No 5

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PROCEEDINGS OF A ONE DAY SEMINAR
HOSTED BY ENGLISH NATURE
AND THE MARINE FORUM

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The **Marine Forum** for Environmental Issues is a non-profit-making organisation which aims to improve communication on marine and coastal issues. It meets normally four times each year and provides a platform for wide-ranging discussions on topical subjects, seeking to reach a consensus view where possible.

The Forum publishes reports at intervals, either reviewing its general activities or covering specific meetings or initiatives. Further details about the Marine Forum may be obtained by writing to the Administrator, c/o Natural History Museum, Dept. of Zoology, Cromwell Road, London SW7 5BD.

**English Nature** is the statutory adviser to Government on nature conservation in England and promotes the conservation of England's wildlife and natural features. Its work includes the selection, establishment and management of National Nature Reserves and Marine Nature Reserves; the identification and notification of Sites of Special Scientific Interest; the provision of advice and information about nature conservation; and the support and conduct of research relevant to these functions. Through the Joint Nature Conservation Committee, English Nature works with sister organisations in Scotland, Wales and Northern Ireland on UK and international nature conservation issues.

# FOREWORD

**Prof Alisdair McIntyre, Chairman Marine Forum,**
**Lord Cranbrook, Chairman English Nature**

The conservation of nature is a highly topical concern, highlighted not least by the recent United Nations Conference on Environment and Development. However, in the past, much of the attention has been directed to terrestrial matters, and until surprisingly recently the size and power of the oceans encouraged the comfortable feeling that Man could not have significant impact on the sea. This view is now clearly untenable. The global depletion of commercial fisheries, the detection of anthropogenic contaminants throughout the oceans, the widespread degradation of coastal waters and, more recently, the threat of sea level rise, have combined to enforce more realistic attitudes.

There is now every incentive for marine nature conservationists to catch up with their terrestrial counterparts. Unfortunately, although much can be learnt from the experience and expertise gained on land, it is not simply a matter of utilising the tried and tested approaches developed throughout the long and distinguished history of terrestrial conservation. The existing methodology cannot easily be applied directly to the sea, where the essentially open, three-dimensional nature of the system presents substantial difficulties. Not even the biota of the sea bottom are amenable to terrestrial techniques: the benthos cannot be neatly fenced off and protected, as can an area of heath or a patch of meadow. Marine benthic communities are structured physically by edaphic factors related to water movements, while their biological processes and the recruitment to their populations are linked through the water column with tides, currents and hydrographic fronts which affect their trophic dynamics and the diverse life-histories of their plant and animal components. If the benthos thus presents problems of conservation, it is clear that pelagic communities must be even more difficult to protect.

This leads to a consideration of whether marine conservation should focus on particular species, or whether in practice these are most likely to be taken care of by simply looking after habitats. Two of the seminar contributions, on benthos and on marine mammals, provide opportunities to explore issues of this kind. In another direction, it might be argued that the overall requirement for marine conservation would be achieved simply by maintaining the natural diversity of species, and that the most straightforward way of reaching this goal would be to ensure good water quality and to reduce human disturbance, particularly from fishing and mariculture. These topics also are the subject of seminar papers. In practice, of course, the solution is highly complex, since it calls for adequate management of fisheries, control of waste disposal, regulation of recreation in all its diversity of forms, and also for monitoring coastal and hinterland developments which are likely to have an impact on the marine environment. To accommodate this we need a comprehensive management plan for coastal zones, a plan that integrates control of land and water, and encompasses entire drainage and river systems.

Unfortunately, the present fragmentation of responsibility makes such an integrated approach difficult, and the existing legal framework introduces additional problems. It is important to recognise that the coastal zone is an interface, and that this line between land and sea cannot be properly conserved unless due attention is paid to each side of the line. It is worth emphasising that the coastal zone is at risk from both land and sea. We should not allow the current attention to land-based sources of pollution, welcome though it is, to divert us from remembering that there are also threats to the coast from the open sea. Apart from wrecks and collisions, operational discharges of oily water from ships generate tar balls which wash up on the shore, and the disposal of garbage from ships, particularly plastic debris, results in litter on the coast. These sources are ostensibly under the control of several

international treaties and agreements administered by the International Maritime Organisation, the UN agency concerned with shipping activities, but they are not always properly implemented. Here, as in most other areas under discussion, the adequate enforcement of regulations is vital.

In developing a strategy for marine conservation we face a great diversity of topics. A major effort on research, review and discussion is essential. The groundwork has been laid by the NCC. Mention should be made of the Estuaries Review, and of the work of the Marine Nature Conservation Review, now continuing within the JNCC. In Scotland last year a seminar focused particularly on the scientific rationale for marine nature conservation; its proceedings will shortly be available. The present seminar may be seen as a further contribution. The debate will involve all the UK country nature conservation agencies, as well as the Joint Nature Conservation Committee, and we must look for the eventual production of a strategy for marine conservation. This strategy must take in local and national considerations while, in the long term, placing our efforts firmly in the international arena where problems of the marine environment properly belong.

# PROGRAMME

## OPENING REMARKS

**Lord Cranbrook**
**Chairman, English Nature**

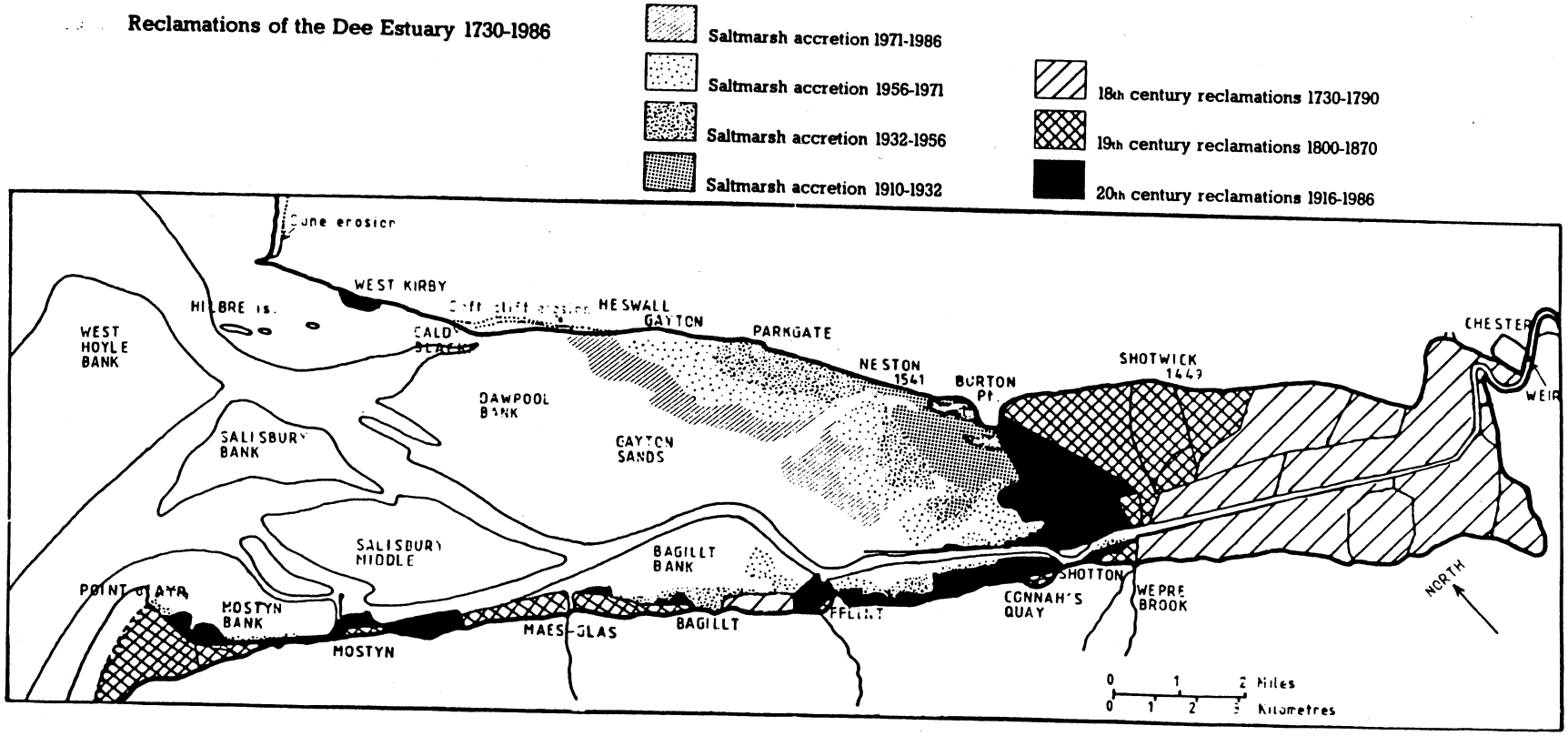
As Professor McIntyre's predecessor as Chairman of Marine Forum, I am delighted to have the opportunity to compliment him on the way he has taken the organisation forward, with the support of Ms Swantje Brodie Cooper. I particularly welcome the move to the Natural History Museum. The initiative taken in arranging this series of seminars will allow the continued free and frank exchange of views.

Professor McIntyre has emphasised that there is much scope for discussion and development in the field of marine conservation. As I see it, ours is the generation that has finally recognised (having learned by hard experience) that the marine environment is not infinitely capable of absorbing the effluent, the abuses and the stresses that are put on it by human activity. We are not ourselves marine animals, and it does perhaps take some courage to venture into the sea. But there is real exaltation in discovering places where the marine environment has been conserved and is still at its best. There are outstanding beauties to be seen underwater and in the close shore environment. I remember Sir Peter Scott, who towards the end of his life evolved the technique for sketching underwater using waterproof crayons and a talc board. He told me that he regretted how late he had turned to underwater nature conservation. He found it a lot easier to observe fishes than birds, but they are just as colourful and their behaviour is just as interesting.

The major thrust of marine nature conservation so far has been devoted to birds. I welcome this. Birds are very useful indicators of the state of the environment at large. Because sea birds spend at least a proportion of their time in that part of the environment we occupy, above the waves, they are amenable to our own scrutiny and our own investigation. Marine conservation now needs to move forward. There remains enormous scope in the underwater world for exactly the combination of amateur and professional involvement that has brought such eminence to bird studies. Here lies this great world of underwater biology, underwater geology, underwater landforms. There are enormously important processes going on in the seas around our country. We must recognise that the coastal zone is the borderline between land and sea. Much of the interest in trying to manage the nature conservation of this area, much of the significance of the decisions that have to be made (and have to be made in the fairly close future) lie in the interrelationship between aspects of management of the land that impact on the sea and management of the wider sea that impacts again on the coastal zone.

We in English Nature are happy to be co-sponsors of this seminar. We are here today in order to expound to you some of the things that we are doing, both with our own staff and through the Joint Nature Conservation Committee. We are also here to discuss with you some of the aspirations and ideas we have for what ought to be done in the future. We have put together a good team. I am glad to see a good mix of visitors whom I welcome, to add to the strength of the presentations and to the discussions that I hope will develop in the course of the day.

**FIGURE 1: THE DEE ESTUARY - progressive enclosure and saltmarsh development since 1730**



progressively enclosed for major industrial development and agricultural use for centuries. As the estuary is squeezed by these reclamations, the tidal volume and the amount of scour is reduced, helping to increase the natural rate of sedimentation. In the early part of this century the introduction of spartina *Spartina anglica*, which rapidly expanded over the mud flats, further exacerbated the process.

The combined effect of these activities has helped make the original ports inaccessible. Thus the docks of Chester, Shotwick, Burton and then Parkgate have progressively been abandoned as they have become silted up. Parkgate, the most recent port to be abandoned, now has an extensive area of saltmarsh along the former sea front which is only occasionally covered by the tide. Access to the quayside by boats is now impossible. Figure 1 shows the extent of enclosure and the growth of saltmarsh in relation to the original estuary.

The mechanism whereby enclosure of the estuary may have influenced these changes, is not clear. However, it is possible that the reduction in the area of the estuary by 25-30% not only aided the process of siltation in the estuary itself but may also have resulted in changes in the sedimentary patterns on the coastline outside. It may be no accident that a depletion of beach levels can be seen near the lighthouse on the Point of Ayr, on the south side of the estuary. There is insufficient information to establish a causal link; however, any further proposals to enclose land within the estuary must consider this wider perspective. There may be other important considerations. During a severe storm in 1991 caravans west of the Point were not affected, partly because the volume of sand in the dunes replenished the beach and absorbed the impact of wave energy during the storm. By contrast the village of Towyn, only a few miles to the west, was badly flooded when the man-made sea defences failed. This circumstantial evidence suggests that the relationship between the enclosure of estuarine land and the impact on the coastline outside the estuary is an important area that requires investigation and suggests that a wider view than is customary must be taken when considering human exploitation of natural systems.

