BIOMARE
Implementation and networking of large-scale long-term
Marine Biodiversity research in Europe

Richard M. Warwick, Chris Emblow, Jean-Pierre Féral,
Herman Hummel, Pim van Avesaath, Carlo Heip

European Marine Biodiversity Research Sites

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Report of the European Concerted Action : BIOMARE
Implementation and Networking of large scale, long term
Marine Biodiversity Research in Europe

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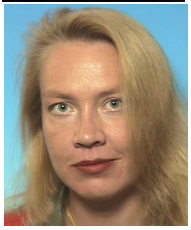

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FOREWORD

In the past few years marine biodiversity has risen from relative obscurity to become an important issue in European policy and science. The reasons are obvious. Species in general are disappearing at a rate never observed since life began on earth. The extinction crisis ranks with global climate change as the greatest threat to the integrity of the biosphere in the 21st century. The seas are no exception and human pressure is changing the diversity of life in coastal waters, the shelves and even the deep sea rapidly and on a global scale.

Species extinction is not just an aesthetic or moral problem. Marine organisms play a crucial role in almost all biogeochemical processes that sustain the biosphere, and provide a variety of products (goods) and functions (services), which are essential to mankind's well being, including the production of food and natural substances, the assimilation of waste, the remineralisation of organic matter and the regulation of the world's climate.

Knowledge about the patterns and changes of marine biodiversity in Europe and the role of marine biodiversity in ecosystem functioning is scattered and imprecise. The scale of the research efforts needed to obtain adequate knowledge for exploration, conservation and restoration of marine biodiversity demands European-scale collaboration. This was at the basis of the BIOMARE project. BIOMARE (Implementation and Networking of large-scale long-term Marine Biodiversity research in Europe) was a Concerted Action sponsored by the EC with the participation of 21 marine laboratories, members of the European Network of Marine Research Station MARS.

The objectives were to achieve a European consensus on the selection and implementation of 1) a network of Reference Sites, 2) internationally agreed standardised and normalised measures and indicators for (the degree of) biodiversity and 3) facilities for capacity building, dissemination and networking of marine biodiversity research. Through the International Biodiversity Observation Year IBOY, DIVERSITAS and the Census of Marine Life CoML, three global initiatives, BIOMARE has attracted attention worldwide as a major effort to coordinate biodiversity research at the European scale and beyond.

The results of BIOMARE have been published in two books and a permanent web site will be maintained by the MARS network. The first book describes the 100 European Marine Biodiversity Research Sites that provide the geographical skeleton for the implementation of long-term and large-scale research in Europe. Of these sites twelve are Reference Sites where conditions are as near to pristine as one can hope for in European waters. The Reference Sites as well as the Focal Sites in impacted areas should form the basis for future intensive surveys to assess the status and long-term development of marine biodiversity in Europe. Most of these sites are close to marine institutes, which can provide the infrastructure required for monitoring, explorative and experimental work.

The second book on biodiversity indicators presents a state of the art of the E.U. politics on biodiversity indicators, a strategy to choose indicators and to monitor biodiversity within the framework of the BIOMARE EMBRS and a catalogue of indicators that are used or recommended and for which at least some consensus on their utility exists. Such indicators are required to translate very complex biological structures and processes into more simple parameters and concepts that can be understood by non-scientists. The challenge was to construct a scientifically solid system that still is useful to the interested scientist, the CZM manager and the public alike. This book sets a first step but much work remains to be done.

Now that the foundations have been laid, it is our hope that marine biodiversity research in Europe will take advantage of the results from BIOMARE and the commitment of the scientists and institutes that supported it. Organization at the European level and partnerships within the European Research Area will be necessary if the marine community is to cope with one of the major challenges that will face it in the rapidly changing political and societal environment in Europe and worldwide.

Carlo Heip and Herman Hummel
NIOO, General Co-ordinators

INTRODUCTION

EUROPEAN MARINE BIODIVERSITY RESEARCH SITES

One of the major objectives of BIOMARE Workpackage 1 was to establish a network of marine coastal sites for comparative studies of marine biodiversity throughout Europe. These are sites where biodiversity research or monitoring is going on, or has been going on, and where the institutions involved in this research have agreed to make the data freely available for European efforts aimed at understanding large-scale patterns of distribution or long-term changes. The institutions have also agreed on a series of protocols aiming at the long-term study of marine biodiversity in Europe, and these are described in a separate publication under Workpackage 2.

Among these **European Marine Biodiversity Research Sites**, a small subset of **Reference Sites** has been selected where human activities or natural local perturbations do not affect biodiversity to any measurable degree, so that any future changes are likely to be dominated by natural factors. These sites have the potential to be used in future for studying large scale effects on biodiversity, such as climate change. The remaining **Focal Sites** are impacted to varying degrees and by varying factors, and these can be used for studying more local effects on biodiversity. The entire network of European Marine Biodiversity Research Sites would be needed to address certain large scale issues such as the effects of climate change on range extensions of species.

An independent panel of scientists has advised the BIOMARE Steering Committee on the selection of Reference Sites (none of these scientists were the proponents of such sites). The sites were scored on a number of strict criteria (table 1):

- They must be as free as possible from anthropogenic and natural stressors that are atypical of the region (e.g. reduced salinity or high turbidity).
- They must comprise a mosaic of representative habitats in a well-defined area.
- A substantial body of background information on the biota must already be available.
- They must be protected by legislation, with a high conservation status.
- They must have an appropriate infrastructure and facilities for marine biodiversity research.
- There must be a strong national commitment to research.

The much larger number of Focal Sites were self-evaluated by their proposers using the same criteria (table 1). For inclusion in the network all criteria except the last (strong national commitment) were relaxed for the Focal Sites, and the intention has been to establish sites with comparable habitats covering a wide geographical range.

The Reference Sites have been further categorised as follows:

- **ATBI Sites.** These are sites where inventories are already available for a large number of components of the biota, and where the production of an All Taxon Biodiversity Inventory (ATBI) is feasible. They have been selected as small islands which are protected against direct human impact and are located in a set of full salinity marine environments approaching pristine conditions.
- **LTBR Sites.** Sites intended for Long-Term Biodiversity Research (LTBR) aiming at understanding the processes that govern the origin, maintenance and change of marine biodiversity, including human impacts. To this end, a number of Focal Sites centred on major well-established marine research laboratories in Europe have also been designated for this purpose. LTBR sites are managed by one or several committed institutes and in future may be the nodes of regional networks involving a number of satellite sites from the same region.
- **SSBI Sites.** Sites under this heading are sites of exceptional or unique biodiversity that may be studied in their own right or may be part of a European effort aimed at inventorying marine biodiversity. These sites could be sites with especially unusual or unique habitat types, sites containing especially rare, unusual or endangered species, containing many invasive/exotic/toxic species, in a biogeographical transition zone, or at the limits of the distribution range of several species.

In practice all the ATBI sites also qualified as LTBR sites, and all the LTBR sites also qualified at SSBI sites, so in the map (Fig. 1) and at the head of the site descriptions that follow, four categories of sites are indicated:

Blue disk – Reference ATBI sites
Blue circle – Reference LTBR sites
Red Disc – Normal Focal sites
Red Circle – Focal LTBR sites

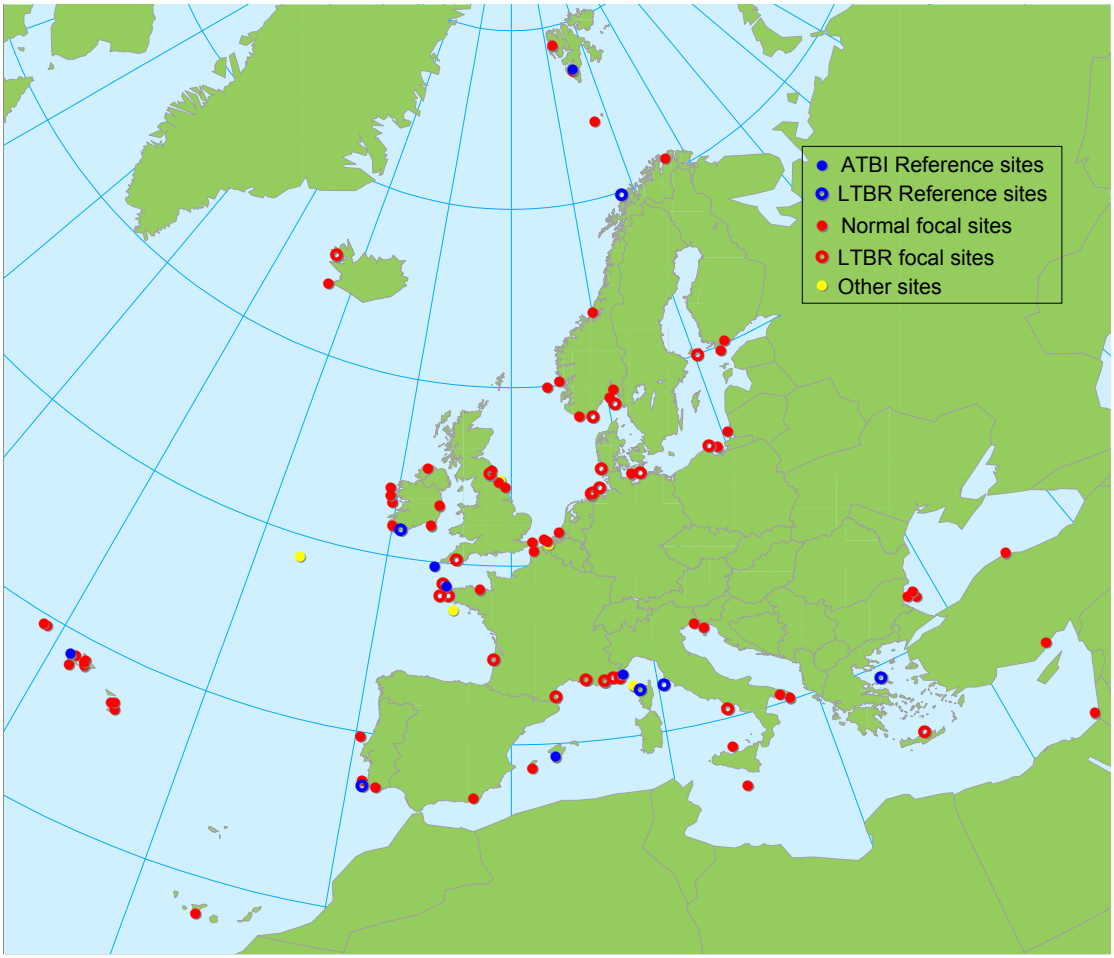


Fig. 1. Distribution map of proposed European Marine Biodiversity Research Sites.

The site descriptions are arranged in groups according to the above categories, and within categories alphabetically by country. The conservation status of each site is also indicated at the head of each site description, as follows:

5 stars – Fully protected as a national park or Natura 2000 site by national legislation.
4 stars – Protection pending but not yet approved by national legislation.
3 stars – Protections status intended and preparatory planning imminent.
2 stars – *De facto* protected because of geographical conditions and location.
1 star – Not protected.

Initially estuaries, lagoons, deltas, deep-sea (abyssal plains, ridges) and purely pelagic habitats have not been included in this network of proposed research sites. However, examples of some of these are included as an appendix to the site descriptions as an indication of the type of sites that might (and should) be included in a further extension of the network.

The future

The network of European Marine Biodiversity Research Sites is not closed with the publication of this book. The BIOMARE Steering Committee has decided to hand over responsibility for the maintenance of the network to the European Network of Marine Research Stations MARS. Future proposals for candidate sites will have to be submitted to MARS and MARS will also become responsible for updating this catalogue from time to time. At the moment of publication of this book several important new initiatives are already planned. It is our hope that the European Marine Biodiversity Research Sites will fulfil an important role in the development of marine biodiversity research within the European Research Area and the Sixth Framework Programme of the European Commission.

Acknowledgements

We are grateful to all those who submitted information on the research sites in a standardised format, and to Damien Allen for producing the site maps.

The Concerted Action BIOMARE was funded under the Energy, Environment and Sustainable Development Programme of the European Union, contract number EVR1-CT2000-20002.

Table 1. *European Marine Biodiversity Research Sites Evaluation List (developed by Herman Hummel and Pim van Avesaath)*
In the list of Habitats seven main habitats are recognised: 1) intertidal sandy sediments, 2) subtidal sandy sediments, 3) intertidal soft muddy sediments, 4) subtidal soft muddy sediments, 5) intertidal hard substrates, 6) subtidal hard substrates, and 7) seagrass-beds.
To become a Reference Site the sites need to fulfil at least for criterion 1a > 1 point, crit 1b >= 1 pt, crit 3b >= 1 pt, crit 3c >= 1 pt, crit 4 >= 2 pt, crit 5a >= 1 pt, crit 6 >= 3 pt; to become an ATBI site the sites need to be a Reference site and to fulfil at least for criterion 1b = 2 pt, crit 2 = 4 pt, crit 3c >= 2 pt, crit 4 >= 3pt, crit 7a >= 1 pt, crit 7b = 1 pt; to become an LTBR site the sites need to have for criterion 6 = 4 points.

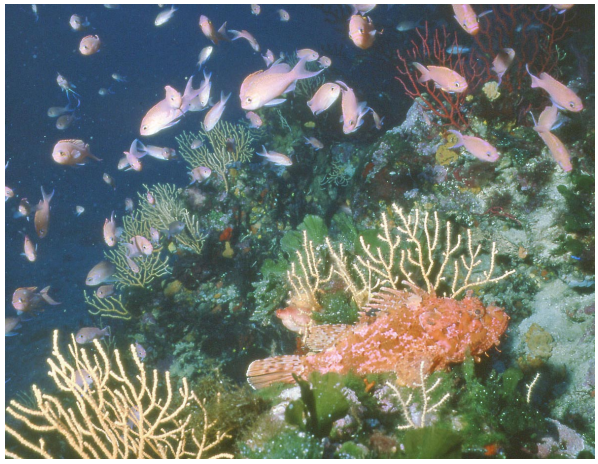
MAIN CRITERION	FACTORS TO BE CONSIDERED	4	3	2	1	0	POINTS	FACTOR	Total POINTS
1. Pristiness / naturalness / degree of human impact	**a.** Background level of eutrophication / pollution / disturbance (absolute level of impact / pristiness)			No pollution, no human impact	Moderate pollution, moderate human impact	High pollution, strong human impact		3	0
	b. Level of eutrophication / pollution / disturbance in relation to background level of region (naturalness)			In relation to background no (additional) human impact detectable or suspected	Possible impact from past activities	Area polluted or disturbed more than average in region		3	0
	c. Presence of an a-typical natural stressor for the area				No	Yes		1	0
2. Array of habitats	Number of available habitats in relation to total number of habitats in the region	80 - 100 % of available habitats	60 - 79 %	40 - 59 %	0 - 39 %			2	0
3. Information available	**a.** Historical data, older than 50 years				Available	Not available		1	0
	b. Monitoring of biodiversity ongoing		Almost ATBI	3 - 7 phyla studied	1 - 2 phyla studied	No research ongoing		1	0
	c. Biodiversity data available freely or on request		Almost ATBI	3 - 7 phyla studied	1 - 2 phyla studied	No information available		1	0
	d. Environmental data available freely or on request			> 10 parameters monitored more than 10 years long	> 2 parameters studied for more than 5 years long	Less parameters, for shorter period monitored		1	0
4. Conservation status		Fully protected as a national park or NATURA 2000 site by national legislation	De facto protected because of geographical conditions and location	Protection pending but not yet approved by national legislation	Protection status intended and preparatory planning imminent	Not protected		1	0
5. Facilities	**a.** Field station (within 4 to 6 hours reach)			Fully operational, can host 10 persons	Limited facilities, can host 5 persons	No facilities		1	0

	b. Suitable boats or research vessels easily available				Available	Not available		0,25	0
	c. within reach of airport (1 day travel)				Yes	No		0,25	0
	d. Continuous access: continuous or seasonal (=limited)				Continuous	Limited (seasonal)		0,25	0
	e. Field knowledge/advise locally (see 5.a) available				Available	Not available		0,25	0
	f. Experimental facilities				Available	Not available		0,25	0
	g. Accommodation				Available	Not available		0,25	0
	h. Training, education locally (see 5.a) available				Available	Not available		0,25	0
	I. High tech equipment locally available				Available	Not available		0,25	0
6. Commitment		Memorandum of understanding signed by institute with budget and science plan	Expression of interest from institute with outline of planned activities	Written commitment from individual scientist with budget and project	Expression of interest from individual scientist with outline of activities	No commitment		1	0
7. Biogeographic Representativeness	**a.** Biodiversity (fauna/flora) representative				Yes	No		1	0
	b. Habitats representative for region				Yes	No		1	0
	c. Biodiversity hotspot				Yes	No		1	0
	d. Transition zone (e.g. zone between major current systems or border between biogeographical regions)				Yes	No		1	0
	e. Endpoints (distribution limit of several species)				Yes	No		1	0
	f. Site of special interest				Yes	No		1	0
	Biogeographical zone								
8. Additional criteria	Mirror sites available? (specify)								
						Total POINTS			0

ATBI Reference Sites

PORT-CROS ISLANDS	France	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 43°00'N, 6°23'E



Coralligenous ground at La Gabinière, with gorgonians, *Anthias* and Red Scorpionfish. Photo J G Harmelin

Description of site:

The National Park of Port-Cros comprises one inhabited island (48 permanent people and several thousand visitors, mostly in summer) and three smaller uninhabited islands, which are part of Hyères Archipelago 8 km off Bénat Cape. The islands are exposed to the main east-west current of the north-west Mediterranean coming from the Gulf of Genova in Italy. The total area is 700 ha of land and 1300 ha of sea. There is no permanent freshwater runoff. Sea-water is very clear and visibility generally exceeds 20m. This area has had the status of National Park since 1963. The marine zone, 600 m off the coast around the islands, includes all the major habitat types of the NW Mediterranean, except pure muddy sediments, and is near bathyal assemblages from deep-sea cliffs. Littoral rocky habitats are well represented, including mid-littoral algal rims of *Lithophyllum byssoides*. There are three small sand beaches. Sublittoral rocky habitats are well represented, with vertical cliffs, boulders, and small caves, coralligenous constructions and various algal assemblages, including diverse *Cystoseira* algae. Sublittoral sandy habitats include typical assemblages associated to "detritic coast sand" that have disappeared from polluted areas, e.g. maerl, large arborescent bryozoans and deep stands of laminarian and other large seaweeds. Seagrass beds are well represented, mostly *Posidonia* beds, and a few *Cymodocea* beds. This is one of the rare Mediterranean marine protected areas receiving active management. Researches on biodiversity and inventories made since 1963 demonstrate its unique richness in habitats, benthic fauna and flora and attest to the recovery of populations of flagship**,** vulnerable**,** species. It constitutes a prominent reference site in this part of the Mediterranean Sea for both the good shape of communities and its biogeographic status, intermediate between northern and southern influences. The Park accommodates a large number of visitors and divers, who are informed and made aware of the problems of biodiversity by the Park authorities and many documents for the layman are available.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

Posidonia beds are well developed and, thanks to the lack of turbidity, reach much deeper limits (33-37m) than along urbanised coasts of the mainland. One of the last "*Posidonia* barrier reefs" of the Western Mediterranean occurs at the bottom of Port-Cros Bay. Comprehensive inventories of many components of the biota have been published or are available from the Marine Park Authority, including Rhodophycota, Phaeophycota, Chlorophycota, Chrysophyceae, Magnoliophyta, Foraminifera, Porifera, Cnidaria, Sipuncula, Annelida, Chelicerata, Crustacea, Mollusca, Brachiopoda, Bryozoa, Echinodermata, Tunicata, Pisces and

Mammalia. The restriction of fishing activity, particularly the ban of trawling and spearfishing, has led to a spectacular increase in fish populations, especially flagship species such as the dusky grouper (*Epinephelus marginatus*), brown meagre (*Sciaena umbra*), large sparids (*Dentex dentex, Sparus aurata, Pagrus pagrus, Diplodus* spp.) and barracuda (*Sphyraena viridiana*). Several large, vulnerable, invertebrate species are well represented, such as the bivalve mollusc *Pinna nobilis*, the decapod crustacean *Scyllarides latus* and the echinid *Centrostephanus longispinus*. The recent population increase of some southern species, particularly fishes, is monitored. The outstanding quality of fish aggregations and general landscape of some sublittoral areas, such as the La Gabinière islet, is very popular among sport divers and frequently covered by media. Approximately 340 scientific publications have been devoted to the marine flora and fauna of Port-Cros.

Dusky grouper (*Epinephelus marginatus*) at La Gabinière, Port Cros. Photo J G Harmelin

Human impact:

There is no industrial pollution or mining, and agriculture is negligible. The permanent population is 48, and most of the visitors in summer (220,000 visitors per year on the island, 16,000 pleasure boats and 20,000 divers) remain only during daytime. Professional fishing is restricted to small trammel net fisheries (one local fisherman and ca. 5 to 6 fishermen from the mainland), with annual catches of 14 tons. Amateur fishing is limited to the north and west coasts beyond 50 m from the shoreline. A charter of good use has been established with regional diving companies for limiting the impact of divers. An underwater path for snorkellers education is organised every summer at La Palud beach by the Park staff. Several studies showing a low level of contamination by pollutants have been published.

On-going research:

Biodiversity studies, additions to the inventories and monitoring of faunistic changes are ongoing on several groups of biota and diverse assemblages, involving approximately 12 professional scientists. Time-series data are available for *Posidonia* beds, dusky grouper (*Epinephelus marginatus*), Brown meagre (*Sciaena umbra*), *Pinna nobilis*, *Paramuricea clavata*, and echinoids.

Facilities:

The main island is accessible by public transport (passenger ferry, 1-hour crossing from Hyères and Lavandou). The Park offers facilities for accommodation and field work, including small boats and an air compressor for diving. Several restaurants are available during the tourist season and some are open throughout the year.

Database available:

Inventories of the fauna and flora are available as Word or Exel files from the Park Authorities.

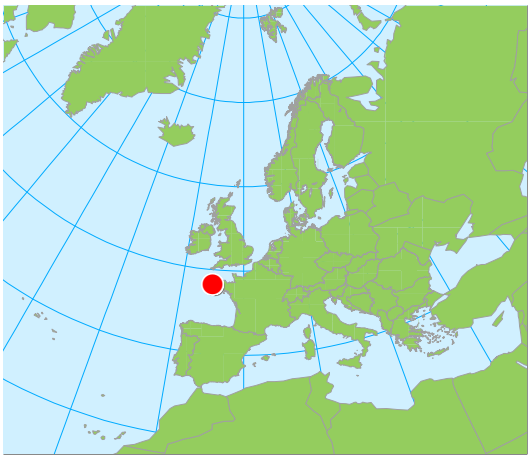
Website:

General data on the Port-Cros National Park, including land and marine area are available on http://www.portcrosparcnational.fr/site.asp and http://www.provenceweb.fr/e/var/portcros/portcros.htm

Commitment:

The National Park authority supports research on the marine zone, mainly done by scientists from the Centre d'Océanologie de Marseille, the Museum National d'Histoire Naturelle, the Universities of Nice and Barcelona. The area is a ZNIEFF zone and Natura 2000 site.

USHANT-MOLENE ARCHIPELAGO, BRITTANY	France	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 49°55'N, 6°19'W

Panorama from Banneg Island. Photo R P Bolan

Description of site:

The Ushant-Molene archipelago, situated some 12 km W of the western end of Brittany, comprises two inhabited islands, 27 islets and hundreds of emerging rocks, delimiting a total area of some 130 km². The archipelago has been a Man and Biosphere UNESCO reserve since 1988. The intertidal area and the subtidal area up to 25 meters depth, constitute the buffer zone of the reserve. This process initiated fundamental studies to describe the main compartments of the island and marine ecosystems and initiated studies and proposals to manage these environments. The establishment of a Marine National Park is currently reaching final stages. The creation of the park itself will take place in 2003. Ushant-Molene archipelago constitutes the central zone of this park, the status of which will continue in perpetuity.

Molene archipelago has, thanks to its very clear water, the largest laminarian field in Europe, including *Laminaria hyperborea, L. digitata, L. saccharina, L. ochroleuca, Saccorhiza polyschides* beds. Although the continent is nearby the islands (3 to 10 miles), there is a tidal front between the archipelago and the mainland, allowing isolation of the Iroise waters from the "continental" waters.

Almost every marine coastal habitat that occurs in Brittany is to be found in the Ushant-Molene archipelago. The only exceptions are intertidal and sublittoral muddy substrata and all truly estuarine habitats that occur all around our peninsula. *Zostera* beds exhibit the longest *Z.marina* leaves recorded in Europe. Boulder fields occur on almost all islands, from very exposed shores to sheltered areas (harbours). These shores have been recognised as important recruitment and/or nursery grounds for many commercially fished species of the Iroise sea (fishes, crustaceans). Extensive maerl beds occur sublittorally in the southern part of the archipelago and this habitat has been designated as especially species rich and needing management and protection under the E.C. habitat directive (1992). Other habitats ranging from coarse gravels and boulders to fine sands and mud together with extensive rocky underwater-cliffs occur sublittorally.

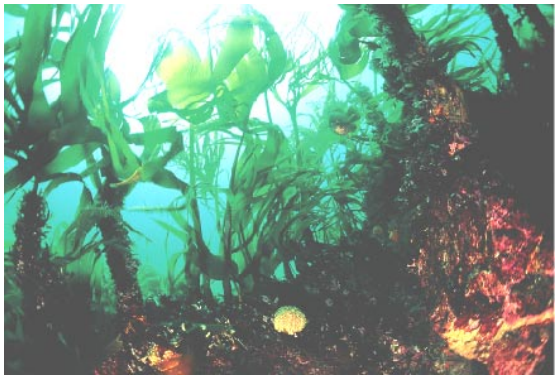
Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The archipelago constitutes a northern limit for several biota of the lusitanian fauna. Also it is a southern limit for several macroalgal species. Inventories of the major marine phyla have been compiled since the middle of last century and are still ongoing. Over 200 publications are dedicated to the biodiversity and natural environment of the Ushant-Molene archipelago. The proposed site can be considered as the highest

representative pristine site of the French Atlantic/Channel coastal ecosystem because of the highest habitat diversity it holds (including intertidal and subtidal *Zostera* beds, maerl beds and intertidal boulder fields) and also thanks to the highest water quality of the area, leading to very high biodiversity for every compartment of the ecosystem. This site is already recognised by local, regional and national authorities (governmental, administrative and scientific), but also by the public, to be of high ecological interest.



Laminaria hyperborea forest with the sea urchin *Echinus esculentus,* the ascidian *Pyura microcosmus* and the sponges *Hymeniacidon sanguinea* and *Aplysilla rosea* . Photo Y Gladu

Human impact:

The archipelago is not under the threat of any industrial pollution, mining or dumping. No agricultural activity occurs on any of the islands. Total population of the archipelago is 1340 inhabitants, on 2 islands. The population has been decreasing since the seventies, with a 30% drop in the last 25 years. Fishing involves 60 professional fishermen in angling and pot fishing, but both activities are decreasing nowadays. Scallop dredging occurs in winter on a very restricted area (15 hectares) close to Ushant. Laminarian harvesting occurs in summer on subtidal rock grounds (50,000 tons/year).

Facilities:

A ferry leaves Brest and Le Conquet daily for the inhabited islands of the archipelago (Ushant- Molene), with a transit time between 45mn and 1h. An air shuttle is also provided from Brest airport daily on a weather permitting (strong winds) basis. From the inhabited isles, smaller vessels are available from the Natural Reserve wardens, that allow access to the other isles and islets of the archipelago. Ifremer and CNRS research vessels are available all year round, after an official (refereed) demand. Programming has to be done one year before the survey. Note that during winter storms work at sea may generally not be possible in most of the area.

IUEM has a diving team and can provide diving equipment, security equipment and an inflatable vessel for SCUBA diving. There are two SCUBA diving clubs that regularly organize dives in the archipelago (one in Ushant and one in Le Conquet). Brest hospital is equipped with recompression chamber. The University of Western Brittany and CNRS are situated near Brest, 20 km from Le Conquet (some 2 hours from the islands). Laboratories provide all classical biodiversity equipment and a scientific library for macrobenthos, phytobenthos, phytoplankton and zooplankton.

Hotels (Ushant & Molene) and youth hostels (Ushant) or a Natural Reserve house (Molene) are available all year round. Two islets have small houses where bivouacs can be organised.

Commitment:

The IUEM marine biology laboratories have funds for biodiversity research programmes in the Molene-Ushant archipelago. The forthcoming, nationally funded, Rebent programme (benthic habitats mapping and long term benthic survey) will include several stations in the area.

On-going research:

The IUEM institute has funded (from 2000) a long-term biodiversity survey on the *Zostera* beds of the Molène Archipelago. Also two laboratories of IUEM are leading on-going macrofaunal and macroalgal biodiversity programmes. Regional authorities and Ministry of Environment fund specific programmes after refereed proposals (generally from one-year to five-year programmes).

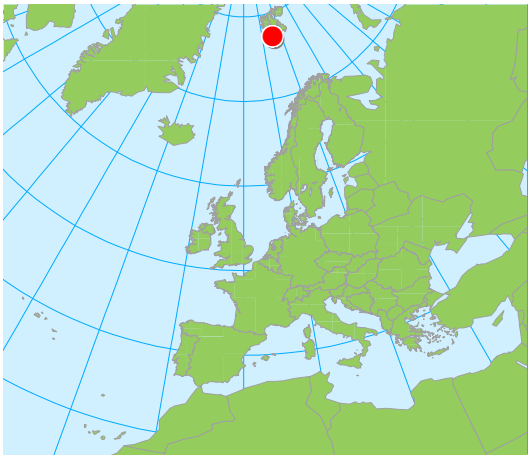
Database available:

A comprehensive intertidal macrozoobenthos biodiversity database is available at the laboratory LEMAR of the European Institute for Marine Research (IUEM), Brest as hard copies or Excel files. For some species habitat, date and abundance are available upon request.

Website:

The database will be available on the IUEM/LEMAR website at http://www.univ-brest.fr/IUEM/UMR6539/

HORNSUND, SPITSBERGEN, SVALBARD ARCHIPELAGO	Norway	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 77°00'N, 15°00'E

Northern shores of Hornsund, photo L Kotwicki

Description of site:

Hornsund is an medium size fjord (30km length, 12-15km wide) with a maximum depth of 260m, and weak sill in the entrance. Tidal glaciers form large part of the inner fjord basin coastline. The Fjord is heavily influenced by the cold Sorkapp Current carrying Arctic waters from the eastern part of the Svalbard archipelago while occasional intrusions of Atlantic waters are observed from the West Spitsbergen Current (arm of North Atlantic Current) carrying relatively warm waters. Hornsund, the southernmost of the Spitsbergen fjords, is the only Arctic fjord with relatively easy access. Other accessible fjords on the western coast are under strong Atlantic water influence, while the Hornsund fauna is of more Arctic character when compared to adjacent areas. It gives a unique opportunity to study the moving border between two contrasting zoogeographical provinces (Subarctic and Arctic). Habitat diversity within the fjord is high, and many sites have a complex array of habitat types in a small area. Wave exposure varies from extremely exposed to very sheltered, often within a short distance. All habitats within the region of Svalbard are present.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Description of fauna and flora:

The biota has a number of special features. Several species from boreal Europe and the High Arctic are found here and nowhere else on Svalbard. The Hornsund marine fauna and flora has received sporadic attention from amateur and professional collectors and recorders over the past century and a half. From the potential pool of some 2500 marine macroscopic species of Svalbard, at least 600 have been noted in Hornsund. Inventories of many components of the biota have been published, most of them in a dedicated series of "Atlases of southern Spitsbergen marine fauna and flora": these include Diatoms, Macroalgae, Cnidaria, Digenea, parasitic Nematoda and Cestoda, Polychaeta, Crustacea (Malacostraca, Copepoda: Calanoida), Mollusca, Bryozoa, Echinodermata, Ascidiacea and Chordata. In addition, there are around 50 other publications relating specifically to the biodiversity or natural environment of Hornsund. The longest formal time series data are for zooplankton (every year from 1988 to the present, averaging 50 samples per year).

Human impact:

There is no industrial pollution, fishing or dredging. Within the Polish Polar Station (current population of 12) there is biological filtering system that treats all the waste water produced at the station. All solid garbage is

stored in metal drums and taken away during re-supply operations in June each year. Approximately 10 cruise ships and occasional research vessels arrive to Hornsund each year.

On-going research:

Hornsund is the major focus for the Polish Arctic National Research Programme. Several marine scientists from a Consortium of Polish Marine Research Institutes spend a significant proportion of their time on the biodiversity- related research. In addition there are numerous Norwegian, British, US and German scientists undertaking marine biological work in the area.

Dendronotus frondosus (Ascanius) at Wilczkodden intertidal pool. Photo L Kotwicki

Facilities:

Polish Polar Station in Hornsund is the only permanently inhabited site in the area, originally established in 1957 as a research station under protection of the Governor of Svalbard for some 15 persons. The Polish Academy of Sciences who owns the facilities expanded them to host summer groups up to 15 persons and 10 members of the wintering, whole year team. There is a basic wet laboratory especially designated for biodiversity work. The fjord is accessible by ship in the ice-free season and by snow scooters or helicopter year round. A number of local boats (in the neighboring capital settlement Longyearbyen) are capable of all normal requirements for biodiversity work may be hired for working in the fjord and offshore. The distance from the fjord to the nearest regular airport and operational laboratory facilities (Longyearbyen and its University) is about 200 km.

Database available:

Records of marine species are stored in EXCEL at the Institute of Oceanology Polish Academy of Sciences. This includes data on abundance, habitat type, collectors names, dates etc.

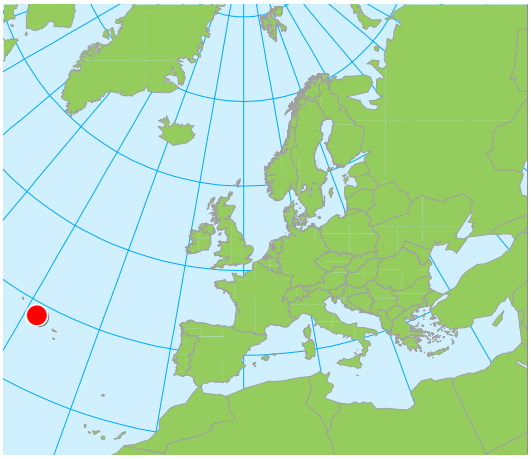
Website:

Information on the Polish Polar Station is available at http://hornsund.igf.edu.pl, and marine biological data on www.iopan.gda.pl .

Commitment:

The Institute of Geophysics Polish Academy of Sciences together with a Consortium of Polish Marine Research Institutes and Norwegian partners (NP and AKVAPLAN) has an agreed science plan and specifically allocated budget for biodiversity work in the Hornsund fjord.

FAIAL-PICO CHANNEL, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 38º32'N, 28°35'W

Faial-Pico Channel. Photo RS Santos *ImagDOP*

Description of site:

This site is located in between the Faial and Pico islands (Central Azores). It is the most diverse and representative complex of habitats in the archipelago. It constitutes a 5 km-wide shelf between the islands and the adjacent coasts. The channel is subject to strong tidal currents and its depths vary from 500 meters at both entrances to an average of 45 meters in the middle. The shallowest mid-channel reef ("Baixa do Sul") is 8 meters deep and is a Site of Conservation Interest under EU-Natura 2000 Network. Two other sites on the neighbouring coast bear the same designation ("Monte da Guia" and "Ilhéus da Madalena"). The Regional Government of the Azores is conducting efforts to classify the area as "Marine Park". The proposed area includes the oldest marine protected area of the Azores ("Monte da Guia"), which is recognized by local people as one of the examples of marine conservation in the archipelago.

