*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pomatoceros triqueter	•••••	•	Common
Pagurus bernhardus	••••	•	Occasional
Gibbula cineraria	••••	•	Occasional
Buccinum undatum	••••	•	Occasional
Modiolus modiolus	•••	••	Common
Crossaster papposus	•••	••	Rare
Asterias rubens	•••	•	Occasional
Ophiothrix fragilis	•••••	•	Abundant
Ophiocomina nigra	•••••	•	Frequent
Ophiopholis aculeata	•••••	••	Abundant
Echinus esculentus	•••••	•	Frequent
Corallinaceae	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland			
R15	Loch Duich / Long	Connor 1989		

Frequency of occurrence

In Britain: Rare

GzFa *Grazed fauna (moderately exposed or sheltered rock)*

MCR.FaAlC Faunal and algal crusts, *Echinus esculentus*, sparse *Alcyonium digitatum* and grazing-tolerant fauna on moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Other features:	Grazed

Biotope description

Moderately exposed circalittoral rock in slight tides with a rather barren appearance (reminiscent of a brittlestar bed after the brittlestars have moved elsewhere - brittlestars *Ophiothrix fragilis* recorded in moderate abundance). Can be sand/sediment scoured or grazed. Usually small *Alcyonium digitatum*, some *Abietinaria abietina* and sparse *Nemertesia* spp. present. Also *Urticina felina*, often associated with patches of muddy shell gravel and sand, or on North Sea coasts *Urticina eques*. Most of rock surface with coralline or non-coralline red algal crusts as well as patches of bryozoan crusts such as *Parasmittina trispinosa*. *Echinus esculentus* common in some areas and *Pomatoceros triqueter* found throughout, especially on vertical faces. The richer examples of this biotope also have *Caryophyllia smithii*, *Antedon bifida*, delicate hydroids, ascidians such as *Ascidia mentula* and holothurians such as *Aslia lefevrei* and *Pawsonia saxicola*, which may appear seasonally, in more cryptic habitats. Regional variants occur - e.g. with *Thuiaria thuja* and *Bolocera tuediae* on North Sea coasts. Under-boulders and crevices often have *Pawsonia saxicola*, *Galathea* spp., encrusting sponges, terebellids, *Pododesmus patelliformis* and *Munida rugosa*.

Similar biotopes

SIR.EchBriCC	Similar grazed crustose appearance but more sheltered

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Occasional
Caryophyllia smithii	•••	••	Occasional
Pomatoceros triqueter	•••••	•	Common
Pagurus bernhardus	•••	•	Occasional
Pododesmus patelliformis	•••	••	Occasional
Parasmittina trispinosa	•••	••	Occasional
Antedon bifida	•••	••	Frequent
Crossaster papposus	•••	••	Occasional
Asterias rubens	•••••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Echinus esculentus	•••••	•	Frequent
Clavelina lepadiformis	•••	••	Occasional
Ciona intestinalis	•••	•	Occasional
Corallinaceae	•••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	Habitat 27	
R1	Shetland	Moss & Ackers 1987	4.2.4	

R4	Isle of May	Bennett 1989	Habitat 38, 39, 43, 44	
R5	St Abbs-Farnes	Brazier *et al*. In prep.b	R5.59	
R5	NE England	Brazier *et al*. In prep.b	R5.65	?
R5	St Abb's Head	Earll 1981		
R5	SE Scotland/NE England	Foster-Smith 1992	MB1, ?MB2, MB4 & DB4, DB5	
R13	Jura & Islay	Hiscock 1983	3.2.4	
R13	Inner Hebrides	Mitchell, Earll & Dipper 1983	(II)	
R14	Loch Roag	Dipper 1983	4.2.2.2	
Other	Sealochs	Howson, Connor & Holt 1994	SL49	
IR4	Youghal Bay	Emblow *et al*. 1995		

GzFa *Grazed fauna (moderately exposed or sheltered rock)*

MCR.FaAlC.Abi Faunal and algal crusts, *Echinus esculentus*, sparse *Alcyonium digitatum*, *Abietinaria abietina* and other grazing-tolerant fauna on moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders, cobbles and pebbles
Zone:	Circalittoral

Biotope description

Moderately exposed circalittoral rock in slight tides with a rather barren appearance (reminiscent of a brittlestar bed after the brittlestars have moved elsewhere - brittlestars *Ophiothrix fragilis* recorded in moderate abundance). Can be sand/sediment scoured or grazed. Usually small *Alcyonium digitatum*, frequent or more *Abietinaria abietina* and other more ephemeral hydroids. This biotope is probably a northern variant of FaAlC.

Similar biotopes

MCR.FaAlC	Tends to be in more exposed conditions than FaAlC and has more robust hydroids *Abietinaria abietina*

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Abietinaria abietina	•••••	••	Frequent
Alcyonium digitatum	•••••	•	Frequent
Urticina felina	•••	•	Occasional
Pomatoceros triqueter	••••	•	Frequent
Calliostoma zizyphinum	•••	••	Occasional
Parasmittina trispinosa	•••	••	Occasional
Crossaster papposus	•••	••	Occasional
Asterias rubens	•••••	•	Occasional
Ophiothrix fragilis	••••	•	Frequent
Echinus esculentus	••••	•	Frequent
Corallinaceae	•••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Hoy			
R4	Isle of May			
R5	Farnes			
R5	NE England			
R13	Loch Sunart			
R11	Solway / Lune Deep			
R15	NW sealochs			

Frequency of occurrence

In Britain: Uncommon

As *Ascidian communities (silt-influenced)*

MCR.StoPaur *Stolonica socialis* and/or *Polyclinum aurantium* with *Flustra foliacea* on slightly sand-scoured tide-swept moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	5-10m, 10-20m

Biotope description

Polyclinum aurantium and/or *Stolonica socialis* on silty, slightly sand-scoured, tide-swept rock with a turf of bryozoans such as *Flustra foliacea* and *Chartella*. There are several ascidian-dominated biotopes with *Flustra* - North Wales/Irish Sea variants with *Sabellaria spinulosa* or branching sponges and this more northern Irish Sea/Flamborough variant with generally fewer species. Some examples from Ireland include *Synoicum incrustatum* and *Polycarpa scuba*. Moderately strong tides also encourage tufts of *Tubularia*. Other ascidians such as *Pycnoclavella aurilucens* common in some areas. Hydroids often abundant in the strong / moderately strong tidal streams.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Leucosolenia botryoides	••••	••	Frequent
Scypha ciliata	•••••	•	Frequent
Cliona celata	•••••	••	Frequent
Tubularia indivisa	•••	••	Occasional
Halecium halecinum	•••	••	Common
Nemertesia antennina	•••	••	Occasional
Hydrallmania falcata	•••	••	Rare
Alcyonium digitatum	•••••	•	Frequent
Urticina felina	•••••	•	Frequent
Sagartia elegans	•••	•	Rare
Polydora	•••	••	Common
Sabella pavonina	•••	••	Occasional
Pomatoceros triqueter	••••	•	Frequent
Homarus gammarus	••••	••	Occasional
Pagurus bernhardus	•••	•	Occasional
Hyas araneus	•••	••	Occasional
Cancer pagurus	•••••	••	Frequent
Janolus cristatus	••••	••	Occasional
Alcyonidium diaphanum	•••••	••	Frequent
Flustra foliacea	•••••	••	Common
Bugula flabellata	•••••	••	Occasional
Bugula plumosa	••••	••	Common
Crossaster papposus	••••	••	Occasional
Henricia oculata	•••	••	Occasional
Asterias rubens	•••••	•	Common
Ophiothrix fragilis	•••••	•	Frequent
Clavelina lepadiformis	••••	••	Frequent
Archidistoma aggregatum	•••	•••	Common
Polyclinum aurantium	•••••	••	Common

Synoicum incrustatum	•	•••	Frequent
Stolonica socialis	••••	•••	Frequent
Botryllus schlosseri	••••	•	Occasional
Botrylloides leachi	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	Flamborough			
R7	Selsey Bill			
IR4	Saltee Islands			

As *Ascidian communities (silt-influenced)*

MCR.MolPol *Molgula manhattensis* and *Polycarpa* spp. with erect sponges on tide-swept moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock; boulders; mixed substrata
Zone:	Circalittoral
Depth band:	5-10m, 10-20m

Previous code

MCR.Mol	96.7

Biotope description

This biotope occurs in the shallower reaches of the circalittoral (upper and lower) at depths of around 8 to 13 m with the main ascidian cover of *Molgula manhattensis* with some *Polycarpa pomaria* and a wide variety of other ascidians mixed in. Sponge species associated with this biotope include *Tethya*, *Cliona*, *Stelligera rigida*, *Stelligera stuposa*, *Raspailia ramosa*, *Esperiopsis*, *Hemimycale* and *Dysidea*. There are also several records with *Axinella dissimilis* and *Axinella infundibuliformis*. *Nemertesia antennina* occurs at most sites, also with *Alcyonium digitatum* and *Actinothoe*. *Flustra* is common in all these ascidian biotopes, but *Chartella* is only found in this one. Red algae associated with the upper circalittoral occur sporadically - more an artefact of the way in which the habitat records have been split. This biotope has some parallels with the erect sponge biotopes (e.g. ErSPbolSH), although it appears to be far siltier at most sites.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Tethya aurantium	•••	••	Occasional
Polymastia boletiformis	••	••	Frequent
Polymastia mamillaris	••	••	Frequent
Cliona celata	••••	••	Occasional
Esperiopsis fucorum	••••	••	Frequent
Dysidea fragilis	••••	••	Frequent
Halecium halecinum	•••	••	Frequent
Nemertesia antennina	••••	••	Frequent
Nemertesia ramosa	•••	••	Occasional
Alcyonium digitatum	••••	•	Occasional
Urticina felina	•••	•	Occasional
Actinothoe sphyrodeta	••••	••	Occasional
Pomatoceros triqueter	•••	•	Frequent
Balanus crenatus	•••	•	Frequent
Cancer pagurus	•••	••	Occasional
Necora puber	•••	••	Occasional
Crisiidae	•••	••	Frequent
Alcyonidium diaphanum	••••	••	Frequent
Flustra foliacea	•••	••	Frequent
Bugula plumosa	•••	••	Common
Asterias rubens	••••	•	Frequent
Clavelina lepadiformis	•••	••	Occasional
Perophora listeri	•••	••	Frequent
Polycarpa pomaria	••••	•••	Common
Polycarpa scuba	•••	•••	Common
Dendrodoa grossularia	•••	•	Frequent
Distomus variolosus	••	••	Occasional

Stolonica socialis	•••	••	Occasional
Botryllus schlosseri	•••	•	Frequent
Molgula manhattensis	••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Margate, Ramsgate			
R8	Plymouth			
R8	Cornwall			
R9	N Devon			
R9	Pembrokeshire			
R10	Anglesey			
R10	Bardsey, Lleyn			
R11	Solway			

As *Ascidian communities (silt-influenced)*

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

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Strong, Moderately strong
Substratum:	Bedrock, boulders; mixed substrata
Zone:	Circalittoral
Other features:	Sand in suspension

Previous code

MCR.Sab.SAs 96.7

Biotope description

Tide-swept rock in areas with high levels of suspended sand with a *Sabellaria spinulosa* crust which supports a wide variety of other species. A dense carpet of ascidians *Molgula manhattensis*, *Polycarpa* spp. and *Polyclinum aurantium*, a turf of bryozoans (*Cellaria sinuosa*, *Bugula plumosa* and *Flustra foliacea*) and sponges such as *Scypha ciliata* and *Polymastia* spp., bryozoans *Alcyonidium diaphanum* and *Scrupocellaria* sp. and *Antedon bifida* may also be present. In some cases this biotope occurs adjacent to MolPol although in deeper water and more tide-swept (scour/turbulent) conditions.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scypha ciliata	●●●●●	●●	Occasional
Pachymatisma johnstonia	●●●	●●	Occasional
Tethya aurantium	●●●	●●	Occasional
Polymastia mamillaris	●●●	●●	Occasional
Cliona celata	●●●●	●●	Occasional
Esperiopsis fucorum	●●●	●●	Occasional
Dysidea fragilis	●●●●	●●	Frequent
Tubularia indivisa	●●●	●●	Frequent
Nemertesia antennina	●●●●	●●	Frequent
Nemertesia ramosa	●●●	●●	Occasional
Hydrallmania falcata	●●●●	●●	Occasional
Sertularia argentea	●●●●	●●	Occasional
Alcyonium digitatum	●●●●●	●	Occasional
Urticina felina	●●●●●	●	Frequent
Sagartia elegans	●●●●●	●	Occasional
Actinothoe sphyrodeta	●●●●	●●	Frequent
Sabellaria spinulosa	●●●●●	●●	Common
Balanus crenatus	●●●●	●	Frequent
Pagurus bernhardus	●●●●●	●	Occasional
Inachus phalangium	●●●●	●●	Occasional
Necora puber	●●●	●●	Occasional
Calliostoma zizyphinum	●●●	●●	Occasional
Ocenebra erinacea	●●●	●●	Rare
Alcyonidium diaphanum	●●●●●	●●	Frequent
Vesicularia spinosa	●●●●	●●	Occasional
Flustra foliacea	●●●●●	●●	Frequent
Cellaria sinuosa	●●●	●●	Frequent
Bicellariella ciliata	●●●●	●●	Occasional
Bugula flabellata	●●●●●	●●	Occasional
Bugula plumosa	●●●●●	●●	Frequent
Bugula turbinata	●●●	●●	Frequent

Antedon bifida	•••	••	Frequent
Asterias rubens	•••••	•	Frequent
Polyclinum aurantium	••••	••	Common
Polycarpa scuba	••••	••	Abundant
Dendrodoa grossularia	••••	•	Common
Molgula manhattensis	•••••	••	Frequent
Corallinaceae	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R7	Seven Sisters	Wood & Jones 1986		??
R9	Bishop and Clerks			
R10	Lleyn	Hiscock 1984b	3.2.9	? (sparse information)
R10	Holy Island			
R11	Burrow Head	Covey In prep.b	R11.33	=
IR1	Off Foyle	Erwin *et al*. 1990	1(C) p39	=

Frequency of occurrence

In Britain: Scarce

SfR *Soft rock communities*

MCR.Pid Piddocks with a sparse associated fauna in upward-facing circalittoral very soft chalk or clay

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock, with flint cobbles
Zone:	Infralittoral, Circalittoral
Other features:	Chalk; clay

Biotope description

Horizontal plains of soft chalk and firm clay bored by bivalves. Species vary with location but *Pholas dactylus*, *Barnea candida* and *Zirfaea crispata* are recorded regularly. Found mainly in south-east England (Sussex and Thanet) although some Irish records exist. Other species present include *Polydora ciliata* and *Crepidula fornicata*. The rock surface is very friable or erodes very quickly and therefore unsuitable for larger species to settle and attach.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria panicea	•••••	•	Occasional
Tubularia indivisa	•••••	••	Occasional
Nemertesia antennina	•••	••	Occasional
Sertularia argentea	••••	••	Occasional
Alcyonium digitatum	••••	•	Occasional
Urticina felina	•••••	•	Occasional
Sagartia troglodytes	•••••	••	Occasional
Sabellaria spinulosa	•••	••	Occasional
Lanice conchilega	••••	•	Occasional
Sabella pavonina	•••	••	Rare
Pomatoceros triqueter	••••	•	Frequent
Balanus crenatus	••••	•	Occasional
Pisidia longicornis	••••	••	Occasional
Cancer pagurus	•••••	••	Frequent
Necora puber	•••••	••	Occasional
Pholas dactylus	•••	•••	Occasional
Barnea candida	•••	•••	Common
Barnea parva	••••	•••	Common
Alcyonidium diaphanum	••••	••	Occasional
Flustra foliacea	••••	••	Occasional
Asterias rubens	•••••	•	Frequent
Molgula manhattensis	••••	••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Thanet		MNCR data	
R7	W Sussex	Irving 1994	4.1.2 & 4.1.3	
R7	Brighton	Wood 1992		
Other	Chalk coasts	George, Tittley & Wood In prep	CC.S23	
IR6	Inner Galway Bay			

Frequency of occurrence

In Britain: Scarce

SfR *Soft rock communities*

MCR.Pol *Polydora* sp. tubes on upward-facing circalittoral soft rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Circalittoral
Other features:	Chalk; limestone

Biotope description

Large patches of upward-facing chalk and soft limestone covered entirely by *Polydora* sp. tubes to the exclusion of almost all other species. Also with *Cliona celata* - boring form only. In a few cases this biotope occurs in small patches amongst other biotopes.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cliona celata	••••	••	Frequent
Polydora	•••••	••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Kent	Wood 1989		
R9	Gower	Hiscock 1979	4.2.5	
Other	Chalk coasts	George, Tittley & Wood In prep	CCS19	In part

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.AntAsH *Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy bedrock or boulders; mixed muddy substrata
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Typically found in sheltered parts of sealochs which might be subject to slight tidal currents. No one phyla or species dominates the rock but the most conspicuous comprise featherstars (*Antedon bifida*, *Antedon petasus* and more rarely *Leptometra celtica*), solitary ascidians (e.g. *Ascidia mentula*) and fine hydroids (*Kirchenpaueria pinnata*, *Halecium halecinum* and *Bougainvillia ramosa*). In the sealochs, where the three species of featherstar are found at the same site *Antedon petasus* is often the more abundant featherstar in deeper water whereas *A. bifida* tends to dominate the shallower regions. *Leptometra celtica* tends to occur in deep water and is also found on rocks on mud plains. *Caryophyllia smithii*, serpulid worms, *Balanus balanus, Munida rugosa*, brachiopods, some brittlestars, and algal crusts are all typically present. Crustose sponges such as *Hymedesmia paupertas* may occur on vertical faces. In deep water at some sites in sealochs *Mycale lingua* and *Leptometra celtica* are found on upward facing rock. This biotope has some overlaps with the solitary ascidian biotopes (As) although these tend to occur is slightly more sheltered conditions with little or no tidal flow.

Similar biotopes

CR.Ant	CR.Ant tends to be shallower and is generally species-poor with more grazed crustose species
MCR.As	Similar suites of species although with fewer feather stars

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Suberites carnosus	•••	••	Occasional
Haliclona urceolus	•••	••	Occasional
Bougainvillia ramosa	•••	••	Occasional
Halecium halecinum	••••	••	Frequent
Halopteris catharina	•••	••	Frequent
Kirchenpaueria pinnata	•••••	••	Frequent
Nemertesia antennina	•••	••	Occasional
Nemertesia ramosa	••••	••	Frequent
Plumularia setacea	•••	••	Frequent
Sertularella polyzonias	•••	••	Occasional
Obelia dichotoma	••••	••	Frequent
Alcyonium digitatum	•••	•	Occasional
Protanthea simplex	•••	•••	Occasional
Caryophyllia smithii	•••••	••	Frequent
Sabella pavonina	•••	••	Occasional
Pomatoceros triqueter	•••••	•	Frequent
Serpula vermicularis	•••	••	Occasional
Protula tubularia	••••	••	Occasional

Munida rugosa	•••••	••	Frequent
Pododesmus patelliformis	•••	••	Frequent
Neocrania anomala	•••••	••	Common
Alcyonidium diaphanum	•••	••	Occasional
Antedon bifida	••••	••	Occasional
Antedon petasus	••••	•••	Frequent
Leptometra celtica	•••	•••	Occasional
Solaster endeca	•••	••	Occasional
Crossaster papposus	••••	••	Occasional
Asterias rubens	•••••	•	Occasional
Ophiothrix fragilis	••••	•	Frequent
Ophiocomina nigra	•••	•	Occasional
Ophiura albida	••••	••	Frequent
Echinus esculentus	•••••	•	Occasional
Clavelina lepadiformis	••••	••	Occasional
Ciona intestinalis	••••	••	Occasional
Corella parallelogramma	•••••	••	Occasional
Ascidia mentula	••••	••	Occasional
Ascidia virginea	••••	••	Occasional
Polycarpa pomaria	•••	••	Occasional
Corallinaceae	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Mull	Bishop 1984	3.5.2.B	?
R13	Islay/Jura	Hiscock 1983	3.2.12	?
Other	Sealochs	Howson, Connor & Holt 1994	SL52	
Other	Norwegian fjords	Connor 1991	NF11	??

Frequency of occurrence

In Britain: Uncommon

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.SubSoAs *Suberites* spp. and other sponges with solitary ascidians on very sheltered circalittoral rock

Habitat classification

		Previous code	
Salinity:	Full, Variable	SCR.SSoAs	96.7
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:	Weak, Very weak		
Substratum:	Bedrock; boulders		
Zone:	Circalittoral		

Biotope description

Silty very sheltered circalittoral rock, (often vertical surfaces) subject to only weak tidal streams with a rich mixture of sponges (*Polymastia boletiformis*, *Suberites carnosus*, occasionally *Suberites ficus*, *Iophon hyndmanni*, *Dysidea fragilis*, *Raspailia ramosa* and *Stelligera rigida*) and a variety of large solitary ascidians (*Ascidia virginea*, *Ascidiella aspersa*, *Ascidia mentula* and, more rarely, *Phallusia mammillata* and *Styela clava*).

Similar biotopes

SCR.AmenCio	Sealoch biotope in similarly sheltered habitat. SubSoAs has greater variety of sponges.
MCR.ErSEun	ErSEun contains similar sponges but differs in rest of composition.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	••••	••	Occasional
Tethya aurantium	••••	••	Frequent
Suberites carnosus	••••	••	Frequent
Polymastia boletiformis	••••	••	Frequent
Polymastia mamillaris	••••	••	Frequent
Stelligera rigida	•••	••	Frequent
Stelligera stuposa	••••	••	Occasional
Raspailia hispida	•••	••	Occasional
Raspailia ramosa	••••	••	Frequent
Esperiopsis fucorum	••••	••	Frequent
Iophon hyndmani	•••	••	Frequent
Hemimycale columella	•••	••	Occasional
Haliclona simulans	•••	••	Frequent
Dysidea fragilis	••••	••	Frequent
Nemertesia antennina	•••	••	Occasional
Caryophyllia smithii	•••	••	Frequent
Alcyonidium diaphanum	•••	••	Common
Henricia oculata	••••	••	Occasional
Marthasterias glacialis	•••	••	Occasional
Clavelina lepadiformis	•••	••	Occasional
Aplidium punctum	•••	••	Common
Didemnidae	•••	••	Occasional
Ciona intestinalis	•••	•	Occasional
Corella parallelogramma	•••	••	Common
Ascidia mentula	••••	••	Frequent
Ascidia virginea	••••	••	Common
Botryllus schlosseri	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R7	Southampton docks	Collins & Mallinson 1987		
R8	Devon & Cornwall rias	Moore In prep	SWI.70	
R9	Milford Haven			
R13	Loch Feochan			
R13	Jura			
R14	Uist			
IR5	Bantry Bay	Emblow *et al*. 1994	BB19	
IR8	Mulroy Bay	Picton *et al*. 1994	MS38	

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.AmenCio Solitary ascidians, including *Ascidia mentula* and *Ciona intestinalis*, on very sheltered circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	5-10m, 10-20m, 20-30m

Previous code

SCR.SoAs in part 96.7

Biotope description

Upper circalittoral, often vertical, bedrock and steep boulder slopes in generally sheltered conditions with little tidal flow and typically with *Ascidia mentula* and *Ciona intestinalis*. Brachiopods and/or *Protanthea simplex* found at some sites (where this biotope may occur above NeoPro for example) and sponges include small amounts of *Esperiopsis fucorum*, *Suberites carnosus*, *Polymastia mamillaris* and barnacles often frequent. Hydroids such as *Halecium halecinum* often present. The large ascidian *Phallusia mammillata* seems to occasionally occur in this biotope. Some of the Irish examples of this biotope have *Corynactis* in shallow water. In extreme shelter, but with perhaps slightly more tidal flow, a more species-rich biotope with solitary ascidians and more sponge (SubSoAs) is found.

Similar biotopes

SCR.AntAsH	Tends to be more species-rich; found in slightly more wave and tide-exposed situations.
SCR.SubSoAs	A more sponge-rich biotope but with similar solitary ascidians

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halecium halecinum	••	••	Occasional
Kirchenpaueria pinnata	••	••	Occasional
Nemertesia antennina	••	••	Occasional
Caryophyllia smithii	••••	••	Occasional
Pomatoceros triqueter	••••	•	Frequent
Protula tubularia	••	••	Occasional
Balanus balanus	••	••	Occasional
Balanus crenatus	••	•	Frequent
Munida rugosa	•••	••	Occasional
Neocrania anomala	••	••	Occasional
Antedon bifida	•••	•	Occasional
Antedon petasus	•••	•••	Frequent
Clavelina lepadiformis	••••	•	Occasional
Ciona intestinalis	••••	•	Frequent
Corella parallelogramma	••••	••	Occasional
Ascidia mentula	•••••	••	Frequent
Corallinaceae	•••••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Sullom Voe			
R12	Clyde sealochs			
R13	Jura			
R13	Loch Sunart			
R14	Lochs Seaforth & Maddy			
R15	Skye sealochs			
R15	Lochs Gareloch, Ewe, Duich & a'Chairn Bhain			
Other	Sealochs	Howson, Connor & Holt 1994	SL53	=
Other	Sealochs	Howson, Connor & Holt 1994	SL54	?
IR4	Lough Hyne			
IR6	Kilkieran Bay			

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.AmenCio.Met Large *Metridium senile* and solitary ascidians on very sheltered circalittoral rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock, boulders or cobbles
Zone:	Circalittoral
Other features:	Silty

Previous code

SCR.MetAs	96.7

Biotope description

Very sheltered circalittoral rock with very large *Metridium senile* (possibly where slight tidal streams pass over rocky ridges) and a variety of solitary ascidians including *Ascidia mentula* and *Ciona intestinalis*. Much of the rock surface appears *Echinus*-grazed and is covered in silt and coralline crusts with sparse *Pomatoceros triqueter*. Occasional *Bolocera tuediae* found at some sites in the north Clyde sealochs. Other species include *Edwardsiella carnea*, *Sarcodictyon roseum* and sparse *Modiolus modiolus*. Often found in shallow water above the *Neocrania* and *Protanthea* biotope (NeoPro) and just below *Laminaria saccharina* forest but has often been included as part of one of these biotopes. This biotope is distinct from other *Metridium*-dominated types (e.g. those which occur on strongly tide-swept and exposed circalittoral rock and steel wreckage) in that most of the associated fauna is characteristic of very sheltered conditions.

Similar biotopes

SCR.AmenCio	Influence of slight tidal flow over rocky ridges encourages large *Metridium* as well as solitary ascidians

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Sarcodictyon roseum	••	•••	Rare
Alcyonium digitatum	•••	•	Rare
Protanthea simplex	•••	•••	Rare
Bolocera tuediae	••	••	Rare
Metridium senile	•••••	••	Frequent
Edwardsiella carnea	••	•••	Occasional
Pomatoceros triqueter	••••	•	Occasional
Pagurus bernhardus	•••	•	Frequent
Cancer pagurus	•••	•	Rare
Liocarcinus depurator	•••	•	Occasional
Carcinus maenas	•••	•	Occasional
Asterias rubens	•••	•	Occasional
Ophiothrix fragilis	•••	•	Occasional
Ophiocomina nigra	•••	•	Rare
Psammechinus miliaris	••••	••	Frequent
Echinus esculentus	•••	•	Occasional
Clavelina lepadiformis	•••	••	Frequent
Ascidia mentula	•••	••	Occasional
Corallinaceae	•••	•	Frequent

Distribution

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

R1	Ronas Voe
R12	Clyde sealochs
R13	Sound of Mull
R15	Skye sealochs

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.Aasp *Ascidiella aspersa* on sheltered circalittoral rocks on muddy sediment

Habitat classification

Salinity:	Full, Variable	
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	
Tidal streams:	Weak, Very weak	
Substratum:	Bedrock or boulders on muddy shell gravel	
Zone:	Circalittoral	

Previous code

SCR.SoAs in part 96.7

Biotope description

Sheltered bedrock and/or boulders on muddy sediment, sometimes subject to variable salinity, with high numbers of *Ascidiella aspersa* and a variety of other solitary ascidians capable of colonising small fragments of hard substrata (shells etc.). *Dendrodoa grossularia* usually present. Less species-rich than the other ascidian biotopes (AmenCio and SubSoAs). Sparse *Antedon* spp., *Ophiothrix fragilis* and hydroids such as *Halecium halecinum* and *Kirchenpaueria pinnata*. *Liocarcinus depurator* often present on the sediment. Similar epifaunal communities are found on *Crepidula fornicata* (CreTha) beds with shell debris, oyster beds (Ost), *Modiolus* beds (ModHAs) and on cobbles and stones - all in estuarine conditions.