A second example is Dungeness, where three nuclear power stations have been sited on what is essentially a transient geomorphological feature. To the west of the power station complex, a natural process of erosion and landward movement of the beach is taking place. In order to maintain the beach and protect the power station, shingle is removed from the east and transported to the west where it is deposited on the shore. The shingle is then moved eastwards again by the action of the sea, maintaining the beach in front of the power station. Eventually the same material arrives at the original extraction point, where it is removed once more and transported to the west, in a cycle which must continue for as long as the power station is present. With a better understanding at the time of the enquiry into the development of how the system operated, it may not have been built in this location in the first place.

## The requirements of coastal zone conservation

### A question of sustainability

The majority of the coastline of Europe has been subject to human exploitation of which the above are two examples. Nowhere but a very few specially protected nature reserves or inaccessible areas is likely to be free from some form of exploitation. Therefore the conservation of the European coastline will rely on the integration of human activities, including economic uses, in a way that can be sustained without damage to the environment. This goal of 'sustainable use' remains the greatest challenge, but what does it mean ?

In some instances it is easy to define. A single yacht moored in an estuary is unlikely to have a major impact on the environment and may enhance its visual attraction. Recreational use of a sand dune can also be sustainable if the dune is managed appropriately, by controlling access and repairing areas of erosion. However, in those areas where sand dune habitat is also lost to car parks and caravans, the level of use may require a degree of interference with the natural system which compromises its nature conservation value.

Coastal development may be sustainable if enough effort is put to protecting it. However, in order to prevent buildings falling into the sea or land becoming flooded, a sea wall or other protective feature of a sufficient design height to protect the land from being affected is required. Whilst the owners of the threatened development will require the current use to be sustained, the nature conservationist may see it in a different light. Loss of coastal land, including the erection of coastal defences, not only destroys the natural habitat but also interferes with the natural functioning of the zone, which as we have seen in the case of the Dee and Dungeness may have unforeseen consequences.

Coastal zone management (CZM)

Coastal zone management provides one way of achieving sustainable use by operating at a level appropriate to the activities influencing the coast and the decision-making process controlling them. Thus CZM policies can develop at a variety of levels, which might include individual sites (such as a whole estuary) or covering a subject (pollution, sea defence) which operates over a wider geographical area. In practical terms these would build on initiatives already in operation such as the Heritage Coast programme and English Natures' Estuaries Initiative. Within the context of these initiatives, coastal zone conservation will involve a continuation of the traditional approach of site and species protection. At the same time a more positive approach which accepts that dynamic change both within and between sites is important in achieving conservation. In areas where the 'coastal squeeze' has reduced the ability of the coast to adjust to changes in the natural environment, such as those associated with sea-level rise, this may be of significance, for both wildlife and sea defence. The way in which these relate to the requirements of coastal zone conservation are considered below under four main headings.

**Site conservation - a dynamic approach**

The traditional way of achieving the conservation of habitats and species has been through a variety of site protection measures, including the designation of National Nature Reserves and Sites of Special Scientific Interest. However, protection is to some extent a static concept which is an anathema on many coastlines where dynamic systems operate. The example of Braunton Burrows, in Somerset, will be used to show how a more dynamic approach to coastal conservation has evolved in recent years.

In 1953, as a result of war time activity and high rabbit populations, a large part of the site was devoid of vegetation and subject to considerable sand blow. Over the next few years marram grass *Ammophila arenaria* and sea buckthorn *Hippophae rhamnoides* were extensively planted, in order to help stabilise the moving sand. At the same time the rabbit population dropped because of myxomatosis. By 1982, there was a considerable increase in vegetation cover - so much so that in recent years English Nature's South West Region have been considering how they can reinstate some of the open vegetation that has been lost from the site. Today attempts are being made to reintroduce grazing to help reverse this process. In a little over 30 years the manager's concern has moved from a desire to prevent sand mobility and erosion to one where there is considered to be too much stability.

Many other sites have been stabilised in the same way, by the planting not only of sea buckthorn but also pine forests. At some sites removal of the trees, in order to help to reintroduce sand mobility into the system, is underway. The key point is that sand dunes are dynamic and there has to be movement of sand in order to retain the full expression of their nature conservation interest. It is the case that today's blow-out is tomorrow's sand dune slack. In dealing with any of the major coastal formations similar principles can be applied. A new shingle beach may help to regenerate a degraded shingle structure if it is left to erode. Estuarine saltmarshes may go through many cycles of erosion and accretion as channels change their courses. Thus protecting the best examples of coastal habitats must include acceptance that dynamic change is a natural and healing process in coastal systems. This is also important when considering habitat restoration (see below).

**The wider coastline**

The coastline of England, despite the growth of development and coastal defence, still supports extensive examples of habitats and species concentrations. Some of the concepts of site protection will continue to be applicable to large sections of the coast because a high proportion is covered by statutory designations. For example, the whole of the North Norfolk Coast and the Wash is included in several Sites of Special Scientific Interest. It is also a Heritage Coast and there are a host of other types of designation (see figure 2). However, for the principles of sustainable use to be applied it is also necessary to consider the wider coastal environment and to understand the way in which our activities impact on it.

For the purposes of this discussion, reference is made to the impact of coastal protection. Concrete sea walls, groynes or revetments are a familiar sight along many soft glacial cliffs, particularly in south-east England. In addition to questioning whether building on a cliff that is inherently unstable represents a sustainable development, it is important to consider the knock-on effects elsewhere. If the coast protection is successful in preventing erosion, the impact on adjacent coasts may be significant. A high beach prevents the sea from attacking the base of a cliff. Since much of the material on the beach is derived from the cliff itself, either directly or by the process of longshore drift, prevention of erosion may have serious consequences for adjacent land. Thus the depletion of a sediment supply, either to nourish beaches or for the building of other natural protective structures, such as sand dunes and shingle bars, results in the need for the coast protection to be extended further along the coast. In this way more than 50% of the coastline of the south-east of England is 'protected' by some form of artificial structure.

The impact on nature conservation is two-fold: firstly, it is essential for the cliff to continue to erode in order to retain the characteristic plant and animal communities and geological features that are often associated with them; secondly, starving adjacent sedimentary systems prevents regeneration of new habitat. Increasingly, the value of a natural beach to coastal stability is being recognised, and in this area at least a more integrated approach to management is being attempted.

This is only one of many wider coastal issues, such as the pollution from rivers that flow into the sea and its impact on wildlife. Pollution from the oil industry both onshore and offshore is also important. Finally, the whole issue of global warming and the possible impact of an increase in the rate of sea level rise provides us with a significant incentive to look at conservation in the context of the wider coastline.

# ESTUARINE AND MARINE WATER QUALITY

**Dr R J Pentreath**
**National Rivers Authority**
30-34 Albert Embankment
London

The NRA has responsibilities relating to the quality of 'controlled waters' within the meaning of the 1989 Water Act - now consolidated into the 1991 Water Resources Act. Such controlled waters include estuaries and the first three nautical miles of the sea. These Acts also allow for the Secretary of State, for the purposes of maintaining and improving the quality of controlled waters, to set water quality objectives (WQOs) for such waters; once set, there is a duty placed upon both the Secretary of State and the NRA to achieve them. The NRA has issued a consultation document on how a WQO scheme might work - including the use of different classification schemes - and, after considering the many responses received, will advise the Secretary of State accordingly.

The quality objectives, and thus standards, which have previously obtained are those arising from EC Directives - primarily those relating to the quality of bathing waters, shellfish waters, and the discharge of certain dangerous substances. New EC Directives, however, are bringing with them new demands to define and monitor water quality in coastal waters in relation to the treatment of urban waste and nitrates in surface waters. Another anticipated Directive is likely to address directly the subject of surface water quality.

The NRA has, therefore, through its Research and Development programme, studied ways by which estuarine and coastal waters may be monitored. Combinations of shore-line, boat and aerial surveillance analyses have been made and are now being considered as the basis of an operational programme. Such a programme would be unique in European coastal waters.

# CONSERVATION IN ESTUARIES

**Dr Malcolm Vincent**
**English Nature**
Northminster House
Peterborough

Estuary conservation in Britain has had a rising profile in recent years. In 1990 the Royal Society for the Protection of Birds launched its "Turning the Tide" campaign, which aimed at raising the national awareness of the importance of our estuaries and the pressures they are facing. The RSPB reinforced its national campaign with a number of local initiatives. The campaign was fully justified as estuaries have a crucial role for wildlife conservation in Britain and western Europe.

During the late nineteen-eighties the former Nature Conservancy Council reviewed the available information on the nature conservation aspects of Britain's estuaries. This work culminated, in 1991, in the NCC publication "Nature conservation and estuaries in Great Britain" - which is normally called "The Estuaries Review". Many of the examples I am going to use to illustrate this talk are taken from that publication which, I am sure, will remain a valuable source of information for those involved in estuary conservation for many years to come. This work on estuaries is presently being extended and updated, and placed into its wider coastal context, by the Coastal Review Unit of the Joint Nature Conservation Committee.

For the purposes of this talk, I shall use the definition of estuaries provided in the estuaries review; that is, a semi-enclosed area, at least partly composed of soft tidal shores, which is open to saline water from the sea and which is receiving a freshwater input. I shall say a little about the value and variety of the estuarine resource, the pressures it faces and what English Nature proposes to do to conserve it.

The scale of Britain's estuary resource is considerable, extending to over half a million hectares. The NCC's "Estuaries Review" identified 155 estuaries, the two largest being the Wash (67,000 ha) and the Severn Estuary (56,000 ha). In contrast, many are relatively small, with 80 estuaries, over half the total number, each having intertidal areas of less than 500 ha. In Britain as a whole, estuarine habitats comprise the second largest component of the national series of Sites of Special Scientific Interest. In England, they form far and away the largest component; about 30% of the area of English SSSIs are comprised of estuarine habitats.

The pattern of scale and distribution of British estuaries and of intertidal areas on estuaries is very similar. Estuaries are distributed all round the coast. The larger estuaries, particularly those with considerable intertidal areas, are, however, somewhat clustered. This can be seen in the groups of estuaries between the Dornoch Firth and Fife, between the Humber and the North Kent coast, the Solent, the Severn and South Wales, and north-west England from the Dee to the Solway. These are complemented by a host of smaller estuaries in south-west England, northern parts of Wales and western Scotland. British estuaries comprise nearly 28% of the entire estuarine area of the European Atlantic and North Sea coastal states. This is more than any other European country - although the international Waddensea forms the largest continuous area.

Any conservation assessment of British estuaries tends to be dominated by reference to their importance for migrant and wintering waterfowl. In January, over 1.7 million waterfowl are present on estuaries - amounting to 62% of the British wintering population. Of these, 580,000 are wildfowl (representing 38% of the British population and 4% of the north-west European population). These are supplemented by 1.1 million waders (a massive 90% of the British population and over 15% of

the East Atlantic flyway population). Not surprisingly, the relative distribution of these populations reflects the overall pattern of estuary distribution, with the main concentrations along the North Sea Coast, the Solent, the Severn, and north-west England, a pattern which is again reflected, although not quite mirrored, in the numbers of different wader species breeding on individual estuaries. The way birds utilise the estuary resource, however, is very complex - being affected by the overall pattern of migration, responses to periods of cold weather and utilisation of the available resource. If you draw a line joining two sites between which the movement of just a single species, for example dunlin, has been recorded, the result is an intricate network across the country. As such networks are drawn up for species after species, the picture becomes vastly complicated. However, what one can say is that all the British estuaries are linked into this network and all have an important part to play.

The diversity of British estuaries is unique in Europe, ranging from the extensive sand and mudflats in such localities as Morecambe Bay, which is used by some 130,000 waders in winter, to estuaries such as the Fal, with its kelp forests, maerl beds and cup corals. Estuaries characterised by sandy intertidal areas tend to be aggregated on the more exposed western coasts and those of the central and northern North Sea. Those characterised by mudflats tend to occur along the Channel coasts and southern North Sea. Of course, many estuaries contain both types, with local geology and topography playing an important role.

The "Estuaries Review" identified some 44 major aquatic estuarine invertebrate and seaweed community types. It is of interest to compare the density of these different communities within individual estuaries with their overall size and value for birds. The result is quite striking. The most diverse estuaries are located in the Solent, south-west England and South Wales. In these estuaries the diversifying factors of a range of substrate type, exposure and salinity are reflected in the range of invertebrate communities. Comment can perhaps be passed on one or two of these communities. For example, the beds of the eelgrass *Zostera* are important as an invertebrate habitat, as nursery areas for species of fish, and as an invaluable food source for winter migrant birds such as brent geese and wigeon. A related group of marine grasses *Ruppia* occur in brackish water. The distribution of eelgrasses reflects the muddier end of the estuary spectrum. In contrast are the communities associated with the reef-building fan worms *Sabellaria*. These reefs usually occur on the open coast and are rare within estuaries, but a few good examples occur, the reefs often developing on bedrock and boulders. This community can occur in areas subject to tidal scour with a high level of suspended material in the water, conditions which arise, for example, in the Severn and parts of the Wash. Time does not allow me to dwell on the other groups of plants and animals which utilise British Estuaries, although estuaries are important for both fish and sea mammals.