The habitats in the channel are very diverse, including littoral and sublittoral rocky and sandy habitats representing the full gradient of hydrodynamic conditions in the Azores, including sandy sheltered bays and beaches, tidal current-swept areas, stretches of exposed rocky coast, shallow mid-channel reefs/pinnacles, islets, steep plunges, caves, boulder fields, volcanic bedrocks, boulder beaches and small shallow hydrothermal fields (mainly gas leaks).

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

Hundreds of species (among algae, macro-invertebrates, fish, cetaceans and birds) inhabit the diversity of habitats that occur within this site.

Several flagship species are present and use the site as a feeding area, such as bottlenose dolphin *Tursiops truncatus* and Common dolphin *Delphinus delphis*. Commercial fish species such as *Epinephelus marginatus*, *Sphyraena viridensis*, *Pagellus* spp., and crustaceans such as *Scyllarides latus* and *Palinuris elephas* also have good populations.

Occasionally is possible to observe truly oceanic species such as *Mobula tarapacana* and large tunas. Avian fauna include several protected marine birds including important populations of *Calonectris diomedea borealis* and a small colony of *Sterna hirundo*.

The researchers from the DOP/UAç, who have been developing biodiversity projects in the area for more than two decades, have recently recommended the establishment of a large MPA in the Channel within a project where the regional Directorates for the Environment and for Fisheries are partners.

Human impact:

No serious sewage problem exists in the area. The tuna-canning factory used to be a low pollution source but lately its activity has been very low and its closing down is forecasted. The area is subject to moderate artisanal fishing pressure. Fisheries mainly target *Pagellus bogaraveo*, *Epinephelus marginatus*, *Serranus atricauda* and *Pagrus pagrus*. Recreational fishermen also use the Channel although there are no quantitative data on this sector. Tourism has a visible and increasing weight on both sides of the channel.

Antipathes wollastoni. Photo R Hofrichter *Imag*DOP.

On-going research:

There are research projects dealing with management of coastal and marine areas, mapping of marine habitats using robotic ocean vehicles, effects of the marine protected areas on the fish community and ecology and population structure of bottlenose dolphins and sperm whales. These projects are funded by EU Programmes, the Portuguese Foundation for Science and Technology and the Regional Government of the Azores.

Facilities:

The island of Faial is served by regular flights from Lisbon. There are good hotels and boarding houses in both Faial and Pico.

The Channel is served by two main ports: Horta (on Faial island) and Madalena (on Pico island). Both offer good harbour facilities. The Department of Oceanography and Fisheries of the University of the Azores (DOP/UAç) is located right in the Horta harbour where it bases its boats. The site proposed is located right at the exit of this harbour. The farthest points of the site are located 7 nautical miles away from Horta. Bad weather conditions, which mainly occur during winter, can limit the access to some habitats (mid-channel reefs, caves) within the proposed site. The summer is by far the best season to work at the site.

The facilities of DOP/UAç have an easy access to the Horta harbour and a well-equipped diving section, laboratories and boats. The laboratories support scientific activities dealing with the description, experiment, and modelling of oceanic ecosystems within the areas of Marine Biology and Ecology, Physical and Chemical Oceanography, and Fisheries.

Scuba diving clubs are present both on the islands of Faial and Pico.

Database available:

Comprehensive inventories are available for algae, benthic macro-invertebrates, fishes, cetaceans, turtles and seabirds. Many of them result from the research carried out by the University of the Azores as well as from some international expeditions that have collected samples in the area.

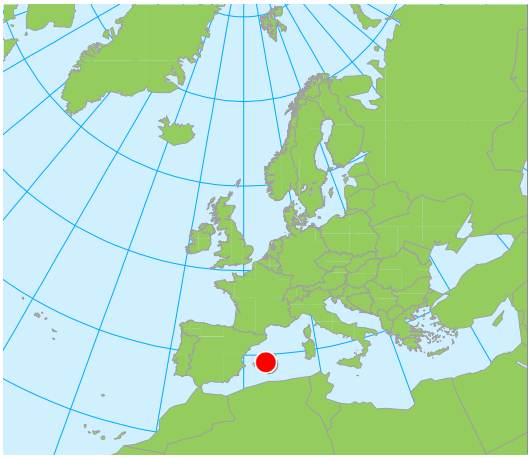
Website:

GIS-based databases are currently being built for the Channel area. Some descriptions, maps and photos of the area and its biodiversity are available at: http://www.horta.uac.pt/projectos/life/habi.html and http://www.horta.uac.pt/species/

Commitment:

The DOP/UAç is committed to monitoring and extended research based on the "Faial-Pico Channel", which at the same time is a complex of three SCIs under Natura 2000. The research and monitoring is funded for the next three years by projects already approved.

CABRERA ARCHIPELAGO, BALEARIC ISLANDS	Spain	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 39°10'N, 2°9'E

Panorama of Cabrera's harbour. Photo Archivo PN de Cabrera

Description of site:

The Archipelago was declared National Park on 1991. It consists of 19 islets (13,18 km^2) situated some 9 km off the Southern tip of Mallorca (Balearic Islands), plus 87,03 km^2 of surrounding sea. The maximum depth in the protected marine zone reaches 110 m. The islands do not support any agricultural practice and remain uninhabited except for a standing population of 12 (mostly Park officials) on the main island. The waters of the Archipelago are characterised by their oligotrophy, accentuated by the low continental influence (there are no rivers or industry in the Archipelago nor in the adjacent Mallorca), and in consequence by an elevated transparency comparable, in Summer, to those of tropical seas. The great heterogeneity of the bottoms, harbouring a large number of the more characteristic benthic communities of the central Mediterranean, and their good state of conservation, makes the Archipelago an ideal place for the study of marine biodiversity in the oligotrophic areas of the Western Mediterranean, and the factors that determine its community structure. In addition, the presence of undisturbed and continuous underwater cliffs between 0 and 65 m are of major interest for studies on benthic zonation and on environmental factors forcing it. Lowermost bathymetric limits for the infralittoral zone (-40 to -45 m) and algal growth (-110 m) have been determined in the Archipelago, and rank amongst the deepest in the W. Mediterranean. Due to the calcareous condition of the Archipelago, the number of marine caves and tunnels is considerable. Several anchialine caves harbouring endemic marine fauna are also known on the two main islands.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

The censed marine biota consists thus far of 455 species of marine plants (Diatoms, Macroalgae and Seagrasses) and 951 metazoans. Comprehensive inventories of many of these groups have been published in a monograph dealing on the Natural History of the Archipelago (Alcover et al. (Eds), 1993): these include diatoms, macroalgae, seagrasses, cnidarians, Ctenophora, Plathelminthes, nemerteans, Polychaeta, sipunculids, echiurids, Crustacea, Mollusca, Phoronida, Bryozoa, Brachiopoda, Phoronidea, Chaetognata, Echinodermata, Ascidiacea, Thaliacea, Larvacea, fishes, marine mammals and reptiles. The Archipelago is outstanding for its extraordinarily diverse fish assemblage, surpassing in number of species any other BIOMARE site. The great abundance of the thermophilic decapod crustacean *Scyllarides latus* is also remarkable. The anchialine cave fauna is noteworthy, including *Burrimysis palmeri*, a monotypic genus of

mysid shrimp endemic from the Archipelago (it is the single blind marine mysid known in European waters), and representatives of either the rare peracarid crustacean order Thermosbaenacea and the primitive copepod order Misophrioida.

Diplodus vulgaris, Coris julis, and Epinephelus costae at Cala Galiota. Photo Archivo PN de Cabrera

Human impact:

The potential human impacts on the site derive from the activity of a fishery fleet based on the nearby ports of Mallorca (59 licensed ships, but only a maximum of 20 permitted to operate per day), and from the high number of visitors. Only traditional artisanal selective fishing (gill nets, line) is allowed. The annual crop is unknown since the ships work also outside the Park, but the volume could be around 100 Tm. In 2001, the Park received 60.000 visitors. The regime of visits is very seasonal, 50% of total visitors concentrating on July-August. Landing is very restricted and only permitted around Cabrera's harbour.

On-going research:

Cabrera is the ordinary research focus for the major biodiversity research laboratories of either the Balearic Islands (i.e., IMEDEA, IEO and the University of the Balearic Islands) and Catalonia (CEAB, ICM and University of Barcelona). Seven scientists spend a significant proportion of their time on this research. Several NGO's carry out marine biological work on the Archipelago also. Apart from basic alpha-taxonomic work, the main projects focus on the effect of marine reserves on fish populations and *Posidonia* meadows.

Facilities:

The Park is only accessible by boat or helicopter. There is a 30 minute crossing by inflatable boat from Colònia de Sant Jordi (the closest harbour to Cabrera on Mallorca's south coast, about 50 km from Palma de Mallorca). During Spring and Summer, several touristic charter boats operate daily to the Archipelago from Colònia de Sant Jordi and Porto Petro; the cruise lasts about 1 h. Touristic charter boats do not operate daily during autumn and winter, but can be arranged for a precise date. In addition, access to charter boats is possible. The Park boats are not, in principle, accessible to researchers, and the facilities for SCUBA diving in the Park depend on the availability of a compressor. There is no laboratory on the islands purposely built or equipped for marine biological work, but some bench space is available in Cabrera's main island harbour. Nevertheless, IMEDEA has a seashore lab on the Mallorcan south coast (Cap Salines), at 9 km from the Archipelago. IMEDEA's main facilities (fully equipped marine research laboratories) lie about 60 km from Colònia de Sant Jordi (less than 1 h by car). These facilities are available only if guest researchers are associated to IMEDEA**.** Housing is available in the Park for up to 8 researchers depending on demand.

Database available:

So far there are no on-line databases available on the Archipelago's Biota. Nevertheless, Alcover et al. (Eds, 1993) includes comprehensive chapters (and check-lists) on Zoo- and Phytoplankton, Macrozoobenthos and Macrophytobenthos.

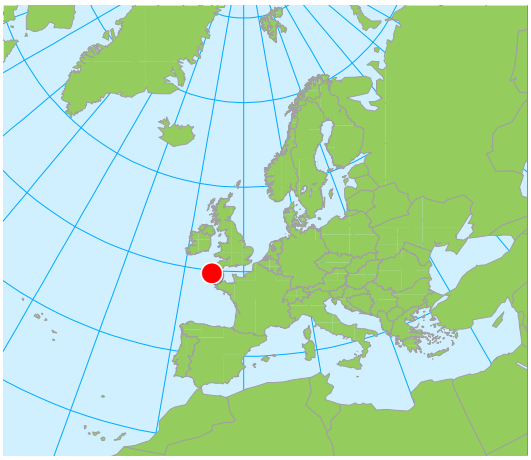
Website:

The Spanish Ministry for the Environment holds an institutional website (http://www.mma.es/parques/lared/cabrera/index.htm) including general information on the management and biotic riches of the Archipelago.

Commitment:

The Spanish Ministry for the Environment' 2001 annual budget for the Park was scheduled as 9,014.423, plus fixed running costs (personnel, etc.). The Spanish Scientific Research Council has an agreed science plan for biodiversity work on the Isles of Cabrera.

ISLES OF SCILLY, SOUTH-WEST ENGLAND	United Kingdom	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 49°55'N, 6°19'W

Panorama from Guthers island. Photo J T Davey

Description of site:

The Isles of Scilly comprise five inhabited islands and more than 300 other uninhabited islands islets and rocks, situated some 40 km west of the SW tip of mainland Britain. The total area delimited by these islands is approximately 95 km2. They have been described as "the only Lusitanian oceanic archipelago in Europe" (English Nature 1994), and the high national importance of these Isles is now recognised by their high conservation status.

Predominantly west-to-east ocean currents and an almost total lack of freshwater runoff results in uniform salinity and low turbidity; the alga *Laminaria ochroleuca*, which occurs in dense stands, has been recorded at depths of up to 30m. Habitat diversity within the archipelago is high, and many sites have a complex array of habitat types in a small area. Wave exposure varies from extremely exposed to very sheltered, often within a short distance. All habitats within the region of SW England are present, except for pure muddy intertidal and subtidal sediments. However, in SW Britain such sediments are usually associated with estuaries, which are in turn associated with high turbidity and low salinity which are considered undesirable features for a BIOMARE Flagship Site typifying the region. The rocky shores and boulder fields are a designated habitat ("reefs") for the Isles of Scilly Special Area of Conservation, as are the extensive intertidal sand-flats and sand beaches. Sublittoral rocky habitats are also designated as part of the "reef" habitat. They range from extremely exposed to very sheltered, and clear water results in extensive kelp forests. Sublittoral sediments range from coarse sand and gravel to fine sand to muddy gravel, which are again a designated habitat ("sandbanks which are slightly covered by sea water all the time") for the SAC. Seagrass beds (of *Zostera marina*) are extensive, the largest in southern Britain, and have a particularly interesting fauna and flora.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

The biota has a number of special features. Several species from southern Europe and the Mediterranean are found on Scilly and nowhere else in Britain, and the Islands have more benthic species defined as 'nationally rare' and 'nationally scarce' than any other locality in SW Britain. The Scillonian marine fauna and flora has received sporadic attention from amateur and professional collectors and recorders over the past century and a half. Comprehensive inventories of many components of the biota have been published, most of them in a dedicated series of papers in the Journal of Natural History: these include Diatoms, Macroalgae, Foraminifera, Cnidaria, Ctenophora, Digenea, free-living Nematoda, Gastrotricha, Polychaeta, Tardigrada,

Acari, Crustacea (Eucarida, Ostracoda, Copepoda: Harpacticoida, Mysidacea,), Pycnogonida, Mollusca, Bryozoa, Entoprocta, Echinodermata. Enteropneusta, Ascidiacea, Thaliacea, Larvacea and Cephalochordata. In addition, there are around 200 other publications relating specifically to the biodiversity or natural environment of Scilly. The longest formal time series data are for zooplankton and phytoplankton. The Continuous Plankton Recorder Survey (CPR) has had routes passing through the coastal waters of Scilly every year from 1950 to the present, averaging 40 samples per year. In connection with the EU Special Area of Conservation (SAC) status, English Nature has initiated regular monitoring programmes for the sandflats, reefs and seagrass beds.

Alcyonium glomeratum, *Axinella dissimilis* and *Holothuria forskali* at Trinity Rocks, St. Martin's. Photo B E Picton

Human impact:

There is no industrial pollution, mining, dumping or dredging, and potentially harmful agricultural runoff is negligible due to strict legislation. The current population is 2057 and this remains more of less static. There is a small shellfishery, potting or using large mesh fixed nets for crabs and lobsters, and only one small (8m) trawler. The use of vessels exceeding 11 metres overall length for the removal of fish from within 6 miles round the Islands is prohibited and strictly enforced.

On-going research:

Scilly is the major focus for the Plymouth Marine Laboratory's programme of biodiversity research. English Nature has statutory responsibility for surveying and monitoring the marine biota of the islands. Seventeen scientists spend a significant proportion of their time on this research, and in addition there are numerous sub-contractors, amateurs and students also undertaking marine biological work on the islands.

Facilities:

The islands are accessible by three means of public transport; passenger ferry, helicopter and fixed wing aircraft. All inhabited islands can be reached from the main centre, Hugh Town, by daily services of local launches, and all shores are accessible via coastal footpaths. Local boats that are capable of all normal requirements for biodiversity work may be hired for working on the uninhabited islands and offshore. The distance from the Islands to the nearest fully equipped marine research laboratories in Plymouth is approximately 160 km 'as the crow flies', and normally takes about 3 hours. There is no laboratory on the islands purposely built or equipped for marine biological work, although active steps are being taken to rectify this situation. Various temporary premises are available for use ranging from the size of small rooms suitable for one or two researchers to the facilities of the local secondary school where field courses of 30 or more students operate. The facilities for SCUBA diving are very comprehensive. Several fully qualified operators offer all facilities: dive-boats, equipment, compressors, and local knowledge of dive-sites. All forms of housing, ranging from self-catering cottages to 4 star hotels, are available. Most hotels close in winter, but guesthouses and self-catering accommodation are available throughout the year.

Database available:

Records of marine species belonging to all taxa are incorporated in the ERCCIS database, in EXCEL on CD-ROM, which is now under the aegis of the Environmental Centre for Cornwall and the Isles of Scilly. This includes data on abundance, habitat type, collectors names, dates etc.

Website:

CPR data for Scillonian coastal waters can be obtained via the SAHFOS website http://www.npm.ac.uk/sahfos/sahfos2.html

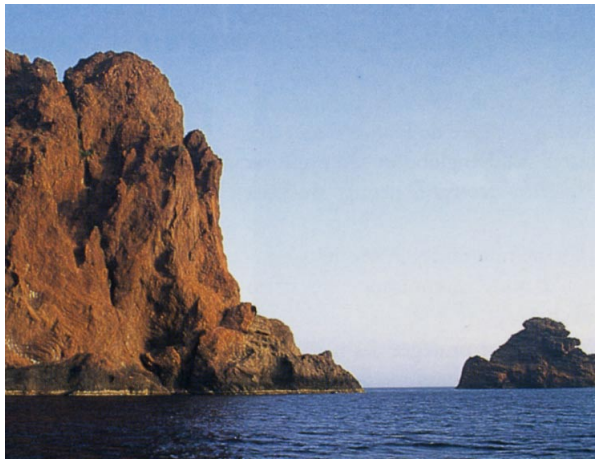
Commitment:

The Plymouth Marine Laboratory has an agreed science plan and specifically allocated budget for biodiversity work on the Isles of Scilly. English Nature has statutory responsibility for monitoring NATURA 2000 habitats.

LTBR Reference Sites

NATURAL RESERVE OF SCANDOLA	France	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 42°22'N, 8°33'W



Punta Palazzo, Scandola. Photo A Meineisz

Description of site:

Situated at the end of Scandola cape (west Corsica), the Natural Reserve of Scandola is a protected area managed by the "Parc Naturel régional de Corse" (PNRC), with both terrestrial and marine parts. The total area is approximately 1919 ha (1000 ha and 919 ha for the marine and terrestrial parts respectively). Created in December 1975, it was established uder the "Réseau des Aires Marines et Côtières Spécialement Protégées de la Méditerranée" (International Convention of Barcelona, 1982). In 1985 it obtained the "European Diploma of the protected Areas" Category A, which was renewed in 1990, 1995 and most recently in 2000, for five years.

Plutonic substrates, high marine currents and total lack of freshwater runoff result in uniform marine salinity and very low turbidity; brown algae *Cystoseira* spp., which occurs in dense and plurispecific (up to 9 species) forests, have been recorded at depths of up to 80m and large "Coralligène" buildups (algal calcareous concretions) are extensive along the deep submarine cliffs. Habitat diversity within the Reserve is high, with a complex array of habitat types in a small area. Wave exposure varies from extremely exposed to sheltered, often within a short distance. Almost all habitats within the region of Corsica are present, except for muddy subtidal sediments. Sublittoral sediments range from fine sand, coarse sand, gravel, algal rhodoliths (maerl, "pralines"), to muddy gravel. Seagrass beds (*Posidonia oceanica*) are extensive and have a particularly interesting fauna and flora. The Reserve of Scandola possesses one of the most important and older (4000 yr B.P.) midlittoral algal calcareous buildups (*Lithophyllum byssoides* rim) in the Mediterranean.

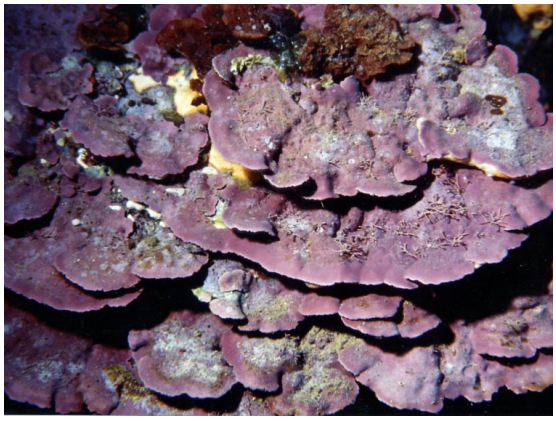
Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The biota has a number of special features. Several Mediterranean species are found at Scandola and nowhere else in France. A lot of marine species regarded as 'rare' and 'scarce' in the Western Mediterranean Basin are present. The Scandola marine fauna and flora has received attention from professional collectors and recorders over the past century. Comprehensive inventories and studies of many components of the biota have been published, most of them in "Travaux Scientifique du Parc Naturel Régional et des Réserves de Corse": these include macroalgae, Cnidaria (*Corallium rubrum*), Trematoda, Digenea, Mollusca, Echinodermata, and Euchordata (fishes, birds, mammals). In addition, there are more than 150 other publications relating specifically to the biodiversity or natural environment of Scandola. The "Parc Naturel

Régional de Corse" has initiated regular monitoring programmes for the rocky and soft substrate communities, seagrass beds, vagile fauna and human activities (fishing and tourism).



Lithophyllum cabiochae, building algal coralline of the "Coralligène". Photo A Meinesz

Human impact:

There is no industrial pollution, mining, dumping, dredging, or potentially harmful agricultural runoff. There is no resident population. The Natural Reserve is subdivided in two parts: one part with limited protection (Professional fishing with dispensation) and one part with complete protection (no fishing and no SCUBA diving). Snorkelling is allowed in all the Reserve. Mooring must not exceed 24 hours.

On-going research:

Scandola is a major focus for different national and international programmes of biodiversity research. The "Parc Naturel Régional de Corse" and its Reserve staff have statutory responsibility for surveying and monitoring the marine and land biota of Scandola. Several scientific teams spend a significant proportion of their time on this research, and in addition there are numerous sub-contractors and students also undertaking marine biological work in the Reserve.

Facilities:

The Reserve is only accessible by boat. All sites can be reached from Galeria, in the north and Porto, in the south. The small boat of the Reserve staff is capable of all normal requirements for biodiversity work and may be hired for working on the coastal shore and offshore. The distance from the protected area to the small field research laboratory of the Reserve (microscopy, SCUBA diving equipments, compressor, accommodations for 4 researchers) in Galeria is approximately 9 km 'as the crow flies', and normally takes about 1 hour. There is no laboratory on the Reserve. The facilities for SCUBA diving are comprehensive. Two fully qualified operators offer all facilities: dive-boat, equipment, compressor, and local knowledge of dive-sites. All forms of housing, ranging from self-catering cottages to hotels, are available. Most hotels close in winter.

Database available:

Records and inventories of marine species belonging to studied groups are available as hard-copies (reviews), and in EXCEL and WORLD versions for specialists. This includes data on names, habitat type, collectors, dates etc.

Website:

Some informations about the "Parc Naturel Régional Corse" and the Natural Reserve of Scandola can be obtained via the website http://www.parc-naturel-corse.com/.

Commitment:

The "Parc Naturel Régional Corse" has established a scientific plan of management and there is a specifically allocated budget for biodiversity work on the Natural Reserve of Scandola. All scientific projects ought to be submitted to the Scientific Committee of the Reserve for valuation and authorization.

NATIONAL MARINE PARK OF ALONNISOS , N. SPORADES	Greece	Conservation status ☆ ★ ★ ★ ★	

Co-ordinates: 39º 30';N, 24º E

Sandy beach from Psathoura island: photo www.alonisos.gr

Description of site:

The only inhabited island included in the Marine Park is the island of Alonnisos. Additionally, more than 25 other uninhabited small islands and many rocks are included in the area. It is widely believed that this area is representative of the entire northern Aegean coastal environment because it is located centrally in the Aegean and almost the entire spectrum of the Aegean coastal habitats can be found there. The coastal environment of the Aegean is considered to be of importance since it hosts a rich flora and fauna, although it is located further from the straits of Gibraltar, which is the main species source for the Mediterranean Areas. Also, many of the Lessepsian migrant species have been recently found in the Aegean and some of them have already reached the area considered here. The area is characterized by a lack of freshwater runoff, and little variation in salinity. *Posidonia oceanica* meadows dominate many of the soft-substrate bottoms included in the Park. Habitat diversity within the archipelago is considered to be high, and many sites have a complex array of habitat types in a small area. Wave exposure varies from extremely exposed to very sheltered, often within a short distance. All types of habitats within the region of Eastern Mediterranean are present, except for pure muddy intertidal and subtidal sediments. Sublittoral sediments range from coarse sand and gravel to fine sand to muddy gravel.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The discussion for the development of the National Marine Park of Alonnisos – North Sporades has been initiated aiming at providing a reserve for the Aegean population of the endangered monk seal (*Monachus monachus*). The area hosts a high number of macrobenthic species, perhaps the highest in the Aegean. Comprehensive studies have been published for many groups of organisms such as Annelida, Polychaeta, Mollusca, Echinodermata, Crustacea, Fish and phytobentic species. Ecological studies have also been published for the area covered by the National Park. Also, a number of publications on the description of the population and on the population dynamics of the monk seal have been appeared in the literature.

Human impact:

The islands included in the area are not populated. The only inhabitant of the entire area is the keeper of the old abandoned monastery, situated in the island of Kyra Panagia. The closest populated islands to the Marine Park are Skiathos, Scopelos and Alonnisos. Their population is 11,000 in total. There is no sewage inside the Marine Park Area. The Island of Scopelos is the only island close to the Park where there is a sewage pipeline. The pipeline is located about 10 nautical miles away from the Park. The sewage receives

no treatment at all. It is estimated that about 3,200 m^3 of sewage flow into the sea during the summer (high tourist season) and about 480 m^3, during winter (no tourist activities). Only coastal fisheries (seine nets, long lines with less than 100 hooks) and angling are allowed inside the Park area. Yachting is allowed in the Park area. There are three sites for anchorage. It is forbidden to spend the night in the Park. Sailors are allowed to swim but they cannot visit the islands. Visits to the islands are scheduled through one-day excursions by small boats, from Skiathos, Scopelos and Alonnisos. Visitors go to the old monastery of Kyra Panagia and to the light of the Psathoura island.

General aspect of hard-substrate sublittoral communities. Photo A. Christou.

On-going research:

Funding for the Marine Park comes from the Ministry of Planning and Public Works and is directed primarily to the protection of monk seals. Also, a substantial amount from the Ministry of Agriculture is directed to the collection of fisheries data from the area. A special legal status is foreseen by the Presidential decree No1, published in the Official Gazette, Issue 4, No. 519, Athens, 28-5-1992. According to the Presidential Decree, there are no time limitations for the legal protection of the Marine Park. The local authorities (mayor and coast guard officers) are charged with the implementation of the Presidential Decree in the Marine Park. A second Decree is to be signed, during autumn 2002, which will create the management authority of the Marine Park. According to the new Presidential Decree, Marine Biodiversity is defined as the key-component of the ecosystem to be continuously monitored. The management authority will release calls for 20 scientist positions as soon as the Presidential Decree has been signed.

Facilities:

The Marine Park is located 7 nautical miles from the port of the Alonnisos island. With an ordinary fishing boat, it takes about 0.5-1 hour to reach the Park from Alonnisos. Special permission from the Ministry of planning and public works is required to carry out any research activities. The Ministry freely gives this permission to Marine Research Institutes. Although the dominant winds are northerly they are not so strong (not more than 7 Beaufort) to cause navigational problems in the area. The distance from the laboratory facilities is a few km from the port of Alonnisos and a few metres from the port of Gerakas (smaller port installations, mainly for fishing boats). In the Station for the protection of the Mediterranean Monk, there is space for Laboratory facilities (two laboratories), for exhibitions, for the reception and communication of the main activities taking place in the Marine Park for visitors and tourists. Also, there are two small boats, suitably modified for small-scale scientific research. There is plenty of space for housing 10 scientists.

Database available:

Information exists only for the activities carried out in the area for the protection of the monk seal (*Monachus monachus*), its population dynamics, fisheries data, and for site-seeing. Most of them exist in electronic form (Excel) and can be requested from individual scientists.

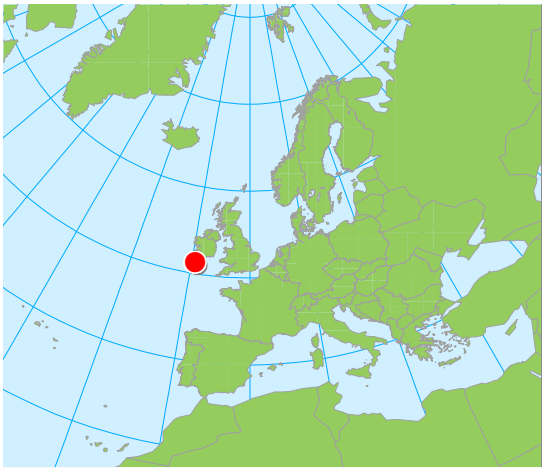
Website:

Some information primarily on sightseeing is available from: <www.alonisos.gr>; <www.mom.gr>.

Commitment:

The General Secretariat of Research and Technology of the Greek Ministry of Development has already signed a letter of intent, where the significance of Marine Biodiversity studies for the economy and the environmental conservation is particularly acknowledged. Also, the Greek Ministry of Environment, Planning and Public Works has statutory responsibility for monitoring NATURA 2000 habitats, included in the area of the Park.

LOUGH HYNE AND ENVIRONS, CO. CORK	Ireland	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 51°30.03'N, 9°18.34'W

Lough Hyne taken from the hills above the north shore

Description of site:

Lough Hyne is a deep landlocked bay or 'marine lake' joined by a narrow channel (Barloge Creek) to the sea. Approximately 4,000 years ago it was a freshwater lake and due to the post-glacial sea-level rise is now saline. The narrowness of the connecting sea channel restricts tidal fluctuations to about 1m and consequently the zonation of the intertidal communities is confined to a narrow band. The rapids created in the narrow channel when the tidal levels inside and outside the lough differ, are of note.

During the summer the lough becomes highly stratified with severe anoxia occurring in the sediments below the thermocline. This is atypical of the region, however it is a very localized event. Since no large estuaries enter the coast the conditions throughout the region are fully saline.

Lough Hyne is the only National Marine Nature Reserve in Ireland. Established in 1981 and managed by Dúchas–the Heritage Service, the Lough has interpretive boards explaining its importance as a marine reserve and is promoted locally as such. Lough Hyne is also a proposed candidate Special Area of Conservation (pcSAC) and Natural Heritage Area. The byelaws of the Marine Stature Reserve Status are strictly followed. No activities are permitted within the bounds of the reserve without prior application for a license.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

Lough Hyne has been extensively studied and is known to have a very high species diversity and richness for such a small area. On the open coast and within the Lough the rocky shores support the Mediterranean sea urchin *Paracentrotus lividus* which is at its most easterly limit in Ireland. Dense stands of kelp *Laminaria saccharina* occur in the rapids with species rich underboulder communities. Within the lough the shallow subtidal reefs have mixed kelp forests with dense foliose red and brown algae. With increasing depth communities more characteristic of wave exposed occur; sponges, hydroids, cup-corals, solitary sea squirts and red algae dominate the boulders. The vertical surfaces are colonised by jewel anemones, sponges and solitary sea squirts. Cobbles, pebbles and gravel support communities of keel worms *Pomatoceros triqueter*, barnacles *Balanus crenatus* and bryozoan crusts.

In sheltered areas solitary sea squirts and sponges cover much of the rock. The cliffs support a wide variety of sponges, (including the rare *Plakortis simplex* and *Halicnemia patera*), cup corals, (the Lough is the only known site in Ireland for the southern cup coral *Caryophyllia inornatus*) and the soft coral *Parerythropodium coralloides*. Two rare gobies, Couch's goby *Gobius couchi* and the Red-mouthed goby *Gobius cruentatus*,

and two sea slugs, *Dicata odhneri* and *Facelina dubia*, more commonly found in the Mediterranean have been recorded. Seventy-five percent of Irish marine algae have been recorded in the area including *Osmundea truncata*, *Gymnogongrus devoniensis* and *Notastoma canariensis*.

The rapids at the entrance to Lough Hyne provide a unique habitat. Photo M Costello

Much of the seafloor is soft mud, although areas of pebbles and gravel are colonised by solitary sea squirts and muddy sand is colonised by burrowing anemones. The scallop *Pecten maximus* is present and the Dublin Bay prawn *Nephrops norvegicus* is common.

Human impact:

There is no industrial pollution, mining, dumping or dredging activity within Lough Hyne. Agricultural pollution is negligible with low inputs of nutrients from surrounding farmland. The surrounding countryside around Lough Hyne has a few private houses and the population is unlikely to increase significantly. Sewage from these houses would generally go into septic tanks or cesspits. No commercial fishing occurs within the reserve boundary, although one license is held by a local fisherman to set prawn pots in the Lough. Some potting and drift net fishing may occur along the open coastline, however this would be outside the reserve boundary. The number of tourists visiting the Lough is low. The main activities would be walking and photography. Any activity within the Lough requires a license, although some limited angling may occur in the Lough itself and along the open coast.

On-going research:

Regional catchment management plans under the Water Framework are currently being commissioned. This should lead to some biodiversity monitoring programmes being established. The management plans for marine SACs are currently being examined and there is a requirement by the National Parks and Wildlife Service to undertake some biodiversity monitoring as part of this designation. Long-term monitoring is voluntarily carried out by Dr Colin Little from the UK.

Facilities:

The open coast section is generally not accessible in winter however the Lough itself is accessible in all weather conditions. It is accessible by car with launching facilities for boats. The maximum distance by boat to the open coast is less than 2 km. Three small laboratories, two with electricity are available on site, providing facilities for accommodation, kitchens, aquaria, sample sorting, preserving, identification and experimental research. The laboratory has a small compressor for diving and space for drying gear. The closest university laboratory would be in Cork, approximately 50-60 km away. There are adequate boats available onsite although no boats are allowed on the lough without a license. Guest facilities are available. There are many guesthouses and self-catering cottages locally and camping has been practical for over 40 years.

Database available:

Limited information is available on the BioMar viewer CD (Picton & Costello 1998). There would not be a comprehensive electronic database of other information for Lough Hyne.

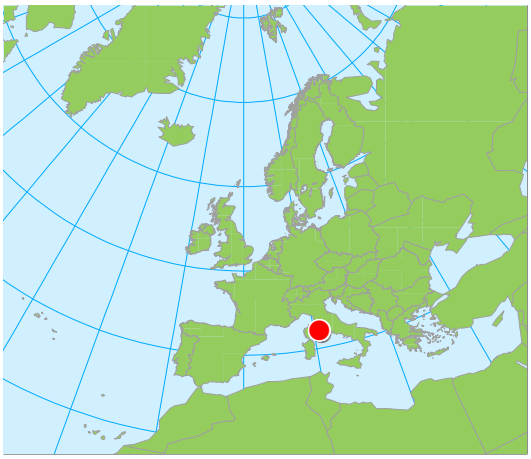
Website:

BIOMAR data is available from http://www.ecoserve.ie/projects/biomar

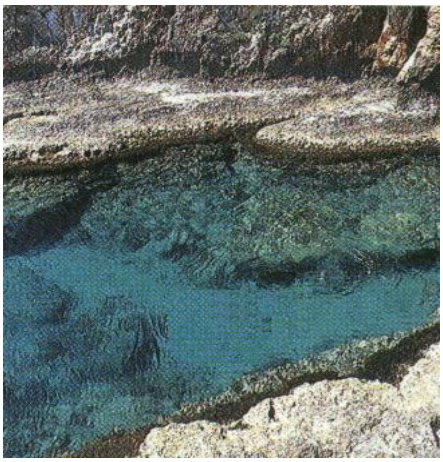
Commitment:

University College Cork owns the three small laboratories on the shore of Lough Hyne thus although there is no formal commitment the facilities allow graduate studentships to work there, and has a long term commitment to conduct research there. There is a requirement by the National Parks and Wildlife Service to undertake some biodiversity monitoring as part of the SAC designation.

TUSCANY ARCHIPELAGO	ITALY	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 42°45'N,10°15'E



View of a common rocky habitat in the Tuscany Archipelago

Description of site:

The Archipelago of Tuscany (AT) comprises 7 islands of different size and geological history. These islands provide the largest system of marine protected areas (MPAs) in Europe, with 61.474 Km^2 of protected waters. The National Park was established in July 1996 with the primary aims of preserving natural habitats and promoting eco-tourism. Public access was prohibited before 1996 on some islands because of the presence of prisons (Gorgona and Pianosa), or because the locality was already a natural reserve (Montecristo).