Similar biotopes

IMX.Ost	Can have similar epifaunal communities
IMX.CreAph	Can have similar epifaunal communities

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halecium halecinum	••	••	Occasional
Kirchenpaueria pinnata	••	••	Occasional
Terebellidae	•••	•	Occasional
Pomatoceros triqueter	•••	•	Frequent
Balanus crenatus	••••	•	Frequent
Munida rugosa	••	••	Occasional
Hyas araneus	•••	••	Occasional
Neocrania anomala	••	••	Frequent
Antedon bifida	••	••	Occasional
Echinus esculentus	••••	•	Occasional
Corella parallelogramma	•••	••	Occasional
Ascidiella aspersa	•••••	••	Frequent
Dendrodoa grossularia	•••	•	Occasional
Corallinaceae	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Ronas Voe & Stromness Voe			
R12	Clyde sealochs			
R13	Lochs Sunart, Etive & Craignish			
R14	Loch Seaforth			
R15	Loch Nevis			
Other	Sealochs	Howson, Connor & Holt 1994	SL67	=
IR8	Mulroy Bay			

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.NeoPro *Neocrania anomala* and *Protanthea simplex* on very sheltered circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m

Previous code

SCR.NeoPro	96.7

Biotope description

Deep rock (often vertical walls) in the landward basins of fjordic sealochs often have dense *Protanthea simplex* growing on rock and tubes of *Chaetopterus* sp. and amongst *Sabella pavonina*. The underlying rock surfaces are covered with *Neocrania anomala* and large solitary ascidians such as *Corella parallelogramma*, *Polycarpa pomaria*, *Ascidia mentula* and *Ascidia virginea* are often present amongst the worm tubes. ROV records in Loch Duich from 60-160 m show a gradual change from the above to a community dominated by white *Sabella* and large numbers of *Protula tubularia*.

Similar biotopes

SCR.NeoPro.CaTw	With *Placostegus*, although similar in some other respects

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Bougainvillia ramosa	●●●	●●	Occasional
Alcyonium digitatum	●●●	●	Occasional
Protanthea simplex	●●●●●	●●●	Common
Metridium senile	●●●	●	Occasional
Chaetopterus variopedatus	●●●	●●	Frequent
Sabella pavonina	●●●●	●●	Frequent
Pomatoceros triqueter	●●●●●	●	Frequent
Protula tubularia	●●●	●●	Occasional
Balanus balanus	●●	●●	Rare
Pagurus bernhardus	●●●●	●	Occasional
Munida rugosa	●●●	●●	Occasional
Carcinus maenas	●●●	●	Occasional
Buccinum undatum	●●●	●	Occasional
Pododesmus patelliformis	●●●	●●	Occasional
Neocrania anomala	●●●●●	●●	Frequent
Asterias rubens	●●●●	●	Occasional
Ophiothrix fragilis	●●●●	●	Frequent
Ophiocomina nigra	●●●	●	Occasional
Ophiura albida	●●	●●	Occasional
Psammechinus miliaris	●●●	●●	Occasional
Echinus esculentus	●●●●	●	Occasional
Ciona intestinalis	●●●●●	●●	Occasional
Corella parallelogramma	●●●●	●●	Occasional
Ascidia mentula	●●●●	●●	Occasional
Ascidia virginea	●●●●	●●	Occasional
Polycarpa pomaria	●●●	●●	Rare
Corallinaceae	●●●●	●	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R12	Clyde sealochs			
R13	Lochs Sunart and Scridain			
R13	Loch Melfort	Buehr 1984	Sites 1 & 2	
R15	Lochs Duich, Long, Ailort, Nevis and Inchard			
Other	Sealochs	Howson, Connor & Holt 1994	SL55	
Other	Norwegian fjords	Connor 1991	NF13	

Frequency of occurrence

In Britain: Uncommon

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.NeoPro.CaTw Brachiopods, calcareous tubeworms (*Placostegus tridentatus*, *Hydroides*) and sponges on variable salinity circalittoral rock

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Very sheltered
Tidal streams:	Very weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral - lower
Depth band:	10-20m, 20-30m

Previous code

SCR.NeoCaTub 96.7

Biotope description

Deep (20-30 m+) bedrock in fjordic sealochs where slight fluctuations in salinity might influence the biotope structure. *Neocrania anomala*, *Pomatoceros triqueter* and *Placostegus tridentatus* occur with large sponges *Clathria barleei*, *Axinella infundibuliformis* and the crustose *Phakellia vermiculata*. This biotope has some similarities with NeoPro.Den although occurs in more open lochs and tends to be more species-rich with erect sponges and solitary ascidians typical of the sheltered conditions.

Similar biotopes

SCR.NeoPro.Den	Similar in respect of variable salinity, although tends to be more species-rich

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Polymastia boletiformis	••	••	Occasional
Axinella infundibuliformis	••	••	Occasional
Clathria barleei	•••	•••	Occasional
Halecium halecinum	••	••	Occasional
Kirchenpaueria pinnata	••	••	Occasional
Nemertesia antennina	••	••	Occasional
Alcyonium digitatum	••	•	Occasional
Gonactinia prolifera	••	••	Frequent
Urticina eques	••	••	Rare
Caryophyllia smithii	••	••	Frequent
Terebellidae	•••	•	Occasional
Sabella pavonina	•••	••	Occasional
Hydroides norvegica	•••	••	Frequent
Placostegus tridentatus	••••	•••	Occasional
Pomatoceros triqueter	•••••	•	Frequent
Serpula vermicularis	•••	••	Occasional
Balanus balanus	•••	••	Occasional
Cancer pagurus	•••	•	Rare
Neocrania anomala	•••••	••	Abundant
Parasmittina trispinosa	••••	••	Occasional
Securiflustra securifrons	•••	••	Occasional
Porania pulvillus	•••	••	Occasional
Henricia	••••	••	Occasional
Asterias rubens	•••••	•	Occasional
Marthasterias glacialis	•••	••	Occasional
Echinus esculentus	•••	•	Occasional
Ascidiella scabra	•••	••	Occasional
Ascidia mentula	••••	••	Occasional
Ascidia virginea	•••	••	Occasional

Corallinaceae	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R12	Loch Fyne			
R13	Loch Leven			
R15	Loch Ewe			
IR5	Kenmare River			
Other	Norway	Connor 1991		

Frequency of occurrence

In Britain: Scarce

BrAs *Brachiopod and solitary ascidian communities (sheltered rock)*

SCR.NeoPro.Den *Neocrania anomala*, *Dendrodoa grossularia*, and *Sarcodictyon roseum* on reduced or low salinity circalittoral rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m
Other features:	Peaty water; very low light level

Previous code

SCR.NeoDen	96.7

Biotope description

This biotope is a variant of the *Neocrania* biotopes which characterise steep circalittoral rock in the landward basins of fjordic sealochs, although in this case it is found only in Loch Etive. There is very little water movement and salinity fluctuates considerably through the year, even in deep (20 m +) water. The near-bare granite supports relatively few species with patches of dense *Dendrodoa grossularia*, small lines of *Sarcodictyon roseum*, sometimes abundant *Neocrania anomala*, a few *Terebratulina retusa* and *Placostegus tridentatus* (which broadly resemble *Pomatoceros triqueter*). The solitary ascidians *Corella parallelogramma*, *Ascidiella scabra* and *Ascidia virginea* are also associated with this biotope. *Echinus*-grazed 'barren' rock is found in other sealochs in Scotland and Ireland occasionally with a similar suite of encrusting fauna. However, *Echinus* were not present in Loch Etive and the bareness of the rock is almost certainly attributable to the variable/low salinity.

Similar biotopes

SCR.NeoPro	Similarly sheltered habitat but NeoPro.Den occurs in reduced salinity conditions

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Pachymatisma johnstonia	•••	••	Rare
Suberites carnosus	•••	••	Rare
Bougainvillia ramosa	•••	••	Occasional
Lafoea dumosa	••••	•••	Occasional
Halopteris catharina	••	••	Occasional
Sarcodictyon roseum	••••	•••	Occasional
Caryophyllia smithii	•••	••	Frequent
Chaetopterus variopedatus	••	•	Rare
Sabella pavonina	••••	••	Occasional
Placostegus tridentatus	•••	•••	Occasional
Neocrania anomala	••••	••	Frequent
Terebratulina retusa	•••	••	Occasional
Eucratea loricata	••	•••	Rare
Crossaster papposus	••••	••	Occasional
Psolus phantapus	•••	•••	Occasional
Ciona intestinalis	•••	••	Occasional
Corella parallelogramma	•••	••	Occasional
Ascidiella scabra	••••	••	Occasional
Ascidia mentula	••	••	Occasional
Polycarpa pomaria	••	••	Frequent
Dendrodoa grossularia	•••••	•	Common
Thorogobius ephippiatus	•••	••	Occasional

Distribution

Sector	***Area***	***Source***	***Section/page***	***Equivalence***
R13	Loch Etive	Howson, Connor & Holt 1994	SL56	=
Other	W Scotland lagoons	Covey, Thorpe & Nichols In prep	Lag.27	?

Frequency of occurrence

In Britain: Scarce

Mod *Sheltered* Modiolus *(horse-mussel) beds*

SCR.ModCvar *Modiolus modiolus* beds with *Chlamys varia*, sponges, hydroids and bryozoans on slightly tide-swept very sheltered circalittoral mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Pebble and shells on muddy sediments
Zone:	Circalittoral

Previous code

SCR.ModSHBy 96.7

Biotope description

Dense *Modiolus modiolus* beds, covered by sponges, hydroids and bryozoans, on soft shelly mud in areas of slight tidal currents. The clams *Chlamys varia* and *Aequipecten opercularis* are present in large numbers amongst the *Modiolus* shells. Sponges include *Mycale rotalis*, *Mycale macilenta*, *Mycale similaris*, *Spanioplon armaturum*, *Iophon hyndmani* and *Haliclona* spp. The holothurians *Thyone fusus* and *Thyonidium drummondii* and the ascidian *Pyura microcosmus* are also present. This biotope is found in Strangford Lough where the *Modiolus* beds are well developed. Similar communities have been found on cobble and pebble plains in stable, undisturbed conditions in other sealochs. However, not all these examples have *Modiolus* beds.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Mycale macilenta	••	••	Occasional
Mycale rotalis	••	••	Occasional
Iophon hyndmani	••	••	Occasional
Spanioplon armaturum	••	••	Occasional
Haliclona urceolus	••	••	Occasional
Alcyonium digitatum	•••	•	Occasional
Cerianthus lloydii	•••	•	Frequent
Urticina felina	•••••	•	Frequent
Terebellidae	•••	•	Occasional
Pomatoceros triqueter	•••••	•	Common
Serpula vermicularis	••	••	Occasional
Balanus balanus	••••	••	Frequent
Pagurus bernhardus	•••••	•	Frequent
Hyas araneus	••••	••	Occasional
Inachus dorsettensis	•••	••	Occasional
Macropodia rostrata	••••	••	Occasional
Liocarcinus depurator	••••	••	Occasional
Gibbula cineraria	••••	•	Frequent
Calliostoma zizyphinum	•••••	•	Occasional
Buccinum undatum	•••••	••	Rare
Pleurobranchus membranaceus	••••	••	Frequent
Modiolus modiolus	•••••	••	Abundant
Chlamys varia	•••	••	Abundant
Aequipecten opercularis	••••	••	Abundant
Antedon bifida	•••••	•	Common
Asterias rubens	•••••	•	Frequent
Ophiothrix fragilis	•••••	•	Frequent
Ophiocomina nigra	••••	•	Occasional
Psammechinus miliaris	•••	••	Frequent

Echinus esculentus	●●●●●	●	Frequent
Thyone fusus	●●	●●	Rare
Thyone roscovita	●●●	●●	Occasional
Thyonidium drummondii	●●	●●●	Occasional
Ciona intestinalis	●●●●	●	Frequent
Corella parallelogramma	●●●●●	●●	Frequent
Ascidiella aspersa	●●●	●	Frequent
Pyura microcosmus	●●	●●●	Occasional
Lithothamnion glaciale	●●●●	●●	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
IR2	Strangford Lough	Erwin *et al*. 1990	Table 38	

Mod *Sheltered* Modiolus *(horse-mussel) beds*

SCR.ModHAs *Modiolus modiolus* beds with fine hydroids and large solitary ascidians on very sheltered circalittoral mixed substrata

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Boulders, cobbles and shells on muddy sediment
Zone:	Circalittoral

Biotope description

Beds or scattered clumps of *Modiolus modiolus* in generally sheltered conditions with only slight tidal movement. Typically occurs in sealochs and the Shetland voes. Large solitary ascidians (*Ascidiella aspersa*, *Corella parallelogramma*, *Ciona intestinalis*) and fine hydroids (*Bougainvillia ramosa*, *Kirchenpaueria pinnata*) present attached to the mussel shells. Decapods such as spider crabs and *Munida rugosa* typically present. Coralline algal crusts on the mussel shells, with some red seaweeds in shallower water. *Aequipecten opercularis* often present in moderate abundances. The much richer version of this biotope ModCvar has far more sponges and hydroids growing on and amongst the *Modiolus* and large numbers of *Chlamys varia*. Brittlestars *Ophiothrix fragilis* and *Ophiocomina nigra*, as well as *Ophiopholis aculeata* are often common, sometimes forming a dense bed as described in Oph. The biotope ModHo, characterised by *Modiolus* and holothurians occurs in similar physiographic features, although seems to be in softer sediment in some cases. There may some overlap in these two biotopes as several of the holothurians extend their tentacles above the surface of the sediment for only a limited amount of time during the year.

Similar biotopes

CMX.ModHo	Distinguished by presence of burrowing holothurians, although they might not be visible at the surface if their tentacles are retracted.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Kirchenpaueria pinnata	•••	••	Occasional
Cerianthus lloydii	•••	••	Occasional
Terebellidae	•••	•	Frequent
Pomatoceros triqueter	•••	•	Frequent
Protula tubularia	•••	••	Occasional
Pagurus bernhardus	••••	•	Occasional
Munida rugosa	•••	••	Frequent
Hyas araneus	•••	••	Occasional
Liocarcinus depurator	•••	••	Occasional
Buccinum undatum	•••••	•	Occasional
Modiolus modiolus	•••••	••	Frequent
Aequipecten opercularis	••••	••	Frequent
Crossaster papposus	•••	••	Rare
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	••••	•	Occasional
Ophiura albida	•••	••	Occasional
Psammechinus miliaris	•••	••	Occasional
Echinus esculentus	••••	•	Occasional
Ciona intestinalis	•••	••	Rare
Corella parallelogramma	•••	••	Occasional

Ascidiella aspersa	●●●	●●	Occasional
Dendrodoa grossularia	●●	●	Occasional
Corallinaceae	●●●	●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Hiscock 1986	7	
R1	Shetland	Pearson, Coates & Duncan 1994	SH1	
R12	Clyde sealochs			
R13	Lochs Leven, Creran and Sunart			
R15	Skye sealochs, Lochs Duich, Ewe and Broom			
Other	Sealochs	Howson, Connor & Holt 1994	SL68	
IR2	Carlingford Lough	Erwin *et al*. 1990	Table 36	

Frequency of occurrence

In Britain: Uncommon

FaV *Faunal turfs (deep vertical rock)*

CR.Ant *Antedon bifida* and a bryozoan/hydroid turf on steep or vertical circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock
Zone:	Circalittoral
Other features:	Vertical or overhanging bedrock

Biotope description

Steep and vertical slopes of bedrock in slightly tide-swept conditions with dense aggregations of *Antedon bifida*, in some locations with a bryozoan turf. The dense aggregations of *Antedon* also extend into infralittoral where they occur on kelp stipes (see EIR.LhypR). *Bugula* spp., *Abietinaria abietina* and *Nemertesia antennina* are often found at the same sites and there are also examples with dense *Ciona intestinalis* and *Pomatoceros triqueter*. Some examples are particularly impoverished with little beneath the feather stars other than coralline crusts (e.g. Summer Isles and Loch Broom). High densities of *Antedon* are widely found, sometimes also in sheltered, silty conditions. Further consideration required of this biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Frequent
Urticina felina	•••	•	Frequent
Terebellidae	••••	••	Occasional
Pomatoceros triqueter	•••••	•	Abundant
Gibbula cineraria	••••	•	Occasional
Parasmittina trispinosa	•••	••	Occasional
Antedon bifida	•••••	••	Common
Porania pulvillus	•••	••	Rare
Asterias rubens	•••••	•	Occasional
Ophiothrix fragilis	••••	•	Occasional
Ophiocomina nigra	••••	•	Frequent
Echinus esculentus	•••••	•	Frequent
Ciona intestinalis	•••	••	Frequent
Corallinaceae	•	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R9	W Pembrokeshire	Hiscock 1980	4.2.1 (2nd half)	
R13	Firth of Lorne	Buehr 1984	4.2.3.2 (1st half)	In part
R15	North Skye			
R15	Summer Isles, Loch Broom			

FaV *Faunal turfs (deep vertical rock)*

CR.Bug *Bugula* spp. and other bryozoans on vertical moderately exposed circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Bedrock; boulders
Zone:	Circalittoral
Other features:	Overhanging and vertical faces

Previous code

MCR.Bug	96.7

Biotope description

Vertical rock faces in the circalittoral (often at same depth as lower infralittoral biotopes as well as deeper) with a dense turf of *Bugula* spp. and *Scrupocellaria* spp. and the sponges *Tethya aurantium*, *Pachymatisma johnstonia*, *Hemimycale columella* and occasionally *Dercitus bucklandi* in crevices are often present. Also patches of *Nemertesia antennina* and *Crisia eburnea*. Most surfaces also with a thin cover of *Cryptopleura*, *Rhodophyllis* 'spiky' and *Plocamium*. Some areas may have large patches of *Clavelina* and a few areas with *Perophora*, *Polycarpa scuba* and *Ascidia mentula*. *Antedon bifida* also occurs in crevices. *Bugula turbinata* tends to predominate in shallower records of this biotope, whereas deeper records have a mixture of at least three *Bugula* spp., dominated by *B. plumosa*. Many of the records with this biotope have been recorded as parts of other habitat records despite the clarity in which this biotope occupies vertical faces of almost any size in some parts of the country, particularly in Wales and further south in the Irish Sea. Softer rock faces bored by *Hiatella arctica* (IR.AlcByH.Hia) tend to be more species-rich, reflecting the large number of niches and holes inhabited by small cryptic species.

Similar biotopes

IR.AlcByH.Hia	Similar range of species although on softer limestone bored by bivalves

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	••	••	Occasional
Pachymatisma johnstonia	•••	••	Occasional
Cliona celata	••	••	Rare
Stelligera rigida	••	••	Occasional
Halichondria panicea	••	•	Rare
Haliclona viscosa	••	••	Rare
Dysidea fragilis	••••	••	Occasional
Tubularia indivisa	••	•	Rare
Actinothoe sphyrodeta	•••	••	Frequent
Balanus crenatus	•••	•	Occasional
Scrupocellaria reptans	•••	••	Frequent
Bicellariella ciliata	•••	••	Frequent
Bugula flabellata	••	••	Frequent
Bugula plumosa	••	••	Occasional
Bugula turbinata	••••	••	Frequent
Aplidium punctum	••	••	Frequent
Lissoclinum perforatum	••	••	Rare
Botrylloides leachi	••	•	Occasional
Plocamium cartilagineum	••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Western Channel			
R10	Bardsey / Lleyn		R10.VBug	=
R10	Anglesey / Menai Strait			

CR.SCup Sponges, cup corals and *Parerythropodium coralloides* on shaded or overhanging circalittoral rock

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Weak, Very weak
Substratum:	Bedrock
Zone:	Circalittoral
Other features:	Overhangs; caves

Previous code

MCR.SCupPar 96.7

Biotope description

This biotope occurs on shaded and overhanging rock, such as on cave walls and ceilings although there are very few records of caves in conditions not subject to wave surge (i.e. deeper circalittoral habitats) and almost all are different in species composition. There are also a few examples of similar communities on very deep (70-100 m+) upward facing rock (in Loch Hourn) and more may be found though the use of ROVs. These often species-rich habitats are almost invariably adjacent to well-mixed turbulent water. Characteristic species include the sponges *Stryphnus ponderosus*, *Dercitus bucklandi*, *Chelonaplysilla noevus*, *Pseudosuberites* sp. and *Spongosorites* sp., the anemones *Parazoanthus* spp., the cup corals *Leptopsammia pruvoti*, *Hoplangia durotrix*, *Caryophyllia inornatus* and the soft coral *Parerythropodium coralloides*. *Thymosia guernei* is sometimes present. Likely to need further splitting with analysis and data from west coast of Ireland.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Clathrina coriacea	•••	••	Common
Dercitus bucklandi	••	••	Common
Stelletta grubii	•••	••	Common
Stryphnus ponderosus	•	•••	Occasional
Thymosia guernei	•	••	Occasional
Spongosorites	•	••	Occasional
Parerythropodium coralloides	•••	••	Abundant
Parazoanthus axinellae	••	••	Occasional
Parazoanthus anguicomus	••	••	Occasional
Caryophyllia smithii	•••	•	Occasional
Hoplangia durotrix	••	•••	Occasional
Leptopsammia pruvoti	••	•••	Occasional
Parablennius gattorugine	••	••	Occasional
Thorogobius ephippiatus	•••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	NE England	Foster-Smith 1992	SV11 & MV11	?
R7	Isle of Wight	Wood 1992	4	?
R8	Scillies (Gat Pt)		K. Hiscock pers. comm. 1997	
R9	W Pembrokeshire	Hiscock 1980		
R9	Skomer	Bunker, Picton & Morrow 1992	3.3.2	
R14	St Kilda	Howson & Picton 1985	5.7	?in part
Other	Chalk coasts	George, Tittley & Wood In prep	CC.S17	
IR1	Rathlin Island	Erwin *et al*. 1990	(E) Caves	
IR8	Mulroy Bay	Picton *et al*. 1994	MS39	

Frequency of occurrence

In Britain: Scarce

6.5 Sublittoral (subtidal) sediment biotopes

Mrl *Maerl beds (open coast/clean sediments)*

IGS.Phy *Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Maerl gravel and coarse sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m

Biotope description

Maerl beds characterised by *Phymatolithon calcareum* in gravels and sands. Associated epiphytes include red algae such as *Cryptopleura ramosa*, *Brongniartella byssoides* and *Plocamium cartilagineum* with *Desmarestia* spp. and *Dictyota dichotoma* also very often present. Algal species may be anchored to the maerl or to dead bivalve shells amongst the maerl. Polychaetes, such as *Chaetopterus variopedatus*, and the gastropods *Gibbula magus* and *Gibbula cineraria* may be present. *Liocarcinus depurator* and *Liocarcinus corrugatus* are often present, although they may be under-recorded; it would seem likely that robust infaunal bivalves such as *Circomphalus casina*, *Mya truncata* and *Dosinia exoleta* are more widespread than available data currently suggests. IGS.Phy contains two distinct entities depending on depth: a shallower type with red seaweeds (IGS.Phy.R) and a lower infralittoral entity with notably less epiphytic seaweeds (IGS.Phy.HEc). It seems likely that stable wave-sheltered maerl beds with low currents may be separable from IGS.Phy; having a generally thinner layer of maerl overlying a sandy /muddy substratum with a diverse cover of epiphytes (e.g. Bosence 1976; Blunden *et al.* 1977; 1981; Davies & Hall-Spencer 1996) but insufficient data currently exists on a national scale. Wave and current-exposed maerl beds, where thicker depths of maerl accumulate, frequently occur as waves and ridge / furrows arrangements (see Bosence 1976; Blunden *et al*. 1977; 1981; Irvine & Chamberlain 1994). At some sites where IGS.Phy occurs, there may be significant patches of maerl gravel containing the rare burrowing anemone *Halcampoides elongatus*; this may be a separate biotope, but insufficient data exists at present. Northern maerl beds in the UK do not appear to contain *L. corallioides* but in south-west England and Ireland *L. corallioides* may occur to some extent in IGS.Phy as well as IMX.Lcor, where it dominates.

Similar biotopes

CGS.Ven.Neo	*Neopentadactyla mixta* may occur in IGS.Phy, but deeper dead maerl can give rise to the CGS.Ven.Neo biotope

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Chaetopterus variopedatus	••	•	Occasional
Lanice conchilega	••	•	Occasional
Galathea intermedia	••	••	Occasional
Gibbula magus	••	••	Occasional
Gibbula cineraria	••	•	Occasional
Ensis arcuatus	••	•	Occasional
Circomphalus casina	••	••	Occasional
Dosinia exoleta	••	••	Occasional
Neopentadactyla mixta	••	••	Frequent
Lithothamnion corallioides	•	•••	Common
Phymatolithon calcareum	•••••	•••	Common
Plocamium cartilagineum	••	•	Frequent

Cryptopleura ramosa	••	•	Occasional
Brongniartella byssoides	••	•	Occasional
Dictyota dichotoma	•••	•	Occasional
Desmarestia aculeata	••	•	Occasional
Desmarestia viridis	••	•	Occasional
Laminaria saccharina	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Pearson, Coates & Duncan 1994	SH2	
R1	Shetland	Tittley *et al*. 1985		
R1	Shetland	Howson 1988	Habitat 41	
R2	Hoy, Wyre, Rousay and Shapinsay Sounds and Wide Firth		R2-4.Phy	
R8	Fal/Helford	Moore In prep	SWI.77	
R8	Falmouth	Davies & Sotheran 1995	p8	
R9	Milford Haven	Moore In prep	SWI.77	
R12	Clyde sealochs	Howson, Connor & Holt 1994	SL71	
R13	Jura/Mull	Howson, Connor & Holt 1994	SL71	
R14	Lochs Tarbet/ Uiskevagh/ Skipport/ Boisdale	Howson, Connor & Holt 1994	SL71	
R15	Summer Isles	Dipper 1981b	p11	
R15	Central/Skye/North-west sealochs	Howson, Connor & Holt 1994	SL71	
IR2	N. Ireland	Erwin *et al*. 1990	p37	
IR6	Galway Bay	Sides *et al*. 1994	KA24	

Frequency of occurrence

In Britain: Uncommon

Features of conservation interest

Phymatolithon calcareum and *Lithothamnion corallioides* are listed on the EC Habitats Directive Annex Vb. Recent studies have revealed infaunal species new to science (Davies & Hall-Spencer 1996).

Mrl *Maerl beds (open coast/clean sediments)*

IGS.Phy.R *Phymatolithon calcareum* maerl beds with red seaweeds in shallow infralittoral clean gravel or coarse sand

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Maerl gravel; coarse sand
Zone:	Infralittoral - upper
Depth band:	0-5 m, 5-10m

Biotope description

Upper infralittoral maerl beds characterised by *Phymatolithon calcareum* in gravels and sand with a wide variety of associated red seaweeds. These algae typically include *Chondrus crispus*, *Halarachnion ligulatum*, *Chylocladia verticillata*, *Hypoglossum hypoglossoides* and *Nitophyllum punctum*. These species are not restricted to maerl beds but their abundance on maerl beds differentiates this biotope from IGS.Phy.HEc. Anthozoans and echinoderms are much less common in this biotope than in IGS.Phy.HEc, which typically occurs deeper than IGS.Phy.R.

Similar biotopes

IGS.Phy.HEc	Phy.R is similar but shallower with more red seaweeds.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	•••	•	Occasional
Scinaia trigona	•••	••	Occasional
Bonnemaisonia asparagoides	••	•	Frequent
Dudresnaya verticillata	••	••	Frequent
Phymatolithon calcareum	•••••	•••	Common
Gracilaria gracilis	••	••	Frequent
Plocamium cartilagineum	•••	•	Frequent
Halarachnion ligulatum	••	••	Occasional
Hypoglossum hypoglossoides	••	•	Rare
Brongniartella byssoides	•••	•	Occasional
Sporochnus pedunculatus	••	••	Occasional
Desmarestia aculeata	•••	•	Occasional
Desmarestia viridis	•••	••	Occasional
Laminaria saccharina	••••	•	Occasional

Frequency of occurrence

In Britain: Uncommon

Features of conservation interest

Phymatolithon calcareum and *Lithothamnion corallioides* are listed on the EC Habitats Directive Annex Vb

Potentially damaging activities

Activity	*Degree of effect*
Fishing (including use of fixed and mobile gear)	
Molluscan shellfish farming	

Maerl, gravel and sand dredging
Land run-off

Mrl *Maerl beds (open coast/clean sediments)*

IGS.Phy.HEc *Phymatolithon calcareum* maerl beds with hydroids and echinoderms in deeper infralittoral clean gravel or coarse sand

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Maerl gravel; coarse sand
Zone:	Infralittoral - lower, Circalittoral - upper
Depth band:	10-20m, 20-30m

Biotope description

Lower infralittoral maerl beds characterised by *Phymatolithon calcareum* in gravels and sand with a variety of associated hydroids and echinoderms. Hydroids present are typically erect colonies such as *Nemertesia* spp. and often occur on the maerl or attached to dead shells within the maerl. Echinoderms such as *Antedon bifida*, *Ophiothrix fragilis*, *Ophiocomina nigra*, *Ophiura albida* and *Neopentadactyla mixta* are occasional or frequent in IGS.Phy.HEc but do not often occur in IGS.Phy.R. Other, more ubiquitous echinoderms such as *Marthasterias glacialis* are found throughout IGS.Phy biotopes.