Estuarine areas have come under considerable human pressure over the years and this is continuing. One of the most important threats is the encroachment of land-based activities into the estuary zone through the process of enclosure by sea walls and conversion of the protected area to either agricultural land or for development. Most estuaries have been subject to this process over the centuries. An example is the periodic encroachment of land claim on to the saltmarsh habitat of the Ribble estuary over the last 135 years, which has continued until recently.

The limits of the intertidal area of estuaries, so important for waterfowl, are set by the high and low water marks. The high water mark is often set by the position of a sea wall. If that sea wall remains in place and is maintained, any rise in sea level will move the position of the low water mark towards it and the intertidal area will be reduced. Sea level rise as a result of sinking land levels following the last ice age is already taking place at least in southern and eastern Britain and the rate of rise is expected to increase as a result of global warming. The main areas likely to be affected are the coast of the southern North Sea and the Channel and parts of north-west England (all notable for their

waterfowl population). Effects of sea level rise include flooding, habitat erosion and salt water intrusion, and are already being felt. A repeat survey in 1988 on the salt marshes of 11 estuaries in Essex and North Kent showed losses of between 10 and 44% of saltmarsh area over a period of only 15 years, probably as a result of sea level rise.

The concentration of urban and industrial areas on estuaries is a notable feature in Britain - for centuries a trading nation with its industries largely dependent on imported raw materials. The intertidal area of many of our smaller estuaries, for example those of the Tyne and Wear, and, increasingly, the Tees, have been utilised for docks and industrial development and associated infrastructure. These pressures continue - witness the recent development at Felixstowe. These pressures are, however, only the most obvious of the many which affect British estuaries. Others include barrage schemes, power generation, extraction and processing of natural gas and oil, military activity, waste discharge, dredging and transport infrastructure, residential, tourism and recreation, wildfowling, fisheries and shell fisheries and many others. Many of man's activities on estuaries are essential to Britain's economic wellbeing and future prosperity, and have to take place there. Others, and I would include such matters as the dumping of domestic and commercial waste and the proposals for new residential development, do not require an estuary location. The issue for Britain is how to maintain economic prosperity, meet people's needs and at the same time maintain the natural resource. The issue is how to manage estuaries in a sustainable way. By sustainable I mean ways that:

- will retain that part of the natural resource which is irreplaceable, or will prove too difficult or expensive to replace;

- will maintain the overall value of Britain's estuaries for wildlife;

- will offset any unavoidable losses through compensatory gains.

This perception of the issue is shared not only by English Nature and the RSPB, but by some Government Departments, some local authorities, and by many other people and organisations. But the perception is not shared universally - far from it. Starting this month (April 1992), English Nature will commence an Estuaries Initiative. The aim of this is to ensure that England's estuaries are managed in a sustainable way. The main objectives of the Initiative are:

- to achieve, within a few years, a widely shared understanding of the value of England's estuaries for wildlife and of the need to use estuaries in a way which will retain the irreplaceable, sustain the overall resource and enhance its carrying capacity for wildlife;

- to achieve, by the year 2000, wide acceptance of management plans, inculcating the above concept, for 50% by number and 80% by area of England's estuaries;

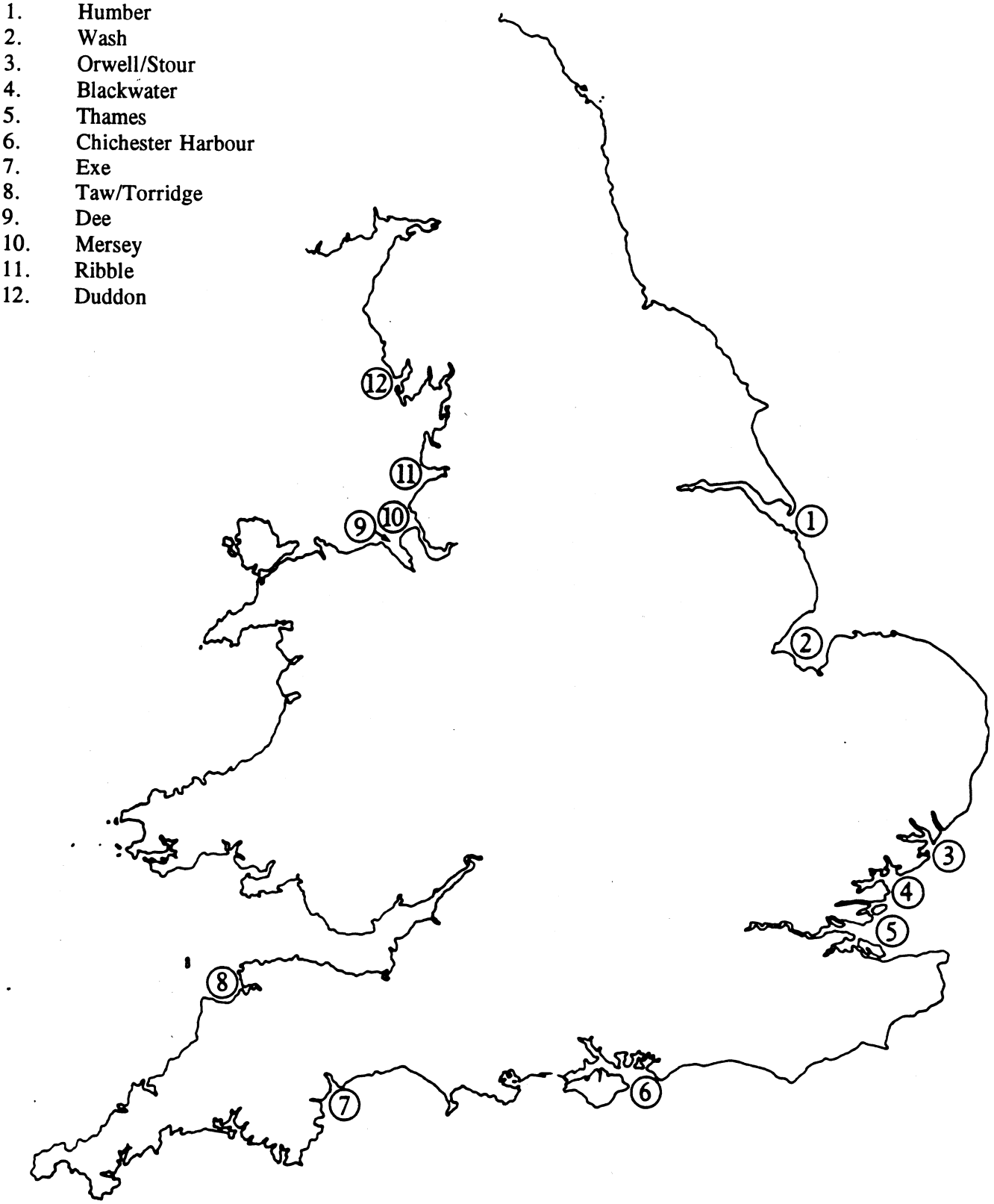
- to achieve, by the year 2000, enhanced management over a substantial proportion of estuaries.

To achieve this we shall be working closely with the Joint Nature Conservation Committee and the conservation agencies in Scotland and Wales, with Government Departments, with local authorities and other public bodies, with the RSPB, the Wildfowl and Wetlands Trust and others in the voluntary sector, and with estuary and maritime users. As regards the first of these objectives, we shall be working with these organisations in the preparation of a national strategy for estuaries which will set clear objectives and define policies by which these will be met. Our intention is that this strategy will provide a framework for planning and decision-taking on matters relating to estuaries.

**FIGURE 1: AREAS SELECTED FOR ESTUARIES INITIATIVE FIRST YEAR**

INDEX

1. Humber
2. Wash
3. Orwell/Stour
4. Blackwater
5. Thames
6. Chichester Harbour
7. Exe
8. Taw/Torridge
9. Dee
10. Mersey
11. Ribble
12. Duddon



The second objective, that of preparing estuary management plans, is intended to be met by a programme of phased plan preparation undertaken over 6 or 7 years. English Nature will:

- contribute to the development of plans already under preparation, and

- encourage and assist in the preparation of further plans.

In 1992/93 we intend to be involved in the preparation of management plans for at least 10 estuaries, possibly more. At the moment, we are looking at proposals to produce management plans for the Humber, Wash, Blackwater, Orwell-Stour, Thames, Chichester Harbour, Exe, Taw-Torridge, Dee, Mersey, Ribble and Duddon estuaries. This first group has been selected on the basis of:

- timeliness, in relation to the willingness of other partners to collaborate in plan preparation and adoption;

- selection of a geographical range and mix of sites, to cover estuaries of differing size, type and wildlife value; and

- the need to help implement our international wildlife obligations under the Ramsar Convention on wetlands, the EC Directive on the conservation of wild birds, and the forthcoming EC Directive on habitats and species.

This group of estuaries represents 12% by number and 40% by area of England's estuaries. Work in which English Nature is involved, is already underway on three estuaries, the Wash, the Exe and the Ribble, with work on the Mersey only a little way behind. Plans for some of these estuaries will be completed this year; others may take two or three years to complete. At the same time as preparing management plans for these estuaries, we shall be identifying estuaries on which work will start next year and beyond. This will involve discussion with the local authorities and other partners with a view to progressing plan preparation as a collaborative effort. Likely candidates include the Fal, Poole Harbour, Morecambe Bay and, perhaps, the Severn. Each management plan will:

- summarise the natural, cultural and economic resources of the estuary within its wider national and international context;

- set out the current management framework;

- identify potential conflicts of interest;

- identify options which will permit the sustainable use of the estuary and formulate appropriate policies;

- identify areas suitable for enhanced management.

English Nature will promote with Government and others the use of these management plans as the basis of future local and national decision taking.

I mentioned that the plans will identify areas for future enhanced management. The nature of this enhancement will vary from estuary to estuary, and between localities in the same estuary. For example the plant and animal communities of many of the saltmarshes of Morecambe Bay, the Solway and the Severn, where grazing levels are heavy, are substantially different from those on the North

Norfolk Coast where grazing is much lighter. Whether the introduction or relaxation of grazing is desirable will depend upon the circumstances, but judicious modification of management can lead to an increase in the overall wildlife resource. Another example of management might be to zone recreational use of the estuary to ensure that areas used for feeding or as high tide roosts by waterfowl are left as undisturbed as possible. Improvements to water quality in estuaries capable of supporting diverse communities, including communities containing sensitive species, or to improve the habitat for migratory fish, could be another measure.

On a more radical note, and looking well to the future, we shall be looking at the potential of areas adjacent to estuaries as replacement habitat to offset the expected losses of intertidal habitat as a result of sea level rise. In the immediate future we shall be developing the appropriate techniques for such habitat re-creation, conducting appropriate trials. Even now, however, we should be considering identifying areas where the coast can be permitted to find a new line, for example by retreating inland against a rising slope, and to try to ensure that such retreat is not prevented by new and inappropriate development.

The third part of the Estuaries Initiative will be the implementation stage, not just the taking of appropriate decisions, but the carrying out of enhancement works. It is envisaged that this phase will follow immediately on from plan production and will involve many of the public agencies as well as English Nature.

It is relatively easy to communicate the importance to the national and European heritage of British estuaries and to draw attention to the pressures they are facing. To achieve lasting and effective conservation, however, will require a considerable and determined effort over many years - involving the whole community. Currently, this process is at an early stage. While, because of the growing awareness of the importance of estuaries, the rates of loss have slowed, at least for the moment, overall the pressures are as heavy as ever. Most of the work which needs doing to achieve our objectives remains still to be done. This work will be complex and may not be as rapid as we would like, but we think our targets are achievable, and with the support of our partners we intend to achieve them.

# CONSERVING MARINE MAMMALS

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During the last twenty or thirty years, there has been a dramatic change in the way the public perceives marine mammals in the UK and much of the rest of the world. Many people now see seals and cetaceans as animals to conserve and protect rather than as a resource. This has been reflected by changes in national and international legislation.

It is important to recognise that questions of conservation and management of marine mammals can raise strong feelings in people. On the one hand, there are hunters who see them as a resource and fishermen who see them as competitors. On the other, there are people for whom marine mammals have a special status which raises them above other animals. Their conservation is always likely to be in the public eye and, because of the depth of support for their protection, is likely to be more assured than for most other kinds of animals.

When considering the conservation of marine mammals, especially cetaceans, it is also useful to bear in mind a number of other points which are a consequence of the simple fact that they live in the sea. They do not necessarily respect national boundaries so that conservation measures need to be considered at an international as well as a national level. Of particular relevance to this presentation is that, in many cases, it may not be useful to distinguish between "English", "British" or even "European" marine mammals.

This also raises the question of whether the conservation of marine mammals is most effectively achieved through the management of species or the management of habitats.

Because they live in the sea, marine mammals are difficult to study and monitor. This means that it is difficult to assess their status, it may be difficult to assess the significance of potential threats, and conservation measures may be difficult to implement.

In this presentation I shall review the national legislation and international agreements affecting marine mammals in Britain, briefly review the current status of knowledge of the various species, identify the main threats to marine mammals which frequent British waters, and discuss conservation needs for the future and how these might be implemented.