Lack of freshwater runoff and the prevailing west-to-east winds guarantee low turbidity and maintain temporal fluctuations in salinity within the bounds set by major oceanographic events. AT includes a wide range of habitats over a broad spatial scale (km). Rocky shores constitute the prevailing habitat characterising more than 90% of mid-shore coastal areas. Sandy beaches occur at Giglio and Elba, whereas mud flats are present only in the latter island. Subtidal habitats support extensive beds of the seagrass *Posidonia oceanica* that alternate with rocky substrata and sandy areas. On some islands (e.g. Gorgona), an interesting habitat of freely moving calcareous algae (maerl) occurs below the depth of 40m. Organisms also experience a diversity of conditions at smaller spatial scales, within habitats, due to changes in pysical and biological features of the environment. For example, in mid-shore and subtidal areas canopy algae alternate with turf-forming and encrusting coralline algae to provide different microhabitats for numerous species of invertebrates and for other algae as well. In shallow subtidal areas, continuous rocky reefs alternate with fragmented shores of boulders and outcrops of rock that support distinct assemblages of fishes.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds	X		

Description of fauna and flora:

The Tuscany Archipelago is a collection of pristine sites offering a unique opportunity to watch species and habitats that are becoming rare on other coasts. Flourishing beds of brown algae (*Cystoseira* spp.) are disappearing from shores close to urban developments, but they are still present at tidal levels and in subtidal areas at these sites. Remnant populations of species in danger of extinction, like the giant limpet *Patella ferruginea*, still thrive at Gorgona and Capraia. Populations of predatory whelks (*Stramonita haemastoma*) and crabs (*Eriphia verrucosa*) occur at high densities and large sizes in the Archipelago, whereas they are intensively exploited on the mainland. Detailed inventories of species have been published for several groups of organisms in the Tuscany Archipelago, including Diatoms, Macroalgae, Protozoa, Cnidaria, Ctenophora, Nematoda, Platelminta, Gastrotricha, Polychaeta, Tardigrada, Crustacea (Eucarida, Ostracoda, Copepoda, Harpacticoida, Mysidacea), Pycnogonida, Mollusca, Bryozoa, Echinodermata and Ascidiacea. These data

have been published in Scientific Journals and as part of a multidisciplinary research programme on the physics, chemistry and biology of the Tuscany Archipelago (Nuccio 1993). In addition, quantitative data are available on patterns of distribution and abundance of most common species at spatial scales ranging from a few centimetres up to 100's of km over a period of 4 yrs. These measures of spatial and temporal variation are important to design appropriate programmes that can reliably detect changes in these assemblages.

Shallow rocky reef with cover of encrusting algae and sponges (island of Capraia). Photo by S Acunto.

Human impact:

AT provides the best example of clean waters and pristineness in the region. With the exception of Elba, which is relatively large and urbanised, the islands have few inhabitants (2-30) and negligible residential development.

On-going research:

The Tuscany Archipelago is an area of special interest for research on biodiversity of marine costal habitats in the Mediterranean. Ongoing research projects undertaken at the Dipartimento di Scienze dell'Uomo e dell'Ambiente (DSUA - University of Pisa) include: (1) quantitative analyses on patterns of distribution, abundance and diversity of species at various scales in space and time; (2) experimental tests of models to explain current patterns of biodiversity, to understand the consequences of loss of biodiversity and to predict future scenarios under forecasted climate change; (3) effectiveness of MPAs; (4) mapping of segrasses.

Facilities:

Most islands are accessible throughout the year by ferry, but there is no public service for Montecristo. Research activities are possible on all islands, but special permission is required for Montecristo, Pianosa and Gorgona. Permission is provided by the Ministry of Agricultural and Forestry and by the Ministry of the Environment; agreements exist with research institutions such as Universities to guarantee continuous research activities at these sites. Laboratory facilities at the University of Pisa can be reached within 6hrs from most islands, but more time may be needed from Montecristo. Boats for field work can be hired in different places along the coast to minimise the time spent moving from one island to another. Boats providing accommodation for 6-8 researches, including facilities for SCUBA diving, can be cheaper than renting a flat. Diving facilities are available at Capraia and Giannutri.

Database available:

EXCEL files are available on CD-ROM for quantitative data. These include measures of abundance of the most common species, estimates of diversity (number of taxa/sampling unit), indication of the spatial and temporal scales over which the data have been collected, a description of predictor physical or biological variables (if applicable), and the timing of sampling. Inventories of species are available either as EXCEL or WORD files.

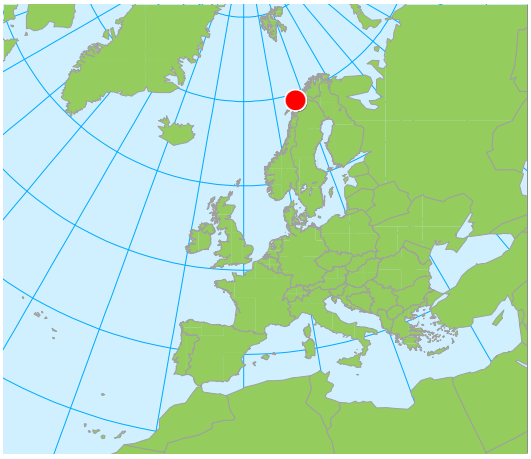
Website:

The Park of the Tuscany Archipelago has an official website.

Commitment:

DSUA has an agreed plan and a two-year funded project for research on biodiversity in the Tuscany Archipelago.

BALSFJORD / MALANGEN, TROMSØ	Norway	Conservation status ☆ ★	



Co-ordinates: 69º20'N, 19º0'E / 69° 30'N, 18° 20'E

Balsfjorden; looking east towards Storvasstind and Piggtind mountains. Photo N Skjegstad

Description of site:

Balsfjord and Malangen are two interlinked fjords situated in the vicinity of Tromsø, northern Norway. Balsfjorden fjord, which is approximately 40 km long, has fairly shallow sills (10 and 35 m) and a maximum depth of 195 m in the central part of the fjord. Malangen is about 50 km long, has a wide open connection to the sea and a sill depth of about 200 m outside the mouth of the fjord. It is divided in two fjord basins of 460 and 250 m depth, respectively. The inner reaches of Malangen are generally ice-covered in winter but its main parts generally remain open. Also Balsfjorden generally remains ice-free due to strong surface currents. The fjords in conjunction represent typical coastal conditions in the area.

As is typical for the area, both fjords are well-oxygenated all year, despite the presence of sills. The bottom-oxygen levels usually remain at least 70 to 80% saturation. In Balsfjorden, the water masses are stratified from May to September but are almost homogeneous due to extensive vertical mixing from late autumn until the end of April. The basin water stays cold year round (1-4°C). In Malangen, the water column comprises three main layers; an upper layer (0-30 m) dominated by down-fjord currents, an intermediate layer to sill depth with up-fjord currents and a bottom layer with weak currents. Malangen bottom water has a mean bottom temperature of 6.5°C. Balsfjorden, although shallower than Malangen, has an enclosed bottom basin, representing a sub-arctic environment. Malangen has a more open pattern of water exchange and is more typically Atlantic-influenced.

The shores around Malangen and Balsfjorden comprise rocky and boulder beaches, with local sheltered coves with coarse sand. In some areas, the terrain slopes very steeply from the mountains to the bottom of the fjord.

Description of fauna and flora:

As a result of the hydrography, Balsfjorden on the bottom contains a typical arctic faunal composition, more so in fact than Atlantic-influenced fjords on the west coast of Svalbard, much further north. Malangen and the shallower parts of Balsfjord are more typical of north-Norwegian Atlantic-influenced fjords. Genetic studies have shown that the area contains several unique stocks of fish.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Comprehensive inventories of many components of the biota have been published internationally during the last 30 years, but older records and descriptions also exist from the early 20th century. Inventories exist of the following taxa: Macrobenthos (Cnidaria, Polychaeta, Crustacea, Mollusca, Bryozoa, Echinodermata), Meiobenthos, Zooplankton (Copepoda,

Cnidaria, Ctenophora, Euphausiacea, Chaetognatha), phytobenthos (green, brown and red macroalgae) and phytoplankton. Ecological and population data exist for fish and seabirds. In addition, there are numerous publications related to the biodiversity or physical environment in the area. Balsfjord has been the subject of a multi-disciplinary research programme studying water masses, plankton dynamics, particle sedimentation, and commercial fish and shell-fish species since the mid-1970s. There exists annual photographic documentation of fixed hard-bottom locations, carried out over an approximately 25 year period.

Hard bottom faunal community at Haugbergnes, Balsfjord, 30m depth. Photo B.Gulliksen.

Human impact:
The area is not impacted by any industrial pollution, mining, dumping, dredging or major agricultural runoff. The main human activities in the marine area are hobby-fishing. No commercial fishing is carried out. The outer parts of the study area have limited boat traffic (mainly local ferries and service vessels), but the inner parts are rarely frequented.

On-going research:

The Balsfjorden/Malangen complex has been extensively studied for several decades. Ongoing research and monitoring is carried out by the University of Tromsø (hard bottom benthos, phyto- and zooplankton). The Norwegian Institute for Fisheries Research carry out research on the invasive red king crab and fish populations. Akvaplan-niva, Polar Environmental Centre carry out studies on soft bottom macrofauna. The Norwegian Institute for Nature Research (NINA) studies migratory wading birds.

Facilities:

The sites are easily accessible by road or boat from Tromsø (approximately 1 hour from the University). Tromsø itself is accessible by road, boat and air, but there are no direct international flights. The university offers affordable lodgings for students and visiting staff. Guest house and hotel accommodation is also available in Tromsø. The University of Tromsø has three research vessels that are available for charter (depending on availability). All vessels are equipped for diving and one is ice-going. The University has fully equipped laboratories and image-processing facilities. Akvaplan-niva, Polar Environmental Centre, also has a fully equipped benthic laboratory.

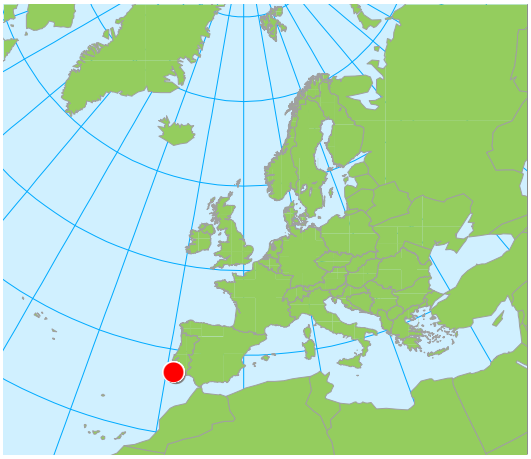
Database available:

At present, biodiversity records are held in databases from several institutes including the University of Tromsø, NIVA and Akvaplan-niva. A priority task for the near future will be to integrate the records into a single database for this site.

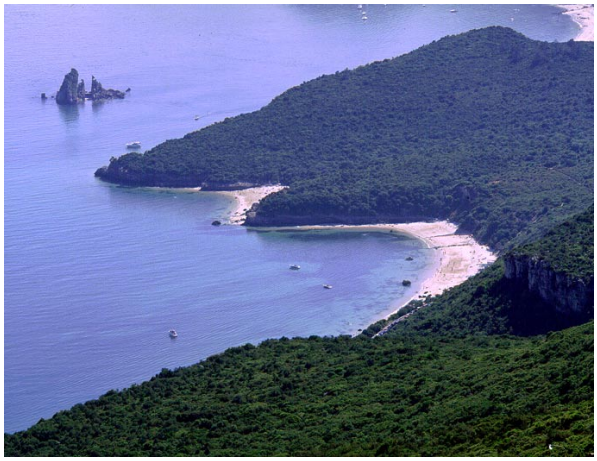
Commitment:

The University of Tromsø has a committed and on-going research programme for hard bottom benthos, phyto- and zooplankton.

ARRÁBIDA MARINE PARK	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 38º29'N, 8º57'W



Panorama from Arrábida Coast. Photo E J Gonçalves

Description of site:

The Arrábida Marine Park is a 25 Km stretch of coastline (55 km^2) located on the Portuguese western shore. Most of the area faces south, being protected from the prevailing north and northwest winds by the adjacent mountain chain of Arrábida. The shore is very steep and the intertidal zone includes mainly rocky cliffs, small beaches and several areas covered by boulders. The subtidal begins with a narrow stretch of rocky substratum that extends offshore for some tens of meters, and to depths of less than 15 m (except at the Espichel Cape area where it reaches more than 40 m). Many large boulders resulting from the erosion of the nearby calcareous cliffs increase habitat complexity. In some places, sandy beaches interrupt this stretch. Beyond the rocky substratum, sandy and muddy bottoms are found.

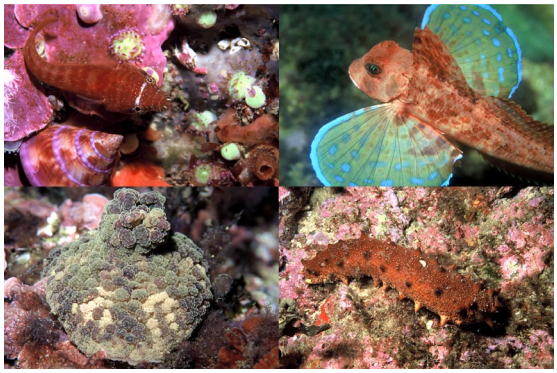
All habitats typical of the region are present, except for intertidal mud flats. There are a wide range of different conditions (exposed and sheltered, sand banks, sandy and muddy bottoms, highly heterogeneous rocky habitats, bedrock habitats, vertical intertidal, seagrass beds). Only rock pools are limited to a few locations due to the vertical orientation of the cliffs.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

The strategic position of the Arrábida Marine Park makes it an ideal laboratory for studies on marine biodiversity and climate change. The shore north and south from the site is mainly composed of sandy bottoms, which gives this site the characteristics of a "continental island". The main orientation of the shore (facing south) allows many organisms that only occur in sheltered places to thrive in the exposed western shore of Portugal. This is also an important biogeographic transition zone of the Lusitanian biogeographic province, which gives it a high importance for monitoring purposes. This area can be regarded as a marine biodiversity hotspot both at national and at European level. It is at the same time an important leisure place during the summer with a great potential for environmental education due to an increasing public awareness of the great natural value of the region. This nature park (land and sea) is currently being proposed as an UNESCO World Heritage Site and was a "Gift to the Earth" by the Portuguese government through WWF in the International Year of the Oceans (1998).

Description of fauna and flora:



Lepadogaster candollei, *Trigloporus lastoviza*, *Alicia mirabilis*, *Holothuria tubulosa* Photos E.J. Gonçalves.

During late spring and summer, dense algae beds are present in many places, ranging from dense tufts of *Asparagopsis armata*, to some brown algae like *Cystoseira usneoides* and, in some sites, *Saccorhiza polyschides*. Encrustating red algae constitutes biogenic reef formations in some areas. The filter-feeding invertebrate fauna is particularly developed and abundant in the Marine Park. The marine life of the Marine Park is relatively well documented but only for some groups (macroalgae, fish and some macroinvertebrates). Over 1000 species of algae, macroinvertebrates, fish, sea turtles and cetaceans have been described. Many species present their distribution limits at or near the limits of the Marine Park. There is also a very high occurrence of rare species and the occurrence of several Mediterranean species (some formerly described as Mediterranean endemics), with some first records for Portugal. The high diversity of habitats and of rocky microhabitats makes this site ideal for biodiversity studies. In fact, each time a new group is studied in detail, many new occurrences for Portugal are described (some are new species to science).

Human impact:

There is no known industrial or agricultural pollution, mining, dumping or dredging. The total human population of the Marine Park is restricted to Sesimbra village with a population of 5898 inhabitants with a negative population growth of 20% from 1991 to 2001. Commercial fishing is restricted to the nearby waters (outside the 6 and 12 miles limit). Inside the marine Park there is still some traditional fishing using small gill nets and lobster pots, and mainly hand lining. The future management plan for the marine park proposes a restriction to fishing, forbidding any fishing activities in more than 50% of the area and in the remaining area restricts fishing to small scale hand lining and lobster pots. Sport-fishing will be forbidden.

On-going research:

The Arrábida Marine Park is the main research focus of the research line on Behaviour and Conservation of Littoral Fishes from the ISPA's Eco-Ethology Research Unit. The Nature Conservancy Institute (ICN) has statutory responsibility for managing, monitoring and research on the Marine Park. There is an Oceanographic Museum belonging to ICN which presents a small research facility. In addition, several students are also undertaking marine biological work in the Marine Park.

Facilities:

The area is 45 min. from Lisbon airport and from our Institute in Lisbon. There is a medium size harbour in Sesimbra village and a large size harbour at Setúbal (10km from the eastern limit of the Marine Park). There is no seasonal limitation on access to the site. Only on rare occasions during the winter, storms with southern winds prevent diving. There is an Oceanographic Museum from the Nature Conservancy Institute in the area with a small research facility, where our group has a diving operation unit with inflatable boats with outboard engines. There are a few rooms to rent near the Museum. Hotels are available in Sesimbra and Setúbal and also in the nearby villages. There are several SCUBA diving operators in the area

Database available:

All information is being processed by our group in cooperation with the Arrábida Marine Park staff (in particular with the Oceanographic Museum). Some data are already available in CD-ROM format, and all taxa databases are currently being design by the research team.

Website:

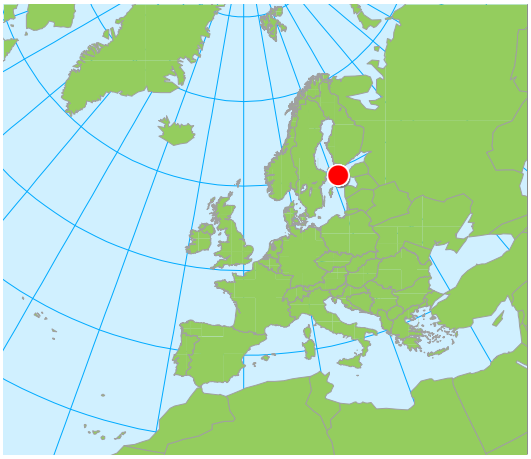
The Arrábida Marine Park website is under construction. The ICN website is: http://www.icn.pt

Commitment:

The ISPA's Eco-Ethology Research Unit (research lines: Ecology and Conservation of Littoral Fishes and Ecology, Ethology and Evolution of Aquatic Vertebrates) has an agreed science plan and specifically allocated budget for biodiversity work on the Arrábida Marine Park with several on-going projects. The Nature Conservancy Institute has statutory responsibility for monitoring NATURA 2000 habitats.

LTBR Focal Sites

N. BALTIC ARCHIPELAGO: ALAND ISLANDS & TVARMINNE	Finland	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 59°45'-60°30'N, 19°20'-23°30'E

Aerial photo of Archipelago Sea. Photo C Boström

Description of site:

The Archipelago Sea (N Baltic Sea, SW Finland) in total covers an area of over 15.000 km2, with over 30.000 islands, forming a mosaic of a distinct zonation, ranging from the innermost sheltered coastal zone (with some freshwater runoff from the mainland, characterized by fjordlike bays), the inner archipelago (more land than water surface, vegetated shoreline, predominantly soft muddy bottoms and low salinity), the middle archipelago (land and water surfaces equal, shoreline vegetated, increasing ratio of rocky substrates), the outer archipelago (small islands with predominantly rocky shores, *Fucus vesiculosus* and *Cladopohora* - belts, shallow sandy bottoms with *Zostera marina* (eelgrass) beds, and deeper muddy bottoms), and the open exposed maritime zone (scattered islets in open coastal sea).

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

Many organisms live at or close to their natural limits of distribution, making overall species diversity low, but unique in the mixture of evolutionary and ecological origin and functioning.

Human impact:

There are no major local sources of pollution (but a steel factory 3 km from the Tvarminne area), mining, dumping, dredging or fish farming. There is some local part-time fishery using gillnets.

Facilities:

Tvarminne Zoological Station Huso Biological Station are fully equipped for biodiversity work.

Available database and website:

Records of all marine species are kept at Tvarminne zoological station, the Finnish Museum of Natural History (University of Helsinki), and Huso biological station, in spreadsheet or text formats. Background information can be found at: http://www.abo.fi/fak/mnf/biol/huso/ and http://www.helsinki.fi/ml/tvea

Commitment and ongoing research:

The region contains two national parks and two biological stations, both the latter having a commitment to perform long-term research and monitoring of local marine biodiversity, process oriented studies and education.

BASSIN D'ARCACHON, BAY OF BISCAY	France	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 44°40'N, 1°10'W

Arcachon Bay, SW opening in the ocean. Photo J Thomas

Description of site:

The Bay of Arcachon is a 156-km² triangular-shaped mesotidal lagoon or semi-enclosed bay, 2/3 of which is intertidal with extended *Zostera* beds and oyster parks. Most channels are 5-10 m deep (max. 20 m). Moderate freshwater inputs come from a river in the SE. All habitats within the Bay of Biscay are present, although hard substrata are artificial.

Description of fauna and flora:

Of special interest are the largest European *Zostera* (*marina* and *noltii*) beds and the long exposed sandy beaches at the entrance of the bay.

Human impact:

There is no sewage or industrial pollution. Nitrogen flux from agricultural practice is now stabilized at a moderate level. The bay is a major centre of natural hatching and rearing of the Pacific oyster, as well as a recreational area.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Facilities:

All facilities for marine biodiversity research are available at the Arcachon Marine Station (boat, fully equipped laboratories, library, accommodation).

Available database and website:

Species inventories of all components of the ecosystem have been regularly updated since 1865 and are available as electronic files and will be made accessible through the website of the Marine Station.

Commitment and ongoing research:

Biodiversity-related research in the area is supported by several local projects and national (CNRS, Ministry of Environment) programmes: spatial distribution patterns of macrozoobenthos (SIBA), invasive species (INVABIO), high time-resolution of phyto- and zooplankton spring development (PRIMEVERE), effects of macroparasites on the population dynamics of molluscs (PNEC-ART2), long-term monitoring of water parameters (SOMLIT).

BAY OF BANYULS-SUR-MER	France	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 42°28'N, 3°08'E

Bay of Banyuls-sur-Mer. Photo by Gilles Boeuf

Description of site:
The Bay of Banyuls-sur-Mer is located on the rocky part of the Catalan coast. It is a shallow (<50m) bay characterized by a transition from sand to mud as depth increases. The Baillaury River shows periodic floods.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are exceptionally diverse, which led to the creation of a marine protected area. They are well documented and researched since 1882.

Human impact:

This area is submitted to very low pollution levels since it is located far away from large cities and major industrial sites. Waters are relatively turbid due to the inputs of the Rhône river enhancing a shift of fauna and flora to lower depth.

Facilities:

All facilities for marine biodiversity research are available, from research vessels, SCUBA diving facilities, fully equipped laboratories, and an important library.

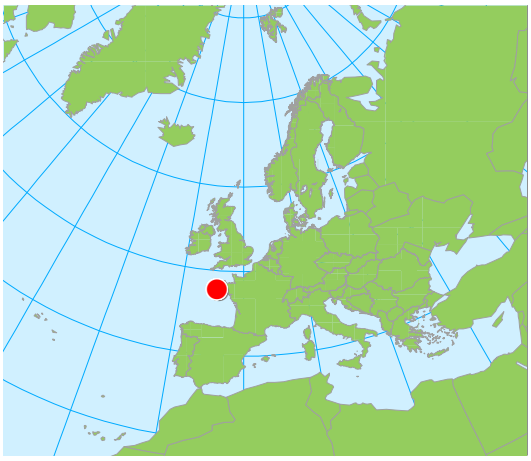
Available database and website:

The species inventory (Faune marine des Pyrénées Orientales) is very comprehensive, and is available as hard copy. Several other data bases are available on request.

Commitment and ongoing research:

The Observatoire Océanologique de Banyuls is involved in various aspects of marine biodiversity research including: (1) the assessment of causes and consequences of recent shifts in benthic macrofauna composition, and (2) the interaction between diversity and functions in microbes. These researches are coordinated with the long term monitoring of environmental parameters.

BAY OF BREST, WESTERN BRITTANY	France	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 48°20'N, 4°30'W

Aerial view of the Northern basin.

Description of site:

The Bay of Brest is a semi enclosed area, shallow (average depth 5m) with all types of grounds ranging from muds to pebbles, together with a high salinity range (i.e. 0 to 36 PSU). Tidal range is high (7m), and the bay has some of the most extensive shores in Brittany.

Description of fauna and flora:

Due to the great variety of soft and rocky bottoms in the bay, the species richness is very high. Also, the bay has the largest and probably richest maerl beds in France. The fauna and flora have been studied since the 19th century and thus are very well documented.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Human impact:

The area is under the influence urban and industrial effluents in its northern basin (20% of the total area) due to the presence of Brest conurbation (220,000 inhabitants). The southern basin is seasonally fished for scallops and for *Venus*. Heavy nutrient inputs (from agricultural origin) come from the large watershed of the two main rivers. Strong tidal currents however ensure renewal of the water sufficient to avoid eutrophication events or heavy pollution of the northern basin.

Facilities:

All facilities for marine biodiversity research are available, from research vessels, diving teams, fully equipped laboratories (University and IFREMER) and the Centre de Documentation de la Mer (France's biggest marine library).

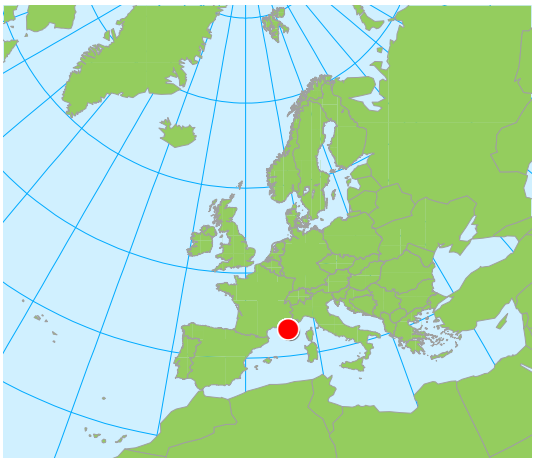
Available database and website:

The species inventory of the IUEM marine station is available as hardcopy, while a web site is under development (http://www.univ-brest.fr/IUEM/UMR6539). The IFREMER website provides a database on contaminant concentrations in several biota.

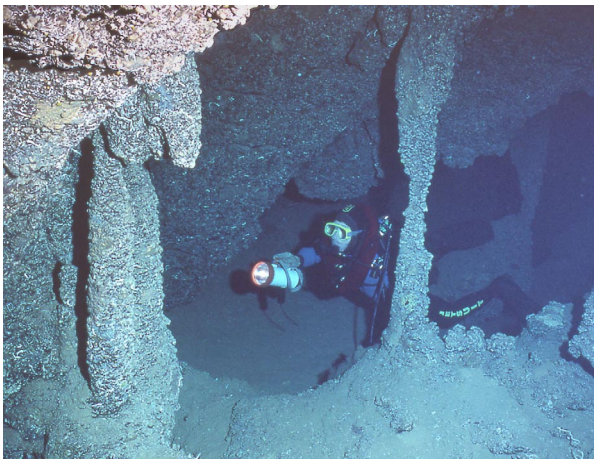
Commitment and ongoing research:

The IUEM marine station has two research laboratories working on all aspects of marine biodiversity in the Bay of Brest (phytoplankton, zooplankton, marcroalgae, macrofauna, fishes). IFREMER laboratories lead ongoing survey programs in the area. The eastern part of the southern basin has been proposed as a Natura 2000 area. The REBENT project (national long term benthic assemblages survey) includes 6 stations in the bay of Brest.

CALANQUES COAST, MARSEILLE	France	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 43°12'N, 5°25'E



Trémies Cave, dark zone, with highly diverse fauna of encrusting invertebrates. Photo J.G. Harmelin.

Description of site:

The uninhabited and uneven limestone shoreline 15 km long, indented by deep "calanques" (fjords), includes numerous fully submerged submarine caves.

Description of fauna and flora:

The site contains a representative array of the Mediterranean habitat types, including rocky substrata, caves and *Posidonia* meadows. It is rich in flagship species, such as the red coral *Corallium rubrum*, gorgonians and numerous endemic Mediterranean species.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Human impact:

A limited part (west side) is under the influence of the sewage outlet of Marseille, which is treated by physico-chemical methods (biological treatment is planned). The eastern area is relatively free from pollution. The site is popular among divers and pleasure boats. It has a limited legal protection, with a planned National Park. Natura 2000 habitat.

Facilities:

Facilities are available at the Centre d'Océanologie de Marseille (COM), with easy access from Marseille and Cassis harbors.

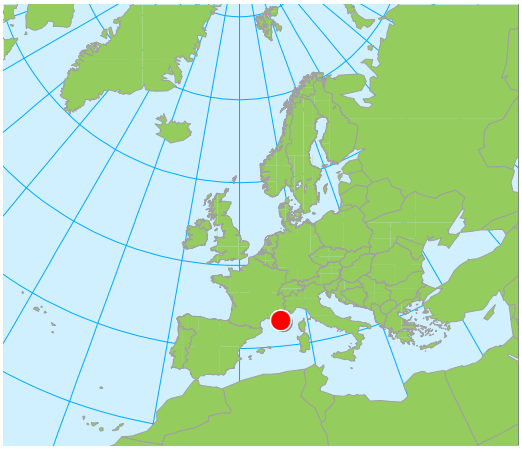
Available database and website:

The species inventory for several invertebrate groups (sponges, serpulid polychaetes, bryozoans, crustaceans) and algae is available in the COM.

Commitment and ongoing research:

The site has been intensively studied by the COM for more than 40 years, both in the zone under the influence of the Marseille sewage and in the unaffected zone. The studies include monitoring and inventories of the sublittoral rocky shore, coralligenous and cave fauna, monitoring of the evolution of the soft bottom fauna and bioaccumulation research in invertebrates.

CARRY-LE-ROUET	France	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 43°19.1'N, 5°9.8'E

Carry reserve: sparids (*Diplodus sargus*, *Sarpa salpa*) in a *Posidonia* meadow mixed with rocks. Photo J G Harmelin

Description of site:

Carry-le-Rouet fisheries reserve (85 ha) is part of the "Côte Bleue" Marine Park, Gulf of Marseilles, France, a managed zone along a rocky, moderately urbanised, coast. The protected area, adjacent to the shore, includes rocky and sandy bottoms gently slopping from 0 to 30-40 m depth.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral		X	X
Seagrass beds	X		

Description of fauna and flora:

The area houses large seagrass beds (*Posidonia oceanica*) mixed with low, heterogeneous, rocks and, to a lesser extent, shallow and deeper sandy communities. There is a rich fish fauna including vulnerable species such as the dusky grouper (*Epinephelus marginatus*) and the brown meagre (*Sciaena umbra*), and a typical rocky sessile fauna, including gorgonians and precious red coral (*Corallium rubrum*).

Human impact:

The no-take area has been strictly protected since 1987 and is physically protected by anti-trawling artificial reefs deployed at its periphery. Diving is forbidden. The area can be subjected to low levels of pollution from nearby Marseilles city (population 850,000) and sporadic runoff of the Rhône river. Natura 2000 habitat.

Facilities:

Diving for marine biodiversity research is possible with the Park staff. Snorkelling is possible freely from the shore. Larger research vessels, fully equipped laboratory and library are available at the Centre d'Océanologie de Marseille.

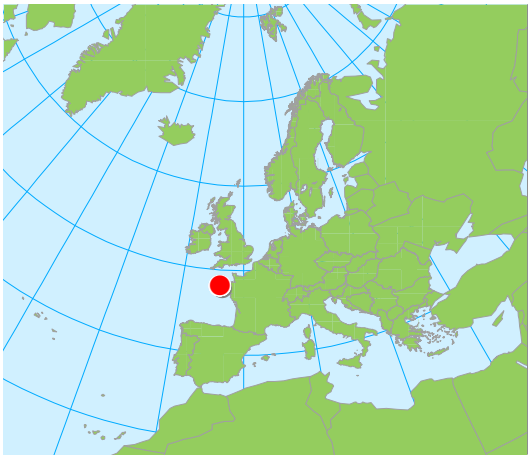
Available database and website:

A fish inventory is available at the Park. Website: http://perso.wanadoo.fr/parcmarin/pages/protect.htm

Commitment and ongoing research:

The Centre d'Océanologie de Marseille and the GIS Posidonie undertake biodiversity-related research in the area.

GLENAN ARCHIPELAGO	France	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 47°43'N, 4°00' W

Glenan Islands from the east. Photo D Rault

Description of site:

The Glenan Archipelago comprises a series of rocky granite islands covering approximatively 50 km^2 surrounded by sandy zones, and is situated 17km south of Concarneau Bay (South Britanny). The island circle delimits a small shallow inner sea. This "lagoon" type of landscape is unique on the NE Atlantic coast, with a complex patchwork of sedimentary and rocky bottoms.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

The inventory of the submarine rocky flora and fauna of the Glenan Islands demonstrates southern influences with, in particular, a dominance of *Saccorhiza bulbosa* in the upper levels of laminarians and an abundance of fields of *Cystoseira* sp. in N.E. and inside the archipelago. The archipelago presents a very large variety of facies within the biocenose of laminarians.

Human impact:

The archipelago is practically devoid of permanent human inhabitants (the number never exceeds 5-10). There is some tourist activity (mainly sailing) in summer, but practically no pollution. Commercial fishing is diverse in the area, but only small boats (<12 m) can operate and trawling is prohibited. Dredging occurs locally (maërl beds).

Facilities:

Only one main island is accessible by public transport (summer). All islands are accessible from the mainland (Concarneau) by local boats. The distance from the Islands to the fully equipped marine biology station in Concarneau is approximately 17km.

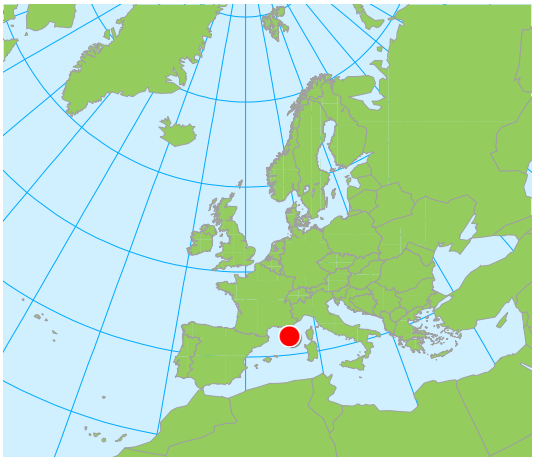
Available database and website:

Databases of locally found marine species are still in preparation. Website: http://www.mnhn.fr/

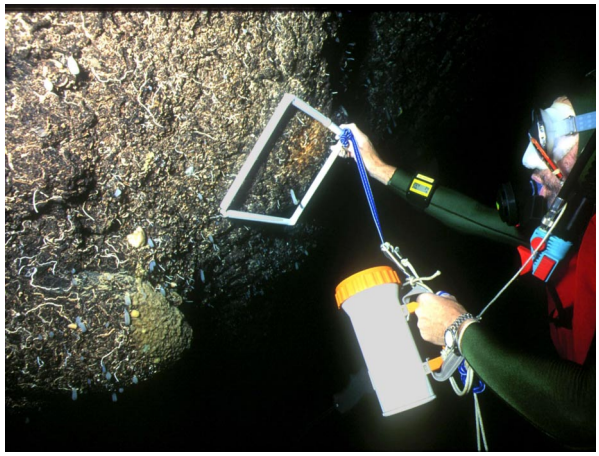
Commitment and ongoing research:

The Glenan site has been studied regularly for more than 120 years and is major focus for the Concarneau Marine Station's programmes and regional networks of subtidal survey. The Marine Biology Station of the Muséum National d'Histoire Naturelle (Concarneau) has an agreed science plan and specifically allocated budget for biodiversity work on the Archipelago.