Similar biotopes

IGS.Phy.R	IGS.Phy.HEc is similar but deeper with less red seaweeds and more hydroids and echinoderms

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halecium halecinum	••	••	Occasional
Nemertesia ramosa	••	••	Occasional
Cerianthus lloydii	••	•	Frequent
Terebellidae	••	•	Occasional
Pecten maximus	••	••	Occasional
Ophiothrix fragilis	••	•	Occasional
Ophiocomina nigra	••	•	Occasional
Ophiura albida	••	••	Occasional
Neopentadactyla mixta	•••	••	Frequent
Phymatolithon calcareum	•••••	•••	Common

Frequency of occurrence

In Britain: Uncommon

Features of conservation interest

Phymatolithon calcareum is listed on the EC Habitats Directive Annex Vb.

Potentially damaging activities

Activity	*Degree of effect*
Fishing (including use of fixed and mobile gear)	
Molluscan shellfish farming	
Maerl, gravel and sand dredging	
Land run-off	

Mrl *Maerl beds (open coast/clean sediments)*

IGS.Lgla *Lithothamnion glaciale* maerl beds in tide-swept variable salinity infralittoral gravel

Habitat classification

Salinity:	Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong
Substratum:	Maerl; shell gravel; stones and coarse sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Upper infralittoral tide-swept channels of coarse sediment subject to variable or reduced salinity which support distinctive beds of *Lithothamnion glaciale* maerl 'rhodoliths'. *Phymatolithon calcareum* may also be present as a more minor maerl component. This biotope can often be found at the upper end of Scottish sealochs where the variable salinity of the habitat may not be immediately obvious. Associated fauna and flora may include species found in other types of maerl beds (and elsewhere), e.g. *Chaetopterus variopedatus*, *Lanice conchilega*, *Mya truncata*, *Plocamium cartilagineum* and *Phycodrys rubens*. IGS.Lgla, however, also has a fauna that reflects the slightly reduced salinity conditions, e.g. *Psammechinus miliaris* is often present in high numbers along with other grazers such as chitons and *Tectura* spp. *Hyas araneus*, *Ophiothrix fragilis* and *Henricia oculata* are also fairly typically present at sites. In Scottish lagoons (obs) this biotope may show considerable variation but the community falls within the broad description defined here.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	••	•	Frequent
Chaetopterus variopedatus	••	•	Occasional
Lanice conchilega	•••	•	Occasional
Hyas araneus	•••	••	Occasional
Tectura testudinalis	••	••	Occasional
Tectura virginea	••	••	Frequent
Mya truncata	••	•	Frequent
Henricia oculata	••	•	Occasional
Ophiothrix fragilis	•••	•	Frequent
Psammechinus miliaris	••	••	Frequent
Lithothamnion glaciale	•••••	••	Common
Phymatolithon calcareum	••	••	Frequent
Plocamium cartilagineum	••	•	Occasional
Phycodrys rubens	••	•	Occasional
Dictyota dichotoma	•••	•	Occasional
Laminaria saccharina	••	•	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	The Vadills, Shetland	Covey, Thorpe & Nichols In prep	Lag.28	
R2	Riddock Shoal, Hoy Sound		MNCR data	
R12	Clyde sealochs	Howson, Connor & Holt 1994	SL63	
R13	Loch Sween	Howson, Connor & Holt 1994	SL63	
R14	Loch Seaforth, East Loch Tarbert, Loch Maddy, Loch Sween	Howson, Connor & Holt 1994	SL63	

R15	Little Loch Broom, Loch Laxford	Howson, Connor & Holt 1994	SL63
R15	Outer Hebrides Obs	Covey, Thorpe & Nichols In prep	Lag.28

Frequency of occurrence

In Britain: Scarce

FaG *Shallow gravel faunal communities*

IGS.HalEdw *Halcampa chrysanthellum* and *Edwardsia timida* on sublittoral clean stone gravel

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Clean stone gravel with pebbles
Zone:	Infralittoral
Depth band:	5-10m, 10-20m

Biotope description

Periodically (seasonally?) disturbed sublittoral stone gravel with small pebbles characterised by the presence of the anemones *Halcampa chrysanthellum* and *Edwardsia timida*. This biotope may also be contain opportunistic red seaweeds such as *Palmaria palmata*, Associated species are often typical of a hydroid/bryozoan turf but with infauna such as *Sabella pavonina* and *Megalomma vesiculosum*. It should be noted that this habitat may show considerable variation in community composition.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Urticina felina		•	Occasional
Aureliania heterocera		••	Occasional
Halcampa chrysanthellum		•••	Rare
Edwardsia timida		•••	Occasional
Euspira catena		••	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Loch Creran	Connor 1990	S12	?
R15	Loch Eynort, Skye		MNCR data	
IR1	Church Bay, Rathlin Island	Erwin *et al*. 1990	p43	
IR2	Strangford Narrows		B.E. Picton pers. comm. 1997	

Frequency of occurrence

In Britain: Scarce

IGS.Sell *Spisula elliptica* and venerid bivalves in infralittoral clean sand or shell gravel

Habitat classification

Salinity:	Full
Wave exposure:	Exposed
Tidal streams:	Strong, Moderately strong, Weak
Substratum:	Clean, coarse sand and shell gravel
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m

Biotope description

Coarse, loose sands subject to moderately strong water movement and containing *Chamelea gallina* may be characterised by a prevalence of *Spisula elliptica*. IGS.Sell differs from IGS.FabMag because it has generally coarser loose sands influenced by greater water movement and populations of the more robust *Spisula elliptica* rather than the brittle-shelled *Fabulina fabula*. The community is less stable in its species composition than IGS.FabMag to which it is closely allied and collectively considered to be the 'Shallow *Venus* Community', the 'Boreal Off-shore Sand Association' and the '*Goniadella*-*Spisula* association' of previous workers (see Petersen 1918; Jones 1951; Thorson 1957; Salzwedel, Rachor & Gerdes. 1985). Epifaunal communities may be reduced in this biotope when compared to IGS.FabMag; both types may have surface sand waves which may be indicative of the presence of venerid bivalves (Warwick & Davies 1977). This hypothesis, however, requires testing. Remote grab sampling is likely to under-estimate deep-burrowing and more dispersed species such as *Paphia*, *Ensis* and *Spatangus*. This biotope may give way to others characterised by *Angulus tenuis*, *Donax vittatus* and *Nephtys caeca* on exposed lower shore sands (LGS.AP.Pon) (Jones 1950). In southern regions of the UK, *S. elliptica* is replaced by *S. subtruncata* in this biotope. It is possible that *Spisula solida* may also be characteristic of this habitat (needs clarification) (see Kühne & Rachnor 1996) and it should be noted that for some workers the three species of *Spisula* commonly encountered in UK waters may present difficulties in identification.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Goniadella		••	Present/Not known
Nephtys cirrosa			
Paradoneis lyra			
Spio			Present/Not known
Spiophanes bombyx			Present/Not known
Magelona mirabilis			Present/Not known
Owenia fusiformis			
Gastrosaccus spinifer			
Bathyporeia pelagica			Present/Not known
Spisula elliptica	••	•••	Abundant
Spisula subtruncata			Abundant
Ensis arcuatus	•		Frequent
Ensis siliqua	•		Frequent
Fabulina fabula			Occasional
Gari fervensis			
Dosinia exoleta			
Tapes rhomboides			
Chamelea gallina			
Sepiola atlantica			
Ophiura albida			Present/Not known

Echinocardium cordatum	•	Rare

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988		
R5	NE England	Brazier *et al*. In prep.b		
R8	Plymouth Sound	Moore In prep	SWI.79	
R8	English Channel	Warwick & Davies 1977		
R8	Scilly Isles	Rostron 1989b		
R9	Central Bristol Channel	Warwick & Davies 1977		
R9	Swansea Bay	Tyler & Shackley 1980		
R9	Southern Irish Sea	Mackie, Oliver & Rees 1995		
IR3	Off Carnsore Point			
Other	Southern and central North Sea	Künitzer *et al*. 1992		
Other	Dutch and Danish North Sea	Künitzer *et al*. 1992		

FaS *Shallow sand faunal communities*

IGS.Mob Sparse fauna in infralittoral mobile clean sand

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Coarse sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Coarse sandy sediment in shallow water, often duned, on exposed or tide-swept coasts often contains very little infauna due to the mobility of the substratum. Some opportunistic populations of infaunal amphipods may occur, particularly in less mobile examples. Sand eels *Ammodytes* sp. may occasionally be observed in association with this biotope (and others). This biotope is more mobile than IGS.NcirBat and may be closely related to LGS.BarSnd on the shore. Common epifaunal species such as *Pagurus bernhardus*, *Liocarcinus depurator*, *Carcinus maenas* and *Asterias rubens* may be encountered and are the most conspicuous species present. A similar biotope, IGS.MobRS, occurs in reduced salinities but differs in that the sparse fauna of IGS.Mob are not tolerant of reduced salinities.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa			Rare
Streblospio shrubsolii	••		Present/Not known
Capitella capitata	•••		Present/Not known
Pontocrates arenarius			
Haustorius arenarius			Rare
Eurydice pulchra	•••		Present/Not known
Pagurus bernhardus			Rare
Liocarcinus depurator			Rare
Carcinus maenas			Rare
Buccinum undatum			Rare
Glycymeris glycymeris			Rare
Asterias rubens			Rare
Ammodytes			Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	NE England e.g. Tweed	Brazier *et al*. In prep.b		
R8	Dorset	Dixon *et al*. 1978	Hab. 11	
R9	Severn Estuary	Mettam, Conneely & White 1994	Clustan 6, 7, 8	
R10	Menai Strait	Lumb 1983	Para. 4.5	
R11	N Irish Sea	Covey In prep.b	R11.37	
IR1	N coast Co. Antrim	Erwin *et al*. 1990	Section 5	
IR3	N of Roslair		L. Sides pers. comm. 1997	

FaS *Shallow sand faunal communities*

IGS.NcirBat *Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand

Habitat classification

Salinity:	Full
Wave exposure:	Very exposed, Exposed, Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong, Weak
Substratum:	Medium-fine sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m

Biotope description

Well-sorted medium and fine sands characterised by *Nephtys cirrosa* and *Bathyporeia* spp. (and sometimes *Pontocrates* spp.) which occur in the shallow sublittoral to at least 30 m depth. This biotope occurs in sediments subject to physical disturbance, as a result of strong tidal streams or wave action and may be closely allied to the intertidal biotopes LGS.AEur and LGS.AP.Pon and intermediate in the degree of disturbance between the subtidal biotopes IGS.Mob and IGS.Sell. The faunal diversity of this biotope is considerably reduced compared to less disturbed biotopes and for the most part consists of the more actively-swimming amphipods. Sand eels *Ammodytes* sp. may occasionally be observed in association with this biotope (and others). The range in wave exposure and tidal streams within which this biotope occurs is indicative of the fact that either wave exposure or tidal streams are responsible for the level of physical disturbance that yields this biotope. This biotope is very similar to IGS.Ncir which occurs in reduced/variable salinities with additional reduced salinity fauna. Stochastic recruitment events in the *Nephtys cirrosa* populations may be very important to the population size of other polychaetes present and may therefore create a degree of variation in community composition (Bamber 1994).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys	•••	•	Present/Not known
Nephtys cirrosa	•••••	•	Present/Not known
Scolelepis squamata	••••	•	Frequent
Spio filicornis	•••	•	Present/Not known
Capitella capitata	•••	•	Present/Not known
Pontocrates arenarius	••••	•	Present/Not known
Bathyporeia	••••	•	Present/Not known
Haustorius arenarius	•••••	•	Frequent
Eurydice pulchra	•••••	•	Frequent
Ammodytes tobianus	••••	•	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	SE Scotland/NE England	Brazier *et al*. In prep.b	R5.71	
R6	Humber		NRA data	
R6	Medway & Hamford Water	Hill & Emblow In prep	R6.31	
R8	Exe, Teign, Camel, Taw/Torridge	Moore In prep	SWI.78	
R9	Severn Estuary	Mettam, Conneely & White 1994		
R10	Wales		R10.NepBat	
R11	Heysham, Morecambe Bay	Rostron 1992	MS11, 13, 14, 15	

FaS *Shallow sand faunal communities*

IGS.ScupHyd *Sertularia cupressina* and *Hydrallmania falcata* on tide-swept sublittoral cobbles or pebbles in coarse sand

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Coarse sand with pebbles and cobbles
Zone:	Infralittoral
Depth band:	10-20m, 20-30m, 30-50m
Other features:	Sand scour

Previous code

IGS.Scup	96.7

Biotope description

Shallow sands with cobbles and pebbles, exposed to strong tidal streams, with conspicuous colonies of hydroids, particularly *Sertularia cupressina* and *Hydrallmania falcata*. These hydroids are tolerant to periodic submergence and scour by sand. Both diving and dredge surveys will easily record this biotope. *Flustra foliacea* and *Alcyonidium diaphanum* may also occur on the more stable cobbles and pebbles, whereas *Lagis koreni* is often a common component of the infaunal sand community. The less scoured biotope MCR.Flu.SerHyd occurs where there is less sand. Infaunal elements of the 'Venus' associations may occur in this biotope; indeed, this biotope may be at one extreme of the spectrum of such associations (E.I.S. Rees pers. comm. 1997).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hydrallmania falcata	••••	••	Common
Sertularia cupressina	•••••	•••	Abundant
Sagartia elegans	••	•	Frequent
Lagis koreni	•••	••	Frequent
Alcyonidium diaphanum	••••	••	Frequent
Flustra foliacea	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Shapinsay Sound		R2-4.Scup	
R4	Dunskeath Castle, Cromarty Firth		R2-4.Scup	
R6	Lowestoft, Thames			
R6	Thanet		MNCR data	
R10	Menai Strait	Lumb 1983	p12-13	
IR1	Lough Foyle	Erwin *et al*. 1990	p42	

FaS *Shallow sand faunal communities*

IGS.Lcon Dense *Lanice conchilega* and other polychaetes in tide-swept infralittoral sand

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Coarse sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Where strong tidal streams or wave action and coarse sand occur in the shallow sublittoral, dense beds of *Lanice conchilega* may occur. Several other species of polychaete also occur as infauna e.g. *Scoloplos armiger*, *Chaetozone setosa* and *Arenicola marina*. The dense *Lanice* biotope (LGS.Lan) on certain lower shores may be a littoral extension of this biotope. This biotope also appears to have a limited occurrence in some Scottish lagoonal entrance channels and some sealochs. Overall, there may be more than one entity in this biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scoloplos armiger			
Pygospio elegans	••		Abundant
Chaetozone setosa	••		Present/Not known
Arenicola marina	••	•	Occasional
Lanice conchilega	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R14	Outer Hebrides lagoons	Covey, Thorpe & Nichols In prep	Lag.36	
R15	Skye		MNCR data	
Other	Sealochs	Howson, Connor & Holt 1994		

FaS *Shallow sand faunal communities*

IGS.FabMag *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves in infralittoral compacted fine sand

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Weak
Substratum:	Stable, fine sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m

Biotope description

In stable, fine, compacted sands in the infralittoral and littoral fringe, communities occur that are dominated by venerid bivalves such as *Chamelea gallina*. The biotope may be characterised by a prevalence of *Fabulina fabula* and *Magelona mirabilis*. Remote grab sampling is likely to under-estimate deep-burrowing species such as *Ensis* sp. (Warwick & Davis 1977). Slightly muddy examples may have low numbers of *Mysella bidentata*. The community is relatively stable in its species composition, unlike IGS.Sell, which is closely allied and collectively considered to be the 'shallow *Venus* community' or 'boreal off-shore sand association' of previous workers (see Petersen 1918; Jones 1950; Thorson 1957). IGS.FabMag differs from IGS.Sell because of the prevalence of the brittle-shelled *F. fabula* over the more robust *Spisula elliptica* and because it occurs in generally finer, more compacted sands. These communities have been shown to correlate well with particular levels of current induced 'bed-stress' (Warwick & Uncles 1980). The 'Arctic *Venus* Community' and 'Mediterranean *Venus* Community' described to the north and south of the UK (Thorson 1957) probably occur in the same habitat and appears to be the same biotope described as the *Ophelia borealis* community in northern France and the central North Sea (Künitzer *et al.* 1992). In very shallow water and eulittoral sands this biotope may give way to IMS.MacAbr. Sites with this biotope may undergo transitions in community composition e.g. IMS.SpiSpi may be a transitional community between IGS.FabMag and CMS.AfilEcor (see Salzwedel, Rachor & Gerdes 1985).

Similar biotopes

LGS.AP.Pon
IMS.SpiSpi
CMS.AfilEcor

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Magelonidae			Common
Magelona mirabilis			Common
Ophelia borealis			Abundant
Pontocrates arenarius			
Urothoe brevicornis			
Bathyporeia elegans			Present/Not known
Bathyporeia guilliamsoniana			
Mysella bidentata			Occasional
Spisula elliptica			
Spisula ovalis			
Fabulina fabula			Common
Donax vittatus			
Chamelea gallina			
Astropecten irregularis			

Echinocardium cordatum	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Belhaven Bay, Dunbar		R3&R4.FfabMag	
R5	NE England	Brazier *et al*. In prep.b	R5.73	
R5	NE England	Brazier *et al*. In prep.b	R5.72	
R9	Bristol Channel	Warwick & Davies 1977		
R9	Carmarthen Bay, Barnstable Bay & eastern Swansea Bay	Warwick & Uncles 1980		
R9	Southern Irish Sea	Mackie, Oliver & Rees 1995		
R9	Swansea Bay	Conneely 1988		
R11	Off-shore Irish Sea	Mackie 1990		
R11	Morecambe Bay	Rostron 1992	MS1, 12, 15	
Other	German Bight	Salzwedel, Rachor & Gerdes 1985		

EstGS *Estuarine sublittoral gravels and sands*

IGS.MobRS Sparse fauna in reduced salinity infralittoral mobile sand

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Very strong, Strong, Moderately strong
Substratum:	Sand (very fine)
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Very mobile sand in areas of strong tidal currents and reduced salinity. No stable community is able to develop within this extremely mobile and abrasive habitat. The fauna encountered in this habitat consists of epifaunal crustaceans or relatively low numbers of species, such as *Bathyporeia* spp. and *Haustorius arenarius*, washed in from adjacent communities. This biotope is found in tidal channels of estuaries and areas where water movement keeps silt and mud in suspension, and excludes even the more robust infauna. If oligochaetes, polychaetes and bivalves are present in any numbers within this habitat type then care must be taken to avoid the inclusion of juvenile or spat recruitment counts which may mask the presence of this biotope. This is particularly relevant as sampling usually occurs at slack water periods when settlement takes place. The biotope bears some similarity with IGS.NeoGam although no freshwater community will be present. IGS.MobRS is a reduced salinity version of IGS.Mob, distinguished from this by the absence of species not tolerant of reduced salinities.

Similar biotopes

IGS.NeoGam

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Eteone	••	••	Present/Not known
Nephtys cirrosa	••••	•	Common
Scoloplos armiger	••••	•	Present/Not known
Spio martinensis	••	•	Present/Not known
Capitella capitata	••	•	Frequent
Tubificidae	•	•	Occasional
Mysidae	•	•	Present/Not known
Neomysis integer	•	•	Frequent
Pontocrates altamarinus	••	•	Present/Not known
Bathyporeia	•	•	Present/Not known
Haustorius arenarius	•	•	Present/Not known
Eurydice pulchra	••	••	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Forth			
R6	Humber	Dalkin, Gudmundsson & Barnett 1996		
R10	Solway	Rendall & Bell 1993		

EstGS *Estuarine sublittoral gravels and sands*

IGS.Ncir *Nephtys cirrosa* and fluctuating salinity-tolerant fauna in reduced salinity infralittoral mobile sand

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Sand (medium-fine)
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	May find surface veneer of mud at slack water

Biotope description

Mobile sand in reduced salinity conditions where tidal currents create an unstable shifting habitat. Characteristic species include the polychaetes *Nephtys cirrosa* and *Scoloplos armiger* along with amphipods of the genus *Bathyporeia* spp. The biotope contains relatively few species each typically in low abundance. It is found in tidal channels with moderate to strong tidal streams. The habitat is more stable than IGS.MobRS and may contain a small percentage of silt/clay, especially when sampled on slack water when deposition of the finer sediment grades occurs. Care should be taken in identification of this biotope due to the presence juveniles and species washed in during slack water. The biotope is a reduced salinity version of IGS.NcirBat, distinguished from this by the absence of species not tolerant of reduced salinities, in particular the polychaete *Chaetozone setosa*.

Similar biotopes

IGS.MobRS
IGS.NcirBat

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa	••••	•	Common
Scoloplos armiger	••••	•	Present/Not known
Spio martinensis	••	••	Present/Not known
Capitella capitata	••	•	Present/Not known
Tubificoides	•	•	Present/Not known
Mysidae	•	•	Present/Not known
Pontocrates altamarinus	••	••	Present/Not known
Bathyporeia	•	••	Frequent
Eurydice pulchra	•	••	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Humber	Dalkin, Gudmundsson & Barnett 1996		
R9	Severn	Mettam, Conneely & White 1994		

EstGS *Estuarine sublittoral gravels and sands*

IGS.NeoGam *Neomysis integer* and *Gammarus* spp. in low salinity infralittoral mobile sand

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Fluctuating low salinity; high biochemical oxygen demand

Biotope description

Upper estuary mobile sands with very low fluctuating salinity characterised by the mysid shrimp *Neomysis integer* (see Arndt 1991) and amphipods of the genus *Gammarus* spp. The harsh physicochemical regime imposed by such environmental conditions in the upper estuary leads to a relatively impoverished community but high densities of the mobile, salinity-tolerant, crustaceans can occur. The biotope is found in the transitional zone between freshwater and brackish environments, relying on the decreased freshwater input during the summer for penetration of the brackish species up-stream. As such this biotope may also contain elements of freshwater communities. It may be found in conjunction with IMU.LimTtub, although it lacks appreciable numbers of oligochaetes. The biotope occurs in a similar habitat to IGS.MobRS although it is more affected by lower salinity.

Similar biotopes

IGS.MobRS

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Mysidae	•	•	Present/Not known
Neomysis integer	•••••	•••	Frequent
Gammarus salinus	••••	••	Present/Not known
Gammarus zaddachi	•	••	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Thames	Attrill 1990		
R6	Humber	Dalkin, Gudmundsson & Barnett 1996		

CGS.Ven Venerid bivalves in circalittoral coarse sand or gravel

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed
Tidal streams:	Moderately strong, Weak
Substratum:	Gravel; coarse sand; shelly sediment
Zone:	Circalittoral
Depth band:	30-50m, >50 m

Biotope description

Circalittoral gravels, coarse sands and shell gravels, often in relatively deep water, may be characterised by the presence of conspicuous venerid bivalves such as *Circomphalus casina*, *Clausinella fasciata*, *Timoclea ovata* and other robust bivalve species such as *Glycymeris glycymeris* and *Astarte sulcata*. *Spatangus purpureus* may also be present especially where the interstices of the gravel are filled by finer particles, in which case, *Gari tellinella* and *Timoclea ovata* may also be prevalent (Glémarec 1973). Such communities in gravely sediments may be relatively species-rich as they may also contain epifauna such as *Hydroides norvegicus* and *Pomatoceros lamarcki*. In sand wave areas this biotope may contain elements of the IGS.Sell and IGS.FabMag biotopes. This biotope has previously been described as the 'Deep *Venus* Community' and the 'Boreal Off-Shore Gravel Association' by other workers (Ford 1923; Jones 1950). CGS.Ven may contain more sub-biotopes than have yet been described in the present work: e.g. Ford (1923) describes a 'Series A' and a 'Series B' characterised by *Echinocardium cordatum*-*Chamelea gallina* and *Spatangus purpurea*-*Clausinella fasciata*. Collectively, the CGS.Ven biotope dominates the offshore Irish Sea benthos (Mackie, Oliver & Rees 1995).

Similar biotopes

CGS.Ven.Neo	CGS.Ven may be an infaunally recorded version of this biotope

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hydroides norvegica		•	
Glycymeris glycymeris		•••	
Astarte sulcata		••	
Gari tellinella		••	
Circomphalus casina		••	
Clausinella fasciata		••	
Timoclea ovata		••	
Spatangus purpureus		•••	
Branchiostoma lanceolatum		••	

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Plymouth	Carthew & Bosence 1986		
R8	English Channel	Holme 1966	6	
R9	Southern Irish Sea	Mackie, Oliver & Rees 1995		
R10	Irish Sea	Mackie 1990	3.2.1.5	
R11	Irish Sea	Mackie 1990	3.2.1.5	
Other	English Channel	Glémarec 1973		
IR2	Rathlin Island	Erwin *et al*. 1990	3A(II)	

CGS.Ven.Neo *Neopentadactyla mixta* and venerid bivalves in circalittoral shell gravel or coarse sand

Habitat classification

Salinity:	Full
Wave exposure:	Exposed, Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Clean shell, maerl and stone gravel; coarse sand
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Previous code

CGS.NeoBv	96.7

Biotope description

Sublittoral plains of clean maerl gravels, shell gravels and stone gravels or sometimes coarse sands, with frequent *Neopentadactyla mixta* and robust bivalves such as *Clausinella fasciata*, *Circomphalus casina*, *Lutraria lutraria* and *Ensis arcuatus*. These sediments may be thrown into dunes by wave action or tidal streams. Widespread species such as *Cerianthus lloydii*, *Chaetopterus variopedatus*, *Lanice conchilega* and *Gibbula magus* are present in many examples of this biotope. Scarcely recorded species such as *Molgula oculata*, *Ophiopsila annulosa* and *Amphiura securigera* may also be found. *O. annulosa* only occurs in records from the south-west of the British Isles. Epifaunal species may include *Pecten maximus* and *Callionymus* spp. This biotope may also occur adjacent to maerl beds and to some extent in the lower infralittoral where some seaweeds may occur in low abundances. It should be noted that *Neopentadactyla* may exhibit periodicity in its projection out of, and retraction into, the sediment (Picton 1993).