## National legislation

### Seals

Matters relating to seals within the territorial waters of England, Wales and Scotland are covered by the Conservation of Seals Act 1970, a number of subsequent Orders relating to this Act, and elements of the Wildlife and Countryside Act 1981. The basis of the Conservation of Seals Act is not to prohibit the killing of seals; rather it describes limitations on how, when and why seals can legally be killed. The following is a summary of the main points of the Act.

A firearm of at least a certain calibre must be used to kill a seal. There is a close season from 1 September to 31 December for grey seals and from 1 June to 31 August for common seals to

protect them during their respective pupping seasons. Orders can be made by the Secretary of State to prohibit the killing of seals at any additional time in any area. Notwithstanding the above, seals can be taken from the wild for the purposes of rehabilitation. It is not illegal to kill a seal unintentionally, and seals can be killed "in the vicinity" of fishing nets to prevent damage to the nets or the fish therein. In addition, licences can be granted by the Secretary of State to take seals at any time in any place for scientific or educational purposes, for live display, or for (i) prevention of damage to fisheries, (ii) reduction of a population surplus for management purposes or (iii) as a resource or (iv) protection of fauna and flora. Before granting such licences, the Secretary of State is required to consult the Natural Environment Research Council. NERC is required to provide the Secretary of State with scientific advice on matters related to the management of seal populations.

In 1988, an Order was implemented with gave year-round protection to grey and common seals in England and Wales, and to common seals in Scotland, in response to concerns about the effects of the phocid distemper epizootic. In 1990, another Order renewed this year-round protection for grey and common seals on the east coast of England from the Scottish border to Newhaven for a period of three years. This area covers all the main pupping sites in England. There is an additional Order protecting common seals year-round in Shetland.

Cetaceans

The Wildlife and Countryside Act 1981, amended in 1986, prohibits the killing of all cetaceans within British territorial waters. It is not illegal to kill an animal incidentally if it "could not reasonably have been avoided". But it is illegal to damage any place which an animal uses for shelter or protection or to disturb an animal while occupying such a place. Such places are easy to dedine for seals, but difficult for cetaceans.

The Fisheries Act 1987 protects all cetaceans from fishing activity within the 200 mile limit.

**International agreements**

The range of many marine mammal species includes territorial waters of more than one country and international waters. The following international agreements are relevant (to a lesser or greater extent) to the conservation of marine mammals which occur in English waters.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973 (CITES) protects certain marine mammals which may be threatened by international trade, such as sperm whales for their teeth.

The Convention on the Conservation of European Wildlife and Natural Habitats 1979 (Berne Convention) places emphasis on the protection of the habitats of endangered and vulnerable species. The harbour porpoise and the bottlenose dolphin are listed on Appendix II requiring the strictest protection. The Berne Convention is important because it requires rather than merely encourages Parties to take actions. It prohibits deliberate damage to breeding or resting sites of Appendix II species. (The Wildlife and Countryside Act 1981 has a similar prohibition for all cetaceans in British waters.) Such places are easy to define for seals but very difficult to define for cetaceans.

As a result of the European Commission habitat directive, member states will be formally required to identify critical habitat of certain species, which will include grey and common seals, bottlenose dolphins and harbour porpoises.

The Convention on the Conservation of Migratory Species of Wild Animals 1972 (Bonn Convention) is concerned with protection of species which regularly cross state boundaries. It requires signatories to enter into agreements to protect species which travel through their territories. In September 1991, the final act on the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas was signed. The text in the appropriate languages is now deposited at the UN in New York; six range states are required to sign for it to be ratified. This Agreement is discussed further below.

**Current status of species**

Seals

As noted above, the NERC is obliged under the Conservation of Seals Act 1970 to provide government departments with scientific advice on matters relating to the management of seal populations. Work done by the NERC's Sea Mammal Research Unit provides the information which forms the basis for Council's advice.

Grey seals

The British grey seal population at the start of the 1990 pupping season is estimated to be 85,100 animals (Hiby, Duck and Thompson, 1992). The increase in total numbers between 1989 and 1990 was 7.3%.

The estimated number of grey seals associated with breeding sites in England and Wales is 6,900; 3,100 in south-west Britain, the rest off the east coast. However, there is known to be considerable movement of grey seals off the east coast of Britain (Hammond, McConnell and Fedak, in press). The population which lives off the English east coast should at least include those animals associated with the breeding site at the Isle of May in the Firth of Forth and the estimate is then 7,900 animals.

Common seals

In 1991, the British common seal population was estimated to be at least 25,000 animals, based on minimum counts of animals hauled out of the water (Hiby *et al*, 1992). At least 2,000 common seals are estimated to live off the east coast of England. Between 1969 and 1988, this population increased at an average rate of 3.5% per annum but was reduced by about 50% following the 1988 phocid distemper epizootic. Counts made since 1988 have shown no evidence of a recovery in numbers.

Cetaceans

Our knowledge of the status of cetaceans species which occur in British waters is poor. It is based largely on opportunistic information obtained from strandings, incidental sightings and by-catches in fishing gear. Few of the available data have been collected from directed, structured studies. With a small number of exceptions, we can do little more than present incomplete general information on these animals. Status cannot be determined for any species of cetacean which occurs in British waters.

The following is a brief summary of our current state of knowledge of cetaceans in English waters.

Harbour porpoise

The North Sea is probably the most important area for this species in the North Atlantic. In British waters, harbour porpoises constitute the majority of incidental sightings and strandings with no overall

trend in the latter from 1913 to 1979 (Easton *et al*, 1982). The frequency of incidental sightings is lowest in the southern North Sea, the Channel and the Irish Sea. An estimate of 61,300 harbour porpoises has been obtained for the northern North Sea in 1989 (Bjørge and Øien, in press). Evans (1990) has reported declines in porpoise abundance in three separate areas in Shetland based on boat surveys carried out during the 1980s. The number of coastal sightings of small cetaceans, including harbour porpoises, appears to have declined during the last 30 years (Tregenza, 1992). Harbour porpoises are the most commonly caught cetacean species in fishing nets in British and European waters of the North Sea, mostly in bottom-set large mesh gill nets.

Dolphins

Strandings and incidental sightings data indicate that bottlenose dolphins are seen all round the British coast but that the number of records has declined in the last 30 years or so (Evans, 1980). There are well-documented resident groups in the Moray Firth, Scotland, and Cardigan Bay, Wales; it is likely that there are others around Britain, even perhaps in English waters.

Most often seen to the south and west of Britain, common dolphins have featured in the media recently because this year over 70 animals have been found dead in southwest England. Many were probably killed in fishing nets and discarded at sea.

Other cetacean species seen regularly in British waters include the whitebeaked, whitesided, striped and Risso's dolphin and the killer and long-finned pilot whale.

**Threats to marine mammals**

Directed kills

Directed killing of seals, under the provision of the Conservation of Seals Act 1970, occurs around the Scottish coast to protect fishing and fish-farming interests. Information on numbers of seals shot is poor so it is difficult to assess the significance of this mortality. In England, the National Trust has been granted licences under the Act to kill grey seal pups to protect flora and fauna on the Farne Islands.

Directed killing of cetaceans is not known to occur in Britain.

Incidental kills

Seals and cetaceans are taken incidentally as by-catches in fishing gear and in anti-predator nets around fish farms. Northridge (1988) suggests that grey and common seals, harbour porpoises and common dolphins are the most commonly caught species, but there is little hard information available. The species which is most affected is thought to be the harbour porpoise, as in much of the rest of northern Europe. For cetaceans, the lack of data on numbers killed combined with a lack of knowledge of population structure and abundance means that it is currently impossible to assess the impact of incidental fishing mortality. A voluntary scheme has been introduced by MAFF and SOAFD for fishermen to record incidentally caught marine mammals; whether this will provide any useful information remains to be seen.

Marine mammals may also be killed incidentally as a result of other human activities, such as collision with boats. No information is available on this in British waters.

Disturbance

Human activities may disturb marine mammals in a number of ways. Seals can habituate to regular disturbance. For example, the haul-out area for grey seals south of the Humber Estuary is part of an airforce bombing range. In addition, acoustic devices to scare seals away from salmon farms have had limited success. More serious disturbance to seals occurs if mothers and pups become separated during the breeding season.

Little is known about the effects of disturbance on the cetacean species which live in British waters. Perhaps the most important source is underwater noise generated by ships with heavy propeller loading, or inshore boats and jet-skis using powerful motors. Coastal species such as bottlenose dolphins appear to be able to tolerate high levels of disturbance generally but it is possible that the effects may become significant if key areas used for specific purposes are consistently disturbed. Evans (pers. comm.) has recently conducted research into the effects of engine noise on small cetaceans.

Another form of disturbance is that related to human concern or interest. One example concerns the friendly bottlenose dolphins which periodically occur around the British coast. Such animals may become popular tourist attractions and the level of attention they receive may border on harassment. The possibility that greater public awareness and interest in marine mammals may lead to an increase in disturbance cannot be ignored.

Environmental contaminants

Organochlorine compounds

The Organochlorine compounds which have caused the most concern with respect to marine mammals are the insecticide DDT and its metabolites and impurities, and the PCB's and their impurities (notably the dioxins and furans).

Bergman and Olsson (1985) have documented serious liver disease in Baltic seals with high organochlorine levels. Reijnders (1986) has shown experimentally that high organochlorine levels in the diet of female common seals caused a decrease in reproductive success. Research is currently underway to investigate the effects of organochlorine levels on common seal immune systems.

Although very high organochlorine levels have been recorded in some small cetaceans (Morris *et al*, 1989), there is no direct evidence of the adverse effect of these compounds equivalent to that for seals. Nevertheless, the potentially harmful effects of such high levels cannot be ignored.

In 1990, the Third Ministerial Conference on the North Sea agreed to phase out and destroy all remaining identifiable uses of PCBs by 1999. This is an important and wise decision but its implementation will not be easy.

Other environmental contaminants

Other environmental contaminants which may pose a threat to marine mammals include heavy metals, oil, marine debris and sewage outfall.

High concentrations of mercury and lead have been found by Law *et al* (in press) in the livers of small cetaceans from the Irish Sea and particularly from the Liverpool Bay area. The highest level was close to the limit of tolerance for mammalian hepatic tissue.

The effects of oil pollution on marine mammals have been much studied (Geraci and St Aubin 1990) but this is probably not a significant threat around Britain.

Marine debris, mainly in the form of plastics and pieces of fishing net, may cause problems to marine mammals. Around the coasts of Britain, it is not unusual to see seals with pieces of net around their necks but it is not known whether or not this is a serious problem in population terms.

Untreated sewage may contain toxic chemicals and novel disease agents which could affect marine mammals. The risks are unknown but should only affect coastal populations living close to the outfall.

In general, the effects of these other agents are not well-known but are probably less important than the potential problems associated with organochlorines.

Changes in prey availability

British seals feed upon a wide range of species (eg Hammond and Prime, 1990), suggesting that changes in the relative abundance of prey available to them would not cause serious problems, although foraging distribution may change. Most cetaceans around the British coast also show a varied diet, where information is available, and the same is probably true for these species. The long-finned pilot whale and Risso's dolphin, which feed mainly on squid, may be more vulnerable to such changes.

Reduction in the abundance of preferred prey species as a result of over-fishing may have more serious consequences. The recent meeting of the ICES Study Group on Seals and Small Cetaceans in Northern European Seas noted that the predicted consequences of reduced availability of preferred prey are: an increase in foraging effort, reduced juvenile growth rate, increased mortality during the first months of life, reduced birth and weaned weight of young and, ultimately, reduced birth rate.

**Conservation needs and action for the future**

Seals

The conservation needs for grey seals are quite well served by the current status quo. The number of animals which are shot by fishermen in defence of their nets is unknown but is not preventing population growth around Britain. The continuing commitment to research on grey seals (by eg MAFF, SOAFD and the Countryside Council for Wales) should ensure a good basis for advice on conservation and management in the future.

For common seals in England, the most immediate conservation need is to ensure the recovery of the East Anglia population which was reduced by about 50% by the phocid distemper epizootic in 1988. This population was growing at about 3.5% before the epizootic and as long as the seals are allowed to breed undisturbed there is currently no reason to doubt that numbers will increase in the future. In Scottish waters, the shooting of common seals around fish farms may cause local problems.

Cetaceans

Cetaceans pose a different level of problem, partly because our knowledge of them is so much poorer and partly because the threats seem to be greater. There are two extremes that can be considered for determining their conservation needs and action for the future. One is to identify the threats and act to remove them on the grounds that they may have potentially serious effects. The other is to

identify the threats but to do nothing until assessment of each one shows whether or not it is serious enough to warrant action. The sensible way forward would seem to be to take the generally precautionary approach of working to remove those threats which, on the basis of available data, seem likely to have an impact on populations whilst gathering more information to assess all the potential threats.

The Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas is an excellent model for this course of action.