LA CIOTAT 3 PP CAVE	France	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 43°09'N, 5°36'E



3 PP cave, counting deep-sea hexactinellid sponge *Oopsacas minuta*. Photo J Vacelet

Description of site:

The 3PP cave, near La Ciotat, is a 120 m long tunnel in a conglomerate layer, with a deep mud layer on the floor. Due to its descending profile, with the entrance 15 m deep and the end 24 m deep, the cave traps by density a cold water mass and has a thermal regime of cold homothermy similar to that of the deep Mediterranean.

Description of fauna and flora:

There are typical faunal assemblages from shadowed and dark caves. Most remarkable are bathyal organisms, such as hexactinellid and carnivorous sponges, that have colonized the cave from a nearby deep canyon.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X	X	X
Seagrass beds			

Human impact:

There is no notable pollution. The cave is rarely visited by local divers.

Facilities:

Facilities are available from the Centre d'Océanologie de Marseille (COM) 25 km distant. There is easy boat access from La Ciotat harbour (1 km).

Available database and website:

A species inventory for several invertebrate groups (sponges, serpulid polychaetes, bryozoans, crustaceans) is available in the COM.

Commitment and ongoing research:

The cave has been intensively studied by the COM for 11 years: continuous temperature recordings, species inventories, biodiversity researches, studies on the physiology, taxonomy and phylogeny of deep-sea species found in this "bathyal island in a littoral environment".

RIOU ARCHIPELAGO, MARSEILLE	France	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 43°11'N, 5°23'E

Gorgonians and red coral on a slightly overhanging cliff. Photo J G Harmelin

Description of site:

The Riou Archipelago, near Marseille, is a group of uninhabited limestone islands with varied topography. The archipelago contains the whole set of sandy and rocky habitats typical of the NW Mediterranean, including vertical cliffs down to more than 70 m and submarine caves.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The Archipelago contains a rich and diverse coralligenous fauna and flora, and is rich in Mediterranean endemic species and flagship species such as the red coral and several gorgonians.

Human impact:

The north coasts of the archipelago may be exposed to the effect of treated sewage from Marseille. The south coasts are under the influence of the general east-west current of the North-Western Mediterranean, and are free from obvious pollution. The site is very popular among divers and marine tourists. It is a Natura 2000 habitat.

Facilities:

Facilities are available at the Centre d'Océanologie de Marseille (COM).

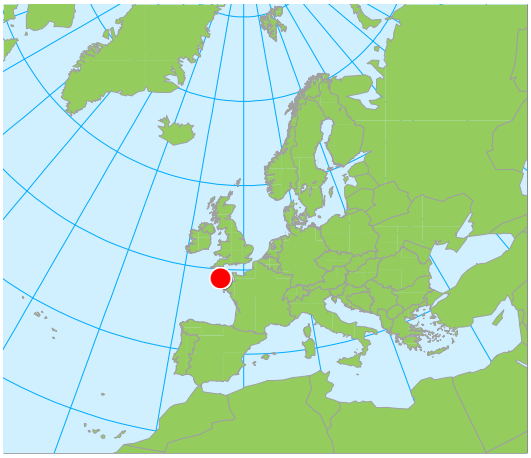
Available database and website:

A species inventory for several algal groups and invertebrates (sponges, serpulid polychaetes, bryozoans, crustaceans) is available in the COM. Web site (mostly terrestrial): http://www.conservatoire-du-littoral.fr/front/process/Content.asp?rub=8&rubec=152

Commitment and ongoing research:

The site has been routinely studied by the COM for 50 years. Ongoing studies include monitoring of the coralligenous and cave assemblages, continuous temperature recordings, permanent quadrats, inventories of the cave and cliff fauna, and changes in flora and fauna after a recent temperature-related mortality event.

ROSCOFF (BAY OF MORLAIX), BRITTANY	France	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 48°43'N, 3°58'W

The Laboratory of Roscoff and the Bay of Morlaix.

Description of site:

Roscoff (Bay of Morlaix), on the North coast of Brittany, France, is a large shallow bay at the entrance of the Channel. It offers a wide variety of biotopes inhabited by a rich fauna and flora (seaweeds). The occurrence of small estuaries exhibits representative salinity gradient effects on sediment and rock. 4 sites are mainly involved with biodiversity research: the Pierre Noire & Rivière de Morlaix benthic long-term survey stations, and the Estacade & Somlit stations for hydrographic and planktonic surveys.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

The fauna (more than 3000 species) and flora (about 700 species) are exceptionally well documented, and have been researched since the Biological Station of Roscoff was opened in 1872.

Human impact:

The area is subjected to low levels of pollution from agricultural activity. Turbity of coastal waters remains relatively low in the greatest part of the area despite the occurrence of small estuaries. A great part of the Bay of Morlaix is classified as a future Natura 2000 area.

Facilities:

All facilities for marine biodiversity research are available, from seagoing research vessel, fully equipped laboratories, 3 practical work rooms, 4 seminar rooms, the Library and the information department, a 52 room hotel and a conference room for 120 people.

Available database and website:

The species inventory ('The Marine Fauna and Flora of Roscoff') is very comprehensive, and is available as hard copy. The data are currently being transferred into a computer data bank; the molluscan inventory is now available on-line (http://www.sb-roscoff.fr).

Commitment and ongoing research:

The Biological Station of Roscoff (particularly the CNRS UMR 7127 research group), is involved in analytical and/or functional biodiversity studies: Phytoplankton team (head: Dr Daniel VAULOT), Zooplankton team (head: Dr Serge POULET, Benthic Ecology team (head: Prof Dominique DAVOULT), Population Genetics and Evolution team (head: Dr Myriam VALERO), Marine Chemistry team (head: Dr Pascal MORIN).

RADE DE VILLEFRANCHE	France	Conservation status ☆	

Co-ordinates: 43°41'N, 7°19'E

Rade de Villefranche-sur-mer (view from the North)

Description of site:
The Bay of Villefranche (French Riviera), is a medium sized but very deep bay (> 300 m depth at the Bay's mouth, > 2000 m 10 nautical miles offshore). Part of the Bay is occupied by a Mediterranean *Posidonia oceanica* meadow and there are deep bioconstructions on hard substratum.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:
Since the creation in 1884 of the "Station russe de zoologie", presently "Observatoire océanologique de Villefranche", numerous studies have concerned fauna and flora, both pelagic and benthic. Many phyla are thus well-documented. A particular feature of the area is that the pelagic fauna exhibits an oceanic character and includes numerous macroplanktonic invertebrate species, mainly gelatinous organisms.

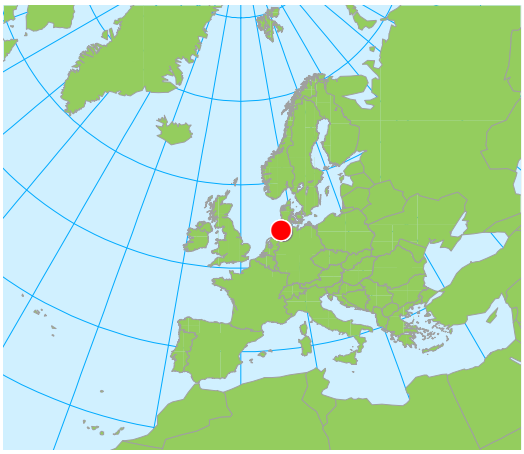
Human impact:
The area is subjected to moderate levels of pollution from the large conurbation of Nice city. Untreated waste waters are introduced east of the Bay (off cape Ferrat) at 80m depth, sporadically increasing seawater nutrients concentration. The water within the Bay is usually very clear and salty due to the low discharge of nearby small rivers (Roya, Var and Paillon). Fishing activity in the area is quite low but boat traffic is high. Invading algae *Caulerpa taxifolia* and *Caulerpa racemosa* are locally present in the Bay.

Facilities:
All facilities for marine biodiversity research are available : two small research vessels, diving equipment, equipped laboratories and several specialized libraries. The laboratory includes accomodation rooms for visiting scientist and student groups. Planktonic species are sampled daily and a large specimen collection is available for retrospective studies.

Available database and website:
Several physical and chemical variables are routinely monitored at one station; this survey is supported by a national program (SOMLIT/RNSM) and data are available on-line. The corresponding species inventory is not yet fully available on-line but it is in progress. The Observatoire has its own website: http://www.obs-vlfr.fr.

Commitment and ongoing research:
The Observatoire Océanologique de Villefranche is under the control of both INSU-CNRS and Pierre et Marie Curie University (Paris). Most of the biodiversity-related research in the area is undertaken by the LOV unit (Laboratoire Oceanographique de Villefranche) which is involved in both national and European programmes.

HELGOLAND ISLAND, NORTH SEA	Germany	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 54°11'N, 07°53'E

Cliff coast and tidal rock flats to the north of the island of Helgoland

Description of site:

The Helgoland area in the inner German Bight comprises all typical sublittoral and the majority of littoral habitats of the southeastern North Sea including unique rocky substrates at Helgoland proper which are completely lacking elsewhere in the area and therefore constitute an oasis-type situation for a rich benthic flora and fauna. The rock flats and more than 35 square kilometres of rocky underwater landscape contain the most species-abundant habitat on the German coasts.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

Due to the richness in biota all major taxa occur and are under study. Typical is the fauna and flora of the rocky intertidal (tidal range 2.5m) and that of sublittoral kelp beds. The pelagic micro-, phyto- and zooplankton have been sampled week-daily for 40 years. An all taxon biodiversity inventory is available.

Human impact:

Helgoland is situated 35 nautical miles away from the coast, outside of the main shipping routes and predominantly outside of the direct influences of the Elbe/Weser-River-inflow into the German Bight. The island complex itself is a protected nature reserve.

Facilities:

A major Marine Station "Biologische Anstalt Helgoland" (as part of the Foundation Alfred Wegener Institute at Bremerhaven, AWI) has conducted marine biological research since its founding in 1892. It has all the facilities of a modern laboratory, and is in easy reach from the mainland via ferries (2.5h), catamarans (1h), and airlines (20min).

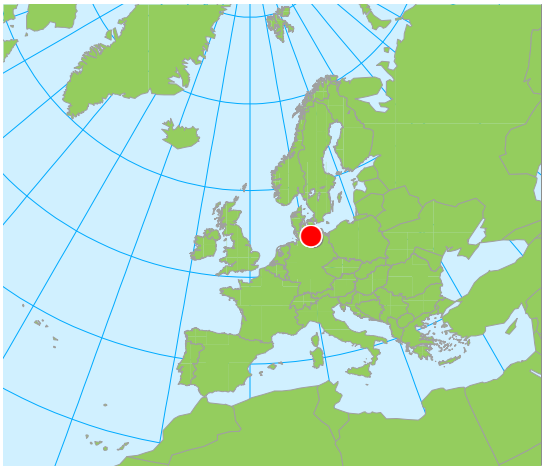
Database available:

The All Taxon Biodiversity Inventory is available in EXCEL on CD-ROM. and the data of the long term series are being made available by the PANGEA data system, accessible via the website (www.awi-bremerhaven.de).

Commitment:

Both biodiversity and long term research is a major topic of the institution's science programme. Accordingly, a considerable part of the institute's budget is dedicated directly to biodiversity research.

MECKLENBURG BIGHT, SOUTH-WESTERN BALTIC SEA	Germany	Conservation status ☆ ☆ ★ ★ ★	



Asterias rubens and *Mya arenaria* shells in 15 m water depths Photo M L Zettler

Co-ordinates: 53° 55'N to 54° 30'N, 10° 45'E to 12° 30' E

Description of site:

In the Mecklenburg Bight, high saline North Sea water mixes with Baltic Sea water, which usually has a lower salinity due to the strong freshwater input from the Baltic Sea catchment area. Almost all habitats, available in the Baltic Sea, are present. Both the changes in habitat on a relatively small scale and the natural salinity gradients are desirable features for biodiversity studies in the Baltic Sea.

Description of fauna and flora:

The Mecklenburg Bight host more than 350 macrobenthic taxa. It forms a natural border regarding the distribution of many marine euryhaline species and as a consequence species number is higher than in adjacent areas to the east or in the Baltic Proper. Biodiversity in the Mecklenburg Bight is representative for the whole southern Baltic Sea.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds		X	

Human impact:

Compared to other parts of the Baltic, industrial pollution, mining, dumping or dredging, is not very pronounced. Mecklenburg Bight has a few hot spots in regard to wastewater in the Lübeck and Wismar area. Potentially harmful agricultural runoff is found in some areas.

Facilities:

The distance from the Bight to the nearest fully equipped marine research laboratories, Baltic Sea Research Institute in Warnemünde (IOW), is about 50 km. The IOW has two research vessels and offers a limited number of rooms for guest researchers.

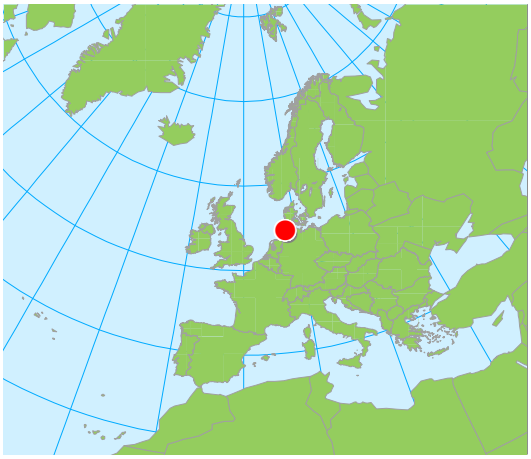
Available database and website:

More than 21,000 records on macrobenthic species are incorporated in the IOW database, and phyto- and zooplankton data are obtainable via the MUDAB database at the Bundesamt für Seeschiffahrt und Hydrographie (BSH). Respective websites are www.io-warnemuende.de and http://www.bsh.de

Commitment and ongoing research:

The Baltic Sea Research Institute has an adopted science plan devoted to biodiversity related research and has allocated a budget for biodiversity work. The institute also performs regular monitoring surveys in the Mecklenburg Bight.

ISLAND OF SYLT, NORTH SEA	Germany	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 55°02'N, 8°26'E

Tidal flats in the north of the island of Sylt. Marked is the Wattenmeerstation Sylt which is part of the Alfred Wegener Institute for Polar and Marine Research. Photo K Reise

Description of site:

The island of Sylt is located in the northern Wadden Sea (south-eastern North Sea). It comprises about 800 km^2 Wadden Sea area as well as the adjacent coastal zone of the North Sea. The Sylt area is representative for large parts of the southeastern North Sea coast. It includes all major soft bottom habitats of the Wadden Sea; sandy and muddy tidal flats as well as extensive seagrass and mussel beds.

Description of fauna and flora:

On the island of Sylt biodiversity has been studied for more than 100 years. The concept "biocoenosis" was established by Karl Möbius (1877) as a result of his work on oyster beds in the area. Since then all major taxa have been studied. At present, a fundamental species knowledge is available which is being extended by current research. Long-term data form a unique documentation of changes in the biodiversity of the area.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral		X	X
Seagrass beds	X		

Human impact:

The Sylt area is one of the least impacted sites of the Wadden Sea. There is no adjacent industry. Mining, dumping and dredging does not happen. Commercial fishery is restricted to low shrimp trawling activity, an intertidal oyster culture (*Crassostrea gigas*) and subtidal mussel cultures (*Mytilus edulis*).

Facilities:

The island of Sylt is accessible by ferry, train and has an airport. The access is not seasonally limited. The laboratory facilities include running seawater, temperature constant rooms, diverse special laboratories and SEM. One research vessel and two zodiaks are in use. Another four research vessels of different size are available. Facilities for SCUBA diving are comprehensive; equipment, dive-boats and compressor are available. Near the laboratory a guest house provides six appartments and up to 20 dormitory beds for students and guest researchers.

Database available:

Records of marine species belonging to all taxa are incorporated in EXCEL on CD-ROM and are available on the website of the institute (www.awi-bremerhaven.de).

Commitment:

Biodiversity and long term research are important topics of the institutions science program. Therefore, part of the institutes budget is dedicated to biodiversity research.

GULF OF HERAKLION, CRETE	Greece	Conservation status ☆	

Co-ordinates: 35°4'N, 25°1'E

Gulf of Heraklion. Photo M Kallergis

Description of site:

The Gulf of Heraklion is a large area where most types of Mediterranean habitats of the soft- and hard-substrata occur. Among the formations of particular interest for the Mediterranean Sea are the calcareous substrates (coralligenous assemblages).

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are very well documented, and have been researched and documented since the times of "Calypso" (the well-known French research vessel) campaigns in the Mediterranean waters, in the early sixties.

Human impact:

The area is subjected to moderate levels of pollution from the large conurbation of Heraklion (pop. 180,000) and port installations, and experiences organic pollution from sewage outfalls, industrial pollution, heavy navigation, and over-fishing activities (primarily by trawling) from October to May. A degree of disturbance is caused in the shallow soft sediments by winter storms.

Facilities:

Most of the facilities needed for marine biodiversity research are available: research vessels (Filia, Aegean Falcon (in construction)); fully equipped laboratories; IMBC Library.

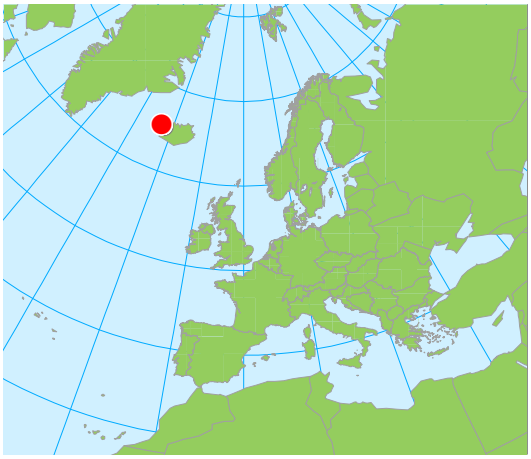
Available database and website:

Information on species occurrences in the Gulf is very comprehensive, and is available both as hard copy and in Excel files. All of the main research projects carried out in the Gulf of Heraklion appear on the Institute's web site: <www.imbc.gr>.

Commitment and ongoing research:

The Institute of Marine Biology of Crete is based on the cost of the Gulf of Heraklion and the main bulk of its coastal biodiversity research efforts have been spent in the area. The Director of the IMBC has already signed a letter of intent, where the significance of Marine Biodiversity studies for the Institute is particularly acknowledged. Interest in the research activities of the area is further strengthened since the Institute has been designated as the National Centre of Excellence for Marine Biodiversity, by the General Secretariat of Research and Technology, Greek Ministry of Development.

BREIDAFJORDUR	Iceland	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 65°00 - 65°40'N, 22°- 23°20' W

A typical intertidal zone near Stykkisholmur, Breidafjordur, West Iceland. Photo Robert A Stefánsson

Description of site:

Breidafjordur is a wide bay in West Iceland, and no coastal region in Iceland offers a greater variety of habitats. The coast is characterized by a large number of small fjords, which open into the bay. The area holds around 65% of Iceland's rocky shores and 40% of Iceland's tidal flats. The bay in sheltered and is characterised by 2,500-3,000 small islands and skerries. It is fully saline.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The biota of Breidafjordur is boreal/subarctic and the fauna and flora is characterized by Eastern North Atlantic species. Several species in Iceland reach their northern limits of distribution in the bay. The tidal flats are rich in invertebrate life, and are extensively used as staging access by migratory birds. Extensive beds of the blue mussel (*Mytilus edulis*) occur at many sites, fed on by huge flocks of the common eider (*Somateria mollissima*). Látrabjarg, one of the largest seabird colonies in the North Atlantic occurs at the mouth of Breidafjordur. Around 7000 harbor seals and 5000 grey seals breed in Breidafjordur.

Human impact:

With a total population of around 5,000 persons, the human impact in Breidafjordur is fairly slight. There is no industrial pollution, mining or dredging. There is commercial small boat fishing for scallops and fishing with Danish seine, small shrimp trawl and hand line. Algae (*A. nodosum* and *Laminaria* spp.) are harvested.

Facilities:

The West Iceland Institute of Natural History is located in the town of Stykkisholmur and offers comprehensive laboratory facilities. The well equipped Institute of Biology, University of Iceland, Reykjavik, is only 2 hours drive from the area. Boats can be hired for field sampling in Stykkisholmur.

Available database and website:

No formal database is available at present. The West Iceland Institute of Natural History and The Institute of Biology, University of Iceland, both have their websites

Commitment and ongoing research:

With the recently established West Iceland Institute of Natural History, research activity in the fjord is expanding. The Institute has good links to the University of Iceland. The area will be used in the future as a pristine reference area in Icelandic monitoring studies. It has been protected by special laws since 1995.

PHLEGREAN ISLANDS, BAY OF NAPLES	ITALY	Conservation status ☆ ★ ★ ★	

Co-ordinates: 40°46'-40°42'N, 13°51'-14°02'E

Panorama from the Benthic Ecology Laboratory in Ischia. Photo V Zupo

Description of site:

The marine reserve "Neptune Kingdom" comprises several environments located along the coastal areas of three islands: Ischia, Procida and Vivara. Almost all habitat typical of the Mediterranean are covered: seagrass meadows, with *Posidonia oceanica*, *Zostera noltii*, and *Cymodocea nodosa*; hard bottom communities with coastal banks, cliffs and caves; sand (coastal sands and *Amphioxus* sands, which represent in Ischia one of the only locations of this peculiar environment in the Gulf of Naples) and muds (detritic muds, which in some areas typically form rhodolith facies).

Description of fauna and flora:

The number of species recorded in the Phlegrean island's checklist is representative of more than 70% of the total species known for the Mediterranean.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X	X	X
Seagrass beds	X		

Human impact:

There are no industries at all in the islands. The main source of disturbance for the system is represented by tourist activities, with the related pollution, and fisheries activity. However, underwater discharge pipes are located all around the island of Ischia at around 50 m depth and they carry partially depurated waters. Both influences will be strongly mitigated after the final activation of the marine park.

Facilities:

From the Laboratory of Benthic Ecology, in Ischia, the whole area is accessible by boat within a radius of 3 miles. The Laboratory is fully equipped for morphological, physiological, molecular and radioisotope studies. It is very easy (30 minutes by hydrofoil) to reach the main building of the fully equipped Stazione Zoologica A. Dohrn in Naples.

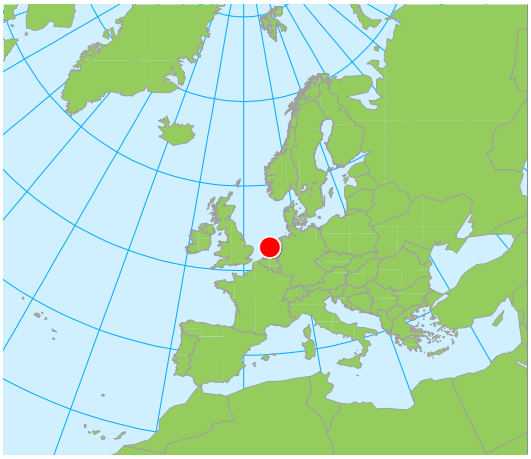
Available database and website:

A CD Rom containing a checklist containing about 2000 species is currently available at the Laboratory of Benthic Ecology. A checklist of conchiferous molluscs present around the islands is on line (http:://estaxp.santateresa.enea.it/censim/censimento.html).

Commitment and ongoing research:

The Stazione Zoologica *A. Dohrn* is commited to a series of long-term large-scale programmes for the study of biodiversity and the monitoring of the marine environment in the Bay of Naples.

BALGZAND	Netherlands	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 52°55'N, 4°50'E

Resarchers at work at Balgzand in the early 1970s.

Description of site:

Balgzand, in the most westerly part of the Dutch Wadden Sea, is a 45 km^2 tidal flat surrounded by deeper gullies down to 40 m. Both the littoral and sublittoral areas are dominated by sand.

Description of fauna and flora:

The fauna and flora have been researched since the laboratory of the Dutch Zoological Society (now NIOZ) was opened in 1876. Intensive long-term monitoring programmes (algae, macrozoobenthos, fish, birds) have been carried out since the 1960s.

Human impact:

Eutrophication and moderate pollution through inflowing North Sea coastal water and freshwater runoff from Lake IJsselmeer occurs. Fishing and tourism are limited.

Habitats present:

	Mud	Sand	Rock
Littoral		X	
Sublittoral	X	X	
Seagrass beds			

Facilities:

All facilities for marine biodiversity research are available, from seagoing research vessels, fixed observation platforms and fully equipped laboratories.

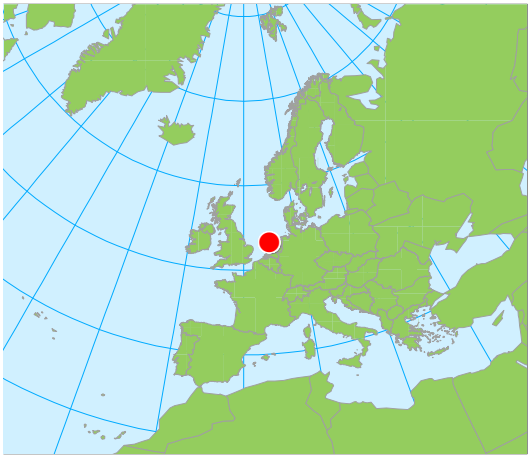
Available database and website:

No specific database is yet available. The NIOZ has its own website.

Commitment and ongoing research:

The Royal Netherlands Institute for Sea Research (Royal NIOZ)is based on the island of Texel, at close distance from Balgzand, and undertakes biodiversity-related research in the area.

FRISIAN FRONT, NORTH SEA	Netherlands	Conservation status ☆	



Co-ordinates: 53°42'N, 4°30'W

Epifauna sampling at the Frisian Front with the Triple D-dregde.

Description of site:

The Frisian Front is a 40 m deep area in the offshore southern North Sea where different watermasses converge. It is situated at the border of the sandy Southern Bight and the Oyster Ground where silty sand prevails. The Frisian Front encompasses a wide gradient in sediment type, food conditions and biodiversity.

Description of fauna and flora:

The fauna has been well documented, and has been the subject of research by the Royal Netherlands Institute for Sea Research from the 1980's onwards.

Human impact:

The Frisian Front lies within an area that for decades has been fished by beam trawlers. It is characterised by high turbidity due to natural causes i.e. the general circulation pattern in combination with the coastal supply of fine particles. Pollution levels fall within the normal range of the offshore North Sea

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X	X	
Seagrass beds			

Facilities:

All facilities for marine biodiversity research are available, i.e. a seagoing research vessel and fully equipped laboratories (climatized rooms with running filtered seawater, salinity and temperature (0 – 30^{o} C) separately adjustable; 50 m^{2} climatized mesocosm space for North Sea work)

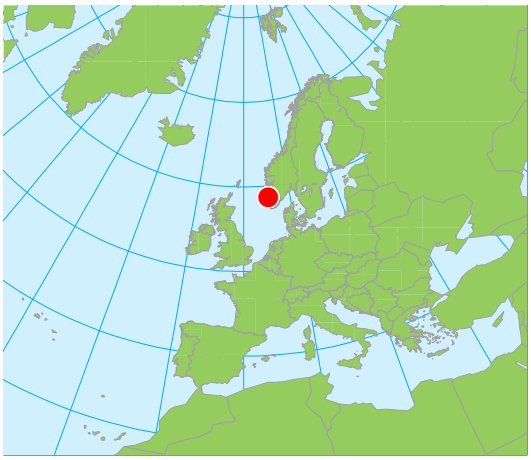
Available database and website:

The species inventory on macrofauna and epifauna is comprehensive and stored in a NIOZ database which can be consulted upon request.

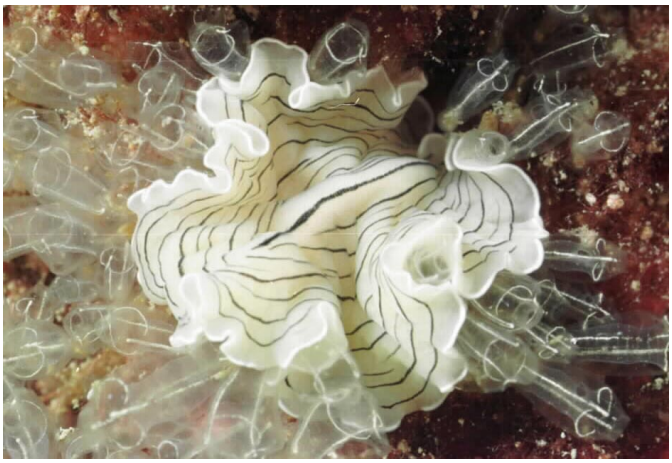
Commitment and ongoing research:

The Frisian Front is part of the area covered by the annual macrofauna monitoring programme by the Royal Netherlands Institute for Sea Research (NIOZ) in cooperation with the National Institute for Coastal and Marine Management (RIKZ). Biodiversity related research on population dynamics of benthic organisms living at the Frisian Front is conducted by the Royal Netherlands Institute for Sea Research.

BØMLO-SOTRA ARCHIPELAGO	Norway	Conservation status ☆ ★ ★ ★	



Co-ordinates: 59º35'-60º30'N, 4º50'-5º20'E



Prostheceraceus vittatus and *Clavelina lepardiformis* . Photo A Pedersen

Description of site:

Bømlo-Sotra archipelago in Hordaland County, southwest Norway, is an outer coastal area characterised by islands, islets, fjords and sounds, supporting a wide variety of habitats. The dominant bottom types are hard-bottom and coralline sand from intertidal to shallow subtidal, and mixed and muddy soft-bottoms in locally sheltered and off-shore deep (>200m) areas.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

The area is part of the most extensively studied marine region in Norway. Large areas are dominated by kelp forest (*Laminaria hyperborea*).

Human impact:

There are no large settlements or industrial plants discharging wastewater in the area, but fish farming may locally affect sheltered habitats. The area is characterised as pristine and representative of the natural conditions in the eastern North Sea.

Facilities:

There are excellent facilities for biodiversity research at Espegrend Field Station of University of Bergen and Austevoll Aquaculture Station, as well as at several smaller laboratories and research units in the area.

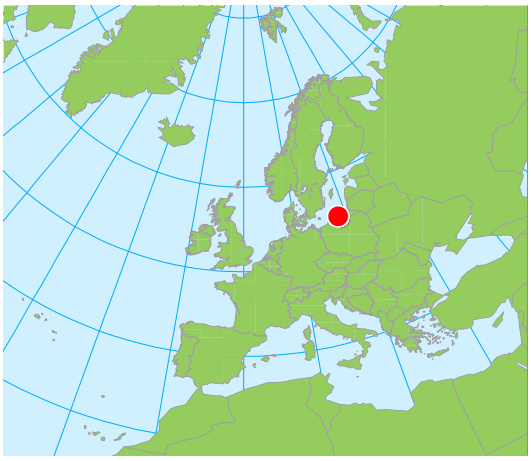
Available database and website:

The species inventory is very comprehensive, with more than 2200 benthic invertebrates and 300 benthic macroalgae registered in several off-line databases. All the main research organisations have their own websites.

Commitment and ongoing research:

Norwegian Institute for Water Research (NIVA), Institute for Marine Research (IMR) and University of Bergen are major sites for biodiversity-related research in the area. Long-term biodiversity monitoring has been carried out since 1990 during the Norwegian Coastal Monitoring Programme, managed by NIVA.

BAY OF PUCK, SOUTHERN BALTIC	Poland	Conservation status ☆ ★ ★	



Co-ordinates: 54°45'N, 18°30'E

The steep shores of Bay at Oslonino. Photo S Andrulewicz

Description of site:

Bay of Puck is an inner basin of the Bay of Gdansk, one of the few embayments on the southern coast of the Baltic sea. Its inner part is a shallow, sandy seagrass bed. It is microtidal, salinity ranging from 3 to 6 PSU, and it is representative of a large region of the southern Baltic.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The exposed character of southern Baltic sea coast makes rare embayments centres of local biodiversity. Extensive *Zostera marina* and *Mytilus edulis trossulus* beds are the structuring elements for the diversity of life in the Bay. From the potential pool of some 500 macroscopic species of the Baltic, at least 170 have been noted in the Bay of Puck.

Human impact:

The major harbour and tourist city of Gdynia is located in the Bay, and the area is eutrophicated to a level typical for this whole region of the Baltic. There is active artisanal net and trap fishing. No dredging or waste disposal is allowed within the Bay.

Facilities

The appropriate laboratory and seagoing infrastructure for biodiversity research is available at the University of Gdansk Marine Research Station at Hel, the Institute of Oceanology in Sopot, the Sea Fisheries Institute in Gdynia and Institute of Oceanography in Gdynia.

Available database and website:

Records of marine species occurrence are stored at the Sea Fishery Institute in Gdynia and the Institute of Oceanography University of Gdansk. Website (operational in December 2002): www.iopan.gda.pl .

Commitment and ongoing research:

The Bay is the major focus for the Polish National Marine Research Programme for biodiversity. A number of marine scientists from Consortium of Polish Marine Research Institutes spend a significant proportion of their time on the biodiversity related research there, and in addition there are numerous European scientists also undertaking marine biological work in the area. The Consortium of Polish Marine Research Institutes has an agreed science plan and specifically allocated budget for biodiversity work. Most of the current marine research and education at University of Gdansk is focused on the Bay.

THE GULLMARSFJORD	Sweden	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 58°15'N, 11°28'E

Panorama from the mouth of the Gullmarsfjord. Photo R Rosenberg

Description of site:

The Gullmarsfjord is the largest fjord in Sweden situated about 120 km north of Gothenburg in the Skagerrak. It is 30 km long and has a maximum depth of 118 m. The fjord has been a natural reserve since 1983 and well known for its high biodiversity and unique fauna. All habitats within the region of west Sweden are present.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The first scientific studies of fauna and flora on the Swedish west coast were carried out in the Gullmarsfjord and initiated in the 1830s. Many classical publications have originated from early studies in the fjord, for example sea urchin development, descriptions of rocky bottom epibiosis, and benthic community classifications. Many publications deal with description and distribution of species from the Gullmarsfjord and more recently their role in the ecosystem has been analysed.

Human impact:

There is no industrial pollution, mining, dumping or dredging, and potentially harmful agricultural runoff is negligible due to strict legislation. No sewage outlets or fish farms are within the fjord area. Demersal fishing for shrimp (*Pandalus borealis*) is restricted to a defined area in the inner part of the fjord 100 days per year.

Facilities:

Kristineberg Marine Research Station has a variety of different size research vessels and is one of Europe's most modern research laboratories, with easy access to all the different habitats. The station has unique facilities for experimental work and for maintaining live organisms for extended periods. It has a fully equipped auditorium, conference facilities, and accommodation for 65 persons.

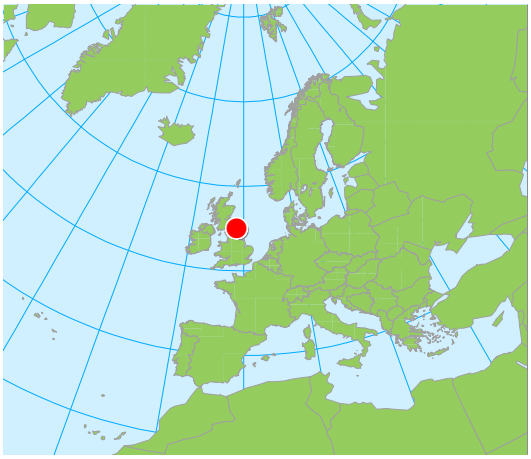
Available database and website:

An historic species record is available in scientific publications and available at the Kristineberg library. Records of 1766 taxa in the area are available on the website: http://www.kmf.gu.se/index_allman_info.html

Commitment and ongoing research:

In addition to about 20 scientists from Kristineberg Marine Research Station, researchers from Uppsala University and the Fisheries Board have laboratory facilities in the fjord area. Many other scientists from all over the world and from different disciplines also use Kristineberg regularly as a base for their research in the fjord.