Similar biotopes

IGS.Phy	CGS.Ven.Neo may occur in circalittoral dead maerl plains, often adjacent to maerl beds
CGS.Ven	Muddier, often deeper gravels than CGS.Ven.Neo
IGS.Sell	More gravely sediments than the coarse sand typical of IGS.Sell

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nemertesia antennina	•••	••	Rare
Cerianthus lloydii	•••	•	Occasional
Chaetopterus variopedatus	••••	•	Occasional
Lanice conchilega	••••	•	Occasional
Pagurus bernhardus	•••	•	Occasional
Liocarcinus depurator	•••	•	Occasional
Gibbula magus	••	••	Occasional
Pecten maximus	••••	••	Occasional
Lutraria lutraria		••	Occasional
Ensis arcuatus	••	••	Occasional
Circomphalus casina		••	Occasional
Clausinella fasciata		••	Occasional
Ophiopsila annulosa	•	•••	Frequent
Amphiura securigera		•••	Frequent
Echinus esculentus	•••	•	Occasional
Neopentadactyla mixta	•••••	••	Frequent
Molgula oculata		•••	Present/Not known
Callionymus lyra	•	••	Occasional
Callionymus reticulatus	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	H43	
R1	Shetland	Earll 1982a		
R5	St. Abbs	Earll 1982b	2	
R8	Fal & Helford River	Moore In prep	SWI.76	
R9	N. Pembrokeshire	Cartlidge & Hiscock 1980	4.9	
R9	Skomer	Bunker & Hiscock 1987		
R9	North Haven	Hiscock 1980		
R10	Bardsey/Lleyn	Hiscock 1984b	3.2.21	
R14	Sealochs	Howson, Connor & Holt 1994	SL73	
R15	N. Canna	Dipper 1981a		
IR1	N. Ireland	Erwin *et al*. 1990	3	

Frequency of occurrence

In Britain: Common

CGS.Ven.Bra Venerid bivalves and *Branchiostoma lanceolatum* in circalittoral coarse sand with shell gravel

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	
Substratum:	Coarse sand with shelly gravel
Zone:	
Depth band:	10-20m, 20-30m, 30-50m

Biotope description

Gravel and coarse sand with shell gravel often contains communities of robust venerupid bivalves (CGS.Ven). Shallower examples, such as the biotope presented here, may support a significant population of *Branchiostoma lanceolatum*. Other conspicuous infauna are *Clausinella* (*Venus*) *fasciata*, *Spatangus purpureus*, *Echinocyamus pusillus*, *Glycymeris glycymeris*, *Nucula hanleyi*, *Spisula elliptica*, *Arcopagia crassa* (especially in the south of UK), *Laevicardium crassum*, *Ampelisca spinipes* and *Psammechinus miliaris*. Sessile epifauna are typically a minor component of this community. Also present are: *Ensis arcuatus*, *Asterias rubens* and *Ophiura albida*. This biotope is related to the 'Boreal Offshore Gravel Association' and 'Deep *Venus* Community' described by other workers (Ford 1923; Jones 1951), and may also be closely allied (the same?) as the '*Venus fasciata*' community of Cabioch (Glémarec 1973). Deeper examples of this biotope give way to other CGS.Ven types.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Ampelisca spinipes			
Nucula hanleyi			
Glycymeris glycymeris			
Astarte sulcata			
Laevicardium crassum			
Spisula elliptica			
Ensis arcuatus			
Arcopagia crassa			
Circomphalus casina			
Clausinella fasciata			
Timoclea ovata			
Ophiura albida			
Psammechinus miliaris			
Echinocyamus pusillus			
Spatangus purpureus			
Branchiostoma lanceolatum			

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R9	Milford Haven	Moore In prep	SWI.79	
Other	French North Sea coast: Sandettie Bank	Davoult *et al*. 1988		
Other	Eastern English Channel: French side	Cabioch & Glaçon 1975, 1977		

Sgr *Seagrass beds (sublittoral / lower shore)*

IMS.Zmar *Zostera marina/angustifolia* beds in lower shore or infralittoral clean or muddy sand

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Clean sand to muddy fine sand or mud
Zone:	Infralittoral
Height band:	Lower shore
Depth band:	0-5 m

Previous code

IGS.Zmar	96.7
IMS.ZmarBv	96.7
LMSND.ZOS	6.95

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
Ulva	••	•	Frequent
Zostera marina	•••••	•••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Hiscock 1989		
R1	Whiteness Voe	Rostron 1989a		
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 1984c	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 1981a	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
Lamprothamnium papulosum	••	•••	Frequent
Ruppia maritima	••••	•••	Abundant
Ruppia spiralis	•	•••	Common

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

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Weak, Very weak
Substratum:	Medium to fine sand; muddy sand
Zone:	Infralittoral
Height band:	Lower shore
Depth band:	0-5 m, 5-10m, 10-20m

Previous code

IGS.EcorEsil 96.7

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
Corystes cassivelaunus	•	•••	Occasional
Liocarcinus depurator	•••	•	Occasional
Carcinus maenas	••	•	Occasional
Ensis arcuatus	•••	••	Frequent
Ensis siliqua	•••	••	Frequent
Astropecten irregularis	••	•••	Occasional
Asterias rubens	•••	•	Occasional
Amphiura brachiata	•••	•••	Common
Ophiura albida	•••	••	Occasional
Ophiura ophiura	••	••	Occasional
Echinocardium cordatum	••••	••	Frequent
Labidoplax digitata	•	•••	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

FaMS *Shallow muddy sand faunal communities*

IMS.SpiSpi *Spio filicornis* and *Spiophanes bombyx* in infralittoral clean or muddy sand

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Weak
Substratum:	Fine, clean sand or muddy fine sand
Zone:	Infralittoral
Depth band:	5-10m, 10-20m, 20-30m

Biotope description

Fine, clean or slightly muddy sands may support a community dominated by the polychaetes *Spio filicornis*, *Spiophanes bombyx* and *Nephtys hombergii*. This is a biotope that is known from varied sediment conditions and occasionally occurs in coarser sands. The biotope may be transitional or part of a succession / cycle between CMS.AfilEcor and IGS.FabMag (see Salzwedel, Rachor & Gerdes 1985). Elements of the communities of these two biotopes are evident in IMS.SpiSpi as well as similarities with IMS.MacAbr and CMS.AbrNucCor. *Ophiura albida* may be common (more than 100 m^{-2}). However, community composition may also be quite varied and may also contain *Fabulina fabula*, *Magelona mirabilis*, and *Lanice conchilega*. *Spio filicornis* and *Spiophanes bombyx* occur in several other biotopes therefore records should only be assigned to this biotope if they clearly do not fit the more stable and widely-occurring biotopes listed above. [The validity of this biotope in Britain and Ireland is uncertain].

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Edwardsia			
Nephtys hombergii	•••••		Common
Spio filicornis	•••••		Abundant
Spiophanes bombyx	•••••		Common
Magelona mirabilis	••••		Common
Lanice conchilega	•••		Present/Not known
Photis longicaudata			Present/Not known
Fabulina fabula	••••		Common
Ophiura albida	••••		Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	German Bight	Salzwedel, Rachor & Gerdes 1985	*Spio filicornis* association	

FaMS *Shallow muddy sand faunal communities*

IMS.MacAbr *Macoma balthica* and *Abra alba* in infralittoral muddy sand or mud

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered
Tidal streams:	Weak
Substratum:	Muddy sand or mud
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m
Other features:	Organically enriched

Previous code

IMS.AbrLag	96.7

Biotope description

Near-shore shallow muddy sands and muds, and sometimes mixed sediments, may be characterised by the presence of the bivalve *Macoma balthica*. *Abra alba*, *Lagis koreni* and *Donax vittatus* may also be significant components although they may not necessarily all occur simultaneously. *Fabulina fabula*, *Nephtys cirrosa*, *Echinocardium cordatum* and *Crangon crangon* may also be present. The community is especially stable (Dewarumez *et al.* 1992). The substratum is typically rich in organic content and the community may occur in small patches or swathes in shallow waters parallel to the shore (Jones 1950; Cabioch & Glaçon 1975). This biotope is known to occur in patches between Denmark and the western English Channel. This community has been included in the 'Boreal Offshore Muddy Sand Association' of Jones (1950) and is also described by several other authors (Petersen 1918; Cabioch & Glaçon 1975). A similar community may occur in deep water in the Baltic (Thorson 1957). This biotope may occur in slightly reduced salinity estuarine conditions where *Mya* sp. may become a significant member of the community (Thorson 1957). Sites with IMS.MacAbr may give over to neighbouring *Amphiura* biotopes with time (E.I.S. Rees pers. comm. 1996).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys cirrosa			
Nephtys hombergii			
Scalibregma inflatum			
Lagis koreni			
Ampelisca spinipes			
Crangon crangon			
Nucula nitidosa			
Fabulina fabula			
Macoma balthica			
Abra alba			
Mya			
Corbula gibba			
Echinocardium cordatum			

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	SW Britain inlets	Moore In prep	SWI.81	
R9	SW Britain inlets	Moore In prep	SWI.81	In part
R9	Central Swansea Bay & north Carmarthen Bay	Warwick & Uncles 1980		
R11	N. Irish Sea	Covey In prep.b	R11.38	In part
R11	Patches throughout Irish Sea	Mackie, Oliver & Rees 1995		

Other	French English Channel coast	
Other	North Sea Southern Bight	Dewarumez *et al*. 1992

FaMS *Shallow muddy sand faunal communities*

IMS.Cap *Capitella capitata* in enriched sublittoral muddy sediments

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak
Substratum:	Muddy sediment
Zone:	Infralittoral, Circalittoral
Depth band:	0-5 m, 5-10m, 10-20m, 20-30m, 30-50m, >50 m

Biotope description

The polychaete *Capitella capitata* is an opportunist especially associated with organically enriched and polluted sediments (Warren 1977; Pearson & Rosenberg 1978) where it may be superabundant. Although more widely occurring, when this species occurs in high numbers and the overall species richness is considerably reduced, the sediments are invariably anoxic and often have a very high organic load. Nematodes, *Tubificoides*, *Pygospio elegans* and *Malacoceros fuliginosus* may also survive in this habitat, but rarely in anything but comparatively low numbers. This biotope may also occur to some extent in the intertidal. IMS.Cap may become established as a result of anthropogenic activities such as fish farming and sewerage effluent but may also occur with natural enrichment as a result of, for example, coastal bird roosts. *C. capitata* may also occur in high numbers in estuaries (see IMU.CapTub), but this may be a result of competitive refuge rather than organic enrichment (Wolff 1973).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nematoda indet.			Occasional
Scoloplos armiger			Occasional
Malacoceros fuliginosus			Occasional
Pygospio elegans			Occasional
Capitella capitata			Super abundant
Tubificoides			Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	Coquet Estuary	Brazier *et al*. In prep.b		
R13	Lochs Linnhe & Eil	Pearson 1975		

CMS.AbrNucCor *Abra alba*, *Nucula nitida* and *Corbula gibba* in circalittoral muddy sand or slightly mixed sediment

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak
Substratum:	Muddy sands; mixed sediments
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Muddy sands or slightly mixed sediments in sheltered or slightly reduced salinity environments may be characterised by the presence of the bivalves *Abra alba*, *Nucula nitidosa* and *Corbula gibba* as well as *N. nucleus*, *Lagis koreni* and *Nephtys* sp. The echinoderms *Echinocardium cordatum*, *Ophiura albida* and *Ophiura ophiura* may also be present. Sandier habitats contain the CMS.AfilEcor biotope and increasing silt (and depth) gives rise to the CMU.BriAchi biotope. The relative density of the characterising species in this biotope is known to vary from year to year (Molander 1962); *Nucula nitidosa* can, in some cases, be at least if not more prevalent than *Abra alba* (Salzwedel, Rachor & Gerdes 1985).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Echiurus echiurus		•••	Present/Not known
Nephtys hombergii		•	
Scoloplos armiger		•	
Lagis koreni		•	Occasional
Nucula nitidosa		••	Abundant
Mysella bidentata		•	Occasional
Abra alba		•	Abundant
Corbula gibba		•	Common
Ophiura albida		•	
Ophiura ophiura		•	
Echinocardium cordatum		••	

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	St Andrews and Aberdeenshire inshore fishing grounds	McIntyre 1958	R3&R4.AalbF	
R4	St Andrews, Aberdeenshire inshore fishing grounds and Smith Bank, Caithness	McIntyre 1958	R3&R4.AalbN	
R9	Plymouth	Ford 1923		
R11	N. Irish Sea	Covey In prep.b	R11.40	
R11	Cumberland coast	Jones 1952		
Other	Inner Danish Waters	Petersen 1918		
Other	German Bight	Salzwedel, Rachor & Gerdes 1985		

CMS.AfilEcor *Amphiura filiformis* and *Echinocardium cordatum* in circalittoral clean or slightly muddy sand

Habitat classification

		Previous code	
Salinity:	Full	CGS.AfilEcor	96.7
Wave exposure:	Moderately exposed, Sheltered		
Tidal streams:	Very weak		
Substratum:	Clean or slightly muddy sand		
Zone:	Circalittoral		
Depth band:	10-20m, 20-30m		

Biotope description

Medium to fine clean / muddy (clayey) sand off shallow wave- exposed coasts can be characterised by *Amphiura filiformis* and *Echinocardium cordatum*. This community occurs in muddy sands and deeper water (Hiscock 1984; Picton *et al.* 1994) and may be related to the 'off-shore muddy sand association' described by other workers (Jones 1951; Mackie 1990). This community is also characterised by *Pholoe* sp., *Nephtys hombergii*, *Nucula nitidosa*, *Callianassa subterranea* and *Eudorella truncatula* (e.g. Künitzer *et al.* 1992). *Virgularia mirabilis*, *Cerianthus lloydii* and *Chaetopterus variopedatus* may be other conspicuous surface features but they do not occur in high numbers in this biotope. Deeper, more muddy sediments may give rise to CMS.AbrNucCor. In areas subject to benthic fisheries disturbance, *Arctica islandica* (if present) may show scars on their shells (Klein & Witbaard 1993).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Virgularia mirabilis			Occasional
Pholoe			
Nephtys hombergii			
Eudorella truncatula			
Callianassa subterranea			
Corystes cassivelaunus			
Turritella communis			
Nucula nitidosa			
Mysella bidentata			
Arctica islandica			
Clausinella fasciata			
Astropecten irregularis			
Amphiura filiformis			Abundant
Echinocardium cordatum			Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R3			R3&R4.NtenMbid	
R5	NE England		R5.73	
R8	Isles of Scilly	Hiscock 1984c	Para.13 & 3.2.23	
R10			R10.PBv.Afil	
R11	N. Irish Sea	Covey In prep.b	R11.39	
R12	Striven/Fyne	Howson, Connor & Holt 1994	SL77	
R13	Mull/Sunart/Linnhe	Howson, Connor & Holt 1994	SL77	
R14	Tarbet/Braigh Mor	Howson, Connor & Holt 1994	SL77	

R15	Cean Traigh/Ailort/ Sound of Arisaig/ Soay Sound/ Talisker Bay/ Bracadale/ L. Broom	Howson, Connor & Holt 1994	SL77
IR8	Lough Swilly	Picton *et al*. 1994	p43
Other	Central and southern North Sea	Künitzer *et al*. 1992	
Other	German Bight	Salzwedel, Rachor & Gerdes 1985	

CMS.VirOph *Virgularia mirabilis* and *Ophiura* spp. on circalittoral sandy or shelly mud

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Sandy mud; shelly mud
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Circalittoral fine sandy mud and shelly gravel may contain *Virgularia mirabilis* and *Ophiura* spp. Such sediments are very common in sealochs, often occurring shallower than the finest mud or in somewhat more exposed parts of the lochs. A variety of species may occur, and species composition at a particular site may relate, to some extent, to the proportions of the major sediment size fractions. Greater quantities of stones and shells on the surface may give rise to more sessile epibenthic species (CMS.VirOph.HAs). Several species are common to most sites including *Virgularia mirabilis* which is present in moderate numbers, *Ophiura albida* and *Ophiura ophiura* which are often quite common, and *Pecten maximus* which is usually only present in low numbers. *Inachus dorsettensis*, *Aporrhais pespelecani*, *Pagurus prideaux* and *Astropecten irregularis*, although less widespread, are typical species of this sediment type. *Virgularia mirabilis* is usually accompanied by *Cerianthus lloydii*, *Chaetopterus variopedatus*, terebellids, including *Lanice conchilega* and, less commonly, *Arenicola marina* and *Myxicola infundibulum* in this biotope. *Amphiura chiajei* and *Amphiura filiformis* occur in high densities in the sandier examples of this biotope but are uncommon in the more gravely muds. Polychaetes and bivalves are the main components of the infauna, although nemerteans, *Edwardsia claparedii*, *Phoronis muelleri* and *Labidoplax buski* are also widespread. Of the polychaetes *Goniada maculata*, *Nephtys incisa*, *Minuspio cirrifera*, *Chaetozone setosa*, *Notomastus latericeus* and *Owenia fusiformis* are the most widespread species. *Myrtea spinifera*, *Lucinoma borealis*, *Mysella bidentata*, *Abra alba* and *Corbula gibba* were common bivalves in this sediment type. *Turritella communis* may form dense aggregations at sandier sites.

Similar biotopes

CMU.SpMeg	CMS.VirOph has more mixed sediment and tends to occur in shallower water
IMU.PhiVir	CMS.VirOph occurs in more mixed sediments and often slightly deeper water

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Virgularia mirabilis	•••••	••	Occasional
Cerianthus lloydii	••••	•	Frequent
Nephtys incisa	••	•	Present/Not known
Minuspio cirrifera	•••	••	Occasional
Chaetopterus variopedatus	••	•	Occasional
Notomastus latericeus	•••	••	Rare
Lanice conchilega	••	•	Occasional
Pagurus prideaux	••	••	Occasional
Inachus dorsettensis	••	••	Occasional
Liocarcinus depurator	••••	••	Occasional
Turritella communis	••	••	Occasional
Aporrhais pespelecani	••	•••	Occasional

Pecten maximus	•••	••	Occasional
Myrtea spinifera	••	••	Rare
Lucinoma borealis	••	••	Rare
Mysella bidentata	•••	•	Occasional
Abra alba	•••	•	Occasional
Mya truncata	•••	••	Occasional
Corbula gibba	••	•	Present/Not known
Phoronis muelleri	••	••	
Asterias rubens	••••	•	Occasional
Amphiura chiajei	••	••	Frequent
Amphiura filiformis	•••	••	Frequent
Ophiura albida	••••	••	Frequent
Ophiura ophiura	••	••	Frequent
Callionymus lyra	•••	••	Occasional

Distribution

Sector	***Area***	***Source***	***Section/page***	***Equivalence***
Other	Sealochs	Howson, Connor & Holt 1994	SL80	Part of

Frequency of occurrence

In Britain: Common

CMS.VirOph.HAs *Virgularia mirabilis* and *Ophiura* spp. with hydroids and ascidians on circalittoral sandy or shelly mud with shells or stones

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Gravely mud; shelly mud; sandy mud with stones or shells
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Biotope description

Circalittoral fine sandy mud with shell gravel and notable quantities of shells or small stones scattered over the sediment surface. These sediments, like CMS.VirOph, may contain *Virgularia mirabilis* and *Ophiura* spp., but shells and small stones scattered over the sediment surface provided sufficient stable substrata for a variety of sessile epifaunal species to occur. Of these the hydroids *Kirchenpaueria pinnata*, *Nemertesia antennina* and *Nemertesia ramosa*, and the solitary ascidians *Corella parallelogramma* and *Ascidia mentula* are most common. The serpulids *Protula tubularia*, *Serpula vermicularis* and *Pomatoceros triqueter* and the barnacles *Balanus balanus* and *Balanus crenatus* are also often present. *Munida rugosa* are frequently found under larger stones. All these species are typical of more rocky habitats in such sheltered conditions.

Similar biotopes

CMU.SpMeg	CMS.VirOph.HAs has more mixed sediment and tends to occur in shallower water
IMU.PhiVir	CMS.VirOph.HAs occurs in more mixed sediments and often slightly deeper water
CMS.VirOph	CMS.VirOph.HAs occurs in sediments with higher proportions of shells and pebbles

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Kirchenpaueria pinnata	•••	•	Occasional
Nemertesia antennina	•••	••	Occasional
Nemertesia ramosa	•••	••	Occasional
Virgularia mirabilis	•••	••	Occasional
Cerianthus lloydii	••••	•	Frequent
Pomatoceros triqueter	•••	•	Occasional
Serpula vermicularis	••	••	Occasional
Protula tubularia	••	••	Occasional
Balanus balanus	••	••	Occasional
Balanus crenatus	••	•	Occasional
Pagurus prideaux	••	••	Occasional
Munida rugosa	••	••	Occasional
Inachus dorsettensis	••	••	Occasional
Ophiura albida	•••	••	Frequent
Ophiura ophiura	••	••	Frequent
Corella parallelogramma	•••	••	Occasional
Ascidia mentula	•••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Sealochs	Howson, Connor & Holt 1994	SL80	Part of

Frequency of occurrence

In Britain: Common

CMS.Ser *Serpula vermicularis* reefs on very sheltered circalittoral muddy sand

Habitat classification

		Previous code	
Salinity:	Full	SCR.Sver	96.7
Wave exposure:	Very sheltered, Extremely sheltered		
Tidal streams:	Weak		
Substratum:	Calcareous tubes; pebbles; shells on sediment		
Zone:	Infralittoral - lower, Circalittoral		
Depth band:	5-10m, 10-20m, 20-30m		

Biotope description

Large clumps (mini 'reefs') of the calcareous tubes of *Serpula vermicularis*, typically attached to stones on muddy sediment in very sheltered conditions in sealochs. A rich associated biota attached to the calcareous tube may include *Esperiopsis fucorum*, thin encrusting sponges, the ascidians *Ascidiella aspersa*, *Pyura microcosmus* and *Diplosoma listerianum* and fine hydroids such as *Halopteris catharina*. In shallow water dense *Phycodrys rubens* may grow on the 'reefs'. Reefs from Loch Creran have been recently studied (Moore 1996). The only other known site in UK for these reefs is Loch Sween, where they are reported to have deteriorated. Otherwise only known from Salt Lake, Cliffden and Killary Harbour, Co. Galway.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Leucosolenia botryoides	•••	••	Occasional
Esperiopsis fucorum	••••	••	Occasional
Halopteris catharina	••••	••	Occasional
Kirchenpaueria pinnata	•••••	••	Frequent
Nemertesia antennina	••••	••	Occasional
Plumularia setacea	••••	••	Occasional
Eupolymnia nebulosa	•••	••	Frequent
Myxicola infundibulum	•••	••	Frequent
Sabella pavonina	•••••	••	Occasional
Pomatoceros triqueter	•••••	•	Common
Serpula vermicularis	•••••	••	Abundant
Balanus balanus	•••••	••	Occasional
Pandalus montagui	•••	••	Frequent
Pagurus bernhardus	•••••	•	Occasional
Munida rugosa	••••	••	Occasional
Hyas araneus	•••••	••	Occasional
Inachus dorsettensis	•••••	••	Rare
Macropodia rostrata	•••	••	Rare
Carcinus maenas	•••••	•	Rare
Tonicella marmorea	••••	••	Occasional
Gibbula cineraria	•••••	•	Occasional
Modiolus modiolus	•••••	••	Occasional
Chlamys distorta	•••	••	Occasional
Aequipecten opercularis	•••••	••	Occasional
Pododesmus patelliformis	••••	••	Occasional
Ophiothrix fragilis	•••••	•	Occasional
Psammechinus miliaris	•••••	••	Frequent
Diplosoma listerianum	•••••	••	Frequent
Corella parallelogramma	•••••	••	Frequent

Ascidiella aspersa	•••••	••	Common
Ascidia virginea	••••	••	Occasional
Dendrodoa grossularia	•••••	•	Frequent
Pyura microcosmus	••	•••	Frequent
Corallinaceae	•••••	•	Frequent
Phycodrys rubens	••••	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Loch Creran, Sween	Howson, Connor & Holt 1994	SL69	=
R13	Loch Sween	Bosence 1979		
R13	Loch Creran	Moore 1996		=
IR6	Salt Lake, Co Galway			

Frequency of occurrence

In Britain: Rare

Features of conservation interest

Very rare biotope. Loch Creran examples very rich in epibiota and probably highly vulnerable to physical disturbance.

Ang *Angiosperm communities (lagoons)*

IMU.NVC A12 *Potamogeton pectinatus* community

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Extremely sheltered, Ultra sheltered
Tidal streams:	Very weak
Substratum:	Mud (often with some stones and shells)
Zone:	Sublittoral fringe, Infralittoral
Depth band:	0-5 m

Previous code

IMU.Pot	96.7

Biotope description

Consistently low salinity infralittoral mud with beds of *Potamogeton pectinatus*. This biotope appears to replace *Ruppia* beds where the salinity is consistently low as opposed to variable. Other associated species are broadly similar to that of IMS.Rup, with blankets of filamentous green algae such as *Enteromorpha intestinalis*, *Cladophora liniformis* and *Rhizoclonium tortuosum*. The grazing gastropods *Hydrobia ulvae* and *Potamopyrgus jenkinsi* are found in this biotope and juvenile *Mytilus edulis* have been observed settled on *Potamogeton* leaves and amongst the algae. The nationally scarce charaphyte *Lamprothamnium papulosum* may be found to some extent in this biotope but more often in neighbouring habitats (see Plaza & Sanderson 1997). Mysids and sticklebacks *Gasterosteus aculeatus* can be found swimming amongst the vegetation. *Mya arenaria* may be found in some examples of this biotope, but the infaunal component of this biotope requires further investigation. This biotope is further described as NVC type A12 (Rodwell 1995).

Similar biotopes

IMS.Rup	Occur in similar, but more consistently reduced salinities

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Mysidae	•••	•	Frequent
Gammaridae	••	•	Present/Not known
Potamopyrgus jenkinsi	•••	•••	Frequent
Mytilus edulis	•••	•	Occasional
Gasterosteus aculeatus	••	••	Occasional
Enteromorpha intestinalis	••	•	Common
Cladophora flexuosa	••	••	Present/Not known
Cladophora liniformis	•••	••	Frequent
Potamogeton pectinatus	•••••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Mussel Loch, Yell, Shetland	Covey, Thorpe & Nichols In prep	Lag.34	
R2	Loch of Stenness, Orkney	Covey, Thorpe & Nichols In prep	Lag.34	
R4	Fearn Lodge Pond (Moray Firth)	Covey, Thorpe & Nichols In prep	Lag.34	
R14	L. an Duin, L. Leodsay, L. Ceann a Bhaigh, L. Obisary	Covey, Thorpe & Nichols In prep	Lag.34	

Frequency of occurrence

In Britain: Scarce

Features of conservation interest

Occurs in lagoonal habitats which are a priority habitat type under the EC Habitats Directive. *Lamprothamnium papulosum* (a protected species under the Wildlife & Countryside Act 1981) may occur in some examples of this biotope.

Ang *Angiosperm communities (lagoons)*

IMU.NVC S4 *Phragmites australis* swamp and reed beds

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Extremely sheltered, Ultra sheltered
Tidal streams:	Very weak
Substratum:	Mud; peat; sand
Zone:	Infralittoral - upper
Depth band:	0-5 m

Previous code

IMU.Phr	96.7

Biotope description

Permanently low salinity muds or peaty muddy sands with some gravel which supports *Phragmites australis* reed beds. These reed beds are often found in enclosed water bodies influenced by freshwater inflow and may have notable quantities of decaying reed material. The substratum may be mixtures of mud, peaty mud, sand and some gravel. Filamentous green algae and charaphytes such as *Lamprothamnium papulosum* and *Chara aspera* may also be found in association with this biotope as well as a the freshwater quillwort *Myriophyllum* spp. The infaunal component of this biotope is poorly known. This biotope is further described as NVC type S4 (Rodwell 1995).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Phragmites australis	•••••	•••	Super abundant
Myriophyllum		••	Occasional
Cladophora		•	Present/Not known
Rhizoclonium		••	Present/Not known
Chara aspera		•••	Common
Lamprothamnium papulosum		•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Easter Loch (Unst, Shetland)	Covey, Thorpe & Nichols In prep	Lag.35	
R3	Fearn Lodge Pond (Moray Firth)	Covey, Thorpe & Nichols In prep	Lag.35	
R14	Oban nam Fiadh	Covey, Thorpe & Nichols In prep	Lag.35	

Features of conservation interest

May contain the nationally scarce *Lamprothamnium papulosum* (see Plaza & Sanderson 1997) which is protected under the Wildlife & Countryside Act 1981.