The purpose of the Agreement is for signatories "to cooperate closely in order to achieve and maintain a favourable conservation status for small cetaceans" in the area covered by the Agreement, by applying, as far as possible, the conservation, research and management measures prescribed. These measures are quite wide-ranging and include:

1. Working towards

   a. the prevention of the release of substances which are a potential threat to the health of the animals,

   b. the development, in the light of available data indicating unacceptable interaction, of modifications of fishing gear and fishing practices in order to reduce by-catches,

   c. the effective regulation to reduce the impact on the animals of activities which seriously affect their food resources,

   d. the prevention of other significant disturbance, especially of an acoustic nature.

2. Conducting research to

   a. assess the status and seasonal movements of the populations and stocks concerned,

   b. locate areas of special importance to their survival,

   c. identify present and potential threats to the different species.

   - Studies under 2(a) should particularly include improvement of existing and development of new methods to establish stock identity and to estimate abundance, trends, population structure and dynamics, and migrations.

   - Studies under 2(b) should focus on locating areas of special importance to breeding and feeding.

   - Studies under 2(c) should include research on habitat requirements, feeding ecology, trophic relationships, dispersal, and sensory biology with special regard to effects of pollution, disturbance and interactions with fisheries, including work on methods to reduce such interactions.

   - These studies should exclude the killing of animals and include the release in good health of animals captured for research.

3. Endeavouring to establish efficient national systems for reporting and retrieving by-catches and stranded specimens, and carrying out full autopsies to collect tissues for further studies, to reveal possible cause of death and to document diet composition.

4. Endeavouring to establish national laws, where these do not already exist, to prohibit the intentional taking and killing of small cetaceans and to impose the obligation to release any animals caught alive and in good health. (UK law already covers these.)

5. Providing information to the general public to ensure support for the aims of the agreement and to facilitate the reporting of sightings and particularly strandings; and to fishermen to facilitate and promote the reporting of by-catches and the delivery of dead specimens required for the research outlined above.

This framework encompasses the precautionary approach of acting to remove those threats which are believed to be of serious concern, whilst encouraging data collection and research to improve our knowledge of the animals in order to assess the impact of these and other threats. The Agreement combines conservation by population and conservation by habitat. For marine animals, this is essential because it is not possible to address all the concerns on either basis alone.

It also, by its nature, recognises the importance of conservation of small cetaceans in an international forum. It remains to be seen how effective the Agreement will be in achieving its aims and how the various called-for actions will be divided amongst the UK and other European countries, and amongst England, Scotland and Wales.

BERGMAN, A., OLSSON, M. 1985. Pathology of baltic grey seal and ringed seal females with special reference to adrenocortical hyperplasia: is environmental pollution the cause of a widely distributed disease syndrome? *Finnish Game Res, 44,* 47-62.

BJORGE, A., OIEN, N. (in press). Distribution and abundance of harbour porpoise *Phocoena phocoena* in Norwegian water. *Rep. int. whal. Commn.* (special issue).

EASTON, D. F., KLINOWSKA, M., SHELDRICK, M. C. 1982. A preliminary analysis of the British stranding records of the harbour porpoise (*Phocoena phocoena*). *Rep. int. Whal. Commn., 32,* 423-7.

EVANS, P. G. H. 1980. Cetaceans in British waters. *Mammal Rev., 10,* 1-52.

EVANS, P. G. H. 1990. European cetaceans and seabirds in an oceanographic context. *Lutra, 33,* 95-125.

GERACI, J. R., ST AUBIN, D. J., *eds.* 1990. *Sea mammals and oil: confronting the risks.* Academic Press, Toronto.

HAMMOND, P. S., PRIME, J. H. 1990 The diet of British grey seals ( *Halichoerus grypus*). *In: Canadian Bulletin of Fisheries and Aquatic Sciences, 222: Population biology of sealworm (*Pseudoterranova decipiens*) in relation to its intermediate and seal hosts* ed. W. D. Bowen, 243-54.

HAMMOND, P. S., MCCONNELL, B. J., FEDAK, M. A. (In press). Grey seals off the east coast of Britain: distribution and movements at sea. *In: Recent Advances in Marine Mammal Science,* ed. by I. L. Boyd. Symp. zool. Soc. Lond., Oxford Univ. Press.

HIBY, A. R., DUCK, C. D., THOMPSON, D. 1992. Seal stocks in Great Britain: surveys conducted in 1990 and 1991. *NERC News,* 30-31.

LAW, R. J., JONES, B. R., BAKER, J. R., KENNEDY, S., MILNE, R., MORRIS, R. J. 1992. Trace metals in the livers of marine mammals from the Welsh Coast and the Irish Sea. *Mar. Poll. Bull., 24,* 296-304.

MORRIS, R. J., LAW, R. J., ALLCHIN, C. R., KELLY, C. A., FILEMAN, C. F. 1989. Metals and organochlorines in dolphins and porpoises of Cardigan Bay, west Wales. *Mar. Poll. Bull., 20,* 512-23.

NORTHRIDGE, S. 1988. Marine mammals and fisheries: a study of conflicts with fishing gear in British waters. A report commissioned by Wildlife Link's Seals Group. 140 pp.

REIJNDERS, P. 1986. Perspectives for studies of pollution in cetaceans. *Mar. Pol. Bull., 17,* 58-59.

TREGENZA, N. J. C. 1992. Fifty years of cetacean sightings from the Cornish coast, SW England. *Biol. Cons., 59,* 65-70.

# CONSERVING MARINE BENTHOS

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Let me first dissect the title of this presentation. By 'conserve' (or 'conservation') I mean "the regulation of human use of the global ecosystem to sustain its diversity of content indefinitely" - not my definition but from the introduction to 'Nature Conservation in Great Britain', published by NCC in 1984. In 'marine' I include all the water which is or includes an element of seawater and thus facilitates the presence of saltwater species. Thus, I include the open sea, estuaries to the limit of saltwater influence on benthos and saline lagoons where species requiring saltwater occur. Within the term 'benthos' I include the plants and animals living on and in the seabed from the splash zone of the shore downwards to the greatest depths of the ocean including sediment, rock and artificial substrata. However, I do not include saltmarshes where the vegetation is much more closely linked to terrestrial habitats. England has a coastline of about 6,000 km and Great Britain of 19,000 km. Within the territorial seas of Great Britain, the area of seabed is equivalent to about 78% of the land surface or, within the 3 mile limit of territorial seas, equivalent to about 34% of the land surface - a lot of seabed to study and understand, especially when almost all of it is out of sight in an environment hostile to man.

The marine habitats and marine life present around our coasts are extremely varied, for a European state. In England, the benthos ranges from the rich and often colourful communities including Mediterranean-Atlantic species in the south-west to the usually less diverse communities which include elements of boreal-arctic flora and fauna on the North Sea coasts. Habitats range from rocky coasts subject to severe wave exposure of the offshore islands of our western coasts to the muddy habitats of calm sheltered water of extensive rias and estuaries. The greatest variety of life is to be found in the coastal zone and it is here that the greatest influence of man occurs, particularly within enclosed water bodies such as estuaries.

Retaining that rich diversity of habitats, communities and species in the face of man's ability to (often substantially) change marine ecosystems requires both an understanding of those ecosystems and the tools to manage potentially conflicting interest. The scientific basis of marine conservation requires work on several fronts:

- identifying the key non-biological factors which determine the distribution of marine species and communities;
- describing, classifying and cataloguing the habitats and communities of species (through a classification of marine 'biotopes');
- identifying the distribution and extent of the 'resource' in terms of species and biotopes;
- identifying the natural fluctuations which occur in marine species and communities and understanding them in terms of the feeding and reproductive biology, physiology and the natural population dynamics including longevity of species; and

- identifying and, as far as possible, quantifying the effects or potential effects of man's activities on benthic habitats, communities and species.

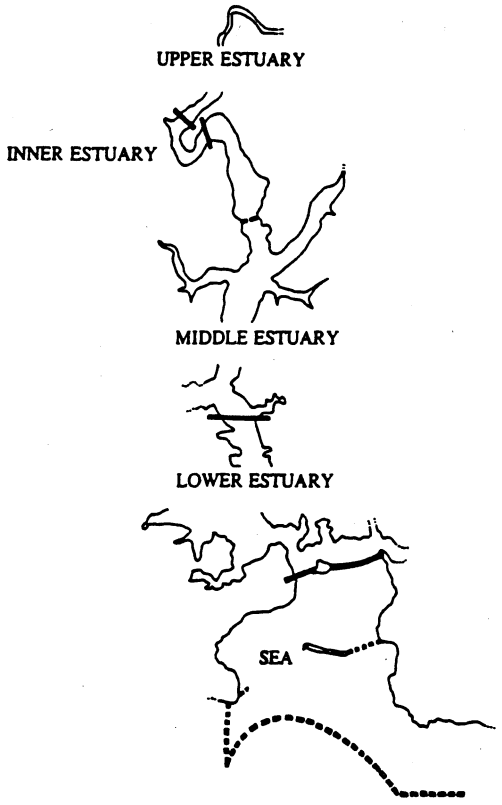
With this information, we can assess the scientific interest and nature conservation importance of particular species and locations and indicate the potential for damage through the activities of man.

The following are the most influential physical features of the marine environment for its benthos.

**Temperature** and its distribution in relation to latitude and oceanic currents determine the biogeographical distribution of species and communities. This was recognised over one hundred and fifty years ago, and the division of the NE Atlantic coast illustrated by Forbes & Goodwin-Austen in 1859 stands as largely correct today (although some of the area names have changed). Around Britain, this means a strong southern influence to the fauna in the south-west as far as the Isle of Wight but extending up the western seaboard, and a strong northern influence in the North Sea where cold winter temperatures encourage the presence of northern species.

**Salinity** is not important in the open sea areas except in some semi-enclosed areas with large estuaries entering them, for instance the east basin of the Irish Sea in Liverpool Bay. However, in estuaries or water bodies enclosed in other ways, salinity becomes an important controlling factor when it falls below about 30‰. The importance of this factor for the benthos of estuaries in Britain has recently been assessed in a paper by Laffoley and Hiscock (in press). Saline lagoons are special habitats cut off from the sea except for a narrow entrance or percolation through what otherwise is a barrier with the open sea. They have been the subject of a major review in English and published in limited circulation reports and summarised in Barnes *et al.* (1989) and analysed in Bamber *et al.* (1992).

**FIGURE 1: DISTRIBUTION OF MAJOR ESTUARINE ZONES IN THE TAMAR ESTUARY (modified from Laffoley & Hiscock (in press))**



**Wave exposure** has both direct effects on the benthos through the tolerance of species to strong water movement and indirect effects through the supply of suspended food or lack of it where little or no water movement occurs and through its effects on siltation and determination of sediment grades.

Many of the effects of **tidal streams** are similar to those of wave action except that they have little influence on seashore life and are not as destructive when strong. They bring suspended food and maintain rocks clear of silt on a continuous basis so that suspension-feeding species thrive and rich communities occur.

The **grade of sediment** present at a site and the mixture of coarse and fine material is of overwhelming importance in determining the infaunal community which develops at a site.

The particular combination of the last four major environmental factors in particular physiographic features often leads to the presence of particular community types associated with them.

Other factors or features will be important. These include the geology of a location or the presence of a thermocline in the water column, features such as caves, overhangs, underboulder habitats and grazing and man-made influences including pollution, artificial substrata and fishing. 'Water quality' - the combination of chemical elements in the water column - is important, as is the presence of frontal systems - areas where two water bodies of different physical characteristics converge.

The work of describing the character and extent of the benthic 'resource' is being undertaken by the Marine Nature Conservation Review, a project started by the Nature Conservancy Council in 1987 but drawing on work undertaken by NCC since the mid-1970s and on a much wider information base existing in the marine science literature. The MNCR now works within the Support Unit of the Joint Nature Conservation Committee. It has the following objectives:

- to extend our knowledge of benthic marine habitats, communities and species in Great Britain, particularly through the description of their characteristics, distribution and extent; and
- to identify sites and species of nature conservation importance.

The data collected will also provide information to support the more general measures required to minimise adverse effects of development and pollution on sites and species of nature conservation importance.

There are six main elements to MNCR work:

- collating and assessing existing information;
- commissioning new field surveys to fill gaps in our knowledge;
- classifying marine biotopes;
- comparative evaluation of sites;
- identifying sites of nature conservation importance and reporting.