FLAMBOROUGH HEAD	United Kingdom	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 54°07'N, 00°05'W

Flamborough Headland. Photo J-P D (IECS)

Description of site:

The headland at Flamborough Head comprises of Upper Cretaceous chalk cliffs. The northern side is formed of hard chalk with flints, resulting in steep vertical cliffs with mobile boulders at the base. The chalk on the south side is softer and more porous, with broad wave-cut platforms and gently sloping shores. The north face is moderately exposed to wave action, whereas the south-facing shores are sheltered. Turbidity is influenced by the soft limestone, chalk and overlying boulder clay found in North Yorkshire and Humberside.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

During the summer months there is a marked difference in the water characteristics between the northern and southern North Sea, this boundary being known as the Flamborough Front. It has a strong effect on the species present and those characteristic of both northern and southern areas are both found here. Within this region of Great Britain certain species are 'nationally rare' or 'scarce' because they are north Atlantic/sub-Arctic species at the margins of their distribution in Great Britain. The cliffs are amongst the most important cliff-nesting seabird-colonies in Europe. The north-facing shore has been identified as being of international importance for its algal communities, particularly in the splash zone on the cliffs and in caves.

Human impact:

In general, the waters and seabed around the headland appear to be relatively clean although turbidity can be high.

Facilities:

Access to much of Flamborough Head is limited by the steep cliffs on the north and the south-east facing shores. Laboratory facilities are found on the Hull & Scarborough Campuses.

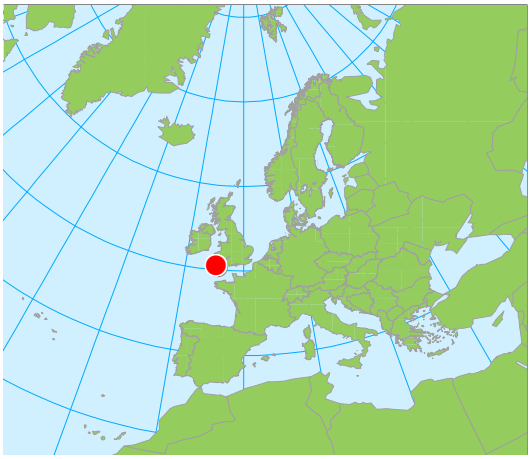
Available database and website:

Records of marine species belonging to all taxa are incorporated in the IECS/SCCS databases, in EXCEL on CD-ROM. Website http://hull.ac.uk

Commitment and ongoing research:

IECS abd SCCS\have an agreed science plan and specifically allocated budget for biodiversity work at Flamborough Head. English Nature has statutory responsibility for monitoring NATURA 2000 habitats.

PLYMOUTH SOUND AND ESTUARIES	United Kingdom	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 50°20'N, 4°10'W

Plymouth Sound, City and Tamar estuary. Photo K Hiscock

Description of site:

Plymouth Sound, in South Devon, England, is a large shallow bay which falls away to deeper water at 30 m. To the north and east are estuaries exhibiting representative salinity gradient effects on sediment and rock.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are exceptionally well documented, and have been researched since the laboratory of the Marine Biological Association was opened in 1888.

Human impact:

The area is subjected to moderate levels of pollution from the large conurbation of Plymouth (pop. 254,000) and naval dockyards, and is quite heavily fished. The coastal waters are relatively turbid due to outflows from muddy estuaries.

Facilities:

All facilities for marine biodiversity research are available, from seagoing research vessels, fully equipped laboratories and the National Marine Biological Library.

Available database and website:

The species inventory ('Plymouth Marine Fauna') is very comprehensive, and is available both as hard copy and on-line. All the main research organisations have their own websites.

Commitment and ongoing research:

The Marine Biological Association (including the Marine Life Information network for Britain and Ireland, MarLIN), Sir Alistair Hardy Foundation for Ocean Science (SAHFOS), Plymouth Marine Laboratory (PML), Plymouth University (UoP) and the National Marine Aquarium (NMA) are all based in Plymouth and undertake biodiversity-related research in the area.

Normal Focal Sites

WESTERN COASTAL BANKS	Belgium	Conservation status ☆ ★ ★ ★ ★	

Co-ordinates: 51°07'N, 2°33'W

Coarse sandy offshore sandwave, enriched with shell hash. Photo S Degraer

Description of site:

The Western Coastal Banks (Ramsar area) comprise a representative collection of the main habitats of the sandbank ecosystems, typical for the Southern Bight of the North Sea. Because of the high geomorphological and hydrodynamical diversity, a wide variety of soft-sediments is found: tertiary clay layers and from muddy sands to coarse sand and shell hash banks. Except for gravel beds, all types of bottoms, present on the Belgian Continental Shelf, are found at the site. Two offshore places have a depth of little below 0 m MLLWS and are exposed to the air a few times a year.

Description of fauna and flora:

The geomorphological - sedimentological diversity is directly responsible for the high benthic species richness of the area. The meio-, macro-, hyper- and epibenthic fauna is well documented (e.g. macrobenthos data since the late 19th century). Numerous seabirds (e.g. common scoter) occur in internationally important numbers.

Habitats present:

	Mud	Sand	Rock
Littoral		X	
Sublittoral	X	X	
Seagrass beds			

Human impact:

There are time-restricted fisheries (mainly sole and shrimp) and touristic shipping, but the area is free of sand extraction, dredging activities, dumping sites, commercial shipping and artificial hard substrata.

Facilities:

All facilities for marine biodiversity research are available (e.g. seagoing research vessels and fully equipped laboratories).

Available database and website:

Except for the century old data (hosted by the Royal Belgian Institute of Natural Sciences), all data are available in electronic databases. All main research organisations have their own websites.

Commitment and ongoing research:

Within the framework of several federal and regional scientific projects, the Marine Biology Section (Ghent University) is investigating the meio-, macro-, hyper- and epibenthos in the area. Seabirds are studied by the Institute of Nature Conservation. Population genetics of epibenthic fish and mysids are covered by the Catholic University of Leuven and Ghent University.

COCKETRICE SANDY BANK	Bulgaria	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 42°38'N, 27°53'E

Description of site:

Cocketrice sandy bank is situated in Burgas bay - the largest along Bulgarian Black Sea coast. The elevated bank (16m depth) with petrified patches is very distinct from the surrounding silt sediment (20-30m depth) that predominates in the bay.

Description of fauna and flora:

Benthic macrofauna is exceptionally rich compared to other areas and habitats in the Black Sea due to the specific habitat. Vulnerable species included in the Black Sea Red Data Book are present. The bank is spawning area of demersal fishes. Studies have been carried out for over a decade and documented in several publications and reports.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral		X	X
Seagrass beds			

Human impact:

Burgas bay is subjected to moderate/high levels of pollution due to urbanisation of the area (pop. 193,000), high industrialisation and the largest harbour in Bulgaria - Port Burgas. However, Cocketrice sandy bank is situated at the outermost part of the bay, which diminishes the human impact on the site.

Facilities:

Facilities for marine biodiversity research including seagoing research vessel, scuba diving equipment, laboratories and library are available at the Institute of Oceanology (affiliated to Bulgarian Academy of Sciences) based in Varna.

Available database and website:

A database is in preparation.

Commitment and ongoing research:

The Institute of Oceanology undertakes annual (seasonal) monitoring of macrozoobenthos, zooplankton and phytoplankton and environmental parameters at the site.

CAPE KALIAKRA MARINE NATURE RESERVE	Bulgaria	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 43°21'N, 28°28'E

Cape Kaliakra. Photo Ts Konsulova

Description of site:

Cape Kaliakra Nature Reserve is the only Bulgarian reserve protecting a marine area - a stretch of sea 500 m wide and 8 km long. It also includes 687,5 ha of steppe areas and cliffs up to 70 m high. The limestone is punched with caves – former refuges of the monk seal, now extinct from the Bulgarian coast.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X	X	X
Seagrass beds			

Description of fauna and flora:

Both terrestrial and marine flora and fauna of the reserve have been studied and documented within the Bulgarian-Swiss Biodiversity Conservation Programme, 1997 (BSBCP). The results of the investigations have been published in a monograph (in Bulgarian) and a technical report with limited distribution (in English).

Human impact:

Local human impact on the area is negligible due to small population (18,640), lack of industry and absence of large harbours in the adjacent territory. A moderate background level of eutrophication is due to the influence of the Danube.

Facilities:

Facilities for marine biodiversity research including seagoing research vessel, scuba diving equipment, laboratories and library are available at the Institute of Oceanology (affiliated to Bulgarian Academy of Sciences) based in Varna.

Available database and website:

A database is in preparation.

Commitment and ongoing research:

The Institute of Oceanology undertakes annual (seasonal) monitoring of macrozoobenthos, zooplankton and phytoplankton along West-East in front of cape Kaliakra beginning 1 nautical mile from the coast.

VARNA BAY	Bulgaria	Conservation status ☆	

Co-ordinates: 43°11'N,27°56'E

Description of site:

Varna Bay is the second largest bay along the Bulgarian Black Sea coast with maximum depth of 18 m. To the west the bay is connected via two channels to Varna lake and Beloslav lake that were originally freshwater and are now brackish.

Description of fauna and flora:

The fauna and flora are well documented, and have been researched since the Marine Biological Station was opened in 1932 in Varna.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X	X	X
Seagrass beds			

Human impact:

The area is subjected to moderate levels of pollution from Varna (pop. 314,539), the adjacent lakes which receive waste water from several chemical and electric power plants, and Varna harbours that are situated in Varna Bay and Beloslav lake. The bay is quite heavily fished, including bottom trawling for invertebrates.

Facilities:

Facilities for marine biodiversity research including seagoing research vessel, scuba diving equipment, laboratories and library are available at the Institute of Oceanology (affiliated to the Bulgarian Academy of Sciences) based in Varna.

Available database and website:

A database is in preparation.

Commitment and ongoing research:

The Institute of Oceanology undertakes annual (seasonal) monitoring of macrozoobenthos, zooplankton, phytoplankton and environmental parameters at the site.

STATION F3, GULF OF FINLAND, BALTIC SEA	Estonia	Conservation status ☆	

Co-ordinates: 59°50'N, 24°50'E

Station F3, Middle part of the Gulf of Finland, Baltic Sea. Bloom of bluegreen algae. Photo J Kotta

Description of site:

The Gulf of Finland is a direct extension of the Baltic Proper, the Baltic Sea. There is no threshhold at the opening of the Gulf, and the maximum depth is some 100 m. The bottom depth decreases towards the east. The Gulf of Finland is influenced by the inflows of saline water from the Kattegat/Skagerrak. Approximately one fourth of the total river water volume, received by the Baltic Sea, enters directly into the Gulf of Finland. Occasionally the presence of a strong halocline may create temporal anoxia in the sediment.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X		
Seagrass beds			

Description of fauna and flora:

The fauna is well documented, and has been researched since 1965. Owing to low salinity, short developing time and isolation, only a limited number of species have been able to adapt to the local conditions. Soft-bottom assemblages below the thermocline show particularly low diversity consisting of only a few species of macrofauna and about 40 to 50 meiofauna species.

Human impact:

The area is subjected to moderate levels of pollution from Tallinn and Helsinki Cities.

Facilities:

All facilities for marine biodiversity research are available, from seagoing research vessels, equipped laboratories, offices, and library at Estonian Marine Institute.

Available database and website:

The inventory of biota and hydrophysical variables is available in the database of the Estonian National Monitoring (updated at the Estonian Marine Institute). All the main research organisations have their own websites.

Commitment and ongoing research:

The Estonian Marine Institute is involved in the monitoring activities of the site. Currently various hydrophysical, hydrochemical and biological (e.g. phytoplankton, zooplankton, phytobenthos, zoobenthos, fish) investigations are carried out related to the biodiversity of the site.

PARNU BAY, GULF OF RIGA, BALTIC SEA	Estonia	Conservation status ☆	

Co-ordinates: 58°12'N, 24°19'W

Parnu Bay, northeastern Gulf of Riga. Photo J Kotta

Description of site:

Parnu Bay is relatively enclosed and shallow (< 12m) bay in the NE part of the Gulf of Riga. In winter the bay is covered by ice, melting down to the bottom in summer. The bay is under the direct influence of freshwater inflow from the Parnu River.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral			
Seagrass beds	X		

Description of fauna and flora:

The biota have been routinely studied since the late 1940s. Due to low-salinity conditions (below 6 psu) and shallowness of the area, freshwater and marine euryhaline species dominate among the species-poor biota. Glacial relicts that are important food-web components in deeper areas of the Gulf of Riga occur in the cold season.

Human impact:

The area is under moderate pollution impact from Pärnu town. Other more important anthropogenic impacts include maritime transport via the Port of Parnu and both commercial and recreational fishing activities. In the close vicinity, the Marine Protected Area (Maritime Park of the Kihnu Strait) has recently been created.

Facilities:

Facilities for marine biodiversity research are available including vessels, fully equipped laboratories and a Library at the Estonian Marine Institute.

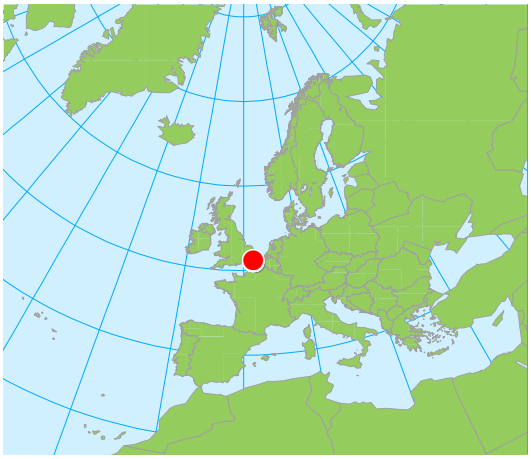
Available database and website:

Datasets (both for the abiotic and biotic environment) are kept at the Estonian Marine Institute, but also partly in the Estonian National Monitoring database.

Commitment and ongoing research:

The Estonian Marine Institute is involved in monitoring activities of the site. Currently various hydrophysical, hydrochemical and biological (e.g., phytoplankton, zooplankton, ichthyoplankton, phytobenthos, zoobenthos, fish) investigations are being carried out in relation to the biodiversity of the area.

GRAVELINES	France	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 51°01'N, 002°05'E

The Gravelines area. Photo SMW

Description of site:

The Gravelines area belongs to the southern part of the *Abra alba* community of the North Sea. It is under the influence of waters coming from the Eastern Channel or from the Scheldt estuary, depending on wind conditions. A long-term survey has been performed at this site since 1973

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X	X	
Seagrass beds			

Description of fauna and flora:

The benthic macrofauna is well documented, related to the *Abra alba* community. There are 160 species, with a mean mean density of 4000.m^{-2} and a mean biomass (AFDW) of 200g.m^{-2}.

Human impact:

The area is located far enough from the harbours of Calais and Dunkirk to be only subjected to moderate levels of pollution. The outflow of the Aa river (mean 6 m^3.sec^{-1}) has little effect on the benthic communities. This site is studied as the out-of-impact reference area for the nuclear power station of Gravelines.

Facilities:

All facilities for marine biodiversity research are available : research vessels, scientific divers, fully equipped laboratories and accommodation at the Marine Station of Wimereux.

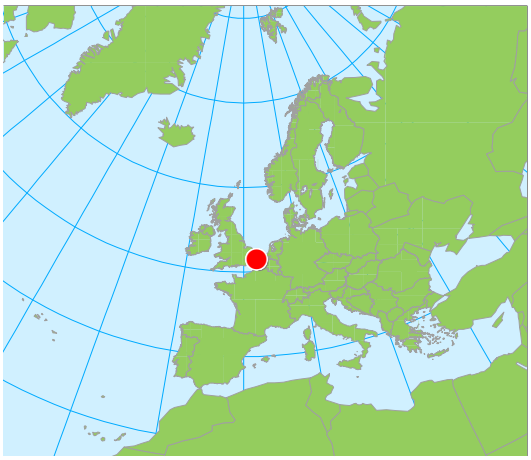
Available database and website:

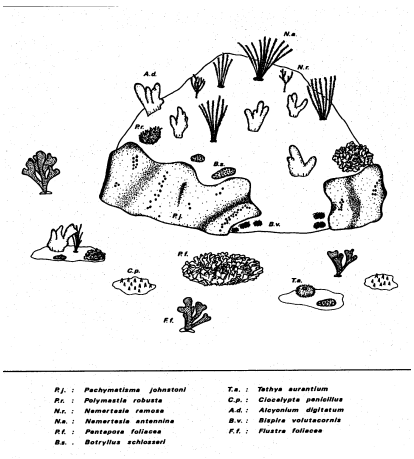
The global species inventory ("Faune et Flore du littoral du Pas de Calais et de la Manche Orientale") is currently updated It is available as hard copy and will be soon available on-line on the website of the Marine Station. The Gravelines series is available both as an Excel file and in the North Sea Benthos Project database.

Commitment and ongoing research:

The Marine Station, the "Unite Mixte de Recherche ELICO" from CNRS and the Lille 1 University are all based in Wimereux and undertake biodiversity-related research in the area.

LES RIDENS	France	Conservation status	





Co-ordinates: 51°45'N, 001°35'E

Type diagram of Les Ridens. Drawing D Menu *in* Davoult & Richard, 1988

Description of site:

Les Ridens is a large rocky shallow area in the center of the Eastern Channel, characterized by a mixing of hard substrata and clean heterogeneous sands and gravel. It is located in an area of low difference between summer and winter water temperatures (<10°C).

Description of fauna and flora:

The fauna is exceptional for the region, several species reach their Northern limit here in the Channel. 270 species have been recorded. There is an important border effect between the fauna of circalittoral rocks (up to 15 m depth) and of heterogeneous sands and gravel (down to 30 m depth).

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral		X	X
Seagrass beds			

Human impact:

The area is subjected to low level of pollution owing to its offshore location. The presence of rocks prevents the pressure by fishing activities.

Facilities:

All facilities for marine biodiversity research are available: research vessels, scientific divers, fully equipped laboratories and accommodation at the Marine Station of Wimereux.

Available database and website:

The global species inventory ("Faune et Flore du littoral du Pas de Calais et de la Manche Orientale") is currently updated, and is available as hard copy and will be soon available on-line on the website of the Marine Station. The inventory of benthic macrofauna and flora of Les Ridens is only available as hard copy.

Commitment and ongoing research:

The Marine Station, the "Unite Mixte de Recherche ELICO" from CNRS and the Lille 1 University are all based in Wimereux and undertake biodiversity-related research in the area in collaboration with the Biological Station of Roscoff for this project.

MONT SAINT-MICHEL BAY	France	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 50°20'N, 4°10'W

Mont Saint-Michel Bay, *Sabellaria alveolata* reefs, mud flats and the Mont Saint-Michel. Photo LM Guillon

Description of site:

Mont Saint-Michel's Bay, at the boundary between Brittany and Normandy is a large shallow bay which falls away to deeper water at 30 m. Maximum tidal range is about 15.5 m. The Bay is characterized by high levels of seawater turbidity and by sediment gradients.

Description of fauna and flora:

The fauna and flora, especially invertebrates and plants of salt marshes, are well documented, and have been researched since the Marine Station of Dinard (MNHN) was opened in 1928.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Human impact:

The area is subjected to low levels of pollution but is one of the major French sites for shellfish farming (6000 tons of Oysters and 10000 tons of mussels per year). The *Sabellaria alveolata* reefs are locally impacted by various human activities (fishing, ecotourism etc.).

Facilities:

All facilities for marine biodiversity research are available, from the Marine Station vessel, fully equipped laboratories and the Marine Station Library and an herbarium.

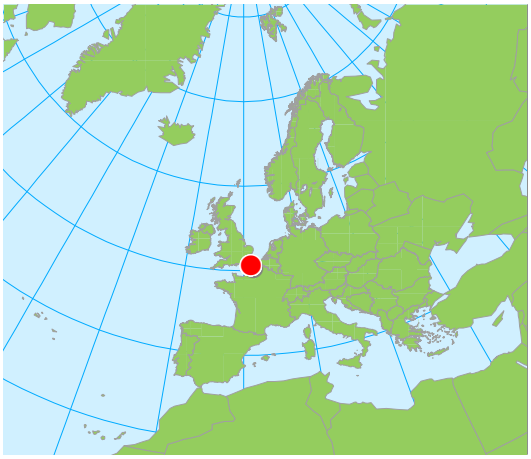
Available database and website:

The species inventory is available (books, reprints, reports etc.).

Commitment and ongoing research:

The Marine Station of Dinard belongs to the MARS Network and to the "Réseau National des Stations Marines" and is closely connected to the IFREMER Marine Station of Saint-Malo and to the Laboratory of littoral geomorphology and environment of Dinard (EPHE). The Station is involved in the French National program of coastal environment (PNEC) and supervises environmental research conducted in the Bay.

***OPHIOTHRIX FRAGILIS* BEDS OF THE DOVER STRAIT**	France	Conservation status ☆	



Co-ordinates: 50°55'N, 001°35'E

The Blanc-Nez (in the foreground) and Gris-Nez capes area.
Photo : Service Maritime de Boulogne sur mer

Description of site:

This site is located in a strong current area in front of Gris-Nez and Blanc-Nez Capes between 20 to 40 m depth. It comprises *Ophiothirx fragilis* beds on pebbles with a sessile epifauna community. This kind of community is found in only three locations in the English Channel. The substratum consists of clean pebbles and heterogeneous sands.

Description of fauna and flora:

The benthic macrofauna is well developed, but mainly dominated (in terms of density and of biomass) by three species : *Ophiothrix fragilis*, *Alcyonium digitatum* and *Urticina felina*. 300 macrobenthic species have been recorded, most of the species being suspension feeders. The mean density of the macrobenthos is 1700.m^{-2} and the mean biomass is 320 g.m^{-2}.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral		X	X
Seagrass beds			

Human impact:

Despite its location in a coastal area, this site is subjected to only moderate levels of pollution of the water masses coming from the English Channel and from the Southern Bight of the North Sea;

Facilities:

All facilities for marine biodiversity research are available at the Marine Station of Wimereux: research vessels, scientific divers, fully equipped laboratories and accommodation.

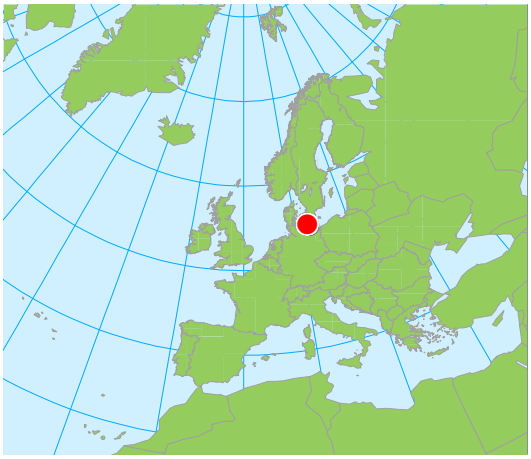
Available database and website:

The global species inventory ("Faune et Flore du littoral du Pas de Calais et de la Manche Orientale") is currently updated, and is available as hard copy and will be soon available on-line on the website of the Marine Station. An inventory of the benthic macrofauna of the *Ophiothrix fragilis* bed of the Dover Strait is only available as hard copy (Davoult D. PhD).

Commitment and ongoing research:

The Marine Station, the "Unite Mixte de Recherche ELICO" from CNRS and the Lille 1 University are based in Wimereux and undertake biodiversity-related research in the area in collaboration with the Biological Station of Roscoff for this project.

DARSS-ZINGST BODDEN CHAIN, SOUTHERN BALTIC SEA	Germany	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 54°20'N, 12°30'E

View from Dierhagen. Photo D Schiedek

Description of site:
The Darss-Zingst Bodden Chain is a shallow coastal inlet with a maximum depth of 10 m south of the Darss-Zingst peninsula. It consists of 4 semi-enclosed water basins with estuarine character. The salinity gradient (1-10 PSU) is caused by high saline Baltic Sea water inflow from the east and a strong freshwater influence from the west.

Habitats present:

	Mud	Sand	Rock
Littoral		X	
Sublittoral	X	X	
Seagrass beds	X		

Description of fauna and flora:
The site has benthic (about 110 taxa) and pelagic communities typical for shallow brackish water, as well as large reed and seagrass meadows and other brackish water vegetation (e.g. *Potamogeton* or *Chara).*

Human impact:
During the past 30 years the Bodden chain was subjected to heavy nutrient input due to agriculture resulting in a substantial deposit of nitrogen, phosphorus and organic carbon in the sediments. The trophic status of the water reaches from hypertrophic (Saaler Bodden) to poly- and eutrophic towards the mouth of the Bodden chain (Grabow). Since 1992 the major part of the Darss-Zingst Bodden Chain has been a national park.

Facilities:

The Biological Station Zingst (Rostock University) is situated in the center of the area. In addition, facilities for marine biodiversity research are available at Rostock University, Department of Biology and at the Baltic Sea Research Institute (IOW); both institutions are about 40 km away. All sampling sites are accessible via coastal footpaths.

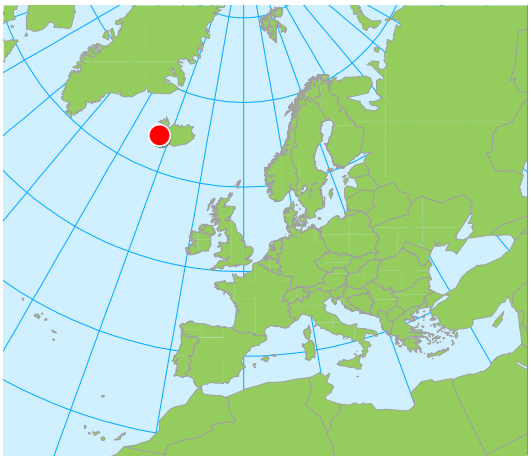
Available database and website:

A very comprehensive source in regard to biota and chemical-hydrographical data is Rostock University (Department of Biology) and the monograph "Die Darss-Zingster Bodden" (Meer & Museum Vol 16, 2001). The database at IOW contains about 2,200 data on macrobenthic species.

Commitment and ongoing research:

The Department of Biology, Rostock University and the Baltic Sea Research Institute both perform biodiversity related research in this area.

OUTER REYKJANES, ICELAND	Iceland	Conservation status ☆ ★ ★	



Co-ordinates: 63°48'N-64°05'N ,22°20'W-22°45'W

Rocky shores off Sandgerði. Photo Reynir Sveinsson

Description of site:

The Reykjanes peninsula, SW Iceland, is exposed to the open Atlantic. The peninsula has a variety of rocky, sandy and muddy shores, extensive bird cliffs and rich subtidal rocky and soft bottoms (muddy, volcanic sediments). The rich sea bird life is supported by a local productive front. Shallow subtidal hydrothermal vents occur at the Reykjanes Ridge.

Description of fauna and flora:

The fauna and flora in the area has been explored since the time of the Danish Ingolf Expedition (1895-1896). The flora and the fauna are both subarctic in character, with many intertidal species reaching their northern limits in the area.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Human impact:

The area is subjected to low levels of pollution (total population < 20,000), mostly due to ship traffic. Locally the area is heavily fished (trawling, nets).

Facilities:

Facilities for marine biodiversity research are available, including possibilities for collecting at sea and using the extensive collections from the BIOICE programme. A field station, the Sandgerði Marine Centre, is located in the area.

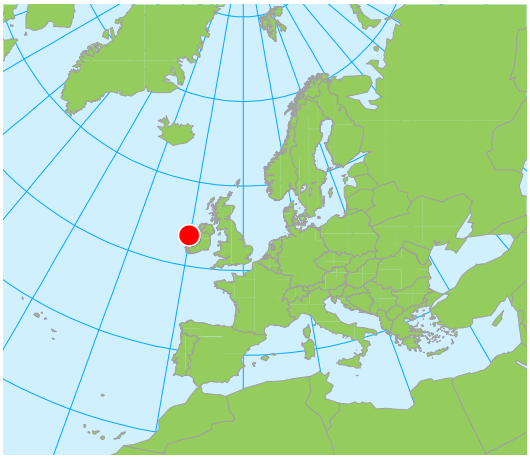
Available database and website:

Much information is found in the series Zoology of Iceland and in local databases (BIOICE database and others). All local research organisations have their own websites.

Commitment and ongoing research:

The Institute of Biology of the University of Iceland, Icelandic Institute of Natural History and the Marine Research Institute conduct research on various aspects of the fauna and flora of the area.

CLARE ISLAND, CO. MAYO	Ireland	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 53°48.07'N,09° 59.87'W

View east from Clare Island to Clew Bay, Co. Mayo. Photo Damian Allen

Description of site:

Clare Island lies off the west coast of Ireland approximately 5 km from the nearest mainland harbour. It is approximately 1600 ha. The majority of the island is rocky with one sheltered sandy bay on the east coast. To the west it is exposed to the Atlantic Ocean with the seabed dropping away to over 100 m.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are well documented from the historical Clare Island survey between 1909 and 1911 published by Robert Lloyd Praeger and was one of the first All Taxa Biodiversity Inventories (ATBI) in the world. The surveys have not been repeated but a range of research projects are underway there.

Human impact:

The island has a population of about 160 mostly living on the southern and eastern sides of the island. There is no heavy industry with farming and fishing the major impacts. One salmon farm is located off the east coast of the island and diving occurs around the island.

Facilities:

There are no specific facilities for marine biodiversity research on the island however extensive facilities occur at the National University of Ireland, Galway (NUIG) approximately 200 km away.

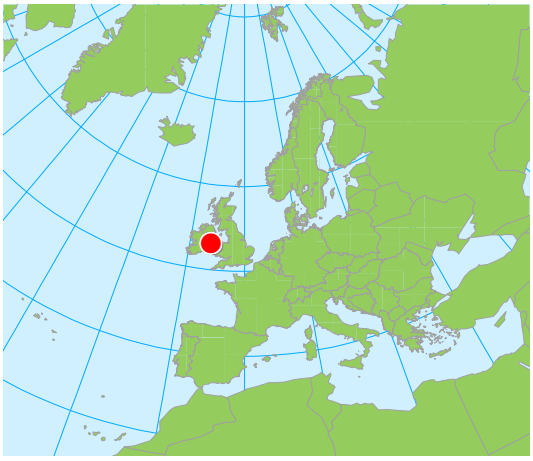
Available database and website:

Details of the old and new Clare Island surveys are found at http://www.ria.ie/projects/clare_island.html.

Commitment and ongoing research:

The Royal Irish Academy has committed to promote studies on Clare Island although there is a need for a complete repeat ATBI.

DUBLIN BAY, CO. DUBLIN	Ireland	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 53° 20.61'N, 06° 9.31'W

Dublin Bay looking south across the lighthouse on Howth Head

Description of site:

Dublin Bay is a large shallow bay on the east coast of Ireland. It is backed by Dublin city and split by the River Liffey. On the north shore is Bull Island which was formed during the construction of the docklands and now supports the most designated nature conservation site in Ireland, primarily for bird life.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The bay is predominantly sand with offshore banks of coarser material occurring to the east. Behind Bull Island occurs extensive mud and sandflats. A small *Zostera* bed occurs on the south shore.

Human impact:

The area is subjected to moderate levels of pollution (primarily nutrients) from the city of Dublin and the dockyards. The bay is quite heavily fished. The coastal waters are relatively turbid due to outflows from muddy estuaries and the sedimentary nature of the seabed.

Facilities:

Facilities for marine biodiversity research are available from several Universities and consulting companies in Dublin.

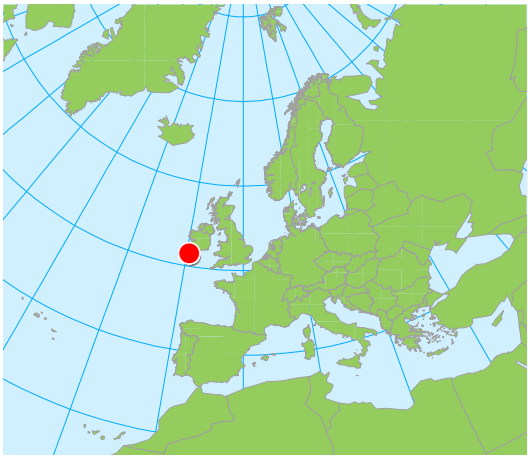
Available database and website:

Dublin Bay has been the subject of extensive work due to the sludge dumping that occurred offshore and more recent developments. The close proximity to the big Dublin colleges has resulted in small research projects being completed. Good baseline data is available for the intertidal habitats and biotopes. Intertidal biotope information is available from http://www.ecoserve.ie/projects/sensmap.

Commitment and ongoing research:

There is ongoing marine biodiversity research in Dublin Bay mostly due to developments within the area. There is a requirement by the National Parks and Wildlife Service to undertake some biodiversity monitoring as part of the SAC designation. Dr Jim Wilson of Trinity College, Dublin has been monitoring intertidal molluscs for 10 years.

KENMARE RIVER, CO. CORK/KERRY	Ireland	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 53° 46.01'N, 09° 56.83'W

Inner Kenmare River is sheltered with fucoid covered rocky shores. Photo Chris Emblow

Description of site:

Kenmare River in Counties Cork and Kerry is a broad sea inlet tapering about 40 km inland. The outer part is over 70 m deep shallowing gently towards the head of the bay. The shores are primarily rocky with shallow sheltered bays and inlets along both the north and south shores.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are well documented from surveys carried out during the BIOMAR project and current mapping surveys to develop management plans for the marine SAC. The range of habitats provide for a rich and varied fauna and flora.

Human impact:

The area is subjected to pressures from aquaculture (Intensive *Mytilus edulis* culture occurs in some of the sheltered bays). The area is not heavily populated.

Facilities:

No facilities occur on site however the whole of the bay is within a few hours drive of Universities at Cork, Limerick and Galway.

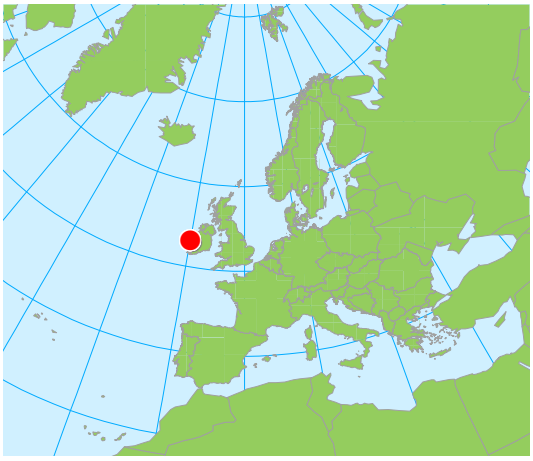
Available database and website:

The results of the BIOMAR survey are available on CD; http://www.ecoserve.ie/projects/biomar.

Commitment and ongoing research:

There is ongoing marine biodiversity research in Kenmare River linked with the development of management plans for the SAC. There is a requirement by the National Parks and Wildlife Service to undertake some biodiversity monitoring as part of the SAC designation.

KILKIERAN BAY, CO. GALWAY	Ireland	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 53° 17.74'N, 009° 44.87'W

The entrance to Kilkieran Bay with numerous small islands and islets create a mosaic of marine habitats

Description of site:

Kilkieran Bay in Co. Galway is a complex marine inlet subject to high wave exposure towards the entrance, and with extremely sheltered areas at the head of the bay. It has many islands and islets resulting in narrow sounds and channels subject to high tidal streams.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds		X	

Description of fauna and flora:

The fauna and flora are well documented from surveys carried out during the BIOMAR project and current mapping surveys to develop management plans for the marine SAC. Particular habitats in Kilkieran Bay have been the subjects of past and present studies completed by the National University of Ireland, Galway (NUIG). The range of habitats provide for a rich and varied fauna and flora.

Human impact:

The area is subjected to some aquaculture activity (mainly salmon farming and *Mytilus edulis* culture). Seaweed (*Ascophyllum nodosum*) collection does occur. However the area is not heavily populated and there is no heavy industry.