MarMu *Shallow marine mud communities*

IMU.TubeAP Semi-permanent tube-building amphipods and polychaetes in sublittoral mud or muddy sand

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak
Substratum:	Muds; clays; muddy sands
Zone:	Infralittoral, Circalittoral
Depth band:	5-10m, 10-20m, 20-30m, 30-50m, >50 m

Biotope description

Sublittoral stable mud and muddy sands occurring over a wide depth range may support large populations of semi-permanent tube-building amphipods and polychaetes. This community is poorly known and appears to occur in restricted patches. Amphipods such as *Ampelisca* spp., *Corophium* spp. and *Haploops tubicola* have been described as occurring in high densities in such habitats (see Petersen 1918; Thorson 1957) and polychaetes such as *Spiophanes bombyx* and *Polydora ciliata* may also be conspicuously numerous. It may be that this community develops as a result of moderate nutrient enrichment. It is possible that this biotope may contain more than one entity as all the characterising species listed need not occur simultaneously.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Polydora ciliata			Abundant
Spiophanes bombyx			Present/Not known
Ampelisca			Abundant
Haploops tubicola			Abundant
Corophium			Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Inner Danish Waters	Petersen 1918		

MarMu *Shallow marine mud communities*

IMU.AreSyn *Arenicola marina* and synaptid holothurians in extremely shallow soft mud

Habitat classification

Salinity:	Full
Wave exposure:	Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mud
Zone:	Infralittoral
Depth band:	0-5 m

Previous code

LMU.Are in part	96.7

Biotope description

In very shallow extremely sheltered very soft muds *Arenicola marina* may form very conspicuous mounds and casts. At such sites, high densities of synaptid holothurians such as *Labidoplax media* and *Leptosynapta bergensis* occur. This biotope typically occurs in waters shallower than about 5 m in sheltered basins of sealochs and lagoons that may be partially separated from the open sea by tidal narrows or rapids. Sediment surfaces may become covered by a diatom film at certain times of the year.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	••••	•	Common
Terebellidae	••••	•	Frequent
Leptosynapta bergensis	•	•••	Common
Labidoplax media	•••••	•••	Frequent
Diatoms - film	••••	••	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Garths Voe	May, Kippen & Smith 1991		
R1	Whiteness Voe	Rostron 1989a		
R1	Brindister Voe & Vadills	Howson 1988		
R1	Burra, Stromness Voe	Hiscock 1986		
R1	South Voe	Covey & Hill 1993		
R1	Shetland		R1.AreSyn	=
R13	Loch Tarbet, Jura	Howson, Connor & Holt 1994	SL83	
R14	Lochs Maddy, Eport & Boisdale	Howson, Connor & Holt 1994	SL83	
R15	Loch a'Chairn Bhain	Howson, Connor & Holt 1994	SL83	

MarMu *Shallow marine mud communities*

IMU.PhiVir *Philine aperta* and *Virgularia mirabilis* in soft stable infralittoral mud

Habitat classification

Salinity:	Full
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Very weak
Substratum:	Mud
Zone:	Infralittoral
Depth band:	5-10m, 10-20m

Biotope description

Physically very stable muds with a high proportion of fine material (greater than 80 %) may contain the seapen *Virgularia mirabilis*. These muds typically occur in shallow water to about 12-15 m where significant seasonal variation in temperature is presumed to occur. This habitat is restricted to the most sheltered basins in, for example, sealochs. Although most records suggest full salinity conditions are prevalent, some sites may be subject to variable salinity. The opisthobranch *Philine aperta* is the most characteristic species of this habitat, occurring in high densities at many sites. The seapen *Virgularia mirabilis*, a species found more widely in muddy sediments, appears to reach its highest densities in this shallow mud. Other conspicuous species found in this shallow muddy habitat include *Cerianthus lloydii*, *Sagartiogeton* spp., *Ascidiella aspersa* and *Myxicola infundibulum*. *Amphiura chiajei* and *Amphiura filiformis* may also be present at some sites. Burrowing crustacean megafauna, characteristic of deeper mud, are rare or absent from this shallow sediment. Of these burrowers *Nephrops norvegicus* may sometimes be recorded. The bivalves *Nucula* sp., *Thyasira flexuosa* and *Corbula gibba* may be other conspicuous infaunal species. The sediment may be covered by a diatom film. In the south of Great Britain, the polychaete *Sternaspis scutata* is also characteristic of this biotope. This polychaete is rare in Great Britain (Sanderson 1996). Indeed, this southern variant of the biotope is very restricted in the UK to Portland Harbour but is known to occur further south in the Gulf of Gascony and the Mediterranean (Glémarec 1973; Dauvin *et al*. 1994). Similar but deeper more stable muds to IMU.PhiVir are characterised by burrowing megafauna (CMU.SpMeg). IMU.PhiVir has a lot of similarity with CMU.BriAchi, possibly differing on account of low disturbance or linkage with enriched overlying waters, however, these hypotheses are untested. IMU.PhiVir may also be closely allied to CMS.AbrNucCor, showing some of the infaunal elements of this biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Suberites ficus	••	••	Rare
Hydractinia echinata	•••	••	Occasional
Virgularia mirabilis	••••	••	Common
Cerianthus lloydii	••••	•	Occasional
Sagartiogeton laceratus	••	••	Occasional
Sagartiogeton undatus	•••	••	Frequent
Nephtys hystricis	•	••	Present/Not known
Terebellidae	•••	•	Occasional
Pagurus bernhardus	••••	•	Occasional
Liocarcinus depurator	•••	••	Occasional
Carcinus maenas	•••	•	Occasional
Philine aperta	••••	•••	Common
Aequipecten opercularis	••	••	Occasional
Abra alba	•	•	Present/Not known
Asterias rubens	•••	•	Occasional

Amphiura chiajei	••	••	Frequent
Amphiura filiformis	•	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Portland Harbour	Moore In prep	SWI.83	
R12	Clyde: Gareloch, Holy L., L. Riddon, L. Fyne	Howson, Connor & Holt 1994	SL84	=
R13	L. Tarbert; West L. Tarbert; Craignish; Scridain	Howson, Connor & Holt 1994	SL84	=
R14	Outer Hebrides sealochs	Howson, Connor & Holt 1994	SL84	=
R15	NW sealochs	Howson, Connor & Holt 1994	SL84	=
Other	Gulf of Gascony	Glémarec 1973		

Frequency of occurrence

In Britain: Uncommon

Features of conservation interest

May contain the nationally rare polychaete *Sternaspis scutata* in southern Great Britain

MarMu *Shallow marine mud communities*

IMU.Ocn *Ocnus planci* aggregations on sheltered sublittoral muddy sediment

Habitat classification

		Previous code	
Salinity:	Full	SCR.Ocn	96.7
Wave exposure:	Sheltered, Very sheltered		
Tidal streams:	Weak, Very weak		
Substratum:	Stones or shells on muddy sediment		
Zone:	Infralittoral, Circalittoral		
Depth band:	0-5 m, 5-10m, 10-20m		

Biotope description

Dense aggregations of *Ocnus planci [?brunneus]* on various substrata, typically muddy but sometimes with stones or shells, in sheltered conditions such as sealochs. Associated species vary but are typical of very sheltered muddy habitats. *Melanella alba*, which parasitises holothurians, is found in large numbers at one site.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Alcyonium digitatum	••••	•	Rare
Virgularia mirabilis	••	••	Occasional
Pholoe inornata	•••	••	Common
Ophiodromus flexuosus	•••	••	Present/Not known
Prionospio ehlersi	•••	••	Abundant
Melinna palmata	•••	••	Abundant
Myxicola infundibulum	•••	••	Rare
Sabella pavonina	••	••	Rare
Melanella alba	•	•••	Occasional
Mya truncata	•••••	•	Present/Not known
Amphiura filiformis	••••	••	Super abundant
Ophiura ophiura	••••	••	Common
Ocnus planci	•••••	•••	Super abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R2	Bay of Firth, Orkney		MNCR data	?
R9	Stackpole		F. Bunker pers. comm. 1997	
R12	Loch Goil	Howson, Connor & Holt 1994	SL85	=
R13	Loch Craignish	Gubbay & Loretto 1991		
R14	Loch Erisort	Howson, Connor & Holt 1994	SL85	
IR2	Carlingford Lough	Erwin *et al*. 1990		
Other	Brittany, France		B.E. Picton pers. comm. 1997	

Frequency of occurrence

In Britain: Rare

EstMu *Estuarine sublittoral muds*

IMU.PolVS *Polydora ciliata* in variable salinity infralittoral firm mud or clay

Habitat classification

Salinity:	Variable
Wave exposure:	Moderately exposed, Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Hard clay, relict peat
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Variable salinity clay and firm mud characterised by a turf of the polychaete *Polydora ciliata*. *P. ciliata* also occurs in high densities elsewhere - see MCR.Pol. (May be a specific feature of the Humber Estuary in these conditions.) This biotope occurs only in very firm mud and clay and possibly submerged relict saltmarsh with a high detrital content. It is characterised, and can be separated from other biotopes, by a combination of the sediment characteristics and the very high density of *Polydora ciliata*.

Similar biotopes

MCR.Pol
IMU.AphTub
IMX.PolMtru

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nemertea indet.	●●●	●	Common
Pholoe synophthalmica	●●●	●●	Frequent
Hediste diversicolor	●●●●	●	Present/Not known
Polydora ciliata	●●●●	●	Common
Pygospio elegans	●●●	●	Common
Neoamphitrite figulus	●●●	●	Abundant
Corophium volutator	●●●●	●	Frequent
Petricola pholadiformis	●	●	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Humber	Dalkin, Gudmundsson & Barnett 1996		

EstMu *Estuarine sublittoral muds*

IMU.AphTub *Aphelochaeta marioni* and *Tubificoides* spp. in variable salinity infralittoral mud

Habitat classification

Salinity:	Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Cohesive mud, possibly with shell debris and stones
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Previous code

IMU.PhoSco	96.7

Biotope description

Variable salinity cohesive muddy sediment dominated by the polychaete *Aphelochaeta marioni* and the oligochaetes *Tubificoides* spp. The polychaetes *Polydora ciliata*, *Cossura longocirrata* and *Melinna palmata* may also occur in high numbers. The cirratulid polychaete *Caulleriella zetlandica* may also occur (there is still inconsistency in the identification of the cirratulid group, compounded by fragmentation during sample processing). This biotope is very common in stable muddy environments and may extend from reduced salinity to fully marine conditions. The biotope may be separated from similar biotopes such as IMU.NhomTub by the abundance of *A. marioni*, terebellids and an indication of the stability of the sediment. In areas of mixed sediment *A. marioni* may also occur in high numbers. In this case it may be difficult to separate IMU.AmpTub from IMX.PolMtru requiring classification on sediment characteristics and associated species such as the bivalve *Mya truncata* in addition to the abundance of *A. marioni*. It may be separated from IMX.CreAph by the relative abundances of the slipper limpet *Crepidula fornicata* in addition to *A. marioni*. This biotope may also be found in conjunction with IMS.MacAbr.

Similar biotopes

IMU.NhomTub
IMU.PolVS
IMX.CreAph
IMX.PolMtru

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Exogone naidina	••	••	Frequent
Nephtys hombergii	••••	•	Common
Polydora ciliata	••	•	Common
Pygospio elegans	•••	•	Present/Not known
Streblospio shrubsolii	•••	••	Frequent
Caulleriella zetlandica	••	•	Common
Aphelochaeta marioni	•••	•	Abundant
Cossura longocirrata	••	••	Frequent
Capitella capitata	•••	•	Frequent
Mediomastus fragilis	••	•	Frequent
Melinna palmata	••	•	Common
Ampharete	•••	•	Common
Tubificoides	•••	•	Common
Phoronis	••	•	Present/Not known

Distribution

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

R5	Tees	Shillabeer & Tapp 1989	
R6	Orwell	Baxter 1989	
R6	Humber	Dalkin, Gudmundsson & Barnett 1996	
R6	Stour	Johnson 1989	
R6	Blackwater	Johnson 1991	
R6	Hamford Water		MNCR data
R6	Swale & Medway		MNCR data
R7	Eastern Channel estuaries	Sheader & Jensen 1990	
R8	Fal	National Rivers Authority 1992	
R9	Milford Haven		OPRU data

EstMu *Estuarine sublittoral muds*

IMU.NhomTub *Nephtys hombergii* and *Tubificoides* spp. in variable salinity infralittoral soft mud

Habitat classification

Salinity:	Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong, Weak
Substratum:	Mud; sandy mud
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Variable salinity soft infralittoral mud and sandy mud characterised by the polychaete *Nephtys cirrosa* and oligochaetes of the genus *Tubificoides*. Also present are low numbers of the bivalves *Macoma balthica*, *Abra alba* and the polychaete *Scoloplos armiger*. The biotope is found in areas of silt deposition in soft and sandy muds but may not form a stable habitat. It may be found adjacent to IMU.ThaTub, separated by the abundance of *Tharyx marioni* and its more cohesive sediments. More mobile muds, IMU.MobMud, may contain a reduced element of this biotope in which case only sediment description will distinguish the two biotopes. This biotope may be in conjunction with IMS.MacAbr.

Similar biotopes

IMU.AphTub
IMU.MobMud

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys hombergii	•••••	•	Common
Scoloplos armiger	•	•	Present/Not known
Streblospio shrubsolii	••	••	Frequent
Aphelochaeta marioni	•	•	Frequent
Tubificoides	••	•	Common
Diastylis rathkei typica	••	••	Common
Macoma balthica	••	•	Present/Not known
Abra alba	•	•	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Forth	Forth River Purification Board 1992		
R4	Forth	Forth River Purification Board 1993		
R5	Tees	Shillabeer & Tapp 1989		
R6	Orwell	Baxter 1989		
R6	Humber	Dalkin, Gudmundsson & Barnett 1996		
R6	Stour	Johnson 1989		
R6	Blackwater	Johnson 1991		
R6	Swale	Sheader & Jensen 1990		
R6	Hamford Water, Swale, Medway		MNCR data	
R7	Portsmouth Harbour	Sheader & Jensen 1990		
R9	Severn	Welsh Water Authority 1984		

EstMu *Estuarine sublittoral muds*

IMU.MobMud Infralittoral fluid mobile mud

Habitat classification

Salinity:	Variable, Reduced / low
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Strong, Moderately strong
Substratum:	Fluid mud
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Found only on slack water

Biotope description

Fluid mobile mud suspended and deposited on each tide. In areas with very high quantities of suspended particulate material in the water column it may become deposited around slack water when tidal currents fall. This can form fluid mud layers up to several metres thick (Warwick & Uncles 1980) becoming a transient habitat in its own right. Species present within this biotope will be those washed in from other communities. This biotope may be under-recorded due to sampling problems, and also where sediment descriptions are absent from field data. It may be found adjacent to; IMU.Tub, IMU.NhomTub and to some extent IMU.ThaTub.

Similar biotopes

IMU.Tub
IMU.CapTub

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephtys hombergii	•	•	Present/Not known
Aphelochaeta marioni	•	•	Present/Not known
Capitella capitata	•	•	Present/Not known
Tubificoides	•	•	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	Tees	Shillabeer & Tapp 1989		
R5	Blyth	Frid & Garwood 1991		
R9	Severn	Warwick & Uncles 1980		

EstMu *Estuarine sublittoral muds*

IMU.CapTub *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Cohesive muddy sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Possible organic enrichment or physical disturbance

Biotope description

Reduced salinity muddy sediment dominated by the polychaete *Capitella capitata* with a very low species richness. Large numbers of the oligochaetes *Tubificoides* spp. may be found in conjunction with the *C. capitata*. The biotope is found in the muddier sediments, usually with a high organic content, away from tidal channels in estuaries. On occasion relatively large numbers of *C. capitata* can be found in sandier sediments within a more mobile habitat although these are thought largely to be imported by tidal streams from nearby populations a definition of a separate biotope may be appropriate. A similar biotope IMU.Tub can be separated from IMU.CapTub by a swap in the dominant species from *C. capitata* to *Tubificoides* spp and may occur in lower salinity. More mobile muds which occur in areas with an extremely high suspended particulate component to the water column, IMU.MobMud, may contain a similar suite of species to IMU.CapTub although in lower abundance. Only a description of the sediment consistency in the field would allow positive classification. The presence of dense *Capitella* has classically been associated with organically enriched and physically disturbed habitats in the marine environment (Warren 1977; Pearson & Rosenberg 1978). In estuaries the presence of this biotope may be associated with other natural factors including the occurrence of a competitive refuge for *C. capitata* in the reduced-salinity environment (Wolff 1973).

Similar biotopes

IMU.Tub
IGS.MobRS

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Eteone longa	•••	•	Common
Marenzelleria wireni	•••	••	Common
Capitella capitata	•••••	•	Common
Tubificoides	••••	•	Frequent
Macoma balthica	•••	•	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Tay	Jones, Herbert & McManus 1989		
R5	Tees	Shillabeer & Tapp 1989		
R6	Humber	Dalkin, Gudmundsson & Barnett 1996		

EstMu *Estuarine sublittoral muds*

IMU.Tub *Tubificoides* spp. in reduced salinity infralittoral muddy sediment

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Cohesive muddy sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m
Other features:	Possibly affected by a high biochemical oxygen demand

Biotope description

Reduced salinity muddy sediments characterised by oligochaetes, particularly of the genus *Tubificoides*. The abundance of the oligochaetes may vary by several orders of magnitude but very few other species will be present. This biotope is found towards the edges of tidal channels in estuaries where current velocities allow deposition of silt and the establishment of an infaunal community. Organic loading and poor water-exchange within the sediment lead to anoxic conditions which may explain the low species richness within this biotope. The biotope may occur downstream of IMU.LimTtub, differentiated by the absence of the freshwater species, and adjacent to more mobile and sandier biotopes in the tidal channels. A similar biotope IMU.CapTub can be separated from IMU.Tub by the dominance of the polychaete *Capitella capitata*. More mobile muds which occur in areas with an extremely high suspended particulate component to the water column, IMU.MobMud, may contain a very similar suite of species to IMU.Tub and can only positively be separated by a description of the sediment characteristics in the field.

Similar biotopes

IMU.LimTtub
IMU.CapTub
IMU.MobMud

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Marenzelleria wireni	•	••	Common
Aphelochaeta marioni	••	•	Present/Not known
Capitella capitata	•	•	Present/Not known
Heterochaeta costata	•	•	Present/Not known
Tubificoides	••	•	Present/Not known
Enchytraeidae	•	•	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Forth	Forth River Purification Board 1993		
R5	Tees	Shillabeer & Tapp 1989		
R6	Medway	Sheader & Jensen 1990		
R9	Bristol Channel	Mettam, Conneely & White 1994		

EstMu *Estuarine sublittoral muds*

IMU.LimTtub *Limnodrilus hoffmeisteri*, *Tubifex tubifex* and *Gammarus* spp. in low salinity infralittoral muddy sediment

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Cohesive muddy sediment
Zone:	Infralittoral
Depth band:	0-5 m
Other features:	Very low, fluctuating salinity; possibly with a high biochemical oxygen demand

Biotope description

Upper estuary muddy sediments with very low fluctuating salinity, characterised by oligochaetes *Limnodrilus hoffmeisteri* and *Tubifex tubifex*. This biotope is found in the transitional zone between the freshwater and brackish environments where tidal currents are sufficiently reduced to allow the deposition of fine silt and the establishment of an infaunal community. The biotope contains elements of both freshwater and brackish communities and may be found adjacent to IGS.NeoGam away from the stronger tidal streams. It is similar to IMU.Tub although the latter lacks the freshwater element.

Similar biotopes

IMU.Tub
IGS.NeoGam

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Limnodrilus hoffmeisteri	•••••	•••	Common
Tubifex tubifex	••••	•••	Present/Not known
Mysidae	•	•	Present/Not known
Neomysis integer	•	••	Present/Not known
Gammarus salinus	•	••	Present/Not known
Gammarus zaddachi	•	••	Present/Not known
Chironomida	•	••	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Forth	Forth River Purification Board 1993		
R4	Forth	McLusky, Hull & Elliott 1993		
R6	Thames	Attrill 1990		
R9	Usk and Wye	Wharfe *et al*. 1979		

CMU.BriAchi *Brissopsis lyrifera* and *Amphiura chiajei* in circalittoral mud

Habitat classification

Salinity:	Full
Wave exposure:	
Tidal streams:	Weak
Substratum:	Silty mud
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m, >50 m

Biotope description

Mud in deep offshore, or shallower stable nearshore, waters can be characterised by the urchin *Brissopsis lyrifera* and the brittle star *Amphiura chiajei*. This community is very similar to CMS.AbrNucCor and CMS.AfilEcor but tends to occur in deeper and siltier muds. Transitional communities between the two may contain large numbers of *Turritella*. In certain areas of the UK such as the northern Irish Sea, this community may also contain *Nephrops norvegicus* and can consequently be the focus for fishing activity (Mackie, Oliver & Rees 1995). Where intense benthic dredge fishing activity occurs populations of the indicator species, *Brissopsis lyrifera* may be depressed, although broken tests may still remain (E.I.S. Rees, M. Costello pers. comm. 1997). This community is the 'Boreal Offshore Mud Association' and '*Brissopsis* - *Chiajei*' communities described by other workers (Petersen 1918; Jones 1950).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Nephrops norvegicus		•••	
Calocaris macandreae		•••	
Turritella communis		••	
Nucula sulcata		••	
Amphiura chiajei		••	
Brissopsis lyrifera		•••	

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R11	Cumbria	Mackie 1990		

CMU.SpMeg Seapens and burrowing megafauna in circalittoral soft mud

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mud; mud with some shell gravel
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m, >50 m

Previous code

CMU.SpNep	96.7

Biotope description

Plains of fine mud at depths greater than about 15 m may be heavily bioturbated by burrowing megafauna; burrows and mounds may form a prominent feature of the sediment surface with conspicuous populations of seapens, typically *Virgularia mirabilis* and *Pennatula phosphorea*. These soft mud habitats occur extensively throughout the more sheltered basins of sealochs and voes and are present in quite shallow depths (as little as 15 m) in these areas probably because they are very sheltered from wave action. This biotope also seems to occur in deep offshore waters in the North Sea, where densities of *Nephrops norvegicus* may reach 68 per 10 m^{-2} (see Dyer *et al*. 1982, 1983), and the Irish Sea. The burrowing crustaceans present may include *Nephrops norvegicus, Calocaris macandreae* or *Callianassa subterranea*. The former of these species is the only one frequently recorded from surface observations, whilst grab sampling may fail to sample any of these species. Indeed, some forms of sampling may fail to indicate seapens as characterising. The crab *Goneplax rhomboides* may sometimes be recorded, again rarely, in this habitat. Large mounds formed by the echiuran *Maxmuelleria lankesteri* are also present in some sealoch sites. It is unclear from the data examined whether differences in the balance of species composition from site to site represent additional biotopes within this assemblage. *Pachycerianthus multiplicatus* is quite specific to this habitat and is scarce in Great Britain (Plaza & Sanderson 1997). The ubiquitous epibenthic scavengers *Asterias rubens*, *Pagurus bernhardus* and *Liocarcinus depurator* are present in low numbers. The brittlestars *Ophiura albida* and *Ophiura ophiura* are sometimes present, but are much more common in slightly coarser sediments. In the deeper fiordic lochs which are protected by an entrance sill, the tall seapen *Funiculina quadrangularis* may also be present (CMU.SpMeg.Fun). The brittlestars *Amphiura chiajei* and *Amphiura filiformis* may be present in large numbers, although there may be some sites, where these species are absent. The infauna may contain significant populations of the polychaetes *Pholoe* spp., *Glycera* spp., *Nephtys* spp., spionids, *Pectinaria belgica* and *Terebellides stroemi*, the bivalves *Nucula sulcata*, *Corbula gibba* and *Thyasira flexuosa* and the echinoderm *Brissopsis lyrifera* , although the latter may not be frequently found in remote samples. Overall, CMU.SpMeg is closely allied to CMU.BriAchi and COS.ForThy and shows strong similarities in infaunal species composition. It may differ from these biotopes as a result of a lack of disturbance or linkage to productive overlying waters (?). IMU.PhiVir is superficially similar to CMU.SpMeg but is found in shallower, less thermally stable waters and lacks the large burrowing species.

Similar biotopes

IMU.PhiVir
CMS.AfilEcor
CMU.BriAchi

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Virgularia mirabilis	••••	••	Frequent
Pennatula phosphorea	••	•••	Occasional
Cerianthus lloydii	•••	•	Occasional
Pachycerianthus multiplicatus	•	•••	Rare
Maxmuelleria lankesteri	•	•••	Present/Not known
Nephtys incisa	••	••	Present/Not known
Nephrops norvegicus	•••	•••	Frequent
Calocaris macandreae	•	•••	Frequent
Callianassa subterranea	•	•••	Occasional
Goneplax rhomboides	•	•••	Occasional
Turritella communis	••	••	Frequent
Amphiura chiajei	••	••	Common
Amphiura filiformis	••	••	Common
Brissopsis lyrifera	•	•••	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	Habitat 35	
R12	Clyde sealochs	Howson, Connor & Holt 1994	SL88	Part of
R13	Mull, Sunart and Linnhe sealochs	Howson, Connor & Holt 1994	SL88	Part of
R13	Jura and Islay	Farrow *et al*. 1979		
R13	Mull	Mitchell, Earll & Dipper 1983	Para. 5	
R13	Scarba	Picton *et al*. 1982		
R14	Outer Hebrides sealochs	Howson, Connor & Holt 1994	SL88	Part of
R15	NW sealochs	Howson, Connor & Holt 1994	SL88	
R15	Skye	Mitchell, Earll & Dipper 1983	Para. 5	
R15	E Rhum	Dipper 1981a		

Potentially damaging activities

Activity	*Degree of effect*
Fishing (including use of fixed and mobile gear)	

CMU.SpMeg.Fun Seapens, including *Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral soft mud

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mud
Zone:	Circalittoral
Depth band:	10-20m, 20-30m, 30-50m
Other features:	Burrows

Biotope description

Deep muds, especially in sealochs, which support populations of seapens such as *Virgularia mirabilis* and *Pennatula phosphorea*, but sometimes also with forests of the nationally scarce *Funiculina quadrangularis*. The sediment is usually extensively burrowed by crustaceans, the most common of which is *Nephrops norvegicus*, but *Callianassa subterranea* may also be present (the latter is likely to be under-recorded by grab sampling because it is deep burrowing). *Lesueurigobius friesii* is present at many sites. *Amphiura* spp. are usually present in high densities.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Funiculina quadrangularis	•••••	•••	Occasional
Virgularia mirabilis	••••	••	Occasional
Pennatula phosphorea	••••	•••	Frequent
Cerianthus lloydii	••••	•	Occasional
Pachycerianthus multiplicatus	••	•••	Occasional
Terebellidae	••	•	Occasional
Astacilla longicornis	••	•••	Rare
Nephrops norvegicus	••••	•••	Frequent
Calocaris macandreae	•	•••	Occasional
Callianassa subterranea	•	•••	Occasional
Pagurus bernhardus	••••	•	Occasional
Turritella communis	••	••	Frequent
Aequipecten opercularis	••	••	Occasional
Aequipecten opercularis	••	••	Occasional
Asterias rubens	••••	•	Occasional
Amphiura chiajei	••	••	Common
Amphiura filiformis	••	••	Abundant
Lesueurigobius friesii	••	•••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	W Scotland sealochs	Howson, Connor & Holt 1994	SL88	Part of
R15	NW Scotland	Howson, Connor & Holt 1994	SL88	Part of

Frequency of occurrence

In Britain: Scarce

CMU.Beg *Beggiatoa* spp. on anoxic sublittoral mud

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Very weak
Substratum:	Mud
Zone:	Infralittoral, Circalittoral
Depth band:	0-5 m, 5-10m, 10-20m
Other features:	Anoxic

Biotope description

Sublittoral soft anoxic mud, often in areas with poor water exchange with the open sea, can have a conspicuous bacterial mat covering of *Beggiatoa* spp. The anoxia may be a result of natural conditions of poor water exchange in some sealochs (and many Scandinavian fjords) or artificially under fish farm cages from nutrient enrichment. The fauna is normally impoverished at such sites, with few elements of the infaunal communities present in other muddy biotopes. Scavenging species such as *Asterias rubens* and *Carcinus maenas* are typically present where the habitat is not too anoxic but in extreme conditions of anoxia little survives other than the *Beggiatoa*. The polychaete *Ophiodromus flexuosus* occurs in high densities at the interface between oxygenated and deoxygenated sediments (in Norwegian fjords).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	••	•	Occasional
Pagurus bernhardus	••	•	Occasional
Carcinus maenas	••••	•	Occasional
Asterias rubens	••	•	Occasional
Beggiatoa	•••••	•••	Frequent
Chorda filum	••	••	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland	Howson 1988	Habitat 38, 46	
R1	Shetland	Hiscock 1986	Para. 12	
R12	Clyde sealochs	Howson, Connor & Holt 1994	SL87	
R13	Lochs Tuath, Feochan & Leven	Howson, Connor & Holt 1994	SL87	
R14	Lochs Grimshader, Mharabhig & Stockinish	Howson, Connor & Holt 1994	SL87	
R15	Lochs Ailort & Long	Howson, Connor & Holt 1994	SL87	
IR5	Bantry Bay	Emblow *et al*. 1994	p53	
Other	Norwegian fjords	Connor 1991	NF20	

KSwMx Laminaria saccharina *(sugar kelp) and filamentous seaweeds (mixed sediment)*

IMX.LsacX *Laminaria saccharina, Chorda filum* and filamentous red seaweeds on sheltered infralittoral sediment

Habitat classification

Salinity:	Full, Variable	
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered	
Tidal streams:	Moderately strong, Weak	
Substratum:	Muddy mixed sediment with cobbles, pebbles or shells	
Zone:	Infralittoral	
Depth band:	0-5 m, 5-10m	