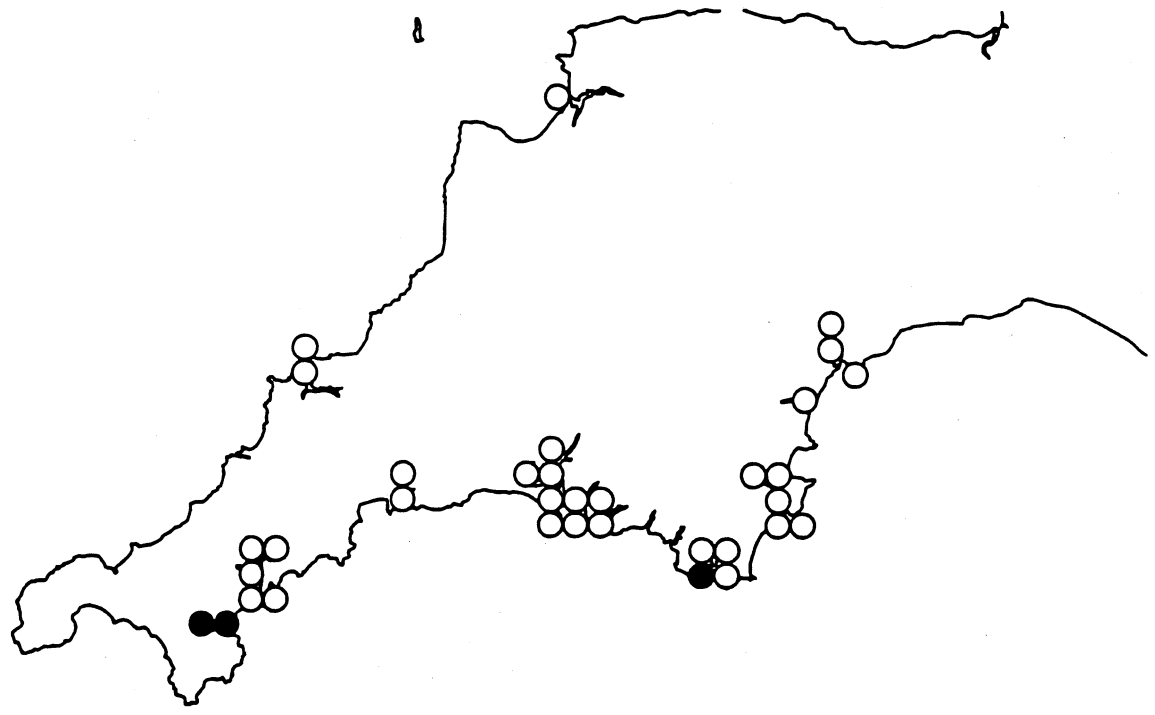
The MNCR has been primarily involved in undertaking field survey work to fill gaps in knowledge of the habitats, communities and species present around our coasts. The work of the MNCR has also

included the development of a computer database for storage, analysis and presentation of data, the development of a structure and a start on the classification of benthic marine biotopes in Great Britain, and the gathering of marine biological information on intertidal SSSIs.

To facilitate assessment of the species assemblages present at a particular location in terms of their nature conservation importance, it is important to be able to compare with similar assemblages elsewhere and to assess the extent of distribution of that particular type of assemblage. This is achieved through the classification of species assemblages into communities and, taking account of habitat, into biotopes. The EC Habitats and Species Directive relies on a similar classification - the CORINE classification - which does have a marine componant, albeit very incomplete for the NE Atlantic and unbalanced in its hierarchical composition (Anonymous 1991). The MNCR has been working towards a system for the classification of benthic marine habitats and communities since it started. We now have a standard system for identifying the distinctive habitat/species assemblage groupings in our survey areas and of displaying and storing that information. Our computer database includes a community classification module which will eventually be used to 'match' survey data to the different types, when they are properly defined. We are about one year into a three-year programme to prepare a classification of benthic marine habitats and communities for Great Britain. We are also working with colleagues in the EC to assist in developing the CORINE classification and will ensure that our classification can be matched into CORINE.

Similarly, for species of nature conservation interest, it is important to know their distribution and extent. For example, *Gracilaria foliifera* is a red alga rare in Great Britain and found only in a few sites in marine inlets in Devon and Cornwall. Of 657 sublittoral habitat records, 13 had *Gracilaria foliifera* present.

**FIGURE 2: DISTRIBUTION OF *Gracilaria foliifera* IN DEVON AND CORNWALL**

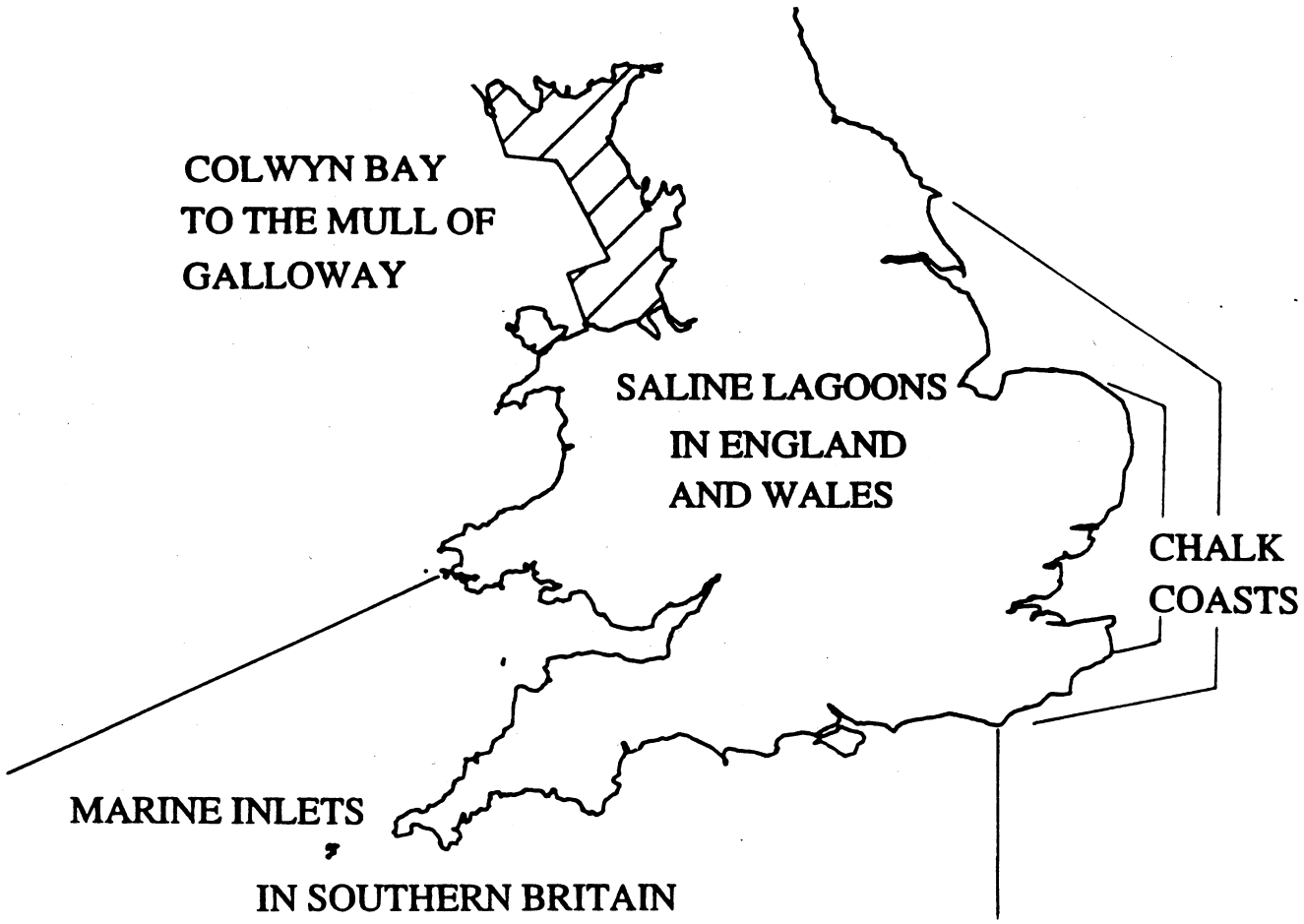


The majority of MNCR work is Phase II survey including descriptions of the abundance of carniverous species in habitats preent at locations selected for survey.

Phase I survey to describe and map the main habitat types present is an important part of assessing the extent of the nature conservation resource. For intertidal substrata this has been undertaken through the project 'Coastwatch'. Further work is being undertaken by the MNCR to develop a more detailed phase 1 habitat and community inventory system for the intertidal. For underwater areas, Phase I survey - 'Seasearch' - is being undertaken by the Marine Conservation Society for the MNCR.

Survey topics completed by us or the MNCR in England and Wales are these: Colwyn Bay to the Mull of Galloway, marine inlets in southern Britain, saline lagoons in England and Wales, and chalk coasts in eastern England.

**FIGURE 3: LOCATION OF SURVEY TOPICS COMPLETED IN ENGLAND AND WALES**



Some of the effects of man's activities are highly visible and cause and effect can be well documented. We all know of the effects of tributyl tin antifoulants on dogwhelks, and the loss of the dogwhelk from our south coast inlets is pretty obvious. What effect might TBT and other antifoulants - designed of course to kill marine life - have on benthic marine life? Several marine scientists have observed a degeneration in marine fauna, especially within our enclosed water bodies. We need to know much more. Understanding the extent to which pollution and disturbance affect benthic communities is very important if we are to manage all of our marine resources with the aim of minimising the impact of man's activities.

Understanding the biology of species is a requirement if we are to predict change and establish cause and effect where change occurs. Feeding biology, reproduction, recruitment, growth rates and longevity are all important. But our current understanding is restricted to generalities or, in detail, to favoured species such as mussels. The work undertaken to establish programmes of monitoring of habitats, communities and species of nature conservation importance started by NCC and continued by English Nature is providing valuable information on the biology of species and communities of nature conservation importance.

Obtaining an understanding of the dynamics of marine ecosystems and of the biology of species including their reproduction and physiology has been undertaken mainly by universities and research institutes, although we have learned a great deal from some monitoring studies undertaken by the statutory nature conservation agencies. Many of the existing data need to be drawn together to provide the key information required for nature conservation action. Additional work is required especially in understanding effects of environmental factors on community dynamics.

Knowledge of the effects of man's activities on marine ecosystems is drawn from work undertaken by universities and research institutes, by the regulatory agencies and by industry including that related to fisheries. A great deal of this work is related to chronic and easily visible pollution or disturbance on communities or effects of single pollutants on single species. Widespread damage may be occurring to species not being studied or through a combination of different pollutants or activities: these are poorly, if at all, understood.

The CHALLENGE of providing sound advice based on scientific knowledge is being addressed. We must use that knowledge to identify species, sites and areas for protection, to minimise adverse effects on benthos as a result of development or exploitation and to develop planning and management regimes which will favour nature conservation.

However, the work of identifying scientific interest and providing nature conservation advice based on scientific knowledge must be supported by the communication and application of that information in a way that influences those who use the marine ecosystem for waste disposal, fisheries, mariculture, recreation, transport, ports, urban development, energy etc. If that influence is assured through persuasion, legislation and action, the PROSPECTS for maintaining rich, varied and productive benthos are good.

ANONYMOUS. 1991. *CORINE Biotopes manual. Habitats of the European Community. Data specifications - Part 2.* Luxembourg, Commission of the European Communities.

BAMBER, R.N., BATTEN, S.D., SHEADER, M., & BRIDGWATER, N.D. 1992. On the ecology of brackish water lagoons in Great Britain. *Aquatic Conservation, 2,* 65-94.

BARNES, R.S.K. 1989. The coastal lagoons of Britain. An overview and conservation appraisal. *Biological Conservation, 49,* 295-313.

FORBES, E., & GOODWIN-AUSTEN, R. 1859. *The natural history of the European Seas*. London, Van Voorst.

LAFFOLEY, D., & HISCOCK, K. (In press.) The classification of benthic estuarine communities for nature conservation assessments in Great Britain. *In: Proceedings of the Estuarine and Coastal Sciences Association Conference on 'Estuarine Gradients'*, Ghent, September 1991. (To be published in the *Netherlands Journal of Aquatic Research*).

NATURE CONSERVANCY COUNCIL. 1984. *Nature conservation in Great Britain*. Peterborough.

# CONSERVATION AND MANAGEMENT OF COASTAL FISHERIES

**Stephen J Lockwood**
**Ministry of Agriculture, Fisheries & Food**
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Conwy

Historically we have always been a coastal fishing nation. Even though we like to think of ourselves as a great distant water fishing nation it was the Iberians, not the British, who established the great Arctic fisheries of the Grand Banks, Iceland and north Norway. Not until the 19th century did we begin to stray far from home shores in significant numbers. Consequently, British measures for conserving marine resources beyond our immediate horizons is a relatively new phenomenon. In contrast, various measures for restricting, managing, conserving coastal fisheries can be traced back to the middle ages.

It must be acknowledged that many, if not all the early measures were protectionist in nature, favouring one group relative to another. They were rarely aimed at safeguarding the stock or the environment. Nevertheless, any measure which seeks to restrict access to a particular ground or resource is likely to limit the total effort which might otherwise be expended on that ground or resource. Thus, 'several orders' extinguish the public right, guaranteed by *Magna Carta*, to fish a wild (bivalve) fish stock and thereby offer a measure of environmental and stock protection which might not otherwise exist. Protection which, it must be said, can benefit a wider fauna than simply the exploited species.