Facilities:

Facilities for marine biodiversity research are available from the National University of Ireland, Galway and there is a small research laboratory at Carna.

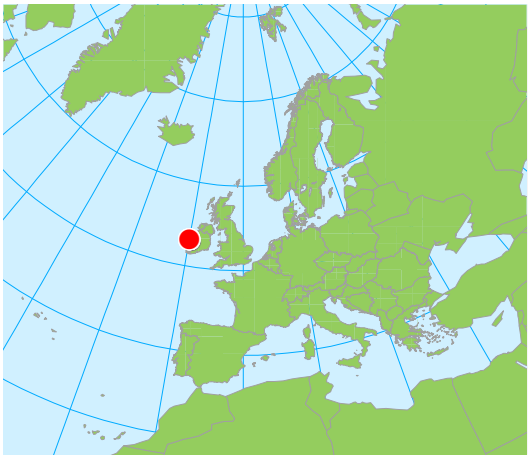
Available database and website:

The results of the BIOMAR survey are available on CD; http://www.ecoserve.ie/projects/biomar.

Commitment and ongoing research:

There is ongoing marine biodiversity research in Kilkieran Bay linked with the development of management plans for the SAC. There is a requirement by the National Parks and Wildlife Service to undertake some biodiversity monitoring as part of the SAC designation.

KILLARY HARBOUR, CO. GALWAY	Ireland	Conservation status ☆	



Entrance to Killary Harbour Photo: Damian Allen

Co-ordinates: 53° 37.53'N, 09° 52.47'W

Description of site:

Killary Harbour on the border of Co. Galway and Co. Mayo is Irelands only fjord. It is a narrow inlet extending approximately 15 km inland. At the entrance the seabed is 42 m shallowing towards the head of the bay.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are well documented mostly through surveys conducted in connection with the aquaculture developments in the area and through prior work completed by the National University of Ireland, Galway.

Human impact:

The area is subjected to high levels of aquaculture particularly mussel (*Mytilus edulis*) in the middle bay with salmon farming in the outer bay. The area is not heavily populated and fishing pressures are generally low.

Facilities:

Facilities for marine biodiversity research are available from the National University of Ireland, Galway which is within a few hours drive.

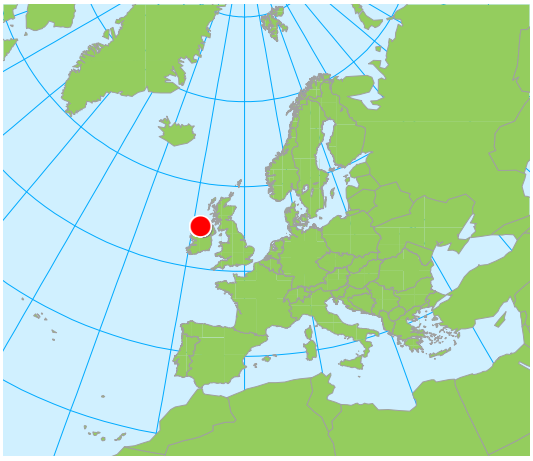
Available database and website:

No database or websites are known although many paper have been published on the marine biodiversity.

Commitment and ongoing research:

No commitment or ongoing research is known.

MULROY BAY, CO. DONEGAL	Ireland	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 55° 13.92'N, 07° 46.59'W

Mulroy Bay is sheltered with areas of strong tidal streams and is suitable for salmon farming. Photo Chris Emblow

Description of site:

Mulroy Bay is a highly convoluted and sheltered inlet in Co. Donegal in the north-west of Ireland. It is divided into three distinct areas by the presence of three significant narrows, thereby protecting the inner reaches from storm surge. The currents in the area can reach 3-5 knots on spring tides and the tidal regime in Mulroy Bay is affected by the narrows, which delays the times of high and low water and reduces the tidal amplitude.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are well documented from surveys carried out during the BIOMAR project and current mapping surveys to develop management plans for the marine SAC. Particular habitats and species in Mulroy Bay have been the subject of past and present studies associated with aquaculture developments and fisheries interests in the bay. The range of habitats provide for a rich and varied fauna and flora

Human impact:

The area is subjected to moderate pressures from salmon aquaculture within the bay and in the past by the scallop *Pecten maximus* fishery. The area is not heavily populated and pollution from land sources can be considered to be minimal.

Facilities:

Facilities for biodiversity research are not available on site however the area is within easy access to several universities in Ireland (less than 4 hours drive).

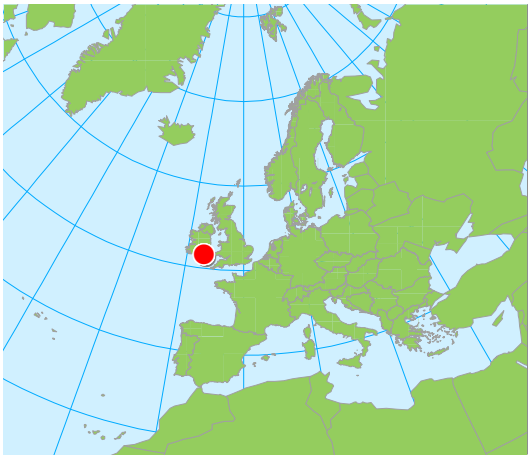
Available database and website:

The results of the BIOMAR survey are available on CD; http://www.ecoserve.ie/projects/biomar.

Commitment and ongoing research:

There is ongoing marine biodiversity research in Mulroy Bay linked with the development of management plans for the SAC and aquaculture development. There is a requirement by the National Parks and Wildlife Service to undertake some biodiversity monitoring as part of the SAC designation.

SALTEE ISLANDS AND THEIR ENVIRONS, CO. WEXFORD	Ireland	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 52° 06.83'N, 006° 36.84'W

The west side of the Great Saltee. Photo: Damian Allen

Description of site:

The Saltee Islands and their environs (Great Saltee, Little Saltee and many small islets and rocks) lie approximately 5 km south of the Co. Wexford coastline in south east Ireland. Great Saltee is approximately 89 ha and Little Saltee 40 ha. The area is subject to high tidal streams and wave action.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora are well documented from surveys carried out during the BIOMAR project and current mapping surveys to develop management plans for the marine SAC. Particular habitats and species in area have been the subject of past and present studies associated with fisheries interests. There are a number of species present that are either rare in Ireland or that have a very limited distribution in Ireland and in Britain.

Human impact:

The area is subjected to low levels of human activity. The islands are uninhabited although temporarily populated with bird researchers during periods of the year. Fisheries activities around the islands are restricted to potting for crab and lobster although the port of Kilmore Quay provides for larger offshore fishing vessels.

Facilities:

Facilities for biodiversity research are not available on site however the area is within easy access to most of the major universities in Ireland (less than 3 hours drive from Dublin).

Available database and website:

The results of the BIOMAR survey are available on CD; http://www.ecoserve.ie/projects/biomar.

Commitment and ongoing research:

There is some ongoing marine biodiversity research around the Saltee Island linked with the development of management plans for the SAC and aquaculture development. There is a requirement by the National Parks and Wildlife Service to undertake some biodiversity monitoring as part of the SAC designation.

SHIQMONA VERMETID REEF	Israel	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 32º49'6N, 34º57'1E

General view of the exposed reef. Photo B Galil

Description of site:

The littoral and infralittoral biota of the Levant is undergoing a profound change due to the influx that have entered the Mediterranean through the Suez Canal and have modified the composition and structure of the biota. If global warming were to affect the Mediterranean sea-water temperature, then thermophilic invasive species would gain a distinct advantage over the native fauna. The infralittoral biota of Shiqmona serves as a sentinel for those changes. The 1500 m long vermetid platform consists of rimmed limestone ledges covered by dense aggregations of gregarious, reef-building, sessile, endemic snails.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

The importance of the reefs lies in the richness of life they sustain, in their rarity, and in the physical protection from erosion they provide the shoreline. The flora, as well as the fish, molluscs, and decapod and amphipod crustaceans are well documented.

Human impact:

The site is pristine with respect to both anthropogenic and natural stresses, relative to the conditions dominant in the region, and the Nature Reserve is not inhabited. However, it is situated south of the town of Haifa, population 270,500. Offshore limited purse-seine fishing occurs seasonally.

Facilities:

All facilities for marine biodiversity research are available, including seagoing research vessels, fully equipped laboratories and a library, at the adjacent National Institute of Oceanography, Israel Oceanographic and Limnological Research.

Available database and website:

The current species inventory is available from the Israel Nature and Parks Authority.

Commitment and ongoing research:

The Israel Nature and Parks Authority undertook an inventory of the biota as part of the process of declaration of the site as a nature reserve. The adjacent National Institute of Oceanography, Israel Oceanographic and Limnological Research undertakes biodiversity-related research in the area.

OTRANTO – S.MARIA DI LEUCA, APULIA, MEDITERRANEAN SEA	Italy	Conservation status ☆ ★ ★ ★	

Co-ordinates: 40°08'N', 18°30'E

Otranto, a view of the coast. Photo P Bolognini

Description of site:

The coast comprises about 60 km of steep rocky shores, long stretches of which are completely pristine. The currents of the strait of Otranto provide a rich nutrient input, so that the hard sessile benthos is particularly rich, with formations that have no comparison in temperate areas.

Description of fauna and flora:

The fauna and flora are well documented, and have been researched for fifteen years. The coast is listed in a law that identifies locations for the institution of Marine Protected Areas.

Human impact:

The area is not subjected to evident sources of pollution. The few existing villages are small and traditional, with almost no sign of the illegal buildings. Trawlers on soft bottoms operate three miles away from the coast. Artisanal fishing by trammel-net, long-lines and lobster traps also occurs.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds		X	

Facilities:

The Marine Biology and Zoology Laboratory of the University of Lecce offers all kind of facilities: a diving centre, a research boat, fully equipped laboratories, and dormatories available for visiting researchers.

Available database and website:

A CD-ROM created to facilitate an underwater visual census has pictures and descriptions of the species of the Porto Cesareo area. A detailed list for hydroids, polychaetes, fishes and molluscs is available.

Commitment and ongoing research:

The Laboratory of Zoology of Lecce University undertakes biodiversity-related research in this area. The coast has also been studied during a two-years EU funded INTERREG project aimed at identifying pristine areas for the institution of Marine Protected Areas in the Salento Peninsula, highlighting the high environmental quality of this coast and the pattern of distribution of benthic organisms and fish.

PORTO CESAREO, APULIA, MEDITERRANEAN SEA	Italy	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 40°13'N,17°55'E

Porto Cesareo; a view of the coast line. Photo P Bolognini

Description of site:

Porto Cesareo, on the Ionian coast of the Mediterranean Sea, has a surface of about 1,800 hectares comprising very different habitats from rocky shores to salt marshes, with assemblages of particular interest. It has been a Marine Protected Area since 1997.

Description of fauna and flora:

The Marine Biology Station of Porto Cesareo was founded forty years ago. The fauna, flora, morphology and geology of the shore are very well documented, and a detailed cartography of the area is also available.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Human impact:

No sources of pollution have been detected, either industrial or of agricultural origin. Artisanal fishing by trammel-net is prevalent and date-mussel fisheries are also widespread. This illegal fishery has devastating impact on sublittoral benthos and has been thoroughly studied in the last ten years.

Facilities:

The Marine Biology and Zoology Laboratory of the University of Lecce, and the Marine Biology Station of Porto Cesareo offer all kinds of facilities: a diving center, a research boat, equipped laboratories and dormatories that are available for visiting researchers.

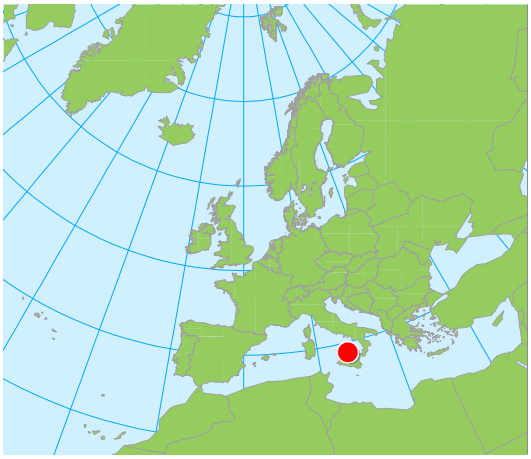
Available database and website:

A CD-ROM on the benthic species collected in that area is available. It was created to facilitate an underwater visual census with pictures and descriptions of about 250 species.

Commitment and ongoing research:

The Laboratory of Zoology of the Lecce University and the Istituto Talassografico di Taranto of the National Research Council carry out several research programs along this stretch of coast. Recently, this Marine Protected Area is under investigation in the framework of a two-year EU funded project (AFRODITE) aimed at studying the Italian marine reserves and their effectiveness.

USTICA ISLAND, SICILY	Italy	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 38º42'N,13º43'E

Panorama of Ustica Island.

Description of site:

Ustica is a volcanic island of about 8 km^2 situated 36 nautical miles off the NW Sicilian coast. The water is highly transparent (Secchi Disk range: 20-40 m) and oligotrophic. There are no river discharges nor agricultural runoff affecting the quality of coastal water.

Description of fauna and flora:

Thus far the known marine biota consists of 783 species of Macrozoobenthos, 395 Seaweeds and 2 Seagrasses. This includes several endemic species (e.g. *Nereis usticensis*, Polychaeta) along with a number of threatened species protected by both Italian and European laws. In addition, several thermophilic species currently expanding northward in the Mediterranean have settled on the Island.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds	X		

Human impact:

Sewage produced by the 1,330 resident population plus that produced by about 15,000 summer visitors is treated *in situ* in a primary treatment plant and discharged to the sea. Garbage on land is 100% sorted and transported to Palermo. There is a management plan for a fishery fleet of 7 licensed local boats; only traditional artisanal selective fishing is allowed.

Facilities:

The Island is accessible by boat from Palermo, Naples and Trapani. A marine research Laboratory managed by the University of Palermo and the MPA management office is available on the Island, including housing for up to 6-7 people within the laboratory building. Several diving centres on the island provide hyperbaric chamber and compressor facilities.

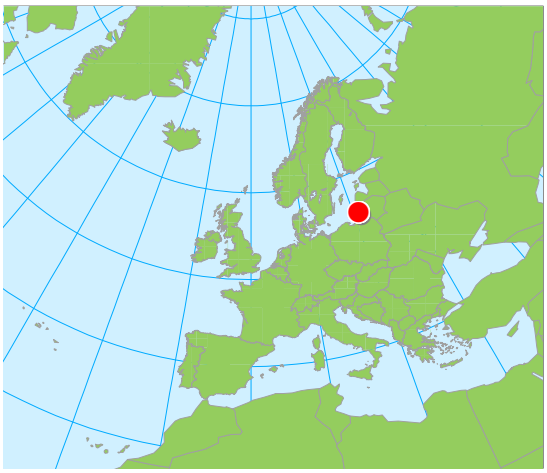
Available database and website:

Currently there are no marine biodiversity on-line databases available on the site. The Italian Ministry for the Environment's website offers some information on the Marine Reserve (http://www.parks.it/riserva.marina.isola.ustica/index.html).

Commitment and ongoing research:

Several Italian research institutions (University of Palermo, IRMA-CNR, ICRAM) are currently undertaking marine biodiversity research in the area. Funding for this research is provided by the Italian Ministry of Environment via the MPA management office.

CURONIAN LAGOON, SOUTH-EASTERN BALTIC SEA	Lithuania	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 55°25'N, 21°07'E

The shore of the lagoon. Photo L Grinius

Description of site:

The Curonian lagoon is a large shallow coastal water body between Lithuania and Russia. It is separated from the Sea by the 94 km long Curonian Spit. The narrow northern part of the Lagoon is exposed to irregular and rapid salinity fluctuations from 0.5 to 7.5 PSU due to sea water inflows, while the rest of the Lagoon is freshwater, being under strong influence of the river Nemunas.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	
Sublittoral	X	X	
Seagrass beds			

Description of fauna and flora:

There are 849 phytoplankton, approx. 130 macrophyte, ca. 90 macrofauna and 53 fish species recorded in the Lagoon. Most of them are of freshwater origin; while the euryhaline brackish water species occur close to the outlet to the sea (within approximately 30-40 km). Large reed stands and macrophyte (e.g. *Potamogeton*) meadows form high habitat diversity. There are 19 introduced species, most of them of Ponto-Caspian origin.

Human impact:

The lagoon is a highly eutrophied water body, both for natural reasons and due to heavy nutrient input (mainly agricultural pollution). It is a rapidly developing tourist region with intensive coastal fishery. There are two protected areas covering the large part of the Lagoon: the Curonian Spit National Park (extending also in the Russian part) and the Nemunas Delta Regional Park. The Lithuanian part of the Lagoon is nominated a candidate to the NATURA 2000 list.

Facilities:

All scientific facilities for marine biodiversity research are available at the Coastal Research and Planning Institute, Klaipeda University (CORPI), Centre of Marine Research (CMR) and Fishery Research Laboratory in Klaipeda. The Institute of Ecology (Vilnius) holds a field laboratory in the vicinity of the Nemunas Delta.

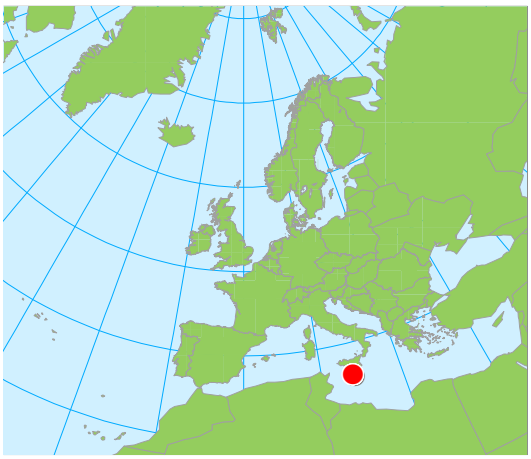
Available database and website:

The lagoon is studied since the beginning of the 1900s. The databases containing inventories of biota, benthic habitats, hydrochemical, hydrophysical and geological information are available from the CMR, CORPI, the Institute of Ecology, the Institute of Geology and Geography.

Commitment and ongoing research:

The Curonian Lagoon is a traditional research site for academic and environmental control institutions of Lithuania. CORPI conducts biodiversity and ecosystem research; CMR performs monitoring of phytoplankton, macrophytes, macrofauna and basic abiotic parameters.

RDUM MAJJIESA	Malta	Conservation status ☆ ★ ★ ★	



Co-ordinates: 35°56'N, 14°20'E

Il-Karraba promontory with Ghajn Tuffieha Bay in the foreground and Gnejna Bay in the background. Photo P J Schembri

Description of site:

The Rdum Majjiesa area, from Ras il-Wahx to Ras ir-Raheb, on the western coast of the island of Malta, extends along approximately 11km of N-S trending coastline with sea cliffs, rocky and sandy shores, boulder fields, shallow bays and rocky shoals; the outer boundary is the 50m depth contour and the whole area covers 4.75km² of seabed.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds	X		

Description of fauna and flora:

Littoral biotopes include sandy and cobble beaches, boulder screes, sheer cliffs and cliffs with surrounding boulder screes. Sublittoral biotopes include: bare sandy bottoms, rock with photophilic algae, seagrass (*Cymodocea* and *Posidonia*) meadows, sciaphilic assemblages on rock, caves, and maerl.

Human impact:

This region is being considered as a potential marine protected area as it supports a representative selection of all major biotopes occurring around the Maltese Islands and is minimally impacted apart from the sandy beaches which are used for bathing and water sports.

Facilities:

The University of Malta is located some 15km from the site.

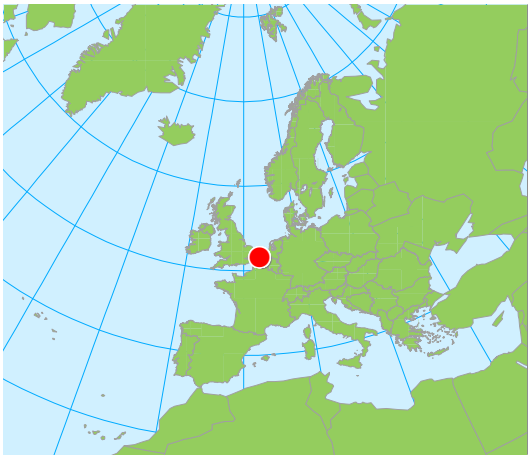
Available database and website:

No information at present.

Commitment and ongoing research:

The area is proposed as a marine protected area and the subject of an extensive habitat survey funded by the United Nations Environment Programme's Mediterranean Action Plan (UNEP/MAP) as part of its Coastal Area Management Programme For Malta (CAMP Malta); a management plan is currently being prepared.

OOSTERSCHELDE	Netherlands	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 51° 35.5'N, 3° 56'E

Vast soft-sediment tidal flats in Oosterschelde. Photo NIOO-CEME

Description of site:

The national reserve Oosterschelde (South-west Netherlands) is a 40 km long sea-arm with a maximum depth of 40 m and constant salinity of 29 to 30 ppt. It is a former estuary, detached from its river input since 1987, and protected form the sea by a moveable barrier that allows input of seawater. Only in the case of storm-surges will it be closed.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The fauna and flora, typical for shallow coastal seas and estuaries, are well documented, and have been studied since 1959 when the NIOO-CEME started to monitor the consequences of the construction of a series of strengthened dikes and barriers in SW Netherlands (the Delta project to protect against storm surges).

Human impact:

Since the area is detached from its riverine input it has a low level of pollution. The (small) cities and villages near the Oosterschelde (in total less than 100,000 inhabitants) have a strict treatment of municipal wastes. Strong activities of shellfish (mainly blue mussel) culture (on the soft sediment) are employed in the area.

Facilities:

All facilities for marine biodiversity research are available: a seagoing research vessel, fully equipped laboratories, and sophisticated experimental facilities such as mesocosms and a flume tank.

Available database and website:

Species inventories and information on environmental factors are available in different databases, the most extensive on zoomacrobenthos in the BIS (Benthos Information System) database at NIOO-CEME (http://www.nioo.knaw.nl), and on abiotic factors at RWS-RIKZ (http://www.waterbase.nl).

Commitment and ongoing research:

The Centre for Estuarine and Marine Ecology of the Netherlands Institute of Ecology (NIOO-CEME), based in Yerseke, has ongoing research in the Oosterschelde regarding several ecological topics, including biodiversity. It is funded by the Royal Netherlands Academy of Arts and Sciences, and able to commit itself to long-term research on European marine biodiversity issues.

INNER OSLOFJORD	Norway	Conservation status ☆	

Co-ordinates: 59°50'N, 10°40'E

Oslofjorden from Ekeberg. Photo B Faafeng

Description of site:

Inner Oslofjord, situated in the southeastern part of Norway right outside Oslo, is a long, narrow basin (maximum depth 164 m). Due to limited water exchange and great depths, the fjord is vulnerable to nutrient loading.

Description of fauna and flora:

The flora and fauna are well documented, starting in 1865 with the work of G.O.Sars. The first monitoring programme was launched by NIVA (Norwegian Water Research Institute) in 1962.

Human impact:

Due to pollution from the city's sewage there is moderate levels of pollution. Removal of phosphorus and nitrogen has resulted in a slow recovery of the fjord. High concentrations of micropollutants in the sediments are found in the Oslo harbour basin.

Habitats present:

	Mud	Sand	Rock
Littoral	X		X
Sublittoral	X		X
Seagrass beds	X		

Facilities:

Marine biodiversity research can be done at several fully equipped laboratories. Research vessel are available.

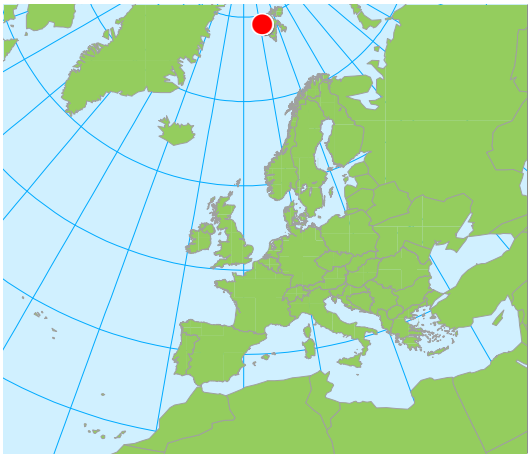
Available database and website:

Databases containing lists of flora and fauna are available at several research institutes and the have all their own websites.

Commitment and ongoing research:

NIVA and Department of Biology, University of Oslo located in Oslo, and Institute of Marine Research located in Bergen, are doing biodiversity research in Inner Oslofjord.

KONGSFJORDEN, SPITSBERGEN ISLAND, SVALBARD ARCHIPELAGO	Norway	Conservation status ☆ ★	



Co-ordinates: 78° 55' N, 11° 56' E

The inner part of Kongsfjorden, Svalbard, viewed from the settlement of Ny Ålesund. Photo Steinar Midtskogen

Description of site:

Kongsfjorden is located on the north-west coast of Svalbard. At the head of the fjord is an active tidal glacier that causes marked environmental gradients in salinity, temperature and sedimentation rates, as well as bottom sediment composition. Kongsfjorden represents a border area between Atlantic and Arctic biogeographical zones. There is a wide range of habitats in the area and the bottom is very heterogenous, ranging from muds to boulders and rock substrates. Glacial deposits and drop-stones further increase habitat diversity.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Description of fauna and flora:

Above water, Kongsfjorden appears truly Arctic, with winter ice-cover in parts and resident populations of various ice-dependent marine mammals (seals, walrus and polar bears) and Arctic birds. However, because the water column is strongly influenced by Atlantic water masses, the benthic macrofauna contains a greater proportion of Atlantic than Arctic taxa.

Human impact:

The only settlement in Kongsfjorden is Ny Ålesund, which has an average of 40 residents. Coal mining was carried out there until 1962. Since then, the settlement has become a research facility. Rigorous waste management is carried out.

Facilities:

Kongsfjorden is accessible all year round by plane from Longyearbyen or by boat. There are fully equipped research facilities, run by Kings Bay AS, including laboratories, accommodation and catering.

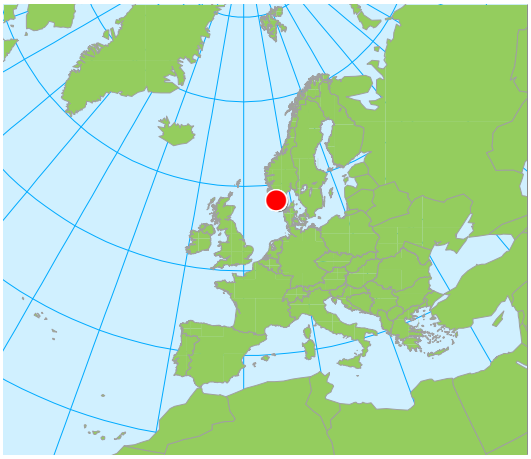
Available database and website:

Norwegian data are stored by the University Courses on Svalbard, the University of Tromsø, the Norwegian Polar Institute and the Norwegian Institute for Nature Research (NINA) and Akvaplan-niva. Databases also exist internationally (including Germany, Poland, UK and Russia).

Commitment and ongoing research:

A wide range of European institutes conduct biodiversity research on Kongsfjorden. An agreed science plan exists between Norwegian and Polish institutes.

LISTA COAST	Norway	Conservation status	



Co-ordinates: 58º00'N, 6º30'-7º00'E

Kelp forest (*Laminaria hyperborea*). Photo NIVA

Description of site:

The coastal area is mostly open, characterised by rocky headlands and sandy beaches. Subtidal sediments in fjords and off-shore habitats vary from sand and coralline sand to sand-mixed mud and fine mud. The site is located in a transition zone between the biogeographical sub-provinces of the Skagerrak and the North Sea.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

Situated at the border of two sub-provinces and sustained by upwelling events, the area has a higher biodiversity than nearby sites. Fucoids and kelp (*Laminaria* spp.) dominate the rocky shores.

Human impact:

There are no large settlements or industrial plants discharging wastewater in the area except for a few fjords receiving moderate to small levels of pollution from local industries. With less strong coastal currents, eddies and upwelling of Atlantic water the area is pristine relative to the North Sea environment.

Facilities:

There are no field stations in the area but several smaller laboratories and research units are available within acceptable travelling distance. The most important units are NIVA and IMR.

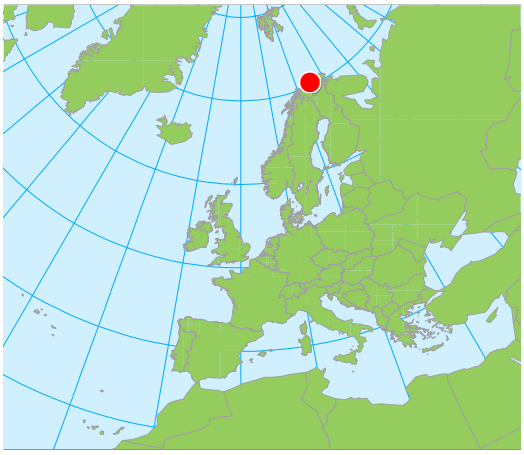
Available database and website:

All the main research organisations have their own websites, and species inventories (benthic invertebrates, benthic macroalgae, phytoplankton, zooplankton) are available from several off-line databases.

Commitment and ongoing research:

The Norwegian Coastal Monitoring Programme managed by Norwegian Institute for Water Research (NIVA) with annual sampling on hard and soft bottom, is the most important long-term biodiversity-related research in the region.

NORTH NORWEGIAN REFERENCE STATIONS	Norway	Conservation status ☆ ★	



Co-ordinates: 70° 10' N, 21°29' E; 70° 52' N, 25°31'E; 70° 03' N, 29°04'E

Typical north-Norwegian coast; Porsanger, Finnmark. Photo R. Palerud

Description of site:

Three representative northern Norwegian fjords are located in Troms and Finnmark counties. The innermost parts are relatively sheltered, but the outer parts are exposed to open sea. Water temperatures vary from 1-12 ° C.

Description of fauna and flora:

Present studies focus on soft bottom macrobenthos (400 taxa recorded) and ecological changes along depth gradients. There are marked similarities across fjords at similar depths.

Human impact:

The sites are not subject to local or regional anthropogenic impact.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds			

Facilities:

Small-scale facilities and boats are available locally. The nearest University facilities are at Tromsø, between 3-7 hours drive away, depending on location.

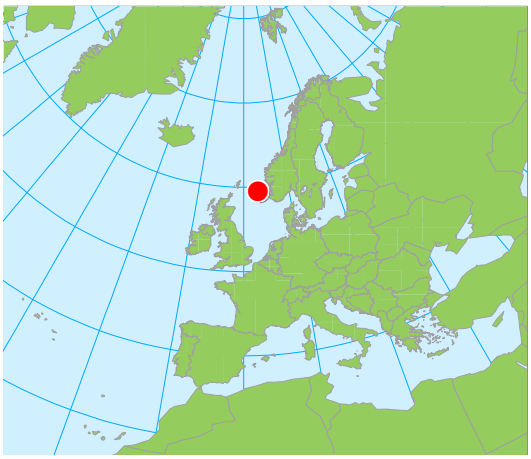
Available database and website:

The soft-bottom macrofaunal database is available at Akvaplan-niva, Polar Environmental Centre / County Governor of Troms.

Commitment and ongoing research:

Repeated monitoring of the reference sites is encouraged for future studies of biological and physical changes (including climate and anthropogenic impact). The existing database is used for biodiversity and ecological research and a publication is pending.

NORTHERN NORTH SEA/ NORWEGIAN SEA	Norway	Conservation status ☆	



Co-ordinates: 56-66.5°N, 1-9 °E

The "sea-mouse" *Aphrodita aculeata* found on soft sediments in the northern North Sea. Photo H P Mannvik

Description of site:

The study area is in open areas of the Norwegian part of the North Sea and the Norwegian Sea. Depths vary between 60-400m and bottom sediments vary from silts to coarse sand. Northern areas contain moraine and drop-stones.

Description of fauna and flora:

The typically sand/mud dwelling bottom fauna has been extensively monitored since the late 1970s, but earlier records exist for fisheries and benthos. Coral reefs are found in the northern areas.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X	X	X
Seagrass beds			

Human impact:

Parts of the area are subjected to low to moderate levels of local impact from oil and gas extraction and also bottom trawling.

Facilities:

Sea-going vessels with rudimentary laboratory facilities or fully equipped research vessels may be chartered from various shipping companies or Norwegian universities.

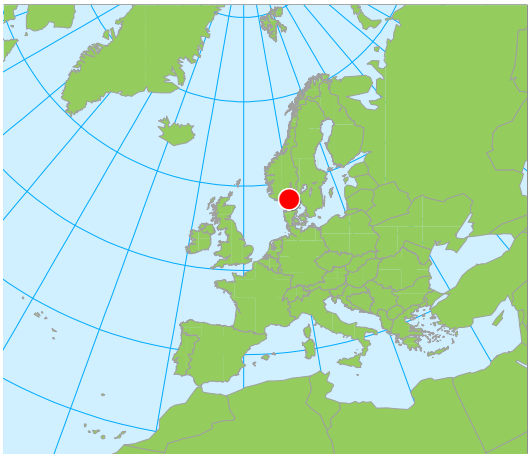
Available database and website:

The data are stored in a national database administered by the Norwegian oil and gas authorities (OLF). This data is available to researchers. Participating consultancy agencies keep their own databases.

Commitment and ongoing research:

There is an established national programme of biodiversity monitoring, which is carried out in each area at 3 year intervals. Nationally, approximately 500 stations are sampled annually by various consultancies. Accredited biodiversity monitoring is carried out by Akvaplan-niva and Det Norske Veritas, also Rogaland Research and Unifob.

NORWEGIAN SKAGERRAK COAST, SOUTH NORWAY	Norway	Conservation status ☆	



Co-ordinates: 58º10'-58º30'N, 8º15-9º15'E

Dasya baillouviana. Photo F E Moy, NIVA

Description of site:

The coastal area is characterised by islands, fjords and sounds. The dominant habitats are hard-bottoms from intertidal to shallow subtidal and muddy soft-bottoms in fjords and off-shore areas. Scattered intertidal soft-bottoms and sandy beaches are found in locally protected areas.

Description of fauna and flora:

Long periods with water temperature above 10°C and yearly amplitude of 15-20°C (summer-winter) together with low surface salinity control the abundance of shallow water species. Fucoids dominate the rocky shores.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds		X	

Human impact:

The area is subjected to moderate to small levels of pollution from local cities, industries and diffuse long-range pollution from the Skagerrak/North Sea. The area is representative of natural conditions in the Skagerrak region.

Facilities:

There are several small laboratories and research units in the area. They are well equipped for sampling, sample sorting and species identification and offer facilities for working with living specimens. The most important units are NIVA and IMR.

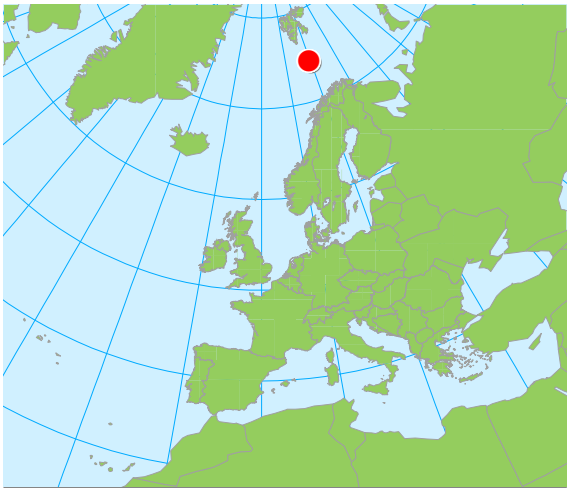
Available database and website:

All the main research organisations have their own web-site, and species inventories (benthic invertebrates, benthic macroalgae, phytoplankton, zooplankton, fish) are available in several off-line databases.