Previous code

SIR.Lsac.X 96.7

Biotope description

Very sheltered infralittoral sandy and muddy mixed cobbles, pebbles and gravels with the cape form of *Laminaria saccharina* and *Chorda filum*. Beneath the kelp canopy, a variety of filamentous and foliose red algae are usually present, along with filamentous brown ectocarpoid algae. In the sandier sediments *Cerianthus lloydii* and terebellids such as *Lanice conchilega* are common. Where the cobbles, pebbles and gravels occur on muddier sediments, the infauna is characterised by a range of polychaetes and bivalves. This biotope is currently very broadly defined, and is likely to be further sub-divided following detailed data analysis, as the infauna and associated seaweeds appear to be distinctive depending on the specific sediment type.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	••	•	Occasional
Arenicola marina	•	•	Occasional
Lanice conchilega	••	•	Occasional
Pagurus bernhardus	••	•	Occasional
Liocarcinus depurator	••	••	Occasional
Carcinus maenas	••	••	Occasional
Gibbula cineraria	••	•	Occasional
Hinia reticulata	•	••	Occasional
Asterias rubens	•••	•	Occasional
Ascidiella aspersa	••	••	Occasional
Gracilaria gracilis	••	••	Frequent
Ectocarpaceae	••	•	Frequent
Dictyota dichotoma	••	•	Occasional
Chorda filum	••	••	Frequent
Laminaria saccharina	••••	•	Frequent
Ulva	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.Lsac.X	=
R1	Shetland	Howson 1988	H34	
R1	Shetland	Moss & Ackers 1987	4.2.7	
R2	Orkney		R2-4.Lsac.X	=
R7	R7 open coast		R7.LsacChoR	=
R8	Scillies	Hiscock 1984c	3.2.19/20	
R10	Aberdaron Bay	Hiscock 1984b	3.2.14	
R10	Menai Strait	Lumb 1983	4.3	
R15	Skye, Rum & Canna	Mitchell, Earl & Dipper 1983	4	
Other	Sealochs	Howson, Connor & Holt 1994	SL61	

Other	Sealochs	Howson, Connor & Holt 1994	SL72
Other	Sealochs	Howson, Connor & Holt 1994	SL81
Other	Sealochs	Howson, Connor & Holt 1994	SL78
Other	R8-9 Inlets	Moore In prep	SWI.63
Other	R8-9 Inlets	Moore In prep	SWI.64
Other	N Ireland	Erwin *et al*. 1990	6
Other	Norway	Connor 1991	NF3

KSwMx Laminaria saccharina *(sugar kelp) and filamentous seaweeds (mixed sediment)*

IMX.Tra Mats of *Trailliella* on infralittoral muddy gravel

Habitat classification

Salinity:	Full
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Very weak
Substratum:	Muddy gravel; muddy sand
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Dense loose-lying beds of the '*Trailliella*' phase of *Bonnemaisonia hamifera* may occur in extremely sheltered shallow muddy environments. Beds of this alga are often 10 cm thick but may reach 100 cm at some sites. Other loose-lying algae may also occur such as *Audouinella floridula* and species of *Derbesia*. Often the mud is gravely or with some cobbles and may be black and anoxic close to the sediment surface. This biotope is widely distributed in lagoons, sealochs and voes but should only be described as IMX.Tra when a continuous mat is found. It is likely that the infaunal component of this biotope may be considerably modified by the overwhelming quantity of loose-lying algae.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	••	•	Occasional
Arenicola marina	••	•	Occasional
Liocarcinus depurator	•••	•	Occasional
Ascidiella aspersa	•••	•	Rare
Bonnemaisonia hamifera	•••	••	Frequent
Trailliella intricata	••••	•••	Common
Laminaria saccharina	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland Voes		R1.Tra	
R2	Hoy Sound, Wide Firth		R2-4.Tra	
R14	Lagoons in Outer Hebrides	Covey, Thorpe & Nichols In prep	Lag.29	
R14	Loch Uiskevagh, Loch Skipport, Loch nan Ceall, Loch Eport	Howson, Connor & Holt 1994	SL82	
R15	Loch a'Chairn Bhain, Loch na Cairidh, Loch a'Chairn Bain	Howson, Connor & Holt 1994	SL82	
IR4	Lough Hyne		M. Costello pers. comm. 1997	

KSwMx Laminaria saccharina *(sugar kelp) and filamentous seaweeds (mixed sediment)*

IMX.Pcri Loose-lying mats of *Phyllophora crispa* on infralittoral muddy sediment

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Very weak
Substratum:	Mud or muddy sand with shells or pebbles
Zone:	Infralittoral
Depth band:	10-20m

Biotope description

Infralittoral mud and sandy mud, sometimes with some shells or pebbles, and a dense, loose-lying cover of *Phyllophora crispa*. This biotope occurs in very sheltered conditions such as those found in sealochs and voes. IMX.Pcri is similar to other biotopes described with dense, loose-lying algae but has been less frequently recorded, and from the few records available, appears to occur in slightly deeper infralittoral waters and typically in fully saline waters. The seaweeds in this biotope may epiphytised by ascidians such as *Ascidiella aspera* and *Ascidia mentula*.

Similar biotopes

IMX.Tra	Similar, but possible slightly deeper, sheltered muddy habitat
IMX.FiG	Similar, but fully saline muddy habitat

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hydractinia echinata	••••	••	Occasional
Cerianthus lloydii	••••	•	Occasional
Terebellidae	•••	•	Frequent
Liocarcinus depurator	•••••	•	Frequent
Carcinus maenas	••••	••	Present/Not known
Pecten maximus	••••	••	Rare
Crossaster papposus	••••	••	Present/Not known
Ascidiella aspersa	•••	••	Frequent
Ascidia mentula	•••	••	Frequent
Phyllophora crispa	•••••	•	Abundant
Plocamium cartilagineum	•••	•	Frequent
Laminaria saccharina	••••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Busta Voe, Luna Ness	Howson 1988		
R2	Wise Firth		MNCR data	
R12	Gairloch	Covey, Thorpe & Nichols In prep		
R15	L. Eisort	Howson, Connor & Holt 1994	SL82	In part

KSwMx Laminaria saccharina *(sugar kelp) and filamentous seaweeds (mixed sediment)*

IMX.FiG Filamentous green seaweeds on low salinity infralittoral mixed sediment or rock

Habitat classification

Salinity:	Reduced / low
Wave exposure:	Extremely sheltered
Tidal streams:	Very weak
Substratum:	Muddy sediment with pebbles & cobbles; rock
Zone:	Infralittoral
Depth band:	0-5 m

Previous code

SIR.FiG 96.7

Biotope description

Shallow muddy sediments, often with boulders, cobbles and pebbles around the edges of lagoons, that are exposed to wide salinity variations are unsuitable for colonisation by many species. Such areas may be colonised by a dense blanket of ephemeral green algae such as *Enteromorpha* spp., *Chaetomorpha linum*, *Cladophora liniformis* or *Derbesia marina*. This biotope may also contain some red seaweeds, such as *Furcellaria lumbricalis*, but always at low abundance (compare with SIR.PolFur). Amongst the filamentous green algae, grazing molluscs and solitary ascidians may be present.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Arenicola marina	•••	•	Frequent
Mysidae	•••	•	Frequent
Carcinus maenas	•••	•	Occasional
Akera bullata	••	•••	Common
Gasterosteus aculeatus	•••	••	Occasional
Beggiatoa	•••	••	Occasional
Percursaria percursa	•	•••	Present/Not known
Enteromorpha intestinalis	••	•	Common
Chaetomorpha linum	•••	•••	Frequent
Cladophora liniformis	••	••	Frequent
Derbesia marina	••	•••	Common

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
Other	Scottish lagoons	Covey, Thorpe & Nichols In prep	Lag.23	

Frequency of occurrence

In Britain: Scarce

MrlMx *Maerl beds (muddy mixed sediments)*

IMX.Lcor *Lithothamnion corallioides* maerl beds on infralittoral muddy gravel

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak
Substratum:	Muddy maerl gravel
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Live maerl beds in sheltered, silty conditions which are dominated by *Lithothamnion corallioides* with a variety of foliose and filamentous seaweeds. Live maerl is at least common but there may be noticeable amounts of dead maerl gravel and pebbles. Other species of maerl, such as *Phymatolithon calcareum* and *Phymatolithon purpureum*, may also occur as a less abundant component. Species of seaweed such as *Dictyota dichotoma*, *Halarachnion ligulatum*, *Gracilaria verrucosa* and *Ulva* spp. are often present, although are not restricted to this biotope, whereas *Dudresnaya verticillata* and *Cutleria multifida* tend not to occur on other types of maerl beds. The anemones *Anthopleura ballii*, *Anemonia viridis* and *Cereus pedunculatus* and the fan worm *Myxicola infundibulum* are typically found in IMX.Lcor whereas *Echinus esculentus* tends to occur more in other types of maerl. IMX.Lcor has a south-western distribution in Britain and Ireland. Sheltered, stable, fully saline maerl beds in the north of Great Britain (where *L. corallioides* has not been confirmed to occur) may need to be described as an analogous biotope to IMX.Lcor (see IGS.Phy).

Similar biotopes

IGS.Phy.R	IGS.Phy.R occurs in less stable environments

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Cerianthus lloydii	••	•	Occasional
Anemonia viridis	•••	••	Occasional
Anthopleura ballii	•••	••	Occasional
Cereus pedunculatus	••	••	Occasional
Myxicola infundibulum	••	••	Common
Liocarcinus depurator	•••	•	Occasional
Tectura virginea	•••	••	Frequent
Gibbula magus	•••••	••	Occasional
Gibbula cineraria	••	•	Occasional
Asterias rubens	•••••	•	Occasional
Dudresnaya verticillata	•••	••	Frequent
Lithothamnion corallioides	•••••	•••	Common
Phymatolithon calcareum	••	••	Frequent
Phymatolithon purpureum	••	••	Occasional
Dictyota dichotoma	•••	•	Frequent
Chorda filum	•••	••	Occasional
Ulva	••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Helford/Fal	Moore In prep	SWI.87	
IR5	Berehaven	Emblow *et al*. 1994		
IR6	Kilkeiran Bay	Sides *et al*. 1994		

Frequency of occurrence

In Britain: Scarce

MrlMx *Maerl beds (muddy mixed sediments)*

IMX.Lfas *Lithophyllum fasciculatum* maerl beds with *Chlamys varia* on infralittoral sandy mud or mud

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered
Tidal streams:	Weak
Substratum:	Mud and muddy gravel with shell
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Shallow, sheltered infralittoral muddy plains with *Lithophyllum fasciculatum* maerl. This rarely recorded maerl species forms flattened masses or balls several centimetres in diameter (Irvine & Chamberlain 1994). IMX.Lfas may be found on mud and muddy gravel mixed with shell. Species of burrowing anemone typical of sheltered conditions may be found in association, for example, *Anthopleura ballii*, *Cereus pedunculatus* and *Sagartiogeton undatus*. Polychaetes such as *Myxicola infundibulum* and terebellids, also characteristic of sheltered conditions, may be present. *Chlamys varia* and *Thyone fuscus* are occasional in all records of this biotope and red seaweeds such as *Plocamium cartilagineum*, *Calliblepharis jubata* and *Chylocladia verticillata* are present.

Similar biotopes

IMX.Lden	Similar habitat with different dominant maerl species
IMX.Lcor	Similar habitat with different dominant maerl species

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Suberites ficus	••••	••	Rare
Hydractinia echinata	••••	••	Present/Not known
Kirchenpaueria pinnata	••••	••	Occasional
Anthopleura ballii	••••	••	Occasional
Cereus pedunculatus	••••	••	Occasional
Sagartiogeton undatus	••••	••	Occasional
Terebellidae	•••••	•	Frequent
Myxicola infundibulum	••••	••	Frequent
Pagurus bernhardus	••••	•	Occasional
Macropodia rostrata	••••	••	Rare
Liocarcinus depurator	••••	••	Occasional
Carcinus maenas	•••••	•	Occasional
Tectura virginea	••	••	Frequent
Chlamys varia	•••••	••	Occasional
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	••••	•	Present/Not known
Thyone fusus	•••••	••	Occasional
Pomatoschistus pictus	••••	••	Occasional
Lithophyllum fasciculatum	•••••	•••	Common
Plocamium cartilagineum	••••	•	Occasional
Calliblepharis jubata	••••	••	Present/Not known
Chylocladia verticillata	••••	••	Present/Not known
Lomentaria clavellosa	••••	••	Present/Not known
Spyridia filamentosa	••••	••	Present/Not known

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
IR4	Roaringwater Bay		Lfas_ir	

Features of conservation interest

Lithophyllum fasciculatum appears to be a rare species of maerl, currently only known from Ireland.

Potentially damaging activities

Activity	*Degree of effect*
Maerl, gravel and sand dredging	

MrlMx *Maerl beds (muddy mixed sediments)*

IMX.Lden *Lithophyllum dentatum* maerl beds on infralittoral muddy sediment

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Mud and maerl gravel
Zone:	Infralittoral
Depth band:	0-5 m

Biotope description

Shallow, sheltered infralittoral mud with *Lithophyllum dentatum* maerl. This rarely recorded maerl species forms locally abundant balls, generally about three centimetres in diameter but as large as 15 cm (Irvine & Chamberlain 1994; H. Fazakerley pers. comm. 1997). IMX.Lden may be found on mud, muddy gravel and in association with small amounts of other maerl species such as *Lithothamnion corallioides*, *Phymatolithon calcareum* and *Lithophyllum fasciculatum*. Filamentous seaweeds such as *Rhodothamniella floridula*, *Asparagopsis armata* (*Falkenbergia* phase) and *Sphacelaria cirrosa* may occur in this biotope, as well as creeping plants of *Gelidium latifolium*, encrusting red and brown algae and small foliose red seaweeds. Faunal components of this biotope include *Gibbula magus*, sponges, burrowing worms, porcelain crabs, *Galathea* spp., amphipods and isopods. Knowledge of the community composition of this biotope is currently incomplete.

Similar biotopes

IMX.Lfas	Similar habitat but different dominant maerl species
IMX.Lcor	Similar habitat but different dominant maerl species

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Galathea		•	
Gibbula magus		••	
Asparagopsis armata		••	
Gelidium latifolium		••	
Lithophyllum dentatum		•••	
Lithophyllum fasciculatum		•••	
Lithothamnion corallioides		•••	
Phymatolithon calcareum		•••	
Sphacelaria cirrosa		••	

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
IR4	Ardgroom & Roaringwater Bays			
IR6	Kilhieran Cove, Mannin Creek & Roundstone, Kingstown & Kinvara Bays			

Features of conservation interest

Lithophyllum dentatum is rare and slow growing: individual plants are estimated to be 20-100 years old (H. Fazakerley pers. comm. 1997). It is possible that Irish populations are unique as they differ from type material from the eastern Mediterranean (see Irvine & Chamberlain 1994). One of the principal associated species, *L. fasciculatum*, is only known from Ireland and other species of maerl, sometimes associated with *L. dentatum* (*L. corallioides* and *P. calcareum*) are listed under Annex V of the EC Habitats Directive.

Oy *Oyster beds*

IMX.Ost *Ostrea edulis* beds on shallow sublittoral muddy sediment

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak, Very weak
Substratum:	Muddy fine sand with shell
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Dense beds of the oyster *Ostrea edulis* can occur on muddy fine sand. There may be considerable quantities of dead oyster shell making up a substantial portion of the substratum. The clumps of dead shells and oysters can support large numbers of *Ascidiella aspersa* and *Ascidiella scabra*. Several conspicuously large polychaetes may be present, such as *Chaetopterus variopedatus* and terebellids, as well as additional suspension-feeding polychaetes such as *Myxicola infundibulum*, *Sabella pavonina* and *Lanice conchilega*. A turf of seaweeds such as *Plocamium cartilagineum*, *Nitophyllum punctatum* and *Spyridia filamentosa* may also be present. This biotope description may need expansion to account for oyster beds in England.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Halichondria bowerbanki	••••	••	Occasional
Esperiopsis fucorum	••••	••	Occasional
Chaetopterus variopedatus	•••••	•	Occasional
Terebellidae	•••	•	Frequent
Lanice conchilega	••••	•	Occasional
Myxicola infundibulum	•••	••	Frequent
Sabella pavonina	•••	••	Common
Ostrea edulis	•••••	•••	Frequent
Ascidiella aspersa	•••	••	Frequent
Ascidiella scabra	•••	••	Occasional
Plocamium cartilagineum	•••	•	Frequent
Spyridia filamentosa	•••	••	Frequent
Nitophyllum punctatum	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R12	Loch Ryan	Howson, Connor & Holt 1994	SL79	=
IR5	Tralee Bay		Ost_ir	
IR7	Broad Haven		Ost_ir	

Frequency of occurrence

In Britain: Scarce

FaMx *Shallow mixed sediment faunal communities*

IMX.VsenMtru *Venerupis senegalensis* and *Mya truncata* in lower shore or infralittoral muddy gravel

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered, Extremely sheltered
Tidal streams:	Weak
Substratum:	Muddy gravel
Zone:	Infralittoral
Height band:	Lower shore
Depth band:	0-5 m

Previous code

IMX.VenMya	96.7
LMGR.VEN	5.96

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
Gelidium pusillum	••	••	Occasional
Corallinaceae	••	•	Abundant
Lithothamnion corallioides	••	••	Rare
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

FaMx *Shallow mixed sediment faunal communities*

IMX.An Burrowing anemones in sublittoral muddy gravel

Habitat classification

Salinity:	Full
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Muddy gravel; muddy shell gravel
Zone:	Infralittoral
Depth band:	10-20m, 20-30m

Biotope description

Sublittoral muddy gravel or shell gravel can contain conspicuous communities of burrowing anemones such as *Mesacmaea mitchellii*, *Aureliania heterocera*, *Cereus pedunculatus* and *Cerianthus lloydii*. Some ascidians such as *Corella parallelogramma* may also be present in the substratum if surface features such as shell material is large enough. There may be more than one variety of this biotope, influenced by the strength of the currents and the composition of the sediment.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Epizoanthus couchii		●●	
Aureliania heterocera		●●	
Cereus pedunculatus		●●	
Mesacmaea mitchellii		●●●	
Scolanthus callimorphus		●●●	

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R8	Isles of Scilly	Hiscock 1984c	Para. 3.2.24	
R9	Skomer	Bunker & Hiscock 1984	Para. 3.4.4	
R9	Lundy	Hiscock 1981	Para. 3.3.7	
R9	Skomer	Bunker & Hiscock 1987		
IR6	Kilkeiran Bay	Sides *et al*. 1994	KA26	

FaMx *Shallow mixed sediment faunal communities*

IMX.Lim *Limaria hians* beds in tide-swept sublittoral muddy mixed sediment

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Mixed muddy gravel and sand
Zone:	Infralittoral, Circalittoral
Depth band:	5-10m, 10-20m, 20-30m
Other features:	Consolidated bed formed from byssus-bound debris

Biotope description

Mixed muddy gravel and sand often in tide-swept narrows in the entrances or sills of sealochs with beds or 'nest' of *Limaria hians*. The *Limaria* form woven 'nests' or galleries from byssus and fragments of seaweeds so that the animals themselves cannot be seen from above the seabed. *Modiolus modiolus* sometimes occur at the same sites lying over the top of the *Limaria* bed. Other fauna associated with this biotope include hydroids such as *Kirchenpaueria pinnata*, *Nemertesia* spp. and *Plumularia setacea*, mobile crustaceans (e.g. *Hyas araneus*) and echinoderms (*Crossaster papposus*, *Ophiothrix fragilis* and *Ophiocomina nigra*). Sometimes red seaweeds occur if the beds are in shallow enough water.

Similar biotopes

CGS.Ven.Neo	IMX.Lim is found in muddier, more sheltered conditions in similar depths
IGS.Lgla	IMX.Lim is sometimes found amongst maerl gravels but is deeper than IGS.Lgla

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Kirchenpaueria pinnata	•••	••	Occasional
Nemertesia antennina	••	••	Frequent
Nemertesia ramosa	••	••	Frequent
Plumularia setacea	••	••	Occasional
Hyas araneus	••••	••	Occasional
Buccinum undatum	••••	••	Occasional
Modiolus modiolus	•••	••	Occasional
Limaria hians	•••••	•••	Abundant
Pecten maximus	•••	••	Frequent
Pododesmus patelliformis	•	••	Occasional
Crossaster papposus	••••	•	Occasional
Ophiothrix fragilis	••••	•	Common
Ophiocomina nigra	••••	•	Common
Phycodrys rubens	•••	•	Occasional

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R12	Loch Fyne	Howson, Connor & Holt 1994	SL74	=
R13	Lochs Linnhe, Sunart & Teacuis; Sound of Mull	Howson, Connor & Holt 1994	SL74	=
R15	Lochs Alsh, Broom & Glencoul	Howson, Connor & Holt 1994	SL74	=

Frequency of occurrence

In Britain: Scarce

EstMx *Estuarine sublittoral mixed sediments*

IMX.CreAph *Crepidula fornicata* and *Aphelochaeta marioni* in variable salinity infralittoral mixed sediment

Habitat classification

Salinity:	Variable
Wave exposure:	Very sheltered, Extremely sheltered
Tidal streams:	Moderately strong, Weak, Very weak
Substratum:	Mixed muddy sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Variable salinity mixed sediment characterised by the slipper limpet *Crepidula fornicata* and the polychaete *Aphelochaeta marioni*. Shell debris and cobbles are colonised by the ascidians *Ascidiella aspersa*, *Ascidiella scabra*, *Molgula* sp. and *Dendrodoa grossularia* (the ascidians may not be recorded adequately by remote infaunal survey techniques). This biotope occurs in the lower estuary where currents allow a stable environment to develop. It is associated with oyster beds and relict oyster beds, (IMX.Ost), in southern England and Wales, separated from these by the superabundance of *C. fornicata*. It may be found adjacent to or in conjunction with IMU.AphTub, again separated by the abundance of *C. fornicata* and its sediment characteristics. It may be associated with IMX.VsenMtru and possibly form a component of SCR.Aasp.

Similar biotopes

IMX.PolMtru
IMU.AphTub
SCR.Aasp
IMX.Ost

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Harmothoe impar	•••	•	Common
Lepidonotus squamatus	••••	•	Common
Eteone longa	•••	•	Frequent
Exogone naidina	••••	•	Frequent
Sphaerosyllis	••••	•	Common
Nephtys hombergii	••••	•	Common
Scoloplos armiger	••••	•	Abundant
Aphelochaeta marioni	••••	•	Common
Mediomastus fragilis	••••	•	Frequent
Tubificoides	•••••	•	Common
Achelia	•••	•	Frequent
Corophium volutator	•••	•	Present/Not known
Pariambus typicus	•••	•	Frequent
Cumacea indet.	••	•	Common
Carcinus maenas	•••	•	Abundant
Crepidula fornicata	•••••	••	Super abundant
Mytilus edulis	•••	•	Common
Abra alba	•••	•	Common
Ascidiella aspersa	•	•	Abundant
Ascidiella scabra	•	•	Common
Molgula	•	•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Orwell estuary	Baxter 1989		
R6	Stour estuary	Johnson 1989		
R6	Blackwater estuary	Johnson 1991		
R6	The Swale & Medway estuary		MNCR data	
R7	Southampton Water		NRA data	
R7	Portsmouth Harbour	Sheader & Jensen 1990		
R7	Langstone harbour	Sheader & Jensen 1990		
R7	Chichester Harbour	Sheader & Jensen 1990		
R9	Milford Haven		OPRU data	

EstMx *Estuarine sublittoral mixed sediments*

IMX.MytV *Mytilus edulis* beds on variable salinity infralittoral mixed sediment

Habitat classification

Salinity:	Variable
Wave exposure:	Sheltered
Tidal streams:	Moderately strong, Weak
Substratum:	Mixed muddy sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m

Biotope description

Shallow sublittoral mixed sediment, often subject to variable salinity conditions, characterised by beds of the common mussel *Mytilus edulis*. Infaunal species include the polychaetes *Heteromastus filiformis* and *Capitella capitata*, the amphipod *Gammarus salinus* and oligochaetes of the genus *Tubificoides*. Epifaunal species in addition to the *M. edulis* include the whelks *Nucella lapillus* and *Buccinum undatum* and the common starfish *Asterias rubens*. This biotope may be an extension of littoral communities SLR.MytX. It is similar to IMX.PolMtru and may be separated by the dominance of *M. edulis* in 'beds' rather than scattered individuals. Care must be taken with data to ensure juvenile spat recruitments are not classified as mussel beds. (Description based on records from the Tay Estuary; this biotope will require further records to confirm description.)

Similar biotopes

IMX.PolMtru

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Harmothoe imbricata	••••	•	Super abundant
Harmothoe impar	•••••	•	Abundant
Eteone longa	••••	•	Abundant
Anaitides maculata	••••	•	Common
Kefersteinia cirrata	•••••	•	Super abundant
Nereididae	•••••	•	Present/Not known
Scoloplos armiger	••••	•	Abundant
Capitella capitata	••••	•	Common
Heteromastus filiformis	••••	•	Common
Scalibregma inflatum	•••	•	Common
Pomatoceros triqueter	•••	•	Abundant
Tubificoides	•••••	•	Abundant
Cirripedia indet.	••••	•	Common
Gammarus salinus	•••••	•	Super abundant
Melita palmata	••••	•	Common
Nucella lapillus	••••	•	Common
Buccinum undatum	•••	•	Super abundant
Mytilus edulis	•••••	•	Super abundant
Asterias rubens	••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R4	Nigg Bay, Dornoch Firth			
R4	Tay Firth	Jones, Herbert & McManus 1990		
R10	Caenarvon Bar, Conwy estuary			
IR1	Lough Foyle	Erwin *et al*. 1990		

Frequency of occurrence

In Britain: Uncommon

EstMx *Estuarine sublittoral mixed sediments*

IMX.PolMtru *Polydora ciliata*, *Mya truncata* and solitary ascidians in variable salinity infralittoral mixed sediment

Habitat classification

Salinity:	Variable
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Moderately strong
Substratum:	Mixed sediment
Zone:	Infralittoral
Depth band:	0-5 m, 5-10m, 10-20m

Biotope description

Variable salinity mixed muddy sediment characterised by the polychaetes *Polydora ciliata*, *Aphelochaeta marioni*, the bivalve molluscs *Abra nitida* and *Mya truncata* and the ascidians *Ascidiella aspersa*, *Ascidiella scabra*, *Molgula* sp. and *Dendrodoa grossularia* (the ascidians may not be recorded adequately by remote infaunal surveys). This biotope occurs in lower estuary mixed muddy sediments which are relatively stable, even though subject to moderate tidal streams. It may be found adjacent to IMU.AphTub, IMX.CreAph, IMX.Ost and IMX.MytV. It may also (as yet unproven) represent the infaunal component of SCR.Aasp. It is similar to IMU.AphTub, separated by a combination of sediment characteristics and the abundance of *A. marioni*. Some difficulty may arise in distinguishing this biotope from reduced versions of IMX.CreAph, IMX.Ost and IMX.MytV as it is unclear at what density the characterising molluscs have to occur to divide a 'bed' from shell debris. This biotope may be associated with IMX.VsenMtru.

Similar biotopes

IMX.CreAph
IMX.MytV
IMU.AphTub
IMX.VsenMtru
IMX.Ost
SCR.Aasp

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Lepidonotus squamatus	•••	•	Present/Not known
Eteone longa	•••	•	Common
Nephtys hombergii	••••	•	Common
Scoloplos armiger	•••	•	Abundant
Polydora ciliata	••••	•	Abundant
Caulleriella zetlandica	•••	•	Common
Aphelochaeta marioni	•••••	•	Common
Mediomastus fragilis	•••	•	Frequent
Melinna palmata	••••	•	Common
Ampharete	•••	•	Common
Tubificoides	•••	•	Frequent
Pariambus typicus	•••	•	Frequent
Carcinus maenas	•••	•	Occasional
Cerastoderma edule	•••	•	Present/Not known
Abra	•••	•	Common
Petricola pholadiformis	••	•	Abundant
Mya truncata	••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R6	Orwell	Baxter 1989		
R6	Blackwater	Johnson 1991		
R6	Swale	Sheader & Jensen 1990		
R6	Swale & Medway		MNCR data	
R7	Southampton Water	Lowthion 1982		
R7	Eastern Channel estuaries	Sheader & Jensen 1990		
R9	Milford Haven		OPRU data	

CMX.SspiMx *Sabellaria spinulosa* and *Polydora* spp. on stable circalittoral mixed sediment

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed
Tidal streams:	Weak
Substratum:	Mixed sediment
Zone:	Circalittoral
Depth band:	30-50m, >50 m

Biotope description

The tube-building polychaete *Sabellaria spinulosa* at high abundances on mixed sediment, with *Polydora* spp. tubes attached. Infauna comprise typical sublittoral polychaete species, together with the bivalves *Abra alba* and *Nucula nitidosa*. Epifauna comprise calcareous tubeworms, pycnogonids, hermit crabs and amphipods.