In a slightly different vein, the introduction of minimum landing and corresponding mesh sizes owes little to good conservation principles but a lot to the self interest of fish merchants. Flatfish nurseries are predominantly coastal, hence, unrestricted coastal fisheries caught large numbers of small fish of limited market value. To safeguard themselves against buying unsaleable small fish, the Victorian fish merchants introduced minimum sizes. To reduce the chore of sorting, the fishermen made the codend meshes of their trawls larger. ie It was the coastal fishermen who introduced the concept of minimum mesh size which now forms a fundamental part of fisheries conservation measures.

Over the past hundred years or so our approach to fisheries management has become more scientific and less overtly protectionist. Indeed, fisheries legislation, both coastal and international, requires conservation measures to be based on sound science and to be non-discriminatory, ie non-protectionist. Despite these constraints it has not prevented the further development of coastal conservation measures whose benefits extend beyond fisheries. eg The 32 bass nursery areas constrain the total fishing effort which might otherwise be exerted and thereby reduce peripheral disturbance. Similarly, restricted or closed areas such as the Southwest Mackerel Box limit effort and gears whose effects can extend beyond fisheries.

As total fishing effort has increased and become more intense it has become ever more apparent that commercial fishing can and does have impacts beyond the exploited stocks. This has been recognised in the Directorate's research programmes in the past but it is a problem which has become increasingly acute in recent years. As a possible first step toward broadening the base from which fishery management criteria may be drawn the Sea Fisheries (Wildlife Conservation) Act (1992) was passed in the dying moments of the last government. This Act should not be viewed as some global panacea. Safeguarding the broader marine environment will still require more than the mantra-like chant of "precautionary principle". A minimum of a sound, logical, if not scientific, case will still be required. In conclusion, it must be recognised that many conservation concerns can be addressed and resolved more readily by seeking a reduction in total fishing effort rather than by demanding the ban on individual methods.

# MARINE NATURE CONSERVATION IN ENGLAND: CHALLENGE AND PROSPECTS

**Earl of Cranbrook**
**Chairman, English Nature**
Northminster House
Peterborough

Today, I have listened with much interest and seen examples of the richness and variety of our coastal wildlife resource and heard views on the ways in which these should be managed. This richness and diversity includes the kelp forests of the Farne Islands or the western Channel, the rich invertebrate communities of the rocky coasts of south-west England, with their assemblages of cup corals, sea fans and sponges, and the mud and sand flats of the central North Sea, with their populations of brittle stars and bivalve molluscs, their eel grass beds and extensive intertidal areas. This marine environment supports tens of thousands of marine mammals, millions of sea birds, millions also of waders and wildfowl, and uncountable numbers of fish and other animals.

The physical and biological resources of our coastal waters not only sustain this treasury of wildlife but also represent a very large extension of the territorial area of England, for which English Nature is responsible. They contribute to landform with the attendant variety of coastal habitats, providing the first line of natural flood defences which dissipate wave energy and help protect coastal land and the lives and livelihoods of the people who live there. Our coastal waters provide harvestable resources of minerals, such as aggregates and sand, of renewables such as fish, crustaceans and molluscs, and of energy in the form of tidal power. They provide an important traditional mode of transportation by navigation (and hence the common law right that is linked to tidal waters), and nowadays they provide enjoyment and inspiration for millions of people, inhabitants of these islands and others who visit from abroad.

However, the contribution that coastal waters make to national and local economies must be managed in a sustainable manner. The effect of our exploitation of coastal waters has been substantial; the pressures on the natural resource are considerable. For example, coastal and nearshore development have required extensive coastal protection and flood defence works. In many places, these have interfered with natural sediment processes. Most treated or untreated domestic sewage and industrial effluent of the national population ultimately reaches the sea by direct discharges or through rivers, modifying coastal water chemistry and the nutrient balance. Shipping and recreational boating require shoreside quays and moorings, and port and channel dredging, and create additional disturbance and risks of oil spills. Commercial fishing with nets causes incidental catches of sea mammals and sea birds whose populations may be affected. Trawling and shellfish dredging are believed to be modifying the character of inshore benthic marine communities; the effects may be significant in terms of population balance.

It is a major challenge for society to provide for prosperity within the context of a healthy and productive natural environment. English Nature has an important role to play to help meet this challenge. I shall outline some of the current ideas that are being discussed within EN. Not all of these have been formally approved by Council but I am happy to expose them to you today in order to benefit from your views.

Our starting point is that English Nature is a creation of statute and operates within a mandate handed down by Parliament. This mandate is encompassed by our Corporate Philosophy, which sets the tone for all our work. Central is our belief that the natural heritage matters to everyone. We are supported by the knowledge that our actions are taken on behalf of society as a whole. Parliament has given us obligations and powers; in fulfilling our duties we shall work within and seek to take

full advantage of this statutory framework. Our fundamental purpose is to promote the conservation of England's wildlife and natural features - within their wider context - working both directly and through others.

Other organisations also have a general duty to take account of nature conservation in coastal waters, for example, harbour conservancies, the NRA, and now MAFF and Sea Fisheries Committees. I was glad at the end of the last Parliament to take forward a private member's Bill, now the Sea Fisheries (Wildlife Conservation) Act 1992, which has provided legislative backing to these duties for MAFF and SFCs. The Crown Estate, the main owner of the seabed, has recently published details of ways in which nature conservation is taken into account in Crown Estate operations. Furthermore, some EC Directives (eg for Bathing Waters, for the Protection of Shellfish Waters or the Conservation of Wild Birds) have set legal obligations which the nation must respect.

Domestically, the nature conservation Acts provide English Nature with special powers and obligations within territorial waters. If the organisation is to meet the expectations of Parliament and of society more widely, there are a number of things which must be done. Firstly we must make appropriate use of available conservation and regulatory mechanisms. Where deficiencies in the regulations are identified, we must advise on changes needed to remedy them. Secondly, we must work to ensure that our marine resources are used in a sustainable way. If this is to be achieved, conservation requirements must be given due weight in the decisions and actions of public authorities, and in industrial and commercial life. This means more than simply consulting English Nature and considering our views. It means incorporating the principles of sustainability into the fabric of corporate life. It means not just taking action to mitigate the extent of losses, but taking action positively to further nature conservation. Thirdly, we must provide encouragement and support to local communities and the voluntary sector. By itself, English Nature can achieve only a fraction of what is necessary. Individuals, local communities and both the public and private sectors must be encouraged to play a full part. The voluntary conservation bodies, many of whom are represented here today, have a vital role to play.

But it is one thing to know what needs to be done - achieving it is another matter. I want now to say something about the goals we in English Nature might set for ourselves - goals against which we would then expect our performance to be judged. These goals would be integrated with and augment our initiative on estuaries, already described by Malcolm Vincent (pages 15-20 above)

The cornerstone of nature conservation policy and practice in Britain remains the identification and notification of Sites of Special Scientific Interest. How can this be used in the marine environment? What role should such SSSIs play? The SSSI provisions are, under present legislation, effective in England only down to mean low water mark. So, in marine terms, their usefulness is confined to the intertidal zone. Nonetheless it is significant to note that over one third of the length of the English coastline has already been notified as SSSI. However this has usually been for reasons such as the shore-edge habitats it supports, habitats such as sand-dunes, saltmarsh and mud and sand flats, its value as feeding and roosting areas for important populations of wildfowl or waders, its value as sea bird breeding areas or its geological or landform interest. In only a small number of current sites have the marine invertebrate and seaweed communities been identified as prime reasons for selection. This is because, in-state-of-the-art terms, marine conservation is still in the basic survey and classification stage - a decade or more behind its terrestrial counterpart. The terrestrial environment has already seen the completion of major resource surveys such as the Nature Conservation Review and the Geological Conservation Review, as well as the production of guidelines to allow the selection of outstanding examples from the range of habitats.

What needs to be done in the marine field? Firstly, in collaboration with staff of the Joint Nature

Conservation Committee and colleagues in the Countryside Council for Wales and Scottish Natural Heritage, we will develop guidelines for identifying sites of SSSI quality on the basis of their communities of marine invertebrates and seaweeds. The information collected by the Marine Nature Conservation Review and the site selection criteria being developed will be invaluable in assisting in this process. Secondly, since the range of many of these communities will fall partly within existing SSSIs, we will ensure that the marine interest is recognised, and also that the advice which we give to local authorities and others about the use made of those areas takes full account of the requirements of this interest. Thirdly, where key marine communities on the shore fall outside existing SSSIs, Council will in due course consider new sites to ensure a satisfactory representation.

This process will take several years to complete. It involves not only the completion of the survey, classification and evaluation that we have heard described today, but also the complex scientific and administrative procedures of site determination and, in some cases, notification. It will require the negotiation of management prescriptions with owners and occupiers and the development of comprehensive guidance for sustainable use, guidance which needs to take account of the needs of the human community as well as the features of special interest. It will, however, represent a major step forward for marine conservation in the intertidal zone.

This leads me to the issue of effective conservation in the **sub-tidal** zone of coastal waters - a zone upon which coastal SSSIs are intimately dependent but over which EN has no statutory remit, except for the Marine Nature Reserve provisions which I shall come to in a moment. Our present state of knowledge suggests that there is at least as great an area of sea and seabed beyond low water mark which is of key importance for nature conservation as occurs intertidally. Perhaps up to half a million hectares around English coasts could fall into this category. Yet only about one percent of this is subject to a statutory conservation mechanism. This is one of the key issues for marine nature conservation which we need to resolve in the 1990s. A mechanism needs to be established to cover the most important areas with reasonable haste and thereby enable conservation needs to be taken into account. The mechanism will have to be understandable and acceptable to our partners and customers operating in the coastal maritime zone, be simple to administer and permit evaluation of its effectiveness.

Proposals to establish a system of formal but non-statutory Marine Consultation Areas in England and Wales are at present out to public consultation. This system would provide a mechanism whereby conservation advice could be given by English Nature, or the Countryside Council for Wales (depending upon the country), to public authorities and private organisations proposing to authorise or undertake any activity likely to have more than a trivial effect within a list of defined marine areas. The public authority or private organisation is then asked to give due weight to this advice in deciding whether, or how, the activity should proceed. The arrangements provide for compliance and effectiveness monitoring. Through such advice and consultation, a framework for nature conservation would be established over a substantial part of the coastal marine environment within which particularly sensitive areas could be given stricter protection, perhaps by being designated as marine nature reserves. Thus the proposals would support conservation measures taken in respect of the larger intertidal SSSIs by providing an element of protection for adjacent marine waters and help to conserve important concentrations of wide ranging sea birds and sea mammals, by exerting a measure of control over the areas they use for feeding and resting.

The consultation paper identifies 13 sites around England's coasts which could be included in the MCA system. Further sites can be added to these in the future. English Nature and the Joint Nature Conservation Committee have advised on the selection of these sites. The criteria used reflected the benefits which we see as being derived from such a system. The distribution of these 13 sites reflects the variety and richness of the marine resource. We have included Holy Island and the Farne Islands,

with their rich sub-tidal communities and their populations of sea birds and seals; the Flamborough Head area with its sub-tidal community developed on a hard chalk substrate, and its sea bird colonies; the soft-substrate communities of the Wash, Blackwater and Colne Estuaries, the Solent Harbours and Morecambe Bay, where additional protection would assist the conservation of the important wader and wildfowl concentrations; the diverse communities of various sites along the Channel coast from Seven Sisters to Poole Harbour; the varied and species rich communities of south-west rias at Salcombe and Falmouth Bay; and the exposed rocky coast and current-swept communities of the Isles of Scilly and of Lundy, with their attendant populations of seals and seabirds. In total, 300,000 hectares are encompassed within the selected areas. The concentration of sites along the Channel reflects the importance of addressing the needs of key areas under considerable pressure.

At this stage we cannot be certain just how effective a non-statutory Marine Consultation Area mechanism would be in assisting the conservation of marine wildlife, but the proposals **do** address many of the important criteria I mentioned earlier and English Nature will work hard to ensure that the MCA system, if established, will be a success. Even assuming Marine Consultation Areas are the success we hope for, there will continue to be a need for providing stricter measures of protection in certain areas, especially to conserve particularly sensitive or important wildlife communities and refugia for important breeding stocks, to provide places where research can be undertaken in a controlled environment and to foster an understanding of marine conservation.

In 1981 the Wildlife and Countryside Act enabled the establishment of Marine Nature Reserves, which can be protected by byelaws. Ten years on there is still only one English reserve, at Lundy. Even here the advantages which we hoped for have not yet been fully attained. I am the first to admit that this does not sound like a very auspicious start, but more can be done - and more will be done. We have three main aims in relation to Marine Nature Reserves. We intend to improve the value for conservation of the marine nature reserve at Lundy, in terms of effective conservation, research, and fostering an understanding of the marine environment. During the course of this year we shall be producing a management plan for the Lundy reserve, in collaboration with local community interests. The aim of the plan will be to provide for the sustainable use of the area and the conservation of its special interests, to stimulate and direct research, and to promote public appreciation of marine wildlife. We intend that this plan will provide a framework for subsequent action, and we shall ensure there is an opportunity for those interested to comment.