Commitment and ongoing research:

The Norwegian Coastal Monitoring Programme managed by Norwegian Institute for Water Research (NIVA) and the Oceanographic Monitoring Programme of Skagerrak managed by Institute for Marine Research (IMR), are the most important long-term activities, with option for participation, in the region.

SOUTH-CAPE TO NORTH-CAPE TRANSECT, SVALBARD TO MAINLAND NORWAY	Norway	Conservation status ☆ ★	



Co-ordinates: 76.5°N, 18°E to 71º 10'N

Bjørnøya (Bear Island) . Photo Bjørn Gulliksen

Description of site:

The transect runs from the southern tip of Svalbard (Sørkapp) to the northernmost point of mainland Norway (Nordkapp), traversing Bear Island, which has conservation status. The transect covers the tidal zone to more than 400 m.

Description of fauna and flora:

The most common biotopes found in the Barents Sea are represented (soft bottom to rock). The dominant water masses are Atlantic, with Arctic water input to the north.

Human impact:

There are no direct human inputs to the area, but bottom trawling is carried out in some places.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds			

Facilities:

Research vessels and laboratories are available from the University of Tromsø and the University Courses on Svalbard (UNIS). Benthic laboratories are also available at Akvaplan-niva, Polar Environmental Centre.

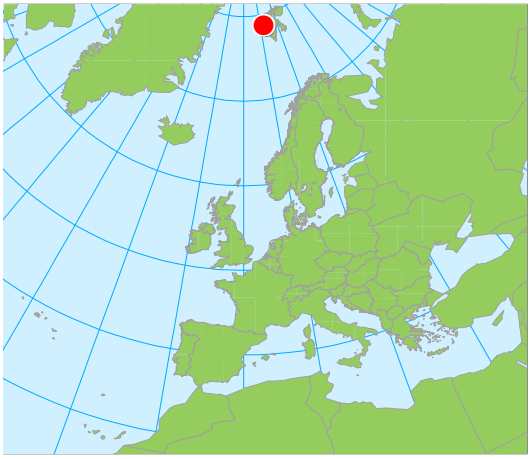
Available database:

Biodiversity data are available from the University of Tromsø, UNIS, Akvaplan-niva (including Russian data), Norwegian Institute for Fisheries Research, the Norwegian Institute for Nature Research (NINA) and the Norwegian Polar Institute (NP).

Commitment and ongoing research:

Benthic programmes are carried out by the University of Tromsø, UNIS, Akvaplan-niva and the Norwegian Institute for Fisheries Research. NINA and NP focus on seabirds and marine mammals. The recent conservation status of Bear Island will lead to a fixed biodiversity monitoring programme there.

SVALBARD FJORDS	Norway	Conservation status ☆ ★	



Co-ordinates: 77-81ºN, 10-21°E

Kong Karls Land, West Svalbard. Photo Jos Kögeler

Description of site:

Most fjords around the Svalbard archipelago have actively calving or retreating glaciers, causing strong environmental gradients in salinity, temperature and sedimentation. Arctic water influence is greatest in northern and eastern areas; Atlantic water dominates western fjords.

Description of fauna and flora:

Svalbard fauna and flora are well documented from some fjords, but for others little or no data are available.

Human impact:

Generally, there is little human impact on Svalbard. Five coal mining settlements exist and fisheries are carried out around the archipelago. Ship traffic is mainly for coal export, provisions and tourist cruises.

Facilities:

Research facilities and accommodation are available in Longyearbyen and Kongsfjorden. Working vessels can be chartered locally and a research boat from the University of Tromsø.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

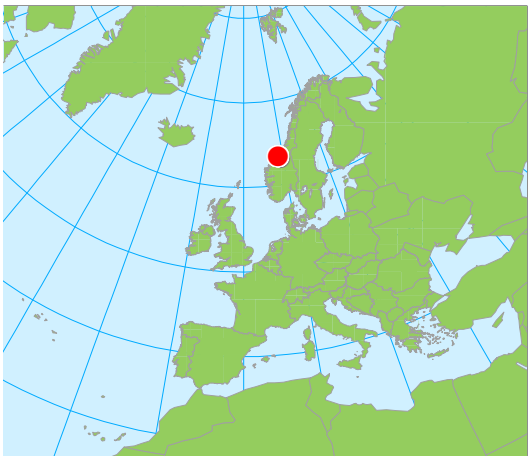
Available database and website:

A database of Svalbard fauna and flora is maintained in cooperation between UNIS, the University of Tromsø and Akvaplan-niva.

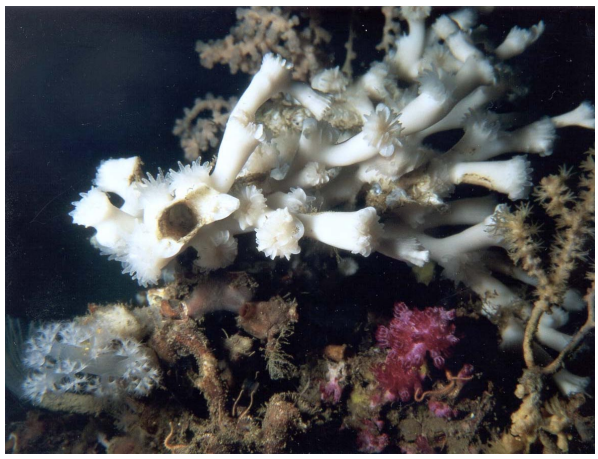
Commitment and ongoing research:

The University Courses on Svalbard (UNIS) and the University of Tromsø have an established and on-going marine research and monitoring programme around the Svalbard archipelago (including plankton, benthos and fish). On-going research on marine mammals and birds is carried out by the Norwegian Polar Institute and the Norwegian Institute for Nature Research (NINA), respectively.

TRONDHEIMSFJORD	Norway	Conservation status ☆ ★	



Co-ordinates: 63°18'N – 64°07'N, 9°45'E – 11°29'E



Lophelia reefs are common at several locations in the Trondheimsfjord, as shallow as 39m. Photo HT Rapp

Description of site:
The Trondheimsfjord situated in Mid-Norway, is 130 km long, having three sills with deep-water basins in between. Mean salinity is about 34psu and bottom temperature 7°C. Soft and hard bottoms, as well as estuaries are present.

Description of fauna and flora:

The fauna and flora are well documented and have been researched since 1760. The deep-water corals with associated fauna are especially conspicuous.

Human impact:
The area is subject to a low level of pollution from the area bordering the fjord, especially from Trondheim (pop.170,000), but the deeper parts of the fjord are little influenced. Commercial trawling and salmon farms are kept to a minimum.

Habitats present:

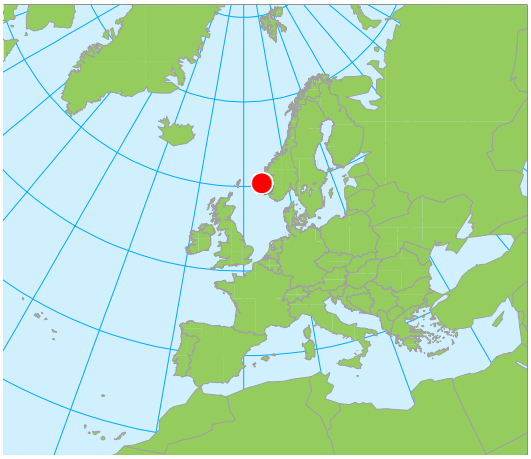
	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Facilities:
All facilities for marine biodiversity research are available, from research vessel, fully equipped laboratories, indoor and outdoor basins, and a University Library.

Available database and website:
The Museum has an inventory of its collections, a long time (> 30 years) series of hydrographic data, and a literature database. The biological station has its own website.

Commitment and ongoing research:
The Trondhjem Biological station and Institute of Natural History at the Norwegian University of Science and Technology undertake biodiversity-related research in the area. Future activity will be concentrated on projects using ROV techniques both for in situ video studies and also using technical installations.

FJORDS IN WESTERN NORWAY	Norway	Conservation status ☆ ★	



Co-ordinates: 59-62°N, 5-7°E

Sørfjorden, Hardanger. Photo B Faafeng

Description of site:

Several fjords at the Western Coast of Norway like Hardangerfjorden, Sognefjorden and others are long, deep fjords with shallow mouths and deep basins inside. Exchange of water is normally only possible within the top water layers.

Description of fauna and flora:

The flora and fauna have been investigated in several of the fjords, but there are no ongoing continuous programs for monitoring of the biota.

Human impact:

Most of the fjords are hardly exposed to pollution from human activities. However, the freshwater run-off is regulated through power plant developments.

Habitats present:

	Mud	Sand	Rock
Littoral			X
Sublittoral	X		X
Seagrass beds			

Facilities:

In Bergen there are fully equipped laboratories for marine biodiversity research. Several seagoing research vessels are available.

Available database and website:

Databases containing lists of flora and fauna are available at several research institutes. They all have their own websites.

Commitment and ongoing research:

The Institute of Marine Research, University of Bergen and NIVA (Norwegian Water Research Institute) located in Bergen and Sogn og Fjordane University College (HSF) located in Sogndal are conducting biodiversity research in some of the fjords in Western Norway.

VISTULA LAGOON, SOUTHERN BALTIC SEA	Poland	Conservation status ☆ ★ ★ ★	

Co-ordinates: 54°42'N, 19°10'E

Description of site:

Vistula Lagoon, southern Baltic Sea, Poland, is a brackish-water (salinity 1-5) shallow lagoon (average depth 2.4 m, maximum depth 4.4 m, area 828km^2) between Poland and Russia. The lagoon is enclosed by Vistula Split from the north and connected with the Gulf of Gdansk by the narrow Pilawa Passage

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	
Sublittoral	X		
Seagrass beds			

Description of fauna and flora:

Biodiversity is low, the fauna and flora comprise freshwater, brackish and marine species including some endogenous species from the PantoCaspian Region.

Human impact:

The area is subjected to moderate levels of pollution mainly urban and agricultural. The lagoon is a tourist region with a well-developed coastal fishery.

Facilities:

All scientific facilities for marine biodiversity research are available at the Hel Marine Station or at the Gorki Wschodnie Station that belong to the University of Gdask.

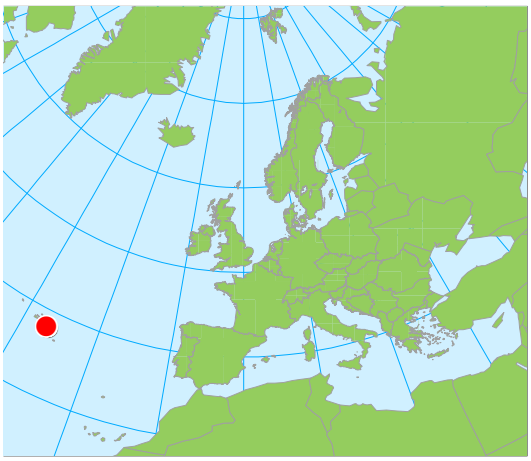
Available database and website:

The species inventory is currently rather sparse.

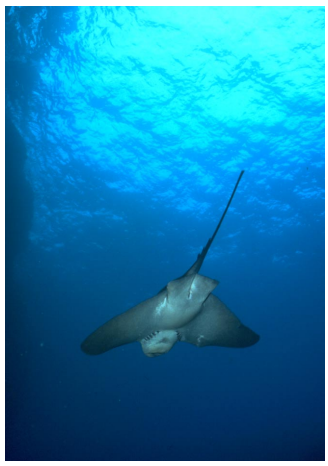
Commitment and ongoing research:

No research on marine biodiversity is currently ongoing in the area.

CABRAS AND FRADINHOS, TERCEIRA ISLAND, AZORES	Portugal	Conservation status ☆ ★ ★ ★	



Co-ordinates: 38º37'40''N, 27º08'44''W



Myliobatis aquila at a cave in Ilhéus das Cabras. Photo L Quinta *Imag*DOP

Description of site:

These are a group of islets on the South coast of Terceira island, 1 to 5 km away from the shore. Reef habitats support typical semi-offshore marine biodiversity. The site includes reefs, caves, boulder fields and sandy bottoms down to 120 m.

Description of fauna and flora:

Mobile organisms like nudibranchs (e.g. *Hypselodoris picta azorica* and *Glossodoris edmunsi*), crustaceans (e.g. *Scyllarides latus* and *Maja capensis*), fishes (e.g. *Anthias anthias*, *Diplodus sargus cadenati* and *Epinephelus marginatus*) and large pelagic fishes (e.g. *Sphyraena viridensis* and *Seriola* spp.) are present in the area. In the southern part of the western Ilhéu das Cabras there is a cave (locally known as "Gruta dos Ratões") with high densities of *Myliobatis aquila*.

Habitats present:

	Mud	Sand	Rock
Littoral			X
Sublittoral		X	X
Seagrass beds			

Human impact:

The area is not subjected to pollution. Artisanal fishing and tourism activities occur within the site.

Facilities:

There is one University Department that conducts research in the area, and that can serve as operational basis. Small vessels from several nearby harbours can easily access the area. The island is served by regular flights.

Available database and website:

http://www.horta.uac.pt/scubazores/Terceira/CabrasFradinhos.htm

Commitment and ongoing research:

The area is important for the conservation of birds and presents shallow bottoms that still hold communities subject to low fishing pressure. The University station in Terceira island houses a small marine biology team which has conducted research on fish communities and marine ecology in general. A few papers and reports dealing mainly with fish and seabirds have been published, resulting from the University research. Other papers deal with exploitation and conservation aspects.

CORVO ISLAND, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 39º42'N, 31º06'W

South view of Corvo Island. Photo: F Cardigos *Imag* DOP

Description of site:

Corvo is the smallest island of the archipelago (17km^2) and it holds only 400 inhabitants. It represents the best opportunity for Integrated Management at the community level. Coastal habitats and resources are considered to be the least altered and exploited by anthropogenic activities in the archipelago. The seabed around the island drops steeply to around 50-100m and then more gradually down to 500m approximately one nautical mile from the shore. Littoral and sublittoral rocky and sandy habitats are very diverse, including vast irregular lava flows, caves and small pinnacles close to shore.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

The bedrock reefs on the southeast coast are the richest areas for marine life around the island. Large gullies several metres wide and up to 20m deep lie perpendicular to the shore. The main biotope below 15m is characterised by *Zonaria tournefortii* with sponges on the overhangs and *Pinna rudis* growing out of the crevices. The fish fauna is very rich with large individuals of *Epinephelus marginatus* as well as an abundance of typical shore species such as *Sparisoma cretense*, *Phycis phycis*, *Muraena* spp., *Serranus atricauda*, *Scorpaena* spp., *Abudefduf luridus* and *Chromis limbata*.

Human impact:

There is little artisanal fishing pressure and negligible anthropogenic pollution inputs.

Facilities:

Research is to be supported by an Interpretation and Research Centre for the MPA (including small lab facilities and boat). The island is served by regular flights and has a small but operational harbour for small to medium-sized ships.

Available database and website:

http://www.horta.uac.pt/scubazores/Corvo/index.html

Commitment and ongoing research:

The Department of Oceanography and Fisheries of the University of the Azores is strongly committed to the development of marine research in Corvo Island. Several papers and reports dealing with algae, benthic invertebrates, fish, seabirds and cetaceans have been published or in preparation, resulting from the University expeditions during the last decade. Other papers deal with exploitation and conservation aspects.

LITORAL NORTE	Portugal	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 41°42'N, 8°50'W

Vila Praia de Âncora, Litoral Norte, Portugal

Description of site:

Litoral Norte is a 60 km streach of coast and adjacent sea that has been a Natura 2000 site since May of 2000. This coast includes three main estuaries (Minho, Lima and Cávado rivers), and has mostly a rocky bottom, with some sandy and muddy areas.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Description of fauna and flora:

The fauna and flora are still not very well documented, but there were some studies published in the XIX century and many others in the last century. Recently several projects have targeted the description of this site's biodiversity, so new information is been produced and published.

Human impact:

The area is subjected to relatively low levels of pollution from the city of Viana do Castelo and its port (pop. 60 000) and other small coastal towns and from some agricultural run-off. It is subject to fishing by traditional methods and the water can be turbid due to sediments coming from rivers and a very hydrodynamic environment.

Facilities:

Facilities for marine biodiversity research are available, mainly in the Centre for Marine and Environmental Research in Porto, where some groups of researchers do their work in this area.

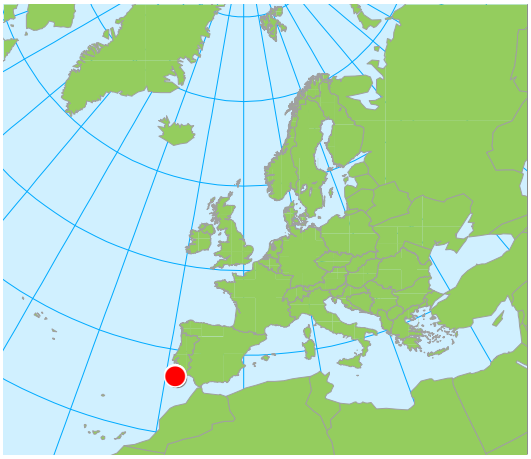
Available database and website:

There is no comprehensive species inventory but some species lists are available both in print format and on-line. Information on the existing data can be obtained from ispinto@cimar.org.

Commitment and ongoing research:

The Centre for Marine and Environmental Research, and the Departments of Botany, Zoology and Aquatic Sciences from the University of Porto, undertake biodiversity-related research in the area. The site is protected under the Habitats Directive, and contains also a National Protected Landscape Area. Here the characterisation of the main marine communities is underway to expand the protected area to include the adjacent 2.5 miles of coastal waters.

COSTA VICENTINA	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 37°00'N, 9°00'W

Rocky shores of the Costa Vicentina. Photo M Sprung

Description of site:

The Costa Vicentina marks the SW-part of the European mainland; it consists of steep rocky cliffs on a tidal coast with sandy beaches at more remote sites.

Description of fauna and flora:

The fauna and flora have been under investigation sporadically for certain taxa during recent years, particularly for the rocky shore line.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Human impact:

Due to its marginal position and its status of protection, human impact on the fauna and flora is limited to fishing and shellfish collection on the shore; sporadically touristic activity may have some impact (diving, beaches used for recreation and water sports) or possible oil spills from passing ships.

Facilities:

Facilities for marine biodiversity research on site are very limited. However, this part of the coast is only situated some 100 km away from the University of Algarve at Faro.

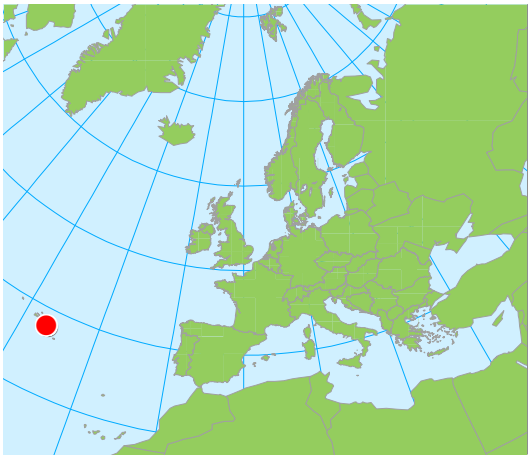
Available database and website:

There are no websites at present for biodiversity data available, but some reports and a photograhic compilation of the macrofauna.

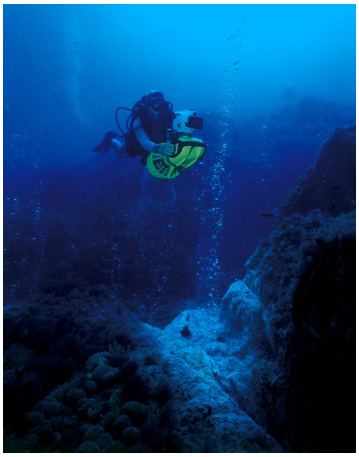
Commitment and ongoing research:

The Costa Vicentina is integrated into a Natural Park whose administration constitutes part of the Instituto da Conservação da Natureza (ICN). Projects on biodiversity on this part of the coast are executed by the Universities at Faro, Evora and Lisbon.

D. JOÃO DE CASTRO BANK, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 38º13'35''N, 26º36'33''W



Surveying the Bank by SCUBA.

Description of site:

This is one of the few known shallow-water hydrothermal vent fields in the world; an underwater volcano located 40 miles off the two main islands of the Azores (S. Miguel and Terceira). Sublittoral offshore rocky habitats include unique shallow (-13 and -40 m) and mid-water (-200 m) hydrothermal vents with bacterial mats. Sediment and boulders occur inside the crater (around 45 m) and around the volcanic apparatus. The slope and base of the bank includes deepwater habitats to depths below 1000 m.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

Conspicuous species of the area include *Mobula tarapacana*, large *Seriola* spp. and *Kyphosus* sp. specimens, and high density schools of *Sphyraena viridensis*. Benthic species include algae, such as *Codium elisabethae* (high densities around shallow vent areas), *Zonaria tourneforti* or *Sargassum* sp., and several invertebrate species.

Human impact:

Professional fishing is allowed in the area and is showing an increasing effect on some target species.

Facilities:

Research is supported by offshore vessel operations such as those of the University in previous years. The neighbouring islands of Terceira (45 nm to NW) and São Miguel (45 nm to SW) can serve as bases for operational structures, taking advantage of the University of the Azores and other facilities (harbour, nautical and diving clubs, harbour warehouses, etc.).

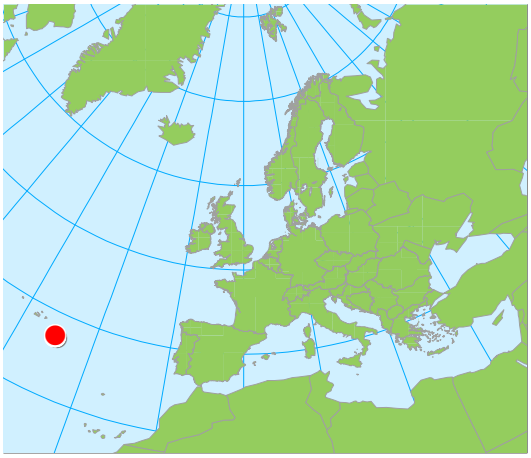
Available database and website:

http://www.horta.uac.pt/scubazores/D_Joao/index.html

Commitment and ongoing research:

There is a written expression of interest from the Department of Oceanography and Fisheries of the University of the Azores, with an outline of planned activities. Reports dealing with bacteria, algae, benthic invertebrate, fish and marine birds have been published or in preparation, resulting from the University expeditions during the last 4 years. Other papers deal with bio-geochemical aspects of the hydrothermal community.

FORMIGAS BANK, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 37º15' N, 24º 45'

Formigas islets. Photo J Fontes *Imag*DOP

Description of site:

This is an offshore seamount rising from abyssal depths to the surface, including a small set of islets. The shallow area (<200m deep) covers 3627.5 ha. And is located between Santa Maria and São Miguel islands, approx. 20 miles off the nearest one.

Habitats present:

	Mud	Sand	Rock
Littoral			X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

There are littoral and sublittoral offshore rocky habitats with unique *Cystoseira* beds in shallow highly irregular volcanic bedrock at the top of the bank. At around 60 meters there is the only registered laminarian occurrence in the Azores. The slope and base of the bank includes deepwater habitats to depths below 1700 m.

Human impact:

There is some exploitation by fishermen. Stronger conservation measures are being implemented to defend the biological communities of the area.

Facilities:

The site is only accessible by boat. Research is to supported by offshore vessel operations such as the ones carried out by the University in previous years.

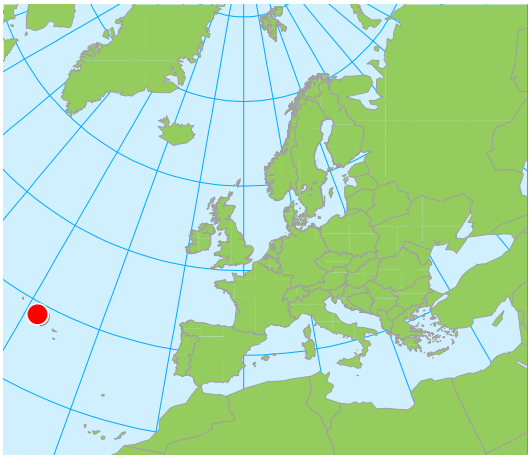
Available database and website:

http://www.horta.uac.pt/scubazores/Formigas/index.html

Commitment and ongoing research:

There is a strong commitment by the Department of Oceanography and Fisheries of the University of the Azores to the continuing study of this area. Several papers and reports dealing with algae, benthic invertebrate, fish and cetaceans have been published or in preparation, resulting from the University expeditions during the last decade. Other papers deal with exploitation and conservation aspects.

LAGES, PICO ISLAND, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 38º23'34"N, 28º15'26"W

Lages overview. Photo F Tempera *Imag*DOP

Description of site:

Located in Pico Island from the westernmost part of "Baía das Lajes do Pico" to "Ponta da Queimada, this is a flat sheltered platform closely linked to the deepwater environment, supporting a unique set of intertidal and subtidal habitats. The area contains a variety of intertidal and sublittoral rocky and sandy habitats including marshland, a large system of intertidal pools and gullies, large stretches of basaltic bedrock, boulder areas, and sandy bottoms. The sheltered bay is confined by the deep-water habitats typical of the steep south coast of Pico.

Habitats present:

	Mud	Sand	Rock
Littoral			X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

Algae species include *Enteromorpha linza*, *Ulva rigida*, *Chondracanthus acicularis*, *Chaetomorpha linum* and *Asparagopsis armata*. It is considered as one of the sites in the archipelago with a higher number of marine species.

Human impact:

The local population is campaigning for a protection against the sea waves during winter storms. This protection may have a strong impact on the pristiness of the area. Impact by local fishermen is low.

Facilities:

This site has a small harbour as well as some good local facilities. Lajes do Pico can take advantage of the proximity of the University facilities at Faial island. Pico island is served by regular flights and daily maritime connections with Faial island.

Available database and website:

http://www.horta.uac.pt/scubazores/Pico/lages.htm

Commitment and ongoing research:

There is a strong effort in studying and defending the natural interest of the area conducted by the University of the Azores. Several published papers and reports dealing with biodiversity (species lists, ecology), physiography and geomorphology of coastal lagoons have resulted from a series of research programmes.

NE COAST OF FLORES ISLAND, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 39º29'06''N, 31º08'42''W

NE coast detail. Photo L Quinta *Imag*DOP

Description of site:

This area is located in the western-most island of the Azores archipelago. The coastal area is defined from Santa Cruz to Ilhéu da Gadelha (approx.: 39º30'N, 31º10'W). It is a sinuous rocky coast (approximately 19 Km-long) fringed by a large system of near-shore islets.

Habitats present:

	Mud	Sand	Rock
Littoral			X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

The site comprises a set of intertidal and sublittoral rocky habitats known to support high marine biodiversity, including intertidal pools and a large number of enclosed bays, submerged caves and islets. Conspicuous species include large specimens of *Epinephelus marginatus*. The bottom is covered by algae but in the steeper areas it is possible to observe phoronids and other less common species. Occasionally, during the night, it is possible to observe *Loligo forbesi*. It is an important area for the reproduction of several protected marine birds, such as *Calonectris diomedea borealis*, *Sterna hirundo* and *Sterna dougallii*.

Human impact:

There is some impact caused by the limpet collectors and fishing using forbidden gears such as scuba equipment.

Facilities:

Research can be conducted on field trips, taking advantage of local facilities (harbour, nautical and diving clubs, fish auction warehouses, etc.). The island is served by regular flights from other islands in the archipelago.

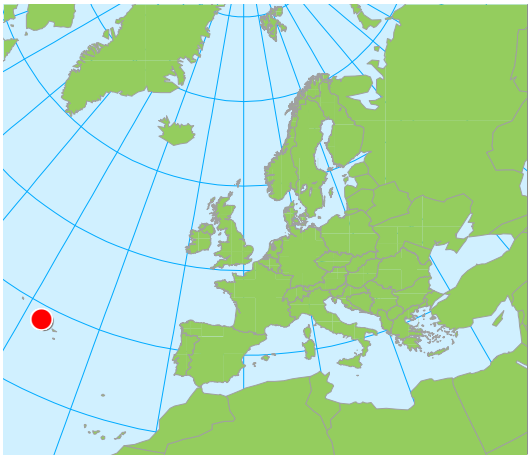
Available database and website:

http://www.horta.uac.pt/scubazores/Flores/index.html

Commitment and ongoing research:

There is a written commitment by the Department of Oceanography and Fisheries of the University of the Azores for the continuation of studies in this area. A few papers and reports dealing with algae, benthic invertebrates, fish and seabirds have been published or are in preparation, resulting from the University expeditions during the last decade. Other papers deal with exploitation and conservation aspects.

NE COAST OF SÃO JORGE ISLAND, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 38º35'N,27º48'W

Fajã dos Cúberes in NE coast of São Jorge Island. Photo RR Ferraz *Imag*DOP

Description of site:

The site is located in the coastal area of São Jorge Island from 38º38'N, 27º58'W to 38º33'N, 27º46'W, and comprises a complex of unique brackish lagoons and marine rocky habitats highly exposed to prevailing swells, within a 23 km wide stretch of coast. It comprises intertidal and sublittoral rocky habitats, including the 2 single brackish lagoons in the archipelago, located on shallow platforms originating from cliff landslides. One islet is highly exposed to oceanic currents and vast boulder fields of volcanic rock are also included on the site.

Habitats present:

	Mud	Sand	Rock
Littoral	X		X
Sublittoral	X	X	X
Seagrass beds			

Description of fauna and flora:

The lagoons vary in their species and habitat composition, but in both there is an intermediate salinity that results in unique environments in the Azorean context. For example, *Tapes decussatus* is present in the southern lagoon, and *Ruppia maritima* in the northern lagoon. Outside the lagoons there is a narrow zone of shallow water followed by a steep slope to depths of around 1000 m. At the shelf edge there are strong currents and the a mixture of coastal and open-ocean species such as *Corypahena hippurus*. The surrounding cliffs are important nesting habitats for marine birds.

Human impact:

Demersal fisheries are practiced throughout the area and the lagoons are used by tourists and for clam harvesting. The fishery is regulated by annually renewable permits issued by the regional government.

Facilities:

Two small villages with marine harbours are located on each side of the area, providing the operational basis for coastal research. The University facilities, 30 km away, can be easily accessed by ship. The island is served by regular flights from other islands in the archipelago.

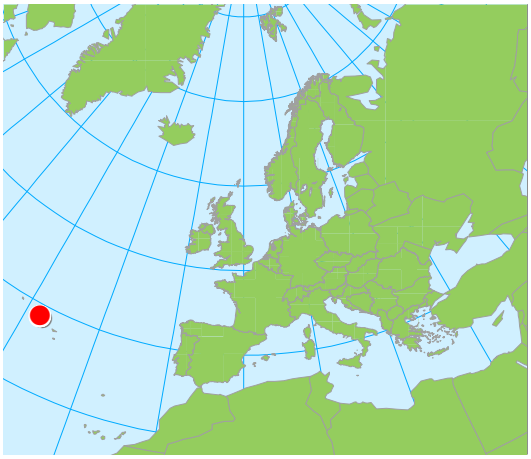
Available database and website:

A temporary website is available at: http://www.horta.uac.pt/scubazores/S_Jorge/ncsji_temp1.htm

Commitment and ongoing research:

There is a written commitment from individual scientists with project budgets to study the area. Several published papers and reports dealing with biodiversity (species lists, ecology), physiography and geomorphology of coastal lagoons have resulted from different research expeditions since the late 1960s.

RESTINGA, GRACIOSA ISLAND, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 39º00'45''N, 27º56'55''W

One of the Restinga islets. Photo RS Santos *Imag*DOP

Description of site:

The site consists of a large irregular lava flow field connecting one large islet to the neighbouring rocky coasts and supporting important underwater habitats. It occupies a 5 km long stretch of coast between Ponta dos Fenais and Carapacho, including Poça bay. It comprises very diverse intertidal and sublittoral rocky habitats along a large stretch of shallow coast, including several islets and small reefs, highly irregular volcanic bedrock and sheltered bays.

Description of fauna and flora:

In the sheltered bays it is occasionally possible to observe turtles, *Caretta caretta*. It is an important area for the reproduction of marine birds, such as *Sterna hirundo*.

Habitats present:

	Mud	Sand	Rock
Littoral			X
Sublittoral		X	X
Seagrass beds			

Human impact:

The area used by artisanal fishermen and by limpet collectors.

Facilities:

Research can be conducted on fieldtrips, taking advantage of local facilities (harbour, nautical and diving clubs, fish auction warehouses, etc.). The University facilities at Faial Island are located 40 km away, and can be accessed by ship. The island is served by regular flights from other islands in the archipelago.

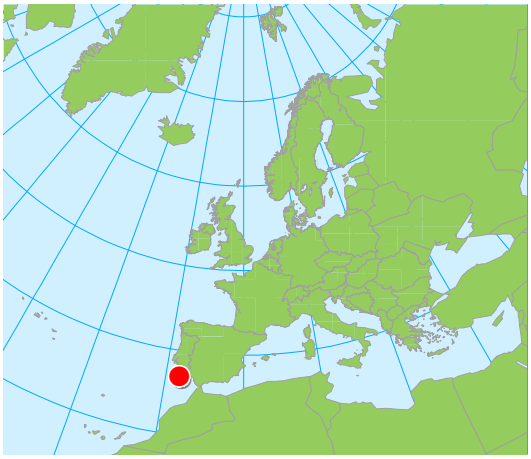
Available database and website:

Islets of Carapacho: http://www.horta.uac.pt/scubazores/Graciosa/Carapacho.htm, and Poça Bay: http://www.horta.uac.pt/scubazores/Graciosa/BaiaPoca.htm

Commitment and ongoing research:

There is a written commitment from individual scientists to a planned series of activities. Several papers and reports dealing with algae, benthic invertebrates, fish and seabirds have been published or are in preparation, resulting from different expeditions since the late 70s. Other papers deal with exploitation and conservation aspects.

RIA FORMOSA LAGOON	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 37°03'N, 7°50'W

Aerial view of the Ria Formosa. Photo M Sprung

Description of site:

The Ria Formosa is a mesotidal fully marine coastal lagoon, extending for about 55 km on the Algarve coast, South Portugal. Most of the lagoon is shallow and consists of saltmarshes and tidal flats. There is an intense water exchange via 7 inlets through the dune belt by which the lagoon is separated from the Atlantic Ocean. The rocky habitats are artificial.

Description of fauna and flora:

The fauna and flora have been under investigation for several decades, with an increased intensity since the 1980s.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Human impact:

There is no heavy industry, but three major towns are situated around the lagoon amounting to a population of about 220,000, with some tourist centres at its extreme points. In many parts of the lagoon bivalves are cultivated (mainly *Ruditapes*), and some aquaculture enterprises have been established in abandoned salinas.

Facilities:

Facilities for marine biodiversity research are available, from small boats to fully equipped laboratories and field stations, and a University Library.

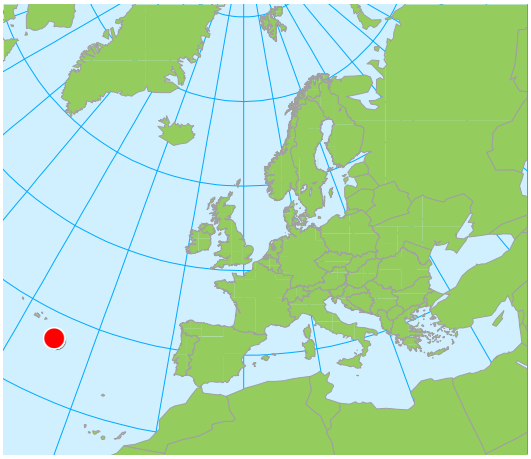
Available database and website:

There are no websites at present for biodiversity data, but some dozen publications, reports and theses on biodiversity related subjects.