Similar biotopes

MCR.Sspi	*Sabellaria* on rock often with more associated hard substratum species. On sediment *Sabellaria* changes the habitat

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Tubulanus	••••	•	Common
Polynoidae	•••••	•	Frequent
Pholoe	•••••	•	Common
Phyllodocidae	••••	•	Abundant
Eteone	••••	•	Frequent
Glycera	•••••	•	Common
Glycinde nordmanni	•••••	•	Common
Syllis	••••	•	Frequent
Exogone naidina	••••	•	Frequent
Exogone verugera	•••••	•	Frequent
Nephtys	•••••	•	Common
Lumbrineris gracilis	•••••	•	Common
Prionospio	•••••	•	Common
Spiophanes bombyx	•••••	•	Frequent
Cirratulidae	•••••	•	Common
Mediomastus fragilis	•••••	•	Frequent
Scalibregma inflatum	•••••	•	Common
Sabellaria spinulosa	•••••	•	Common
Ampharetidae	•••••	•	Common
Ampelisca	•••••	•	Present/Not known
Abra alba	•••••	•	Common
Sphenia binghami	•••••	•	Common
Ophiura	•••••	•	Abundant

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	NE England	Brazier *et al*. In prep.b	R5.70	=
R6	The Wash	National Rivers Authority 1991		

Frequency of occurrence

In Britain: Common

CMX.ModMx *Modiolus modiolus* beds on circalittoral mixed sediment

Habitat classification

Salinity:	Full
Wave exposure:	Moderately exposed, Sheltered
Tidal streams:	Moderately strong
Substratum:	Muddy gravel and sand, with shells and stones
Zone:	Circalittoral
Depth band:	20-30m, 30-50m, >50 m

Biotope description

Muddy gravels and coarse sands in deeper water of continental seas may contain venerid bivalves with beds of *Modiolus modiolus*. The clumping of the byssus threads of the *M. modiolus* creates a stable habitat that attracts a very rich infaunal community. Brittlestars such as *Ophiothrix fragilis* may also occur with this community. This biotope is very similar to the 'boreal off-shore gravel association' and the 'deep Venus community' described by previous workers (Ford 1923; Jones 1951). Similar *Modiolus* beds on open coast stable boulders, cobbles and sediment are described under MCR.ModT.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Iophonopsis nigricans		••	
Abietinaria abietina		••	
Sertularella polyzonias		••	
Buccinum undatum		••	Frequent
Modiolus modiolus		••	Abundant
Astarte sulcata		••	Occasional
Circomphalus casina		••	
Clausinella fasciata		••	
Timoclea ovata		••	
Ophiothrix fragilis		•	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R5	NE England	Brazier *et al*. In prep.b	R5.69	=
R11	Off SE Isle of Man	Jones 1951		
IR2	Off Co. Down	Erwin *et al*. 1990	Table 37	=

Frequency of occurrence

In Britain: Uncommon

CMX.ModHo Sparse *Modiolus modiolus*, dense *Cerianthus lloydii* and burrowing holothurians on sheltered circalittoral stones and mixed sediment

Habitat classification

Salinity:	Full, Variable
Wave exposure:	Sheltered, Very sheltered
Tidal streams:	Weak, Very weak
Substratum:	Pebbles, boulders and cobbles on muddy gravel
Zone:	Circalittoral
Depth band:	10-20m, 20-30m

Previous code

SCR.ModHo 96.7

Biotope description

Pebbles and cobbles on muddy shell gravel in sealochs with dense *Cerianthus lloydii* and sparse *Modiolus modiolus*. Large burrowing holothurians (many only extend their tentacles above the sediment surface seasonally) include *Psolus phantapus*, *Paracucumaria hyndmani*, *Thyonidium commune*, *Thyone fusus* and *Leptopentacta elongata*. This biotope is well developed in the Clyde sealochs, although many examples are rather species-poor. Some examples in south-west Scotland sealochs have greater quantities of boulders and cobbles and therefore have a richer associated biota (compared with other sheltered *Modiolus* bed biotopes such as SCR.ModHAs). Examples in Shetland are somewhat different in having the cucumber *Cucumaria frondosa* amongst sparse *Modiolus* beds and a slightly different balance in abundance of other species; for example the brittlestar *Ophiopholis aculeata* is more abundant in these far northern examples in the voes and narrows (see MCR.Oph.Oacu).

Similar biotopes

SCR.ModHAs	Similar epifauna, although without holothurians.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Hydractinia echinata	•••	••	Occasional
Alcyonium digitatum	•••	•	Rare
Cerianthus lloydii	••••	•	Frequent
Terebellidae	•••	•	Occasional
Pomatoceros triqueter	•••	•	Occasional
Pagurus bernhardus	•••••	•	Frequent
Munida rugosa	•••	••	Occasional
Hyas araneus	•••	••	Occasional
Liocarcinus depurator	•••	••	Occasional
Carcinus maenas	•••	•	Occasional
Buccinum undatum	••••	•	Occasional
Modiolus modiolus	••••	••	Occasional
Aequipecten opercularis	•••	••	Occasional
Asterias rubens	••••	•	Occasional
Ophiothrix fragilis	••	•	Occasional
Ophiura albida	•••	••	Frequent
Psammechinus miliaris	•••	••	Occasional
Echinus esculentus	••••	•	Occasional
Cucumaria frondosa	••	•••	Occasional
Leptopentacta elongata	••	••	Occasional
Paracucumaria hyndmani	••	•••	Occasional

Thyone fusus	•••	••	Occasional
Thyonidium drummondii	••	•••	Occasional
Psolus phantapus	•••	•••	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R1	Shetland		R1.ModHo	
R12	Clyde sealochs	Howson, Connor & Holt 1994	SL70	=
R13	SW Scotland sealochs	Howson, Connor & Holt 1994	SL70	=
R15	Skye sealochs, Lochs Duich, Ewe & Broom		MNCR data	

COS.AmpPar *Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy very fine sand near margins of deep stratified seas

Habitat classification

Salinity:	Full
Wave exposure:	
Tidal streams:	Weak
Substratum:	Cohesive muddy sand or sandy mud
Zone:	Circalittoral
Depth band:	>50 m

Biotope description

Dense stands of *Ampharete falcata* tubes which protrude from muddy sediments, appearing as a turf or meadow in localised areas. These areas seem to occur on a crucial point on a depositional gradient between areas of tide-swept mobile sands and quiescent stratifying muds. Dense populations of the small *Parvicardium ovale* occur in the superficial sediment. Both *Amphiura filiformis* and *A. chiajei* may be present together with *Nephrops norvegicus* in higher abundance than the CMU.BriAchi or CMS.AfilEcor biotopes. Substantial populations of mobile epifauna such as *Pandalus montagui* and smaller fish also occur, together with those that can cling to the tubes, such as *Macropodia* spp. A similar turf of *Melinna cristata*, a maldanid worm, has been recorded from Northumberland (Buchanan 1963).

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Scalibregma inflatum			Abundant
Amphictene auricoma			Common
Lagis koreni			Abundant
Ampharete falcata			Super abundant
Pandalus montagui			
Crangon crangon			
Nephrops norvegicus			
Macropodia linaresi			
Goneplax rhomboides			Common
Nuculoma tenuis			Common
Mysella bidentata			Common
Parvicardium ovale			Super abundant
Abra nitida			Abundant
Amphiura chiajei			Super abundant
Amphiura filiformis			Abundant
Brissopsis lyrifera			Abundant
Agonus cataphractus			
Liparis liparis			

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R13	Loch Etive	Gage 1972		
IR3	Irish Sea		E.I.S. Rees pers. comm. 1997	

Frequency of occurrence

In Britain: Scarce

Features of conservation interest

A very rich and diverse biotope which is likely to be very limited in extent. Potentially vulnerable to fisheries disturbance although the density of the tubes clogs the nets of *Nephrops* trawlers and therefore deters them. The key ampharetid species in this biotope is thought not to have pelagic larvae, limiting dispersal from this specialised habitat.

Potentially damaging activities

Activity	*Degree of effect*
Fishing (including use of fixed and mobile gear)	

COS.ForThy Foraminiferans and *Thyasira* sp. in deep circalittoral soft mud

Habitat classification

Salinity:	Full
Wave exposure:	
Tidal streams:	Very weak
Substratum:	Soft mud
Zone:	Circalittoral
Depth band:	>50 m

Biotope description

In deep water and soft muds of Boreal and Arctic areas, a community dominated by foraminiferans and the bivalve *Thyasira* sp. may occur (Thorson 1957; Künitzer *et al.* 1992). This community typically occurs in water deeper than 100 m in the northern North Sea (Künitzer *et al.* 1992) and have been referred to as 'Foraminifera communities' by other workers (e.g. Stephen 1923; Thorson 1957; McIntyre 1961). Foraminiferans such as *Saccammina*, *Psammosphaera*, *Crithionina* and *Astorhiza* are important components of this community with dead tests numbering thousands per m^2 (see Stephen 1923; McIntyre 1961) and sometimes visible from benthic photography (Mackie, Oliver & Rees 1995). It is likely that a community dominated by *Astorhiza* in the Irish Sea is another distinct biotope (E.I.S. Rees pers. comm. 1997). Polychaetes, e.g. *Paraonis gracilis*, *Myriochee heeri*, *Spiophanes kroyeri*, *Tharyx* sp., *Lumbrineris tetraura*, are also important components of this biotope. These communities appear to have no equivalent on the continental plateau further south (Glémarec 1973) but are known from the edge of the Celtic Deep in the Irish Sea (Mackie, Oliver & Rees 1995). The benthos in these offshore areas has been shown to be principally Formanifera and similar, rich communities may exist in Scottish sealochs (McIntyre 1961). Shallower water may give rise to a *Brissopsis*-dominated communities (CMU.BriAchi). Communities from yet deeper (northern) waters at the extremes of the North Sea may be reminiscent, although dissimilar to COS.ForThy (see Pearson *et al*. 1996) reflecting a higher proportion of silt/clay. A fully Arctic version of this biotope has also been described (Thorson 1934, 1957) although it should be noted that Jones (1950) considered this Boreal foraminiferan community to be part of a 'Boreal Deep Mud Association'.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Foraminifera			
Exogone verugera			
Nephtys			
Aricidea catherinae			
Minuspio cirrifera			
Thyasira			
Thyasira flexuosa			
Amphiura			

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R3			R3&R4.AalbT	
R9	Edge of the Celtic Deep, SW to Milford Haven	Mackie, Oliver & Rees 1995		
R13	Loch Eil	Feder & Pearson 1988		
R13	Loch Nevis	McIntyre 1961		
Other	Northern North Sea	Künitzer *et al*. 1992		

Other	Fladen Grounds, northern North Sea	McIntyre 1961
Other	Norwegian fjords	
Other	E North Sea between Bergen and Moray Firth	Stephen 1923
Other	E Greenland	Thorson 1934

COS.Sty *Styela gelatinosa* and other solitary ascidians on very sheltered deep circalittoral muddy sediment

Habitat classification

Salinity:	Full
Wave exposure:	Very sheltered
Tidal streams:	Weak
Substratum:	Mud with terrigenous debris
Zone:	Circalittoral
Depth band:	>50 m

Biotope description

This biotope is known only from deep water in Loch Goil (Clyde sealochs) in fine mud at 65 m with terrigenous debris. Large numbers of solitary ascidians, including *Styela gelatinosa*, *Ascidia conchilega*, *Corella parallelogramma* and *Ascidiella* spp., occur together with terebellid worms and the bivalve *Pseudamussium septemradiatum*. It is possibly an ice age relict biotope.

Characterising species

	% Frequency	*Faithfulness*	*Typical abundance*
Glycera tridactyla	●●●●●	●	Present/Not known
Terebellidae	●●●●●	●	Frequent
Pseudamussium septemradiatum	●●●●●	●●	Common
Abra alba	●●●●●	●	Occasional
Paracucumaria hyndmani	●●●●●	●●	Rare
Corella parallelogramma	●●●●●	●	Frequent
Ascidiella aspersa	●●●●●	●	Frequent
Ascidiella scabra	●●●●●	●	Abundant
Styela gelatinosa	●●●●●	●●●	Frequent

Distribution

Sector	*Area*	*Source*	*Section/page*	*Equivalence*
R12	Loch Goil	Howson, Connor & Holt 1994	SL89	=

Frequency of occurrence

In Britain: Rare

Features of conservation interest

Notable for the very high density of *Styela gelatinosa*; only one known location in the British Isles for this species.

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			
– **Linear coast**	-	-	12.1
– **Islands / rocks**	-	19	19.2
– **Offshore seabed**	-	-	-
– **Semi-enclosed coast**	-	-	12.2
– **Strait / sound**	-	12	12.3
– **Barrier beach**	-	-	?19.3
ENCLOSED COAST			
– **Embayment**	Large shallow inlets and bays	12	12.4
– **Sealoch**		12	12.5
– Fjordic sealoch	-	12	12.51
– Fjardic sealoch	Large shallow inlets and bays	12	12.52
– Open sealoch	(Large shallow inlets and bays)	12	12.53
– **Ria /voe**	Large shallow inlets and bays	12	12.6
– **Estuary**	Estuaries	13.2	13.2
– Coastal plain estuary	Estuaries	13.2	13.21
– Bar-built estuary	Estuaries	13.2	13.22
– Complex estuary	Estuaries	13.2	13.23
– **Isolated saline water (lagoon)**	Lagoons	21	21
– Isolated saline lagoon	Lagoons	21	21.2
– Percolation saline lagoon	Lagoons	21	21.3
– Sluiced saline lagoon	Lagoons	21	21.4
– Silled saline lagoon	Lagoons	21	21.4
– 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	**Not covered by SSSI designations**						
Circalittoral							
Circalittoral offshore							

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 **MNCR BioMar**	**EC** **Habitats Directive**	**Europe** **CORINE 1991**	**Europe** **Palaearctic 1996**	**Baltic** **HELCOM 1997**	**France** **ZNIEFF-MER 1994**	**UK** **BAP 1997**
Littoral rock	May be included in Reefs	18.1	11.28 + 11.29 + 11.2A	2.1.1.3 + 2.1.2.3 + 2.2.3 + 2.3.3 + 2.11.2	I.4 + II.4 + II.5	Littoral rock
Exposed littoral rock						
Mod. exposed littoral rock						
Sheltered littoral rock						
Littoral sediments	Mudflats and sandflats not covered by seawater at low tide (not all types covered)	14	11.27	-	-	Littoral sediment
Littoral gravels and sands		16.11 + 17.1	-	2.4.3 + 2.5.3 + 2.6.3	I.2 + I.3 + II.3	
Littoral muddy sands		includes 11.321	includes 11.321	2.5.3	II.2	
Littoral muds		includes 15	includes 15	2.7.3	I.1 + II.1	
Littoral mixed sediments		-	-	2.8.3	-	
Infralittoral rock	Reefs	11.23 + 11.24 + 11.25 + 11.26	11.23 + 11.24 + 11.25 + 11.26	2.1.1.2 + 2.1.2.2 + 2.2.2 + 2.3.2 + 2.11.1	III.6 + III.9	Inshore rock
Exposed infralittoral rock						
Mod. exposed infra. rock						
Sheltered infralittoral rock						
Circalittoral rock				2.1.1.1 + 2.1.2.1 + 2.2.1 + 2.3.1 + 2.11.1	IV.6	
Exposed circalittoral rock						
Mod. exposed circa. rock						
Sheltered circalittoral rock						
Circalittoral offshore rock				-	-	Offshore shelf rock
Sublittoral sediments	-	11.22	11.22	-	-	Inshore sediment
Infralittoral gravels and sands	Sandbanks slightly covered by seawater all the time	includes 11.31 & 11.41	includes 11.31 & 11.41	2.4.2 + 2.5.2 + 2.6.2	III.3 + III.4 + III.5 + III.7	
Infralittoral muddy sands				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

9 References

Ackers, G. 1977. *Mixon Hole Project: A project for Underwater Conservation Year's 'Adopt a site' scheme*. Unpublished, Dolphins Underwater Club.

Anon. 1995. *Biodiversity: The UK Steering Group Report*. London, HMSO for Department of the Environment.

Arndt, E.A. 1991. Ecological, physiological and historical aspects of brackish water fauna distribution. *In*: *Estuaries and coasts: Spatial and temporal intercomparisons*. *Estuarine and Coastal Sciences Association 19 Symposium*, ed. by M. Elliott & J.P. Ducrotoy. Olsen and Olsen.

Attrill, M.J. 1990. *The Thames Estuary Benthic Programme: A site by site report of the quarterly macrofauna surveys April 1989 - March 1990*. Unpublished, National Rivers Authority, Thames Region Biology Report.

Bamber, R.N. 1993. Changes in the infauna of a sandy beach. *Journal of Marine Biology and Ecology, 172*: 93-107.

Bamber, R.N. 1994. The structuring of a littoral sand community by *Nephtys cirrosa* Ehlers. *Polychaete Research, 16*: 37-40.

Baxter, A.J. 1989. *Survey of the subtidal and intertidal benthic fauna in the Orwell estuary. Autumn 1988/Spring 1989*. Unpublished, National Rivers Authority, Anglian Region.

Bennett, T.L. 1989. Littoral and sublittoral survey of the Isle of May, Fife. *Nature Conservancy Council, CSD Report*, No. 907. (Marine Nature Conservation Review Report, No. MNCR/SR/2.)

Bishop, G.M. 1984. Report of the Mull expedition, June 4-18,1983. (Contractor: Marine Conservation Society, Ross-on-Wye.) *Nature Conservancy Council, CSD Report*, No. 528.

Bishop, G.M., & Holme, N.A. 1980. Survey of the littoral zone of the coast of Great Britain. Final report - part 1: the sediment shores - an assessment of their conservation value. (Contractor: Marine Biological Association/Scottish Marine Biological Association, Plymouth/Oban.) *Nature Conservancy Council, CSD Report*, No. 326.

Blunden, G., Farnham, W.F., Jephson, N., Barwell, C.J., Fenn, R.H., & Plunket, B.A. 1981. The composition of maerl of economic interest in northern Brittany, Cornwall, and Ireland. *Proceedings of the International Seaweed Symposium*, 651-656.

Blunden, G., Farnham, W.F., Jephson, N., Fenn, R.H., & Plunket, B.A. 1977. The composition of maerl from the Glenan Islands of South Brittany. *Botanica Marina*, *20*: 121-125.

Bosence, D.W.J. 1976. Studies on two unattached coralline algae from Western Ireland. *Palaeontology 19:* 365-395.

Bosence, D.W.J. 1979. The factors leading to aggregation and reef formation in *Serpula vermicularis* L. *In*: *Biology and systematics of colonial organisms*, ed. by G. Larwood & B.R. Rosen, *11*: 299-318. London, Academic Press.

Brazier, D.P., & Connor, D.W. 1995. *MNCR/BioMar biotope classification workshop, 21-23 November 1995, Conwy, Wales*. Unpublished, Joint Nature Conservation Committee. (Marine Nature Conservation Review Report.)

Brazier, D.P., Davies, J., Holt, R.H.F., & Murray, E. In prep.a. *Marine Nature Conservation Review Sector 5. South-east Scotland and north-east England: area summaries*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series.)

Brazier, D.P., Davies, J., Holt, R.H.F., & Murray, E. In prep.b. Marine Nature Conservation Review Sector 5. South-east Scotland and north-east England: biotope classification. *JNCC Report*, No. 231.

Buchanan, J.B. 1963. The bottom fauna communities and their sediment relationships off the coast of Northumberland. *Oikos*, *14*: 154-175.

Buehr, M. 1984. A sublittoral survey of the central Firth of Lorne. (Contractor: Marine Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 549.

Bunker, F.StP.D., & Hiscock, S. 1984. Surveys of sublittoral habitats and communities around Skomer Marine Reserve in 1983. Volume 1. (Contractor: Marine Conservation Society/Field Studies Council, Ross-on-Wye/Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 551.

Bunker, F.StP.D., & Hiscock, S. 1987. Sublittoral habitats, communities and species of the Skomer marine reserve - a review. (Contractor: Field Studies Council, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 747. (FSC Report, No. (OFC)/1/87.)

Bunker, F.St.P.D., Picton, B.E., & Morrow, C.M. 1992. *New information on species and habitats in the Skomer Marine Nature Reserve (and other sites off the Pembrokeshire coast)*. (Contractor: Marine Seen/Ulster Museum, Pembroke/Belfast.) Unpublished report to Countryside Council for Wales.

Cabioch, L. & Glaçon, R. 1975. Distribution des peuplements benthiques en Manche orientale, de la baie de Somme au Pas-de-Calais. *C.R. Acad. Sci. Paris*, t. 280, sér. D:491-494.

Cabioch, L. & Glaçon, R. 1977. Distribution des peuplements benthiques en Manche orientale, du cap d'Antifer à la baie de Somme. *C.R. Acad. Sci. Paris*, t. 285, sér. D:209-212.

Carthew, R., & Bosence, D. 1986. Community preservation in recent shell-gravels, English Channel. *Palaeontology*, *29*: 243-268.

Cartlidge, D., & Hiscock, K. 1979. South-west Britain sublittoral survey. Field survey of sublittoral habitats and species in south Pembrokeshire. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 251.

Cartlidge, D., & Hiscock, K. 1980. South-west Britain sublittoral survey. Field survey of sublittoral habitats and species in north Pembrokeshire. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 295.

Collins, K.J., & Mallinson, J.J. 1987. Marine flora and fauna of Southampton Docks. (Contractor: K.J. Collins & J.J. Mallinson, Southampton.) *Nature Conservancy Council*, *CSD Report*, No. 721.

Commission of the European Communities. 1991. *CORINE biotopes*. Luxembourg, Office for Official Publications of the European Communities for Commission of the European Communities.

Conneely, M.E. 1988. *Swansea Bay benthic studies. Final report*. Unpublished, Welsh Water Authority, Directorate of Scientific Services, Tidal Waters Unit. (Tidal Waters Report.)

Connor, D.W. 1989. Survey of Loch Duich, Loch Long and Loch Alsh. *Nature Conservancy Council*, *CSD Report*, No. 977. (Marine Nature Conservation Review Report, No. MNCR/SR/10.).

Connor, D.W. 1990. Survey of Lochs Linnhe, Eil, Creran and Aline. *Nature Conservancy Council*, *CSD Report*, No. 1703. (Marine Nature Conservation Review Report, No. MNCR/SR/12.)

Connor, D.W. 1991. Norwegian fjords and Scottish sealochs: a comparative study. *JNCC Report*, No. 12. (Marine Nature Conservation Review Report, No. MNCR/SR/18.).

Connor, D.W. 1994a. *Marine biotopes. A working manual of biotopes from UK coastal waters. Version 4.94*. Unpublished, Joint Nature Conservation Committee. (Marine Nature Conservation Review Report.)

Connor, D.W. 1994b. *Marine biotopes. A working manual of biotopes from UK coastal waters. Version 11.94*. Unpublished, Joint Nature Conservation Committee. (Marine Nature Conservation Review Report.)

Connor, D.W. *ed*. 1997. *Classification of benthic marine biotopes of the north-east Atlantic. Proceedings of the second BioMar-Life workshop, Dublin, 10 September 1995*. Unpublished, Joint Nature Conservation Committee.

Connor, D.W., Brazier, D.P., Dalkin, M.J., Hill, T.O., Holt, R.H.F., Northen, K.O., & Sanderson, W.G. 1997a. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Version 97.06. *In*: *BioMar biotope viewer: a guide to marine habitats, fauna and flora of Britain and Ireland*, ed. by B.E. Picton & M.J. Costello. Dublin, Environmental Sciences Unit, Trinity College.

Connor, D.W., Brazier, D.P., Hill, T.O., Holt, R.H.F., Northen, K.O., & Sanderson, W.G. 1996. *Marine Nature Conservation Review: marine biotopes. A working classification for the British Isles. Version 96.7*. Peterborough, Joint Nature Conservation Committee.

Connor, D.W., Dalkin, M.J., Hill, T.O., Holt, R.H.F., & Sanderson, W.G. 1997b. Marine Nature Conservation Review: marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes. Version 97.06. *JNCC Report*, No. 229.

Connor, D.W., Hill, T.O., Little, M.C., & Northen, K.O. 1995a. Marine Nature Conservation Review: intertidal biotope manual. Version 6.95. *JNCC Report*, No. 249.

Connor, D.W., & Hiscock, K. 1996. Data collection methods (with Appendices 5 - 10). *In*: *Marine Nature Conservation Review: rationale and methods*, ed. by K. Hiscock, 51-65, 126-158. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series.)

Connor, D.W., Hiscock, K., Foster-Smith, R.L., & Covey, R. 1995b. A classification system for benthic marine biotopes. *In*: *Biology and ecology of shallow coastal waters*. *Proceedings of the 28th European Marine Biology Symposium*, ed. by A. Eleftheriou, A.D. Ansell & C.J. Smith, 155-165. Fredensborg, Olsen & Olsen.

Costello, M.J., Connor, D.W., Sides, E., Foster-Smith, R.L., & Hiscock, K. 1997. *Collecting and using data for management of marine and coastal biotopes. Final report of the BioMar project*. Dublin, Environmental Sciences Unit, Trinity College.

Covey, R. In prep.a. *Marine Nature Conservation Review Sector 11. Liverpool Bay and the Solway Firth: area summaries*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series.)

Covey, R. In prep.b. Marine Nature Conservation Review Sector 11. Liverpool Bay and the Solway Firth: biotope classification. *JNCC Report*, No.232.

Covey, R., & Hill, T.O. 1993. *Shetland oil spill marine benthos survey 25 February - 2 March 1993. Field survey report*. (Contractor: Joint Nature Conservation Committee, Peterborough.) Unpublished report to Scottish Natural Heritage.

Covey, R., Thorpe, K., & Nichols, D. In prep. Marine Nature Conservation Review Sectors 1-4 and 12-15. Lagoons in Scotland: biotope classification. *JNCC Report*, No. 233.

Dalkin, M.J., Gudmundsson, H., & Barnett, B. 1996. *HEC grid survey 1995 (Subtidal benthic survey - quinquennial classification)*. Environment Agency, Lincoln.

Dauvin, J.C., Bellan, G., Bellan-Santini, D., Castric, A., Françour, P., Gentil, F., Girard, A., Gofas, S., Mahe, C., Noël, P., & Reviers, B. de. 1994. *Typologie des ZNIEFF-MER. Liste des paramétres et des biocoenoses des côtes françaises métropolitaines*. 2nd ed. Paris, Muséum National d'Histoire Naturelle, Secrétariat Faune-Flore. (Collection Patrimoines Naturels, Série Patrimoine Ecologique, No. 12.)

Davies, J. & Hall-Spencer, J. 1996. *Mapping of the benthic biotopes in the proposed Sound of Arisaig Special Area of Conservation.* Edinburgh, Scottish Natural Heritage. (Scottish Natural Heritage/BioMar Report.)

Davies, J., & Sotheran, I. 1995. *Mapping the distribution of benthic biotopes in Falmouth Bay and the lower Fal Ruan estuary*. Peterborough, English Nature. (English Nature Research Report, No. 119.)

Davoult, D., Dewarumez, J., Prygiel, J., & Richard, A. 1988. *Benthic communities map of the French part of the North Sea*. University de Lille Flandres Artois, Station Marine de Wimereux.

Devilliers, P., & Devilliers-Terschuren, J. 1996. *A classification of Palaearctic habitats*. Strasbourg, Council of Europe Publishing. (Nature and environment, No. 78.)

Devon Wildlife Trust. 1993. *Marine survey report. Plymouth Sound and approaches. A report on the wildlife resource of Plymouth Sound and the adjacent open coast*. Unpublished, Devon Wildlife Trust.

Dewarumez, J.-M., Davoult, D., Anorve, L.E.S & Frontier, S. 1992. Is the "muddy heterogenous sediment assemblage" an ecotone between the pebbles community and the *Abra alba* community in the Southern Bight of the North Sea?. *Netherlands Journal of Sea Research. 30:* 229-238.

Dipper, F. 1981a. Sublittoral survey in the Small Isles, Inner Hebrides: Rhum, Canna, Eigg and Muck. *Nature Conservancy Council*, *CSD Report*, No. 314.

Dipper, F. 1981b. Sublittoral survey of the Summer Isles, Ross and Cromarty. (Contractor: Underwater Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 365.

Dipper, F. 1983. Sublittoral survey of habitats and species in and around Loch Roag, Lewis, Outer Hebrides. (Contractor: Underwater Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 505.