We also intend to pursue a programme of future MNR designations building on the work of the Marine Nature Conservation Review. This programme will be developed in full consultation with local communities, maritime interests and users of marine resources, including the voluntary sector. We shall seek to achieve their full collaboration and involvement in all parts of the process, from initial selection through to subsequent management. In this way we hope to avoid a recurrence of some of the misunderstandings and delays experienced in the past. To ensure the effectiveness of this programme, we intend to press for improvements in the manner in which statutory protection is given for Marine Nature Reserves. Much of the delay, and also the limited ultimate protection afforded to MNRs, has been due to weaknesses in the law. We shall ask for these to be rectified.

At this point I think it is appropriate to mention something which has been exercising our attention a great deal of late and which is certainly both a prospect and a challenge for the future - and that is the new EC Directive on the Conservation of Natural and Semi-natural Habitats and of Wild Fauna and Flora.

Although this Directive has a strong terrestrial focus, it will also have implications for marine conservation, for both habitat and species protection. One of the principal requirements of the Directive is for the establishment of a Community list of areas that contain important examples of

certain habitat types, or which are necessary for the survival of certain species. The appropriate Member State will then be required to take measures appropriate to the ecological requirements of those habitats and species. In particular, Member States will have to take steps to avoid the deterioration of those habitat types or the habitats of those species, and disturbance of the species for which the areas have been listed. These provisions will also apply to the Special Protection Areas designated under the existing EC Directive on the Conservation of Wild Birds. Habitats eligible for the Community list, and for the required protection, include shallow water sandbanks, estuaries, shallow inlets and bays, lagoons and reefs, as well as intertidal and coastal habitats such as mud and sandflats, saltmarshes and dune systems. The species for which such areas may be listed include the common and grey seals. The Joint Nature Conservation Committee is currently involved in work which will lead to the preparation of the national list of these areas. In England there are likely to be a significant number of these areas, which, in due course, will require the conservation measures to which I have referred.

English Nature will become heavily involved in the implementation of this Directive. This involvement will include advising on the conservation measures which need to be taken, and the legal and administrative measures. Of particular concern will be the measures needed for areas beyond low water. For example, the existing Special Protection Area for the Wash, designated under the Birds Directive includes tens of thousands of hectares for which there is presently no legal protection in fact. We will carry out our responsibilities by contributing to the site selection and designation process in intertidal areas and coastal waters and by defining appropriate management for the areas designated and supporting the implementation of that management. The full implications of the Directive for English Nature's work in the marine environment are still unclear, but they seem likely to be considerable.

SSSIs, Marine Consultation Areas, Marine Nature Reserves and EC Directive sites (whatever the means of conserving them) are matters in which English Nature will be involved on a day-to-day basis. But we can only undertake a small proportion of the work that is needed for inshore marine conservation. For much of the remainder, we will be relying on others. Our role, here, will be to encourage and support, but it will be for others to achieve the conservation benefits.

Through advice and encouragement, supplemented when ppropriate by the financial support we are able to give by way of grants, we will aim to develop systems of advice and mutual support involving other bodies statutorily charged with duties towards conservation in the marine environment, specifically, harbour conservancies, the NRA, MAFF, Sea Fisheries Committees and the Crown Estate Commissioners. We will foster improvements to the management of existing voluntary marine nature reserves, and develop their potential for education and the involvement of the public. We recognise the potential of these voluntary reserves, and the energy and enthusiasm which exists locally to manage them properly. We wish to encourage and support these initiatives, and to encourage local authorities and the voluntary sector to establish and manage further voluntary reserves. At present there are six such reserves in England; we hope to see the network expanded. Throughout, our aim will be to stimulate and support projects which will enhance the understanding of England's marine heritage and encourage the participation and enjoyment by the public of marine nature conservation. In this way we hope not only to enable the local conservation community to become fully involved in contributing to marine nature conservation but also to widen the constituency of support for, and the appreciation of, the work which is being done.

I want now to turn to the wider marine environment, the thousands of kilometres of our inshore coastline and the tens of thousands of square kilometres of our territorial waters, which will remain outside protected area designation in the foreseeable future. What are the critical needs? What should we do?

Taking the coast itself first, a major issue which has to be faced is how society is going to manage the natural dynamism of the coastline in a scenario which includes an expected rise in relative sea level as a consequence, firstly, of isostatic sinking and, secondly, of global warming. If society addresses this issue by adopting the policy of maintaining the coast in its present position, through a line of artificial structures, the effects will be interference with the coastal sediment systems, the loss of many of our natural coastal landforms and the loss of much of our intertidal habitats. English Nature recognises the imperative of safeguarding human life, but our general stance is that, where this is not at issue, it is preferable to work with nature rather than against it. To put it simply, we believe that if you conserve the natural processes - sediment supply, transfer and deposition - the coastal landforms and the habitats and species dependent upon them will look largely after themselves.

At present, English Nature is formulating its ideas, in discussion with others, on how society can best handle the conflicts of interest and aspiration that this issue will generate. During this period we look forward to a close dialogue with Departments and with the National Rivers Authority. Concurrent with this, however, we intend to set in train investigations which will help future management of the coasts within the framework of working with nature. Amongst the foremost of these will be habitat creation, particularly of habitats which are at risk or where there are particular opportunities. Saline lagoons, for example, are a threatened habitat for which there are special responsibilities under the EC Directive on Habitats and Species, to which I referred earlier. Our survey data indicate that England has over 90% of the saline lagoon habitat of Great Britain, a habitat which includes many rare and threatened species. It is a habitat which we intend to target for particular action.

But what about those tens of thousands of square kilometres of open sea space to which I referred earlier? What are we going to do about them? Foremost among the aims of this seminar is to improve the understanding of the pressures which nature conservation is facing in the inshore marine environment generally, so that we can identify the priority issues and preferred courses of action. This will show us where to encourage and support work on identifying the nature, extent and severity of marine impacts. Without this basic knowledge, the needs of the natural marine resource cannot be addressed in a strategic way. This information can be drawn on to provide advice to government and others on means of utilising the resource in ways which can be maintained and will not result in permanent loss or damage. This will enable a long-term monitoring strategy to be determined that will identify changes and trends in the natural environment. This will help to assess its general health and assist in the development of appropriate policies in the future. For example, we believe, from the work of others, that the North and Irish Seas are trawled with an intensity that is likely to have altered the nature of the benthic communities of large tracts. It can be argued that sustainable management of fisheries should involve the allocation of some more nearly pristine, sanctuary areas. If the right mix can be maintained, trawling can be accepted and indeed supported by nature conservation. If the fishing industry catches significant numbers of small cetaceans, or sea birds, to the extent that the British populations of these animals are likely to become threatened, then we have to say that the situation is not acceptable and action needs to be taken. On the information presently to hand there is reason to think this may be the case, at least for some small cetaceans. The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas, under the Bonn Convention on the conservation of migratory species, is designed to ensure that parties take effective action to control such losses. English Nature has a clear role to assist in this.

For some impacts, of course, the interests of fisheries and wildlife conservation are in accord with each other. One of these is the shared desire to keep pollution of the seas to the lowest level practicable. Pollution hits the headlines when it is visible or dramatic, for example the recent contamination of the Fal Estuary caused by minewater from Wheal Jane or the oil spills that blacken public beaches and cause heavy mortalities among sea birds. The former Nature Conservancy

Council undertook extensive research into the location of habitats and communities susceptible to oil spills and produced, in 1991, an Atlas of the coast of Great Britain which summarised this information, and also produced advice sheets for over 900 specified localities recommending action to be taken in the event of an oil or chemical spill. English Nature continues to advise the Department of Transport and local authorities. We are currently considering how we can extend the quality and scope of this advice, to raise further the level of service we provide.

Coastal waters receive inputs of contaminants from rivers and from industrial and sewage discharges. Unless they are severe, the effects of such persistent discharges are less easy to assess. Water quality objectives are expected to be set for coastal waters by 1995. Determining these objectives for wildlife will prove a major challenge - especially given the limited extent of water quality information, and of information on the relationship between water quality and natural communities in the marine environment. However, English Nature clearly has a duty to provide advice on this issue, as we do for freshwaters.

The development of a long-term monitoring strategy is also of fundamental importance. Our existing monitoring at Lundy and the Scilly Islands, for instance, has demonstrated that some small species, (for example, cup corals) are surprisingly long lived, the same individuals surviving for many years. Whole populations are thus potentially vulnerable to physical damage or disturbance.

Not only does monitoring provide information on the dynamics of natural processes and communities, it can also prove valuable in indicating anthropogenically induced changes, such as the effects of pollution or global warming. For this reason, additional monitoring effort may be appropriate for marine habitats, within the framework of the Environmental Change Network being established under the auspices of the Natural Environment Research Council.

Summing up, I envisage that English Nature will have a key role to play in addressing the challenges and improving the prospects for Marine Nature Conservation. We can do this in several ways. We can take direct action, for example in our work on SSSIs, MCAs, MNRs and the sites established under the EC Birds and Habitats Directives. Through co-operating with Government Departments and other public bodies we can help them make the right choices that will sustain our rich marine heritage. We can give advice where we see gaps or changes needed in the legislative and administrative process, to provide the mechanisms needed for effective management and regulation, and we can give the lead to local authorities and the voluntary sector to enable them to make the fullest contribution to marine conservation. And at all times we will seek ways of involving others to increase their appreciation and enjoyment of marine wildlife, and be active in stimulating the necessary research and monitoring work which is needed to underpin the taking of appropriate action within designated areas and the open sea.

English Nature will try hard to achieve these aims. If we succeed, it will be because we have been supported by the Government of the day, by other statutory bodies, responsible marine interests, local communities, learned institutions and the concerned public. We will **only** succeed if we have that support.

## LIST OF DELEGATES

| Name: | Organisation: |
|---|---|
| Ms Abbot, J.I. | University College London |
| Ms Adams, R.F. | Hydrographic Office |
| Mr Adams, R.N. | Independent |
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| Mr Amos, S.C. | Eastern Sea Fisheries |
| Ms Adnitt, C.S. | Posford Duvivier |
| Dr Ashby, K.R. | Youth Hostel Association |
| Dr Asken, C.G. | Shellfish Ass. of Great Britain |
| Mr Baker, M.P. | University College London |
| Ms Ballard, S. | Southern Science Ltd |
| Ms Barton, J.E. | Unicomarine |
| Dr Baxter, J.M. | Scottish Natural Heritage |
| Mr Beach, C.F. | Eastern Sea Fisheries |
| Mr Bell, P. | Hampshire County Planning |
| Ms Bennett, T. | Joint Nature Conservation Committee |
| Mr Berry, C. | St Abbs Voluntary Marne Nature Reserve |
| Mr Betts, S. | Kings College London |
| Ms Birchenough, L. | Ministry of Agriculture, Fisheries and Food |
| Mr Bide, P.J. | Department of the Environment |
| Ms Blyth, S.A. | University College London |
| Dr Bolt, S.R.L. | Anglian Water |
| Mr Boyling, P. | Ministry of Agriculture, Fisheries and Food |
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| Mr Burgon, J.P. | The National Trust |
| Mr Bunce, R. | Department of the Environment |
| Mr Burn, M. | Department of the Environment |
| Ms Burton, S.M. | Independent |
| Mr Buxton, R.M. | Independent |
| Mr Cassidy, N.T. | Friends of the Earth |
| Ms Chick, S. | Kings College London |
| Mr le Claire, G. | Institute of Offshore Engineering |
| Mr Cole-King, A.J. | University of Wales |
| Mr Collins, S.F. | English Nature |
| Mr Connor, D.W. | Joint Nature Conservation Committee |
| Mr Corlett, J. | Independent |
| Mr Covey, R. | Joint Nature Conservation Committee |
| Ms Cox, A.J. | University College London |
| Mr Cox, M. | Crown Estate |
| Mr Craig, N.C.D. | ICI Group |
| Cranbrook, Earl of | English Nature/Marine Forum |
| Ms Davies, H. | Irish Sea Forum |
| Mr Davies, J. | Joint Nature Conservation Committee |
| Dr Davies, J.M. | Scottish Office Agriculture and Fisheries Department |
| Dr Davies, L.M. | Energy Technology Support Unit |
| Mr Davies, P. | Crown Estate Commission |
| Dr Doody, P. | Joint Nature Conservation Committee |

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| Ms Duncan, K. | English Nature |
| Dr Dyer, M.F. | Unicomarine |
| Dr Earll, R. | Marine Conservation Society |
| Ms Eastwood, S.M. | King's College |
| Ms Edwards, J.M. | Devon Wildlife Trust |
| Mr Emblow, C.S. | Joint Nature Conservation Committee |
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| Dr Eno, N.C. | Joint Nature Conservation Committee |
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| Mr Fox, R.J. | University College London |
| Mr Fulton, S.G. | Scottish Office Environment Department |
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| Ms Heeps, C. | Bournemouth Polytechnic |
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| Dr Howard, S. | Metocean |
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| Mr James, D.L. | Independent |
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| Mr Kirby, M. | Countryside Commission |
| Dr Laffoley, D. | English Nature |
| Ms Lake, E.A. | British Gas plc. |
| Dr Langslow, D.R. | English Nature |
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