Commitment and ongoing research:

Several institutions around the Ria Fomosa are involved in research activities: the Instituto da Conservação da Natureza (ICN; part of which is responsible for the administration of the Natural Park Ria Fomosa), the Instituto de Investigação das Pescas e do Mar (IPIMAR, particularly on species of economic interest), the Universidade do Algarve with its research centre Centro de Ciências do Mar on aspects of biodiversity from documentation of the distribution of species to molecular biological methods.

S. COAST AND REEFS OF SANTA MARIA ISLAND, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 36º56'N, 25º03'W

Ilhéu da Vila on the south coast of Santa Maria island.

Description of site:

Located in the coastal area of Santa Maria Island within a square from 36º55,7'N, 25º10,5'W to 36º55,2'N, 25º'01'W, this stretch of coast 30 km long displays the typical environment of the islands' sheltered southern coasts. It comprises very diverse intertidal and sublittoral sandy and rocky habitats along a stretch of shallow coast dominated by soft bottoms, including large sandy beaches, sheltered bays, small reefs and one islet.

Description of fauna and flora:

The islet has several caves and in its interior it is possible to see less common species for the Azores, such as *Tylodina perversa*.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Human impact:

A series of fish species are targeted by artisanal fishermen.

Facilities:

Research is conducted on fieldtrips such as the ones carried out by the University of the Azores in previous years, taking advantage of local facilities (harbour, nautical and diving clubs, fish auction warehouses, etc.). The island is served by regular flights from other islands.

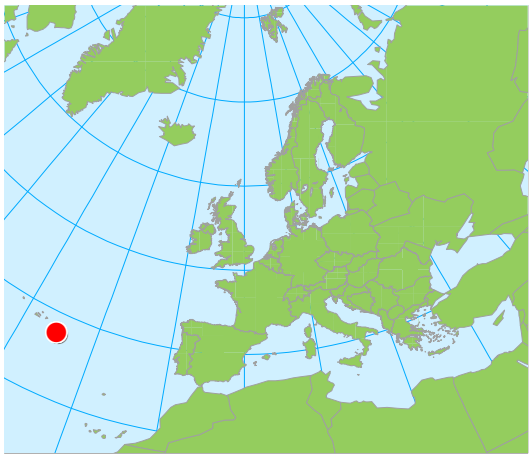
Available database and website:

http://www.horta.uac.pt/scubazores/S_Maria/index.html

Commitment and ongoing research:

There is a written commitment by individual scientists to an agreed programme of activities. Several papers and reports dealing with algae, benthic invertebrates, fish, seabirds and cetaceans have been published or are in preparation, resulting from the University expeditions during the last decade. Other papers deal with exploitation and conservation aspects.

VILA FRANCA ISLET, SÃO MIGUEL, AZORES	Portugal	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 37º42'09''N, 25º26'35''W

Aerial view of Vila Franca Islet. Photo: Simão Rego

Description of site:

The area is an ancient submerged volcanic crater 1.2km south of Vila Franca village. The islet comprises a shallow inner lagoon with a diameter of 150 m. It has one main water entrance and several fissures (locally named "Golas"). The fissures are scattered around the islet and play a important role in the water circulation.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

There is a strong zonation of bottom species according to depth. From the splash zone to the subtidal it is possible to observe different dominances of *Melaraphe neritoides*, *Bangia* cf. *fuscopurporea*, *Littorina striata*, *Chthamalus stellatus*, *Rivolaria atra*, *Fucus spiralis*, *Stramonita haemastoma*, *Mitra nigra*, *Enteromorpha compressa*, *Patella aspera*, erect Corallinaceae, *Paracentrotus lividus*, *Ophidiaster ophidianus* and *Gymnogongrus tenuis* (Morton, 1990). It is the only place in the Azores where maerl beds have been recorded.

Human impact:

There is a strong impact of tourism in the area. Small-scale fishing activities occur around the islet despite being forbidden by the regulations of the declared Marine Protected Area.

Facilities:

The Department of Biology of the University of the Azores is located in São Miguel Island. This Department has good laboratories that may be used for support of studies in the area. The laboratory is located within one hour driving time from Vila Franca.

Available database and website:

http://www.horta.uac.pt/scubazores/S_Miguel/IlheuVilaFranca.htm

Commitment and ongoing research:

There is a written commitment from individual scientists to study the area. There are several papers, reports and books published including the work of Brian Morton, António Frias Martins and Joseph C. Britton.

STRUNJAN AND CAPE MADONA, GULF OF TRIESTE	Slovenia	Conservation status ☆ ★ ★ ★ ★	

Co-ordinates: 45° 32'N,13 °35'E and 13 °37'E

The Nature reserve Strunjan is a very important marine protected area in the Gulf of Trieste.

Description of site:

Nature Reserve Strunjan and Natural Monument Cape Madona are two Slovenian marine protected areas beneath typical sandstone flysch cliffs. Both sites are characterized by a variety of microhabitats and specific abiotic conditions which reflects in high biodiversity of the area.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Description of fauna and flora:

The intensive mapping and monitoring of the fauna and flora of the Slovenian coastal sea has been ongoing since 1998. To date at least 1,700 species of animals have been recorded for the area.

Human impact:

The proposed sites are facing some anthropogenic impacts such as nautical traffic, angling and bathing, since the protected regime is not fully enforced. . The locations are not under any direct source of pollution. Despite the protected status of both sites, the illegal harvesting of protected mussels is still ongoing.

Facilities:

All facilities for biodiversity research are available nearby. The Marine Biology station is appropriately equipped for different aspects of biodiversity research (research labs, SCUBA diving staff and facilities, video-and photo equipment, boats and vessels).

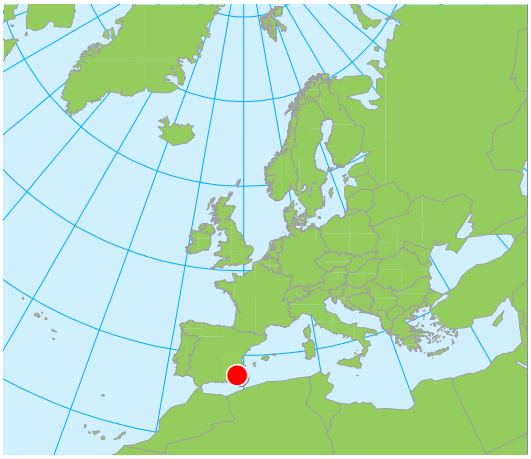
Available database and website:

The inventory of fauna and flora is held at the Marine Biology Station (National Institute of Biology). The websites regarding both marine protected areas are available at http://projects.msp.nib.si/Tunis2000/, http://projects.msp.nib.si/Biodiversity_and /http://dragonja.nib.si

Commitment and ongoing research:

The Marine Biology Station (National Institute of Biology) is undertaking biodiversity research in the proposed sites and in other parts of the Gulf of Trieste (northern Adriatic). Good cooperation has been established with Italian and Croatian colleagues.

CABO DE GATA, ALMERIA	Spain	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 36°44'N, 2°11'W

Panorama of Cabo de Gata. Photo J. Templado

Description of site:

Cabo de Gata, SE Spain, is one of the most arid zones in Europe. It is a rough volcanic coastline consisting of cliffs, calas and interspersed sandy beaches extending along 45 km. Its 12.200 ha of marine protected area represents the biggest portion of protected coastline of the Mediterranean.

Description of fauna and flora:

The fauna and flora are very well documented, with more than 1200 species reported thus far, including a detailed bionomic cartography of the bottoms. Seagrass beds of *Posidonia* and *Cymodocea* are especially well represented in the area.

Human impact:

The area is free of human impact: there are no industries or rivers discharging nearby, and it has not been affected by massive tourism. The protected area includes 6 portions of Integral Reserve where fishing is completely forbidden.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds	X		

Facilities:

The "Aula del Mar" of Cabo de Gata offers facilities for marine biodiversity research such as housing for up to 20 persons, laboratory and boat.

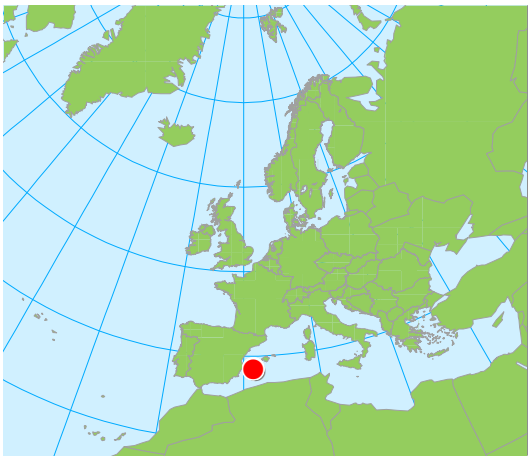
Available database and website:

The species inventory is very comprehensive and is available only as hard copy. To date, there is no institutional web-site on the site.

Commitment and ongoing research:

For the last 20 years several research teams from Spanish universities (Málaga, Murcia, Autónoma de Madrid) and the Spanish Scientific Research Council have undertaken continuous biodiversity research at the site.

PARC NATURAL DE LES SALINES D'EIVISSA I FORMENTERA, BALEARIC ISLANDS	Spain	Conservation status ☆ ★ ★ ★ ★	



Co-ordinates: 38°48'N, 1°27'E

Eivissa-Formentera Sound. Photo J Mayol

Description of site:

The site corresponds to the sandy shallow banks and associated islets situated between Eivissa and Formentera. This area includes the best preserved and extensive barrier reefs of the seagrass *Posidonia oceanica* in the Mediterranean.

Description of fauna and flora:

The fauna and flora is exceptional, with a high diversity of benthic communities. Up to 353 species of Metazoans, 140 Seaweeds and 3 Seagrasses have been reported from the site thus far.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds	X		

Human impact:

The area is free of pollution (no industry, rivers or human conurbations nearby). Nevertheless, excessive yacht anchoring may represent a threat for the preservation of the *Posidonia* seagrass beds.

Facilities:

There are two boats available for marine biodiversity research on request from the Balearic Government Fisheries Office.

Available database and website:

The species inventory is very comprehensive, but the information appears scattered over specialised journals. Thus far there is no institutional web-page concerning the site.

Commitment and ongoing research:

The Universities of the Balearic Islands and Barcelona, as well as several research teams of the Spanish Scientific Research Council (IMEDEA, CEAB) carry out biodiversity research at the site. This research focuses mainly the ecology of seagrasses and on the effects of marine reserves on the fish populations.

PUNTA DE LA RASCA, TENERIFE, CANARY ISLANDS	Spain	Conservation status ☆ ☆ ★ ★ ★	

Co-ordinates: 28º1'N, 16º42'W

"Vieja Colorada" (*Sparisoma cretense*) and *Echinaster sepositus*. Photo J Núñez

Description of site:

Punta de la Rasca is on the southernmost tip of Tenerife. An inmense and uninhabited lava field, its coasts harbour some of the best preserved marine communities of the Canary Islands. Bottoms are mainly rocky, with interspersed patches of the the seagrass *Halophila decipiens*. There are also extensive underwater cliffs going down to 30m

Habitats present:

	Mud	Sand	Rock
Littoral			X
Sublittoral		X	X
Seagrass beds	X		

Description of fauna and flora:

The biota of the area has been thoroughly studied although the information appears scattered over specialised journals. There are species check-lists available for most taxa comprising the macro-, micro- and meiobenthos, zooplankton, phytoplankton and phytobenthos. Thus far the known biota is composed of 1,283 species of Metazoans, 438 of Seaweeds and 2 Seagrasses.

Human impact:

The area is free of pollution since there are no rivers, industries, cities or agricultural runoff nearby. The waters are extraordinarily transparent (Secchi disc depth between 60 and 125 m) and oligotrophic (surface mean annual concentration <0.08 μ atom-g P-PO_4 mol//).

Facilities:

Facilities for marine biodiversity research are available at the University of La Laguna, IEO, and Museo de la Naturaleza y el Hombre, about 100 km (highway) away, and are available for guest researchers only if they are associated to these institutions. SCUBA diving facilities are provided by the many diving centres situated nearby.

Available database and website:

There are currently no marine biodiversity databases available on-line nor institutional website on the site.

Commitment and ongoing research:

Several public research institutions of the Canary Islands are currently undertaking marine biodiversity research in the area, e.g.: Museo de la Naturaleza y el Hombre, Centro de Planificación Ambiental, Instituto Canario de Ciencias Marinas, IEO, and the University of La Laguna.

ERDEMLI (OFFSHORE)	Turkey	Conservation status ☆	

Co-ordinates: 36.4°N, 34.4°E

Institute of Marine Sciences, Erdemli, southern Turkey. Photo A E Kideys

Description of site:

Two stations off Erdemli are located 1-2 miles offshore in front of the Institute of Marine Sciences, which is based 5 km west of Erdemli city on the southern Turkish cost. The entire region is part of the large sandy and relatively shallow (down to 100 m depth) Mersin Bay.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	
Seagrass beds			

Description of fauna and flora:

The plankton of these stations has been monitored at regular intervals (almost monthly) since the second half of the 1990s. There have been also a few studies on the benthos (including fish) in different years.

Human impact:

The area is subjected to moderate levels of pollution from the large conurbation of Mersin (pop. over one million) and cargo shipping. The Bay is quite heavily fished particularly by trawlers. The coastal area of the stations is relatively turbid due to the outflow of the medium sized Lamas River.

Facilities:

All facilities for marine biodiversity research are available, from seagoing research vessels, sufficiently well equipped laboratories and a library.

Available database and website:

A species inventory and associated physico-chemical oceanographic data are being included in the database and there are plans to make them available on-line.

Commitment and ongoing research:

The Institute of Marine Sciences is trying to maintain research at these stations to obtain long-term data. As long as the necessary finance is secured, there is enthusiasm to pursue monitoring.

SINOP PENINSULA, SOUTHERN BLACK SEA	Turkey	Conservation status ☆ ★ ★	

Co-ordinates: 42°03’41’’N, 35°02’41’’E

Hamsilos Bay, Sinop, Turkey

Description of site:

The Black Sea has historically been one of the most biologically productive regions in the world. Sinop Peninsula is located on the Southern coasts of the Black Sea. It has quiet bays covered with forest. Hamsilos Bay is 11 kilometers from the city.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds	X		

Description of fauna and flora:

Many studies are available on the marine biota of the Black Sea coasts of Ukraine, Romania and Bulgaria. Consequently, it can be said that the Black Sea has a rich fauna, but little information is available on the marine biota of the Turkish coasts. In 1987, the species which live at the upper-infralittoral of the Akliman and Hamsaroz Bays located in the Sinop province of the West Black Sea region were studied by Öztürk. Since then several more studies have been made of the invertebrates and algae of the Sinop Coast.

Human impact:

There is no industrial pollution, mining, dumping or dredging, and potentially harmful agricultural runoff is negligible due to strict legislation. In the last decade, the local population in Sinop has been about 25,000; however the population increases up to 60,000 in summer. Seine netting is the form of commercial fishing used in the area.

Facilities:

The area is accessible by bus. The distance from the site to the Sinop Fisheries Faculty is only 2 km. Facilities for SCUBA diving are available. Several fully qualified operators offer all facilities: dive-boats, equipment, compressors, and local knowledge of dive-sites.

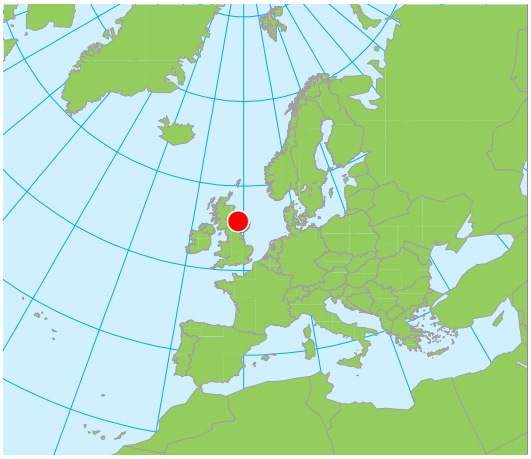
Available database and website

Records of marine species belonging to several taxa from the neigbouring regions are incorporated in EXCEL data sheets and/or ACCESS databases. No website is available for the site.

Commitment and ongoing research:

The Sinop Fisheries faculty has an agreed science plan and specifically allocated budget for biodiversity work on Hamsilos Bay, Sinop. Hamsilos Bay has government protection.

THE FARNE ISLANDS	United Kingdom	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 55°38'N, 1°37'W

Inner Farne, the largest island of the Farnes group. Photo Judy Foster-Smith

Description of site:

The Farne Islands, off the Northumberland coast, England, are a small archipelago of some 15 to 28 islands, depending on the state of the tide. They consist of an outcrop of hard dolerite which forms south-west facing cliffs, providing suitable habitat for many different species of seabird. The islands stand in depths of up to 30m and the clarity of water attracts divers from throughout Britain. The islands are owned and managed by The National Trust (England).

Description of fauna and flora:

Over 70,000 pairs of seabirds breed on the islands. There is also an important breeding colony of grey seals, *Halichoerus grypus*, of around 3,500 individuals. These populations have been monitored since the 1970s and 1950s respectively. Rich sublittoral communities occur on the vertical rock faces and extensive areas of tide-swept cobbles. Regular sightings of cetaceans occur.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Human impact:

The islands are popular with tourists, in particular for bird watching, seal watching and diving. The surrounding waters are unpolluted.

Facilities:

Research facilities, including a research vessel, can be arranged at the University of Newcastle (approximately 50 miles away).

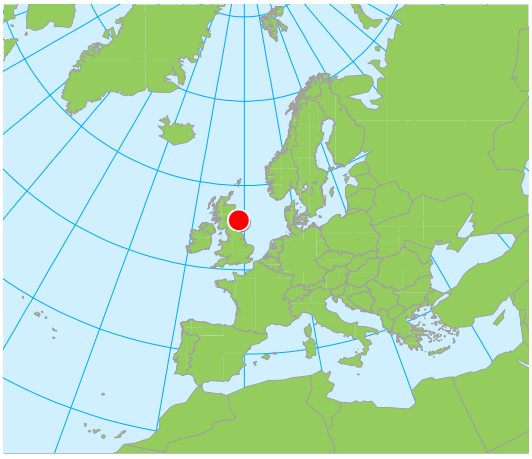
Available database and website:

Much of the scattered information on the marine fauna and flora of the Farnes area is given in '*The Marine Fauna and Flora of the Cullercoats District*' (hardcopy only). Data on the seabirds and grey seals are managed by the National Trust.

Commitment and ongoing research:

The seabird and seal populations are monitored on an annual basis as part of the National Trust's management plan for the islands as part of the National Trust's management plan for the islands. Other aspects of marine monitoring are carried out with support from the School of Marine Science and Technology (Dove Marine Laboratory), the University of Newcastle.

FILEY BRIGG AND FILEY BAY	United Kingdom	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 54°13'N, 00°16'W

Filey Brigg and Filey Bay. Photo J-P D (IECS)

Description of site:

Filey Brigg is a long spit of rock (Lower Cretaceous Grit) which limits Filey Bay, a sand beach in the South. The Brigg dips to the South, with the steep North side taking heavy weather and sheltering the bay creating striking gradients of exposure including circalittoral expansion. Low vertical walls of sandstone at the base of boulder clay are easily weathered. Turbidity is influenced by the clay in bad weather. Filey Bay itself is an extensive plain of tide-swept sands with ripples, waves and dunes.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral		X	X
Seagrass beds			

Description of fauna and flora:

The exposed North side of the Brigg differs from the South sheltered side by sparse fucoids with patches of *Mastocapus stellatus.* The Southern side harbours a higher diversity of plants and animals with a lower shore which is partly silted. A kelp forest develops there and circalittoral rock is occupied by hydroids and bryozoans. Filey Bay has mostly fine sands with sparse crustacean and polychaete communities.

Human impact:

There are no industrial activities in the area and all sewage is discharged through a modern treatment plant. A traditional fishery has operated since the 12th century, with only very few small boats remaining. The beach is popular but with very little nautical activities and not much bathing.

Facilities:

All facilities for marine biodiversity research are available on the University of Hull Scarborough Campus and on the Hull Campus at the Institute of Estuarine and Coastal Studies (Department of Biological Sciences).

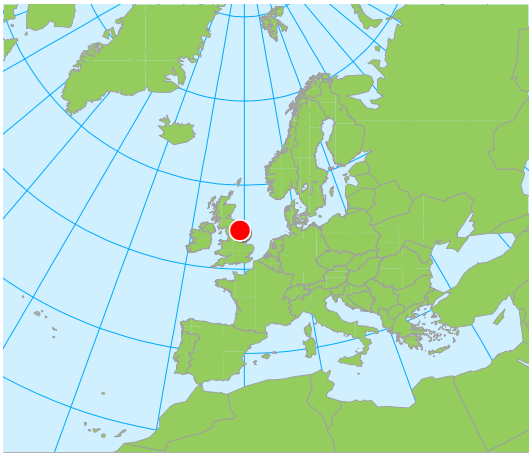
Available database and website:

The University of Hull and other British Universities together with the London Natural History Museum have been collecting data for decades and made it accessible to English Nature which manages the area. Information has been compiled in the Marine Nature Conservation Review and in the JNCC Coastal Directories (EC BioMar-Life programmes).

Commitment and ongoing research:

The University of Hull (Institute of Estuarine and Coastal Studies) and its branch at Scarborough undertake biodiversity-related research in the area.

ROBIN HOOD'S BAY	United Kingdom	Conservation status ☆ ☆ ★ ★ ★	



Co-ordinates: 54°25'N, 00°31'W

Robin Hood's Bay. Photo J-P D (IECS).

Description of site:

Robin Hood's Bay is a crescent-shaped sloping rock platform limited by very high cliffs. It results from a structural uplift (Lower Jurassic overlain with glacial boulder clay) protected by a headland nearby and fast eroding cliff with fossils. In the bay, tidal streams are much reduced, offering relatively sheltered conditions to organisms over large expanses of intertidal rocks and in pools. In the subtidal, a rock plain is found, including muddy sand plains with boulders.

Description of fauna and flora:

The general layout of animals and plants follows a sequence of zones dominated by the dominant fucoids and abundant barnacles. .In the nearby kelp forest with red algae, the sea slug *Stelliger bellulus* is found in shallow waters (it is nationally rare). In the subtidal, *Taonia atomaria* is at its northern limit of distribution in the UK

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds			

Human impact:

There are no industrial activities in the area and all sewage is discharged through a modern treatment plant at Whitby. A traditional fishery has operated since the 12th century, with only small boats remaining. The beach is popular but with very little nautical activities and bathing only during a few days in summer. Animals and plants are collected by students on field trips, which are well established in the region.

Facilities:

There is a visitors Centre in the village with limited laboratory facilities. All facilities for marine biodiversity research are available on the University of Hull Scarborough Campus which also has offices and teaching rooms at Whitby.

Available database and website:

The University of Hull and other British Universities together with the London Natural History Museum have been collecting data for decades and made it accessible to English Nature which manages the area. Information has been compiled in the Marine Nature Conservation Review and in the JNCC Coastal Directories (EC BioMar-Life programmes).

Commitment and ongoing research:

The University of Hull (Institute of Estuarine and Coastal Studies) and its branch at Scarborough undertake biodiversity-related research in the area.

Other Sites (estuaries, pelagic, deep-sea)

DYFAMED PELAGIC SITE, OFF VILLEFRANCHE SUR MER	France		

Co-ordinates: 43°25'.2 N, 7°51' 8 E

DYFAMED site. photo Météo-France

Description of site:

This is an instrumented pelagic station in the Ligurian Deep Sea, Northwestern Mediterranean, located 28 nautical miles offshore, off the Liguro-provençal current. The water depth is 2300 m and the seabed comprises soft sediments. The site is located in the Northwestern part of a central divergent zone characterised by high salinity (>38.30) and a shallow thermocline during summer; deep mixing events may occur during winter.

Habitats present:

	Mud	Sand	Rock
Pelagos			
Bathyal	X		
Seagrass beds			

Description of fauna and flora:

There is an oligotrophic to mesotrophic productivity regime. Epi- and mesopelagic communities include *Calanus helgolandicus, Euchirella rostrata* and *Salpa maxima*; nekton includes planktivorous fishes, turtles and cetaceans (*Balaenoptera physalus, Stenella coeruleoalba*). There is a deep soft-sediment benthos community

Human impact:

This is very low : off the coastal Ligurian current there is moderate shipping traffic and no legal fishing activity. The site is included in the French-Italian "whales sanctuary", LIFE program.

Facilities:

Monthly surveys are conducted using CNRS oceanographic ships (3 h transit time from Nice harbour). Laboratories and accomodation rooms are available at the Observatoire de Villefranche-sur-Mer and the Laboratoire d'océanographie de Villefranche (LOV). The site is instrumented permanently with sediment traps and a Meteorological buoy operated by Météo-France.

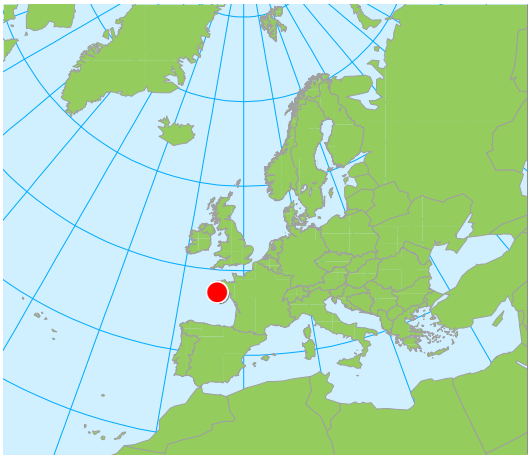
Available database and website:

Descriptions of methods and results are available on line (data available from 1991) on the DYFAMED site http://www.obs-vlfr.fr/jgofs2/sodyf/home.htm or through JGOFS-France data base: (http://www.obs-vlfr.fr/jgofs/html/bdjgofs.html).

Commitment and ongoing research:

Physical, chemical and biological (bacteria, phytoplankton, mesozooplankton and macroplankton) parameters are currently monitored in the water column.

ESTUARIES AND RIAS OF SOUTHERN BRITTANY	France		



Co-ordinates: 47°45'N,3°48'W

Laita estuary, Photo D R

Description of site:

A remarkable feature of the south coast of Brittany is the presence of a series of rias (short estuaries of 10-20 km length) strongly influenced by the tides and exhibiting sharp salinity gradients. Together, these rias can be considered as a system having a global influence through their impact on the productivity of the near ocean and their role as nurseries for local species.

Habitats present:

	Mud	Sand	Rock
Littoral		X	X
Sublittoral	X	X	X
Seagrass beds			

Description of fauna and flora:

The fauna and flora are documented through regular sampling (trawling, dredging) in relation to the research programmes of the Marine Biology Station of Concarneau.

Human impact:

The estuaries of this area are variously subjected to pollution of diverse origins: industry, agriculture for some estuaries, quasi-absence of pollution for some others. This situation is very well suited for comparative environmental studies.

Facilities:

All facilities for marine biodiversity research are available, from seagoing research vessels to low draugt boats. The nearby marine Biology Station of Concarneau offers fully equipped laboratories.

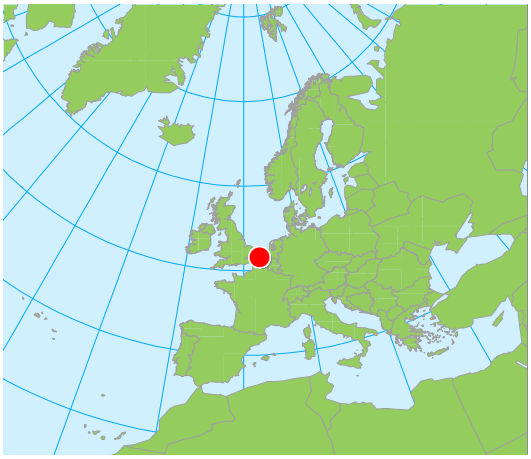
Available database and website:

Continuous research has been conducted and inventories produced since 1970. A database is under construction.

Commitment and ongoing research:

The Marine Biology Station (Muséum National d'Histoire Naturelle) carries out inventories and regular surveys within the framework of combined field and laboratory ecotoxicology programmes.

WESTERSCHELDE	Netherlands		



Co-ordinates: 51° 23'N, 3° 44'E

Saeftinghe: one of Europe's largest saltmarshes in the Westerschelde. Photo NIOO-CEME

Description of site:

The Westerschelde, in South-west Netherlands, is a 160 km long estuary with a maximum depth of 30 m. Its banks are enforced with dikes. The tides go up to the city of Ghent, Belgium. The Westerschelde is one of the only two remaining estuaries in the Netherlands, yet is rather polluted.

Description of fauna and flora:

The fauna and flora, typical for estuaries, are well documented, and have been studied since 1959 when the NIOO-CEME started to monitor the consequences of the construction of a series of strengthened dikes and barriers in SW Netherlands (the Delta project to protect against storm surges).

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Human impact:

Irrespective strong regulations on municipal and industrial wastewater, the Westerschelde suffers, due to high concentrations of industry and major cities along its borders, from a high level of pollution. A small impact arises from fishing on shrimps and flatfish.

Facilities:

All facilities for marine biodiversity research are available: a seagoing research vessel, fully equipped laboratories, and sophisticated experimental facilities such as mesocosms and a flume tank.

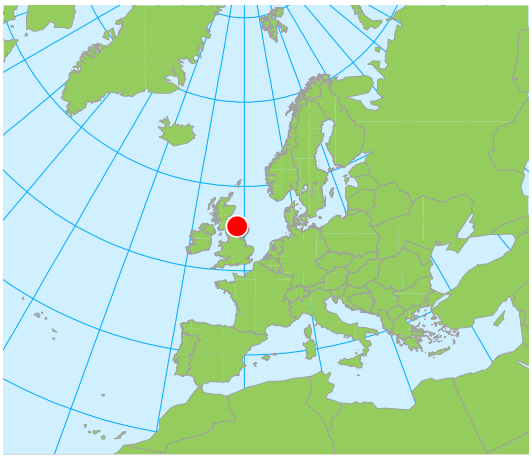
Available database and website:

Species inventories and information on environmental factors are available in different databases, the most extensive on zoomacrobenthos in the BIS (Benthos Information System) database at NIOO-CEME (http://www.nioo.knaw.nl), and on abiotic factors at RWS-RIKZ (http://www.waterbase.nl).

Commitment and ongoing research:

The Centre for Estuarine and Marine Ecology of the Netherlands Institute of Ecology (NIOO-CEME), based in Yerseke, has ongoing research in the Westerschelde regarding several ecological topics, including biodiversity. It is funded by the Royal Netherlands Academy of Arts and Sciences, and able to commit itself to long-term research on European marine biodiversity issues.

ESK ESTUARY	United Kingdom		



Co-ordinates: 54°29'N, 00°37'W

The upper Esk estuary. Photo J-PD (IECS)

Description of site:

The river Esk drains the Yorkshire Moors National Park. Its estuary is a narrow complex estuary 12 km long. It consists mainly of sediments sheltered behind the piers at the estuary mouth. An extensive bedrock and boulder shore and a weir make up the majority of hard substrata. Mudflats and silted channels are found in the upper parts of the estuary.

Habitats present:

	Mud	Sand	Rock
Littoral	X	X	X
Sublittoral	X	X	X
Seagrass beds			

Description of fauna and flora:

The fauna and flora comprise of typical estuarine communities, including low salinity tolerant seaweeds (Fucoids), together with muds characterised by polychaetes and *Corophium volutator*. The biotopes in the infralittoral are submitted to moderate wave exposure, relatively high turbidity and moderate scour. On the exposed coast, just off the estuary, Whitby rock holds a higher diversity with a wave-exposed kelp forest.

Human impact:

The Esk is well-known as a salmon and sea-trout river and coastal fisheries are still lively at Whitby Harbour. In Summer Whitby is a busy small sea-side resort. Water quality in the estuary is very good (Grade A). There is very little litter, debris, oil or chemical pollution, although nutrient enrichment from agriculture on the watershed might occur during periods of low water. Tourism is seasonal and has little impact on the estuary itself.

Facilities:

All facilities for marine biodiversity research are available on the University of Hull Scarborough Campus which also has basic facilities on site at Whitby.

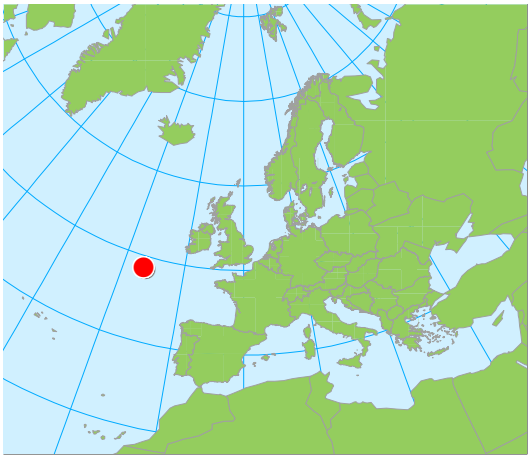
Available database and website:

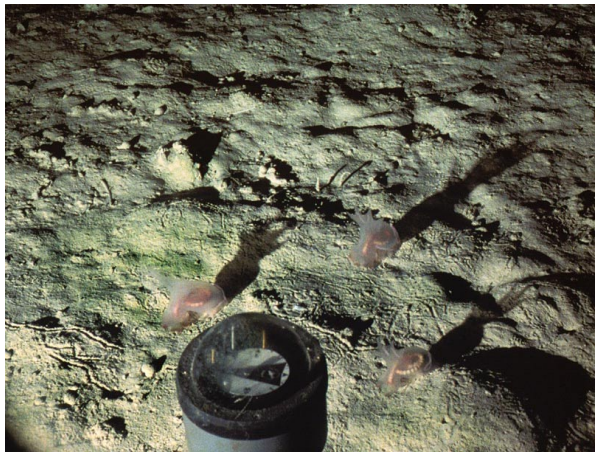
The University of Hull and other British Universities together with the London Natural history Museum have been collecting data for decades and made it accessible to English Nature which manages the area. Information has been compiled in the Marine Nature Conservation Review and in the JNCC Coastal Directories (EC BioMar-Life programmes).

Commitment and ongoing research:

The University of Hull (Institute of Estuarine and Coastal Studies) and its branch at Scarborough undertake biodiversity-related research in the area.

PORCUPINE ABYSSAL PLAIN, NE ATLANTIC OCEAN - DEEP-SEA TIME SERIES.	International waters		





Co-ordinates: 48°50'N, 16°30'W

Porcupine Abyssal Plain – Time-lapse photography (SOC)

Description of site:

The Porcupine Abyssal Plain is a flat, vast expanse of muddy seabed with occasional, scattered rocky abyssal hills. The area covers an area about half the size of the European landmass. It is the site of the EU deep-sea time series station sampled in EU FP II, III and IV projects.

Description of fauna and flora:

The fauna has been well documented as part of previous large-scale EU projects. Data are available on micro-organisms, meiofauna, macrofauna, invertebrate megafauna and fish. A time series from 1989 to present shows evidence of large-scale regime shifts, probably in relation to inter-annual variability in surface primary production and the downward flux of organic matter from surface waters.

Habitats present:

	Mud	Sand	Rock
Littoral			
Sublittoral	X		X
Seagrass beds			

Human impact:

A pristine site. No anthropogenic impact, but one affected by variability in the flux of organic matter from the sea surface and hence to decadal-scale (climate) change in primary production and zooplankton packaging of detrital material. The site is useful as a reference for distinguishing natural and anthropogenic change.

Facilities:

Access by large oceanographic research vessels as part of coordinated European-scale research projects.

Available database and website:

The species inventory is comprehensive and is available from the research organisations that participated in the original EU-sponsored research projects. Parts of the database are being prepared for inclusion in the Ocean Biogeographical Information System (OBIS), part of the international programme, the Census of Marine Life (CoML).

Commitment and ongoing research:

The Southampton Oceanography Centre is continuing the time series work at the EU time series station until such time that a new large-scale EU-sponsored, collaborative research programme can be re-established.

BIOMARE participants

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