Dixon, I., Harrison, K., Hodder, J., & Roberts, C. 1978. *Report of the second Dorset Underwater Survey, July 1977 - March 1978*. (Contractor: Dorset County Council, Purbeck Heritage Coast.) Unpublished report to Dorset County Council/Nature Conservancy Council/Dorset Naturalists' Trust.

Doody, J.P., Johnston, C., & Smith, B. *eds*. 1993. *Directory of the North Sea coastal margin*. Peterborough, Joint Nature Conservation Committee.

Dyer, M.F., Fry, W.G., Fry, P.D., & Cranmer, G.J. 1982. A series of North Sea benthos surveys with trawl and headline camera. *Journal of the Marine Biological Association of the United Kingdom*, *62*: 297-313.

Dyer, M.F., Fry, W.G., Fry, P.D., & Cranmer, G.J. 1983. Benthic regions within the North Sea. *Journal of the Marine Biological Association of the United Kingdom*, *63*: 683-693.

Dyrynda, P. 1983. *Investigation of the subtidal ecology of Holes Bay, Poole Harbour*. (Contractor: University College Swansea, Department of Zoology.) Unpublished report to Nature Conservancy Council.

Earll, R.C. 1981. The sublittoral ecology of the St Abbs area, Berwickshire. (Contractor: Underwater Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 411.

Earll, R.C. 1982a. Report on a sublittoral survey of Shetland. (Contractor: Underwater Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 466.

Earll, R.C. 1982b. The sublittoral ecology of the St Abbs area, Berwickshire. (Contractor: Underwater Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 468.

Earll, R.C. 1983. *Shallow sublittoral ecosystems in the Moray Firth*. (Contractor: R. Earll.) Unpublished report to Nature Conservancy Council.

Emblow, C.S., Picton, B.E., Morrow, C.C., Sides, E.M., & Costello, M.J. 1994. *Marine communities of the Bantry Bay area, and an assessment of their nature conservation importance*. Unpublished, Environmental Sciences Unit, Trinity College. (Field Survey Report.)

Emblow, C.S., Picton, B.E., Sides, E.M., Morrow, C.C., & Costello, M.J. 1995. *Marine communities of the Youghal Bay area, and an assessment of their nature conservation importance*. Dublin, Environmental Sciences Unit, Trinity College. (BioMar Report.)

Erwin, D.G., Picton, B.E., Connor, D.W., Howson, C.M., Gilleece, P., & Bogues, M.J. 1990. *Inshore marine life of Northern Ireland*. Belfast, HMSO for Department of the Environment(Northern Ireland).

Farrow, G., Scoffin, T., Brown, B., & Cucci, M. 1979. An underwater television survey of facies variation on the inner Scottish shelf between Colonsay, Islay, and Jura. *Scottish Journal of Geology*, *15*: 13-29.

Feder, H.M., & Pearson, T.H. 1988. The benthic ecology of Loch Linnhe and Loch Eil, a sea-loch system on the west coast of Scotland. V. Biology of the dominant soft-bottom epifauna and their interaction with the infauna. *Journal of Experimental Marine Biology and Ecology*, *116*: 99-134.

Fincham, A.A., & George, J.D. 1986. A preliminary survey of intertidal invertebrate communities between Shakespeare Cliff and Abbot's Cliff, Kent. (Contractor: British Museum (Natural History), Department of Zoology, London.) *Nature Conservancy Council*, *CSD Report*, No. 645.

Ford, E. 1923. Animal communities of the level sea-bottom in the water adjacent to Plymouth. *Journal of the Marine Biological Association of the United Kingdom*, *13*: 164-224.

Forth River Purification Board. 1992. *Survey of the benthic fauna and sediments around the BP Exploration Kinneil outfall diffuser site. September 1992*. (Contractor: Forth River Purification Board, Edinburgh.) Unpublished report to BP Oil Grangemouth Refinery Ltd. (Tidal Waters Report, No. TW19/92.)

Forth River Purification Board. 1993. *Annual monitoring of the fauna and sediments in the estuary and Firth of Forth 1991/92*. Unpublished, Forth River Purification Board. (Tidal Waters Report, No. TW 4/93.)

Foster-Smith, R. 1992. *The 'Seasearch' regional guide for north-east England and south-east Scotland*. Unpublished, Marine Conservation Society, Ross-on-Wye.

Frid, C.L.J., & Garwood, P.R. 1991. *The marine biology of the Blyth estuary: a baseline survey*. (Contractor: University of Newcastle upon Tyne, Dove Marine Laboratory) Unpublished report to National Power.

Gage, J. 1972. A preliminary survey of the benthic macrofauna and sediments in Lochs Etive and Creran, sea-lochs along the west coast of Scotland. *Journal of the Marine Biological Association of the United Kingdom*, *52*: 237-276.

George, J.D., Tittley, I., & Wood, E. In prep. Marine Nature Conservation Review Sectors 5-8. Chalk coasts in south-east England: biotope classification and overview. *JNCC report*. No. ?

Gibson, C.W.D. 1996. *Harmonisation of habitat classifications*.(Contractor: Bioscan, Oxford.) Unpublished report to Joint Nature Conservation Committee, Peterborough.

Glémarec, M. 1973. The benthic communities of the European North Atlantic continental shelf. *Oceanography and Marine Biology. An Annual Review*, *11*: 263-289.

Gubbay, S., & Loretto, C.J. 1991. Seasearch survey of Loch Craignish. (Contractor: Marine Biological Consultants, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 1207. (MBC report, No. 91/SS/1.)

Helsinki Commission. 1997. *Definitions of marine and coastal biotopes for the red list of biotopes of the Baltic Sea region. 28 April 1997 draft.* Unpublished paper for the fourth meeting of the Project group on red list of biotopes on the Baltic Sea region, Isle of Vilm, Germany.

Hill, T.O., Emblow, C.S., & Northen, K.O. 1996. *Marine Nature Conservation Review Sector 6. Inlets in eastern England: area summaries*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series.)

Hill, T.O., & Emblow, C.S. In prep. Marine Nature Conservation Review Sector 6. Inlets in eastern England: biotope classification. *JNCC Report*, No. 234.

Hiscock, K. 1978. South-west Britain sublittoral survey. Field survey of sublittoral habitats and species in the region of Padstow. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 196.

Hiscock, K. 1979. South-west Britain sublittoral survey. Field survey of sublittoral habitats and species along the Gower coast. June 25th to 30th, 1978. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 274.

Hiscock, K. 1980. South-west Britain sublittoral survey. Field surveys of sublittoral habitats and species in west Pembrokeshire (Grassholm, Skomer and Marloes Peninsula). (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 301.

Hiscock, K. 1981. South-west Britain sublittoral survey. Field surveys of sublittoral habitats and species around Lundy. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 354.

Hiscock, K. 1983. Sublittoral survey of Jura and Islay. June 20th to July 3rd 1982. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 476.

Hiscock, K. 1984a. Rocky shore surveys of the Isles of Scilly. March 27th to April 1st and July 7th to 15th 1983. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 509.

Hiscock, K. 1984b. Sublittoral survey of Bardsey and the Lleyn peninsula. August 13th to 27th, 1983. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 612.

Hiscock, K. 1984c. Sublittoral survey of the Isles of Scilly. July 2nd to 16th, 1983. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 529.

Hiscock, K. 1986. Marine biological surveys in Shetland. August 1986. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No.678.

Hiscock, K. 1989. Marine biological survey of upper Whiteness Voe, Shetland Islands. 13 & 14 June 1989. *Nature Conservancy Council*, *CSD Report*, No. 973. (Marine Nature Conservation Review Report, No. MNCR/SR/9.)

Hiscock, K. *ed*. 1995. *Classification of benthic marine biotopes of the north-east Atlantic. Proceedings of a BioMar-Life workshop held in Cambridge. 16-18 November 1994*. Peterborough, Joint Nature Conservation Committee.

Hiscock, K. 1996. Interpretation of data. *In*: *Marine Nature Conservation Review: rationale and methods*, ed. by K. Hiscock, 73-84. Peterborough, Joint Nature Conservation Committee. (Coasts and saes of the United Kingdom. MNCR series.)

Hiscock, K. *ed*. 1996. *Marine Nature Conservation Review: rationale and methods*. Peterborough, Joint Nature Conservation Committee. (Coasts and seas of the United Kingdom. MNCR series.)

Hiscock, K., & Connor, D.W. 1991. Benthic marine habitats and communities in Great Britain: the development of an MNCR classification. *JNCC Report*, No. 6. (Marine Nature Conservation Review Report, No. MNCR/OR/14.)

Hiscock, S. 1986. Sublittoral survey of the mid-Wales sarns (reefs): Sarn Badrig, Sarn-y-bwch and Cynfelin patches. July 2nd-9th 1986. *Nature Conservancy Council*, *CSD Report*, No. 696.

Holme, N.A. 1966. The bottom fauna of the English Channel. II. *Journal of the Marine Biological Association of the United Kingdom*, *46*: 401-493.

Howson, C.M. *ed*. 1987. *Directory of the British marine fauna and flora. A coded checklist of the marine fauna and flora of the British Isles and its surrounding seas*. Ross-on-Wye, Marine Conservation Society.

Howson, C.M. 1988. Marine Nature Conservation Review: survey of Shetland, Foula and Fair Isle, 1987. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 816.

Howson, C.M. 1989. Surveys of Scottish sealochs. Sealochs on the Isles of Harris and Lewis. (Contractor: University Marine Biological Station, Millport.) *Nature Conservancy Council*, *CSD Report*, No. 982.

Howson, C.M., Connor, D.W., & Holt, R.H.F. 1994. The Scottish sealochs. An account of surveys undertaken for the Marine Nature Conservation Review. (Contractor: University Marine Biological Station, Millport.) *JNCC Report*, No. 164. (Marine Nature Conservation Review Report, No. MNCR/SR/27.)

Howson, C.M., & Picton, B.E. 1985. A sublittoral survey of St. Kilda. (Contractor: British Sub-Aqua Club/Marine Conservation Society, London/Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 595.

Howson, C.M., & Picton, B.E. *eds*. 1997. *The species directory of the marine fauna and flora of the British Isles and surrounding seas*. Belfast, Ulster Museum and Ross-on-Wye, Marine Conservation Society.

Institute of Terrestrial Ecology. 1975. Report to the Nature Conservancy Council on some aspects of the ecology of Shetland. *Nature Conservancy Council*, *CSD Report*, No. 14.

Institute of Terrestrial Ecology. 1996. *Workshop on habitat classification, ITE Monks Wood, United Kingdom, 24-25 June 1996. Proceedings*. (Contractor: Institute of Terrestrial Ecology, Monks Wood, Cambs.) Unpublished report to European Topic Centre on Nature Conservation.

Irvine, L.M., & Chamberlain, Y.M. 1994. *Seaweeds of the British Isles. Volume 1 Rhodophyta. Part2B Corallinales, Hildenbrandiales*. London, HMSO for The Natural History Museum.

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

Johnson, M.W. 1989. *Stour subtidal survey, April 1989*. Unpublished, National Rivers Authority, Anglian Region.

Johnson, M.W. 1991. *Subtidal survey of the Blackwater estuary*. Unpublished, National Rivers Authority, Anglian Region.

Joint Nature Conservation Committee. 1996. *Guidelines for selection of biological SSSIs: intertidal marine habitats and saline lagoons*. Peterborough, Joint Nature Conservation Committee.

Jones, A.M., Herbert, R.A., & McManus, J. 1989. *Environmental investigations in the Tay estuary, July 1989*. (Contractor: University of Dundee, Environmental Advisory Unit, Dundee.) Unpublished report to Tayside Regional Council Water Services Department, Dundee. (Report, No. 7/12/239.)

Jones, A.M., Herbert, R.A., & McManus, J. 1990. *Environmental investigations in the Tay estuary, July 1990*. (Contractor: University of Dundee, Environmental Advisory Unit, Dundee.) Unpublished report to Tayside Regional Council Water Services Department, Dundee. (Report, No. NW7/12/270.)

Jones, N.S. 1950. Marine bottom communities. *Biological Reviews*, *25*: 283-313.

Jones, N.S. 1951. The bottom fauna off the south of the Isle of Man. *Journal of Animal Ecology*, *20*: 132-144.

Jones, N.S. 1952. The bottom fauna and the food of flatfish off the Cumberland coast. *Journal of Animal Ecology*, *21*: 182-205.

Klein, R., & Witbaard, R. 1993. *The appearance of scars on the shell of* Arctica islandica *L.* (Mollusca, Bivalvia) *and their relation to bottom trawl fishery*. Unpublished, Nederlands Instituut voor Onderzoek der Zee.

Kühne, S. & Rachnor, E. 1996. The macrofauna of a stony sand area in the German Bight (North Sea). *Helgoländer Meersuntersuchungen. 50:* 433-452.

Künitzer, A., Basford, D., Craeymeersch, J.A., Dewarumez, J.M., Derjes, J., Duinevald, G.C.A., Eleftheriou, A., Heip, C., Herman, P., Kingston, P., Neirmann, U., Rachor, E., Rumohr, H., & Wilde, P.A.J.de. 1992. The benthic infauna of the North Sea: species distribution and assemblages. *ICES Journal of Marine Science*, *49*: 127-143.

Laffoley, D.d'A., & Hiscock, K. 1988. *Marine biological survey of Rockall, 28 and 29 June 1988. Field report*. Unpublished, Nature Conservancy Council. (MNCR Report, No. 005.)

Lowthion, D. 1982. *Southampton Water - benthic invertebrate results 1974 - 1982*. (Contractor: National Rivers Authority, Waterlooville.) Unpublished report for Southern Water.

Lumb, C.M. 1983. Menai Strait sublittoral survey. (Contractor: University College of North Wales, Marine Science Laboratories, Menai Bridge.) *Nature Conservancy Council*, *CSD Report*, No. 467.

Mackie, A.S.Y. 1990. Offshore benthic communities of the Irish Sea. *In*: *The Irish Sea: an environmental review. Part 1: nature conservation*, ed. by Irish Sea Study Group, 169-218. Liverpool, Liverpool University Press for Irish Sea Study Group.

Mackie, A.S.Y., Oliver, P.G., & Rees, E.I.S. 1995. *Benthic biodiversity in the southern Irish sea*. Unpublished, Studies in Marine Biodiversity and Systematics from the National Museum of Wales. (Biomor report, No. 1.)

Maggs, C., & Hiscock, K. 1979. South-west Britain sublittoral survey. Field survey of sublittoral habitats and species in north east Cornwall (Tintagel Head to the Devon border). (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council*, *CSD Report*, No. 282.

May, S.J., Kippen, A., & Smith, J. 1991. *Chemical and biological monitoring in Sullom Voe, 1990*. (Contractor: Field Studies Council Research Centre, Oil Pollution Research Unit, Pembroke.) Unpublished report to Shetland Oil Terminal Environmental Advisory Group. (FSC Report, No. FSC/RC/5/90.)

McIntyre, A.D. 1958. *The ecology of Scottish inshore fishing grounds. 1. The bottom fauna of east coast grounds, Marine research*: *1*: 1-24.

McIntyre, A.D. 1961. Quantitative differences in the fauna of boreal mud associations. *Journal of the Marine Biological Association of the United Kingdom*, *41*: 599-616.

McLusky, D.S. 1993. Marine and estuarine gradients - an overview. *In*: *Marine and estuarine gradients (ECSA 21)* ed. by P. Meire & M. Vincx. *Netherlands Journal of Aquatic Ecology*. *27 (2-4)*, 489-493.

McLusky, D.S., Hull, S.C., & Elliott, M. 1993. Variations in the intertidal and subtidal macrofauna and sediments along a salinity gradient in the upper Forth estuary. *In*: *Proceedings of the 21st Symposium of the Estuarine and Coastal Sciences Association held in Gent, 9-14 September 1991. Marine and estuarine gradients (ECSA 21)*, ed. by P. Meire & M. Vincx, *Netherlands Journal of Aquatic Ecology*, *27*(2/4): 101-109.

Mettam, C., Conneely, M.E., & White, S.J. 1994. Benthic macrofauna and sediments in the Severn estuary. *Biological Journal of the Linnean Society*, *51*: 71-81.

Mills, D.J.L. 1994. A manual for the analysis of data held on the Marine Nature Conservation Review database. *JNCC Report*, No. 173. (Marine Nature Conservation Review Report, No. MNCR/OR/18.)

Mitchell, R., Earll, R.C., & Dipper, F.A. 1983. Shallow sublittoral ecosystems in the Inner Hebrides. *In*: *The natural environment of the Inner Hebrides*, ed. by J.M. Boyd & D.R. Bowes, *Proceedings of the Royal Society of Edinburgh. Series B: Biological Sciences*, *83*: 161-184.

Molander, A.R. 1962. Studies on the fauna in the fjords of Bohusln with reference to the distribution of different associations. *Arkiv fur Zoologi*, *Series 2*: *15*: 1-64.

Moore, C.G. 1996. The distribution of serpulid reefs in Loch Creran, Argyll. *Scottish Natural Heritage Research, Survey and Monitoring Report*, No. 53.

Moore, J.J. In prep. Marine Nature Conservation Review Sectors 8-9. Inlets in south-west Britain: biotope classification. *JNCC Report*, No. 266.

Moss, D., & Ackers, G. 1987. *A sublittoral survey of Shetland, 1987*. Unpublished, Marine Conservation Society, Ross-on-Wye.

Moss, D., & Davis, C.E. 1997. *Proposal for a European classification*. (Contractor: Institute of Terrestrial Ecology, Monks Wood, Cambs.) Unpublished report to European Topic Centre on Nature Conservation.

National Rivers Authority. 1991. *Wash subtidal survey, August 1991*. Unpublished, National Rivers Authority (Anglian Region).

National Rivers Authority. 1992. *NRA South-west Region estuary data 1990 to 1992*. Unpublished, National Rivers Authority South-west Region.

O'Connor, B., McGrath, D., Könnecker, G., & Keegan, B.F. 1993. Benthic macrofaunal assemblages of greater Galway Bay. *In*: *Biology and environment*. *Proceedings of the Royal Irish Academy, Section B*: *13*(3): 127-136.

Oslo and Paris Conventions. 1997. *Workshop on species and habitats. Texel: 24-28 February 1997. Summary record*. Unpublished report, Ministry of Transport, Public Works and Water Management, Rijswijk, The Netherlands.

Pearson, T.H. 1975. The benthic ecology of Loch Linnhe and Loch Eil, a sea-loch system on the west coast of Scotland. IV. Changes in the benthic fauna attributable to organic enrichment. *Journal of Experimental Marine Biology and Ecology*, *20*: 1-41.

Pearson, T.H., Coates, A., & Duncan, J.A.R. 1994. Shetland subtidal sediment community analysis. Report on analysis of subtidal sediment data from Shetland to identify community types present. (Contractor: SEAS Ltd, Oban.) *JNCC Report*, No. 191. (Marine Nature Conservation Review Report, No. MNCR/OR/20.) (SEAS Report, No. SR64.)

Pearson, T.H., Mannvik, Hans-Petter, Evans, R., & Falk-Petersen, Falk. 1996. The benthic communities of the Snorre Field in the Northern North Sea. 1. The distribution and structure of communities in undisturbed sediments. *Journal of Sea Research 35(4):* 301-314.

Pearson, T.H., & Rosenberg, R. 1978. Macrobenthic succession in relation to organic enrichment and pollution of the marine environment. *Oceanography and Marine Biology. An Annual Review*, *16*: 229-311.

Penny, J.W., Young, A.J., & Goodman, K.S. 1982. *A survey of the intertidal shores of the Isle of Foula, Shetland, 1980-1981*. (Contractor: Brathay Exploration Group, Ambleside.) Unpublished report to Brathay Hall Trust.

Petersen, C.G.J. 1918. The sea bottom and its production of fish-food. A survey of the work done in connection with valuation of the Denmark waters from 1883-1917. *Report of the Danish Biological Station*, *25*: 1-62.

Picton, B.E. 1993. *A field guide to the shallow-water echinoderms of the British Isles*. London, Immel Publishing for Marine Conservation Society.

Picton, B.E., & Costello, M.J. *eds*. 1997. *BioMar biotope viewer: a guide to marine habitats, fauna and flora of Britain and Ireland*. Dublin, Environmental Sciences Unit, Trinity College.

Picton, B.E., Emblow, C.S., Morrow, C.C., Sides, E.M., & Costello, M.J. 1994. *Marine communities of the Mulroy Bay and Lough Swilly area, north-west Ireland, with an assessment of their nature conservation importance*. Unpublished, Environmental Sciences Unit, Trinity College. (Field Survey Report.)

Picton, B.E., Howson, C.M., Connor, D.W., & Williams, A. 1982. Sublittoral survey of Scarba, Lunga and the Garvellachs.(Contractor: B.E. Picton, Belfast.) *Nature Conservancy Council, CSD Report*, No. 436.

Plaza, J., & Sanderson, W.G. 1997. Rare sea-bed species. *In*: *Coasts and seas of the United Kingdom. Region 15 & 16: Northwest Scotland: the Western Isles and west Highland*, ed. by J.H. Barne, C.F. Robson, S.S. Kasnowska, J.P. Doody, N.C. Davidson & A.L. Buck, 116-121.

Posford Duvivier Environment. 1996. *Mapping the intertidal habitat and species of selected marine Special Areas of Conservation*. Peterborough, Posford Duvivier Environment for English Nature.

Rendall, D.A., & Bell, A.A. 1993. *A preliminary study of the fauna of the subtidal zone of the inner Solway Firth*. Unpublished, Solway River Purification Board. (Biological Report, No. 13.)

Richards, A., Bunker, F. & Foster-Smith, R. 1996. *Handbook for marine intertidal phase 1 and SSSI habitat mapping.* Bangor, Countryside Council for Wales (Natural Science Report, No 95/6/1.)

Rodwell, J.S. *ed*. 1995. British plant communities. Volume 4. Aquatic communities, swamps and tall herb fens. Cambridge, Cambridge University Press.

Rodwell, J.S. In prep. *British plant communities. Volume 5: maritime and weed communities*. Cambridge, Cambridge University Press.

Rostron, D. 1983. Animal communities from sublittoral sediments in the Isles of Scilly. July 1983. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 507.

Rostron, D. 1989a. Sediment communities in upper Whiteness Voe, Shetland. June 1989. *Nature Conservancy Council, CSD Report*, No. 971.

Rostron, D.M. 1989b. Animal communities from sublittoral sediments in the Isles of Scilly. September 1988. (Contractor: Field Studies Council, Oil Pollution Research Unit, Pembroke.) *Nature Conservancy Council, CSD Report*, No. 918.

Rostron, D.R. 1992. Sublittoral benthic sediment communities of Morecambe Bay. (Contractor: SubSea Survey, Pembroke.) *JNCC Report*, No. 47. (Marine Nature Conservation Review Report, No. MNCR/SR/22.)

Salzwedel, H., Rachor, E., & Gerdes, D. 1985. Benthic macrofauna communities in the German Bight. *Verífflithungen des Institut fur Meeresforschung in Bremerhaven, 20*: 199-267.

Sanderson, W.G. 1996. Rare marine benthic flora and fauna in Great Britain: the development of criteria for assessment. *JNCC Report*, No. 240.

Sheader, M., & Jensen, A.C. 1990. *NRA (Southern Region) estuarine survey 1990*. (Contractor: University of Southampton, Department of Oceanography, Southampton.) Unpublished report to National Rivers Authority, Southern Region.

Sheppard, C.R.C., Jupp, B.P., Sheppard, A.L.S., & Bellamy, D.J. 1978. Studies on the growth of *Laminaria hyperborea* (Gunn.) Fosl. and *Laminaria ochroleuca* de la Pylaie on the French Channel coast. *Botanica Marina, 21*: 109-116.

Shillabeer, N., & Tapp, J.F. 1989. Improvements in the benthic fauna of the Tees estuary after a period of reduced pollution loadings. *Marine Pollution Bulletin, 20*: 119-123.

Sides, E.M., Picton, B.E., Emblow, C.S., Morrow, C.C., & Costello, M.J. 1994. *Marine communities of Kilkeiran Bay, the Aran Islands and the Skerd Rocks and an assessment of their conservation importance*. Unpublished, Environmental Sciences Unit, Trinity College. (Field Survey Report.)

Stephen, A.C. 1923. Preliminary survey of the Scottish waters of the North Sea by the Petersen grab. *Scientific Investigations of the Fisheries Division of the Scottish Home Department*, *11*.

Thorson, G. 1934. Contributions to the animal ecology of the Scoresby Sound Fjord complex (east Greenland). *Meddelelser om Grønland. Kommissionen for Videnskabelige Undersøgelser I Grønland. 100 (3)*: 1-67.

Thorson, G. 1957. Bottom communities (sublittoral or shallow shelf). *Memoirs of the Geological Society of America*, *67*: 461-534.

Tittley, I., Farnham, W.F., Fletcher, R.L., Morrell, S., & Bishop, G. 1985. Sublittoral seaweed assemblages of some northern Atlantic islands. *Progress in Underwater Science*, *10*: 39-52.

Tittley, I., & George, J.D. 1993. *Chalk coasts littoral survey, January-March 1993*. (Contractor: Natural History Museum, London.) Unpublished report to Joint Nature Conservation Committee. (Unpublished raw data.)

Tittley, I., Price, J.H., Fincham, A.A., & George, J.D. 1986. The macrobenthos of chalk and green sand shores in south-eastern England. (Contractor: British Museum (Natural History), London.) *Nature Conservancy Council*, *CSD Report*, No. 677.

Tyler, P.A., & Shackley, S.E. 1980. The benthic ecology of linear sandbanks: a modified *Spisula* sub-community. *In*: *Industrial embayments and their environmental problems: a case study of Swansea Bay*, ed. by M.B. Collins & Others, 539-559. Oxford, Pergamon Press.

von Nordheim, H., Norden Andersen, O., & Thissen, J. eds. 1996. Red lists of biotopes, flora and fauna of the Trilateral Wadden Sea Area, 1995. *Helgoländer Meeresuntersuchungen*, *50* (Suppl.).

Warren, P.J. 1977. The *Nephrops* fishery off north-east England. *Annales Biologiques*, *34*: 234-235.

Warwick, R.M., & Davies, J.R. 1977. The distribution of sublittoral macrofauna communities in the Bristol Channel in relation to the substrate. *Estuarine and Coastal Marine Science*, *5*: 267-288.

Warwick, R.M., & Uncles, R.J. 1980. Distribution of benthic macrofauna associations in the Bristol Channel in relation to tidal stress. *Marine Ecology (Progress Series)*, *3*: 97-103.

Welsh Water Authority. 1984. *Influence of the Rhymney valley, Ystradyfodwg and Pontypridd and Cardiff East trunk sewer outfalls on the benthic macroinvertebrate fauna of the Severn estuary*. Unpublished, Welsh Water Authority, Directorate of Scientific Services. (Report, No. B/1/84.)

Wharfe, J.R., Flynn, E., Richardson, A., & Li Shing Tat, B. 1979. *Ecological studies of the benthic invertebrate macrofauna of the Usk and Wye estuaries, south Wales*. Unpublished, Welsh Water Authority, Directorate of Scientific Services, Marine Laboratory.

Wolff, W.J. 1973. The estuary as a habitat. An analysis of data on the soft-bottom macrofauna on the estuarine area of the rivers Rhine, Meuse and Scheldt. *Zoologischer Verhandelingen*, *(Delta Institute for Hydrobiological Research*, *Communication, No. 106)*: *126*.

Wood, C. *ed*. 1984. Sussex sublittoral survey. Selsey Bill to Beachy Head. (Contractor: Marine Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 527.

Wood, C. 1990. 'Seasearch' survey of sandstone reefs off Eastbourne, East Sussex, June - July 1989. (Contractor: Marine Biological Consultants, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 1145.

Wood, C. 1992. *Sublittoral chalk habitats in southern England. Report of the Marine Conservation Society, South East Group Chalk Cliffs Project 1985-1991*. Unpublished, Marine Conservation Society, Ross-on-Wye.

Wood, C., & Jones, E. 1986. Seven Sisters marine surveys. (Contractor: Marine Conservation Society, Ross-on-Wye.) *Nature Conservancy Council*, *CSD Report*, No. 684.

Wood, E. 1988. Flamborough Headland: sublittoral survey. (Contractor: Dr E. Wood, Basingstoke.) *Nature Conservancy Council*, *CSD Report*, No. 832.

Wood, E. 1989. Channel Tunnel site (Shakespeare Cliff, Kent): Sublittoral monitoring 1989. Report to Eurotunnel/Nature Conservancy Council. (Contractor: Dr E. Wood, Basingstoke.) *Nature Conservancy Council*, *CSD Report*, No. 1001.

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*			
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*		

Examples of groups or species for each category

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

Index to